APERO Documentation

Version 0.8.001

Neil Cook

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Chapter 1

Latest version: 0.8.001

APERO is a pipeline designed to reduce astrophysical observations (specifically from echelle spectrographs). It is the official pipeline for:

- SPIROU (SPectropolarimeter InfraROUge) on the Canada-France-Hawaii Telescope CFHT.

APERO Publications:

- APERO: A PipelinE to Reduce Observations – Demonstration with SPIRou

APERO can also be used for:

- NIRPS HE (Currently under construction)
- NIRPS HA (Currently under construction)

Chapter 2

Overview

2.1 General User documentation

This section provides a general guide to using APERO.

2.1.1 Installation

Once you have installed APERO you can read about running APERO *here*.

Note: A Guide for installing python can be found *here*

2.1.1.1 Download from GitHub

Change to your desired installation directory (from now on this is referred to as *DRS_ROOT*) e.g. `/home/user/bin/apero-drs/`

Clone

Clone from github

```
git clone https://github.com/njcuk9999/apero-drs
```

This may take some time (in future most of the data required will be a separate download), and we still have many (now redundant) files from the spirou_py3 repository.

Choose branch

Change to the *{DRS_ROOT}* directory

Choose which branch:

- **master version**
    This is the version currently recommended for all general use. It may not contain the most up-to-date features until long term support and stability can be verified.
    Change to this branch with

```
git checkout master
git pull origin master
```

- **developer version**

  Note the developer version should have been tested and semi-stable but not ready for full sets of processing and definitely not for release for non-developers or for data put on archives. Some changes may not be in this version that are in the working version.
  Change to this branch with

  ```
  git checkout developer
  git pull origin developer
  ```

- **working version**

  Note the working version will be the most up-to-date version but has not been tested for stability - use at own risk.
  Change to this branch with

  ```
  git checkout working
  git pull origin working
  ```

2.1.1.2 Prerequisites

APERO is coded using python 3

Currently we recommend python 3.9 (however 3.7 and 3.8 are supported).

Please do not use python 2 with APERO.

Please use the requirements file to install the exact required modules i.e. from the git hub directory

```
pip install -r requirements_current.txt
```

Note: Some developer tools require additional modules. Please use the requirements_developer.txt for these (This can be done at any time after the installation process to use the tools).

Warning: Please make sure you are in the correct environment (especially if using conda). If using conda it is worth doing a *which pip* to make sure your pip is installing the python modules to the correct environment (and not, for example, your base or system environment).

2.1.1.3 Setup

Possible pre-installation step

When doing a full reduction it may be useful to have a static raw directory (e.g. if a raw directory has files coming in from observations / synced to other servers).

For a static full reduction it is preferable not to add new raw files during processing (i.e. it requires time to update database, templates could need to change with new observations etc)

For this reason a script *copyraw.py* exists i.e.

```
python setup/copyraw.py --indir /path/to/full/raw/dir --outdir /path/to/new/symlink/
↪dir --do_symlink
```

By default it create symlinks but these can be turned off and hard copies can be created with the following:

```
python setup/copyraw.py --indir /path/to/full/raw/dir --outdir /path/to/new/symlink/
↪dir --do_copy
```

Run the installation script

Change to the *{DRS_ROOT}* directory

Run the installation script

```
python setup/install.py --name={PROFILE}
```

where {*PROFILE*} is a short descriptive name for a setup (you can have multiple profiles with one installation)

e.g.

```
python setup/install.py --name=setup_njc_200903
```

Step-by-step guide

Follow the step-by-step guide:

- A: User configuration path
  This is the path where your configuration will be saved. If it doesn't exist you will be prompted to create it. (This will be referred to as *DRS_UCONFIG* from now on (default is `/home/user/apero/`*PROFILE*)
- B: Instrument settings
  Install *INSTRUMENT*. If yes it will install the instrument if not then it will not install the instrument. Currently only SPIRou is supported
- C: Set up paths
  The first question will ask whether to set up paths individually. If *[Y]es* it will allow you to set each path separately (i.e. for raw, tmp, reduced, calibDB etc). If *[N]o* you will just set one path and all folders (raw, tmp, reduced, calibDB etc)) will be created under this directory.
- D: Setting the directory/directories
  Will prompt you to enter the directory path/paths (will ask you for each if you answered that paths be set up individually in step C above.
- E: Clean install
  If you type [Y]es you will be prompted (later) to reset the directories this means any previous data in these directories will be removed. Note you can always say later to individual cases.

Warning: Resetting a directory will remove all files/sub-directories from within these folders

---

Note: A to E will repeat for all installable instruments (To step up just one use the *–instrument* argument

---

2.1.1.4 Activating the APERO profile

To activate an apero profile you need to source the *{DRS_UCONGIG}/{PROFILE}.{SYSTEM}*.setup script.

Details of this should be in green at the end of the installation process

i.e. for bash:

```
source {DRS_UCONFIG}/{PROFILE}.bash.setup
```

i.e. for tcsh/csh/sh

```
source {DRS_UCONFIG}/{PROFILE}.sh.setup
```

---

e.g. with bash and our example profile above:

```
source {DRS_UCONFIG}/{PROFILE}.sh.setup
```

We strongly recommend setting up a alias for this

i.e. for bash (i.e. in ~/.bashrc ~/.profile or ~/.bash_aliases):

```
alias {PROFILE}="source {DRS_UCONFIG}/{PROFILE}.bash.setup"
```

i.e. for tcsh/csh/sh (i.e. in ~/.tcshrc, ~/.cshrc etc)

```
alias {PROFILE} "source {DRS_UCONFIG}/{PROFILE}.sh.setup"
```

Note: This must be done every time one wishes to use APERO (and must be done after one activates the conda environment

conda activate apero-env

One could add these both to automatically happen in a ~/.bashrc but we recommend activating each time.

Following on from typing this command you should see a splash screen validating the installation and letting you know everything is good to run APERO recipes and tools.

For details about the splash screen click here.

2.1.1.5 Updating from github

1. Choose a branch (as in *Choose branch*)
2. Update the branch (pull from github)

```
git pull origin {branch}
```

3. Make sure you are in an APERO profile

```
source {DRS_UCONFIG}/{PROFILE}/setup.bash.setup
```

or if you have it aliased

```
{PROFILE}
```

e.g.

```
source /home/user/apero/setup_njc_200903/setup.bash.setup
```

or if you have it aliased

```
setup_njc_200903
```

4. Update using the installation script

```
python setup/install.py --update
```

This will use all current settings and update the

2.1.2 Using APERO

The user scripts to reduce data are referred to as 'recipes'.

From a coding point of view this due to the fact that they literally list the steps (where each step is a function or set of functions).

By design recipes are kept to a bare minimum of code and all heavy functionality is done in the functions that are called in the recipes.

Currently supported instruments are:

- SPIRou (See the section on recipes *here*)

There are two ways to use APERO:

1. Using recipes individually
2. Using the processing script to automatically generate batches of recipe runs (based on provided run files)

both of these require installation (see *here*) and activating a profile (see the next section *here*)

2.1.2.1 Activating the APERO profile

To activate an apero profile you need to source the *{DRS_UCONGIG}/{PROFILE}.{SYSTEM}*.setup script.

Details of this should be in green at the end of the installation process

i.e. for bash:

```
source {DRS_UCONFIG}/{PROFILE}.bash.setup
```

i.e. for tcsh/csh/sh

```
source {DRS_UCONFIG}/{PROFILE}.sh.setup
```

e.g. with bash and our example profile above:

```
source {DRS_UCONFIG}/{PROFILE}.sh.setup
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i.e. for bash (i.e. in ~/.bashrc ~/.profile or ~/.bash_aliases):

```
alias {PROFILE}="source {DRS_UCONFIG}/{PROFILE}.bash.setup"
```

i.e. for tcsh/csh/sh (i.e. in ~/.tcshrc, ~/.cshrc etc)

```
alias {PROFILE} "source {DRS_UCONFIG}/{PROFILE}.sh.setup"
```

Note: This must be done every time one wishes to use APERO (and must be done after one activates the conda environment

conda activate apero-env

One could add these both to automatically happen in a ~/.bashrc but we recommend activating each time.

Following on from typing this command you should see a splash screen validating the installation and letting you know everything is good to run APERO recipes and tools.

2.1.2.2 Running recipes indvidiually

One can simply run a recipe by using python or the command line. For details on individual recipes please check the recipe definitions for a specific instrument (e.g. for SPIROU click *here*).

2.1.2.3 Using the processing script

The processing script is the recommended way to run the reduction.

Details of how to use the processing script can be found *here*.

2.1.3 Known Issues

Currently known issues and problems with APERO. Last updated: 2020-07-24 (NJC).

2.1.3.1 Recipes

Long term:

- Weird residuals left in order_profile after dark_flat (loc)
- Calibrations switch over at different points from PM to AM calibrations (should really only use "older")

Concerns:

- CFHT trigger not using apero_processing.py –> will soon be incompatable (re: merging calibrations)
- CFHT trigger not using pid to get output filenames –> checksum (will soon be incompatable)

2.1.3.2 External

Long term:

- can't use barycorrpy in parallel –> update astropy (version 4.1) and barycorrpy (version >0.3.1))

2.1.4 TODO

This is the currently list of items that need to still be completed. Last updated: 2020-11-30 (NJC).

Note: bullet points are not ordered

2.1.4.1 APERO

For all instruments / in general.

Current known Issues/ small immediate tasks:

- 0.6.132 log.fits flat get A,B,C,AB,A,B,C entries (PLOTDIR different)?? not seen in 0.7
- need to check databases exist when resseting tmp/red etc - may not exist and then crashes [Neil]
- need to deal with installing mysql-connector-python and sqlalchemy [Neil]
- processing - need to id polar files (distinguish from spectro files) [Neil/Chris]
- **file outputs - need to check all files [Neil]**
  - primary header only - other headers should be minimal [Neil]
  - no image / table in primary extension (affects reading/writing) [Neil]
- EA pre-processing code for cosmics [Etienne/Neil]
- review comsic extraction code changes by EA [Etienne/Neil]
- raw index should check last modified and update if new

High priority:

- polar code update [Neil/Eder/Chris]

Medium priority:

- add NIPRS changes to 0.7 branch
- DRS tests [Charles + Thomas]

Low priority:

- bisector for CCF (new extension in CCF outputs?) [Etienne/Neil]
- proper SNR calculation [Etienne/???]
- test barycorrpy against pyasl and other BERV calculators (precision) [Thomas?]
- apero_processing.py work with CANFAR [Neil/Chris + CANFAR collab]
- CCF masks from SpT/Teff (after masks are more mature) [Etienne/Neil]
- instead of copying assets download them (clean up github) [Neil]
- add doc strings/typing to all functions, descriptions to all constants, review all constant min/max/dtypes [Neil]
- apero_langdb.py - integrate with error/warning finding (tools.module.error.find_error.py)
- go through all summary plots and decide which plots, write figure captions, improve plots, write quality control description, decide which header keys to print [Charles/Thomas]
- write documentation [Neil/Etienne/Charles/Thomas]
    - code to write constants/keywords
    - write doc strings
    - autodoc with sphinx once doc strings are in
    - assign people to write constant descriptions
    - add authors to constants
- write paper [Neil/Etienne]

Coding only tasks:

- deal with all python warnings [Neil]
- display func for all functions [Neil]
- add more debug printouts [Neil]
- code to find unused functions/constants [Neil]
- setup instrument tool [Neil/Thomas/Charles]
- Windows compatibility [Neil]

Later:

- persistence correction [Olivia/Etienne/Neil]
- add EA mask generation from templates [???]
- add EA template matching [???]
- uncertainty propagation [???]
- co-production of e2ds and e2dsff still needed? [???]

2.1.4.2 SPIRou specific

High priority:

- EA masks from templates [???]

Low priority:

- finish *obj_spec_spirou* and *obj_pol_spirou* (Do not use them now) [Neil]

2.1.4.3 NIRPS specific

High priority:

- convert/adapt cal_wave / cal_wave_master [Etienne/Neil]
- push 0.6 code to 0.7 [Neil]
- **cut at Y=2880 norders=46**
  - problem with localisation (coefficient consistency) [Etienne/Neil]

Low priority:

- convert obj_mk_tellu (should just be a direct convert) [Etienne/Neil]
- convert obj_fit_tellu (should just be a direct convert) [Etienne/Neil]
- convert obj_mk_template (should just be a direct convert) [Etienne/Neil]
- convert cal_ccf (should just be a direct convert) [Etienne/Neil]

Later:

- T.B.D.

2.1.4.4 APERO utils and analysis

This is a list of tasks mainly from here Last updated: 2020-11-25 (NJC).

High priority:

- object alias gaia/2mass list [Thomas]
- Preprocessing Recipe test 1 [Charles/Thomas]
- Dark Master recipe test 1 [Charles/Thomas]
- Bad Pixel Corretion Recipe test 1 [Charles/Thomas]
- Localisation Recipe test 1 [Charles/Thomas]
- Shape Master Recipe test 1 [Charles/Thomas]
- Shape (per night) Recipe test 1 [Charles/Thomas]
- Flat/Blaze Correction test 1 [Charles/Thomas]
- Thermal Correction Recipe test 1 [Charles/Thomas]
- Master leak correction Recipe test 1 [Charles/Thomas]
- Master wavelength solution Recipe test 1 [Charles/Thomas]
- Nightly wavelength solution Recipe test 1 [Charles/Thomas]
- Extraction Recipe test 1 [Charles/Thomas]
- Extraction Recipe test 2 [Charles/Thomas]
- Leak correction Recipe test 1 [Charles/Thomas]
- Make Telluric Recipe test 1 [Charles/Thomas]
- Fit Telluric Recipe test 1 [Charles/Thomas]
- Make Template Recipe test 1 [Charles/Thomas]
- CCF Recipe test 1 [Charles/Thomas]

Lower priority:

- Check consistency of README/documentation/wiki for recipes
- BERV comparison
- Telluric templates
- PCA Components
- Timing stats
- Summary plot review / update (html/interactive)

2.1.5 APERO in depth

2.1.5.1 The base module

The base module contains very basic functionality and is kept at a bare minimum, in general sub-modules and scripts in here cannot use other APERO functionality (hence the less functionality in here the better).

2.1.5.2 The core module

This is where the core functionality is stored. In general all core functionality should be instrument independent, however there is a separate sub-module specifically for instrument dependent code (and default settings).

2.1.5.3 The io module

This is the input/output module. In general these should not use any functionality from APERO and instead are modules that have independent pieces of code or use other python modules related to the input and output of files (reading, writing etc.).

2.1.5.4 The language module

This module has all the functionality referring to the language database (except the database itself which is a base module). The language functionality refers to the use of the print codes and relating them to a specific language - i.e. no user text should be written into the codes instead should be referred to via codes to text in the langauge database.

2.1.5.5 The plotting module

All plotting functionality should be located in here and called from any recipe when required. In theory no plotting code should be located elsewhere in APERO.

2.1.5.6 The Recipe module

This is where the recipes for each instrument are stored.

2.1.5.7 The science module

The science module contains all functionality related to astrophysics algorithms. It is divided into sub-modules as follows: calibration functionality ("calib"), extraction functionality ("extract"), polarimetry functionality ("polar"), pre-processing functionality ("preprocessing"), atmospheric correction functionality ("telluric") and radial velocity functionality ("velocity").

Preprocessing functionality

Calibrating pre-processed files

TODO: Fill in this section with details of apero.science.calib.general.calibrate_ppfile

Check fp files

TODO: Fill in this section with details of apero.science.calib.general.check_fp_files and apero.science.calib.general.check_fp

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Preprocessing functionality

Raw file header fixing

The header fixes are controlled via `apero.core.core.drs_file.fix_header()` which in turn uses the *Pseudo-Const* method `HEADER_FIXES()`. This is defined for each instrument (e.g. `apero.core.instruments.spirou.pseduo_const.HEADER_FIXES()`)

For SPIRou the current header fixes are as follows:

- clean object name (via `apero.core.instruments.spirou.pseduo_const.clean_obj_name()`)
- get target type (via `apero.core.instruments.spirou.pseduo_const.get_trg_type()`)
- get mid observation time (via `apero.core.instruments.spirou.pseduo_const.get_mid_obs_time()`)
- get the raw data type (via `apero.core.instruments.spirou.pseduo_const.get_dprtype()`)

Raw file identification

This takes a given input file and checks it against the instrument *file-definitions*. The *file-definitions* give all the criteria by which an input file can be matched as a specific drs file type.

This is done via `apero.science.preprocessing.identification.drs_infile_id()` which in turn calls `apero.core.core.drs_file.id_drs_file()` and returns a tuple - whether the file was found in the instruments definition and the drs file type (*DrsInputFile* instance)

Gaia ID and object finding

We assume the header either has a Gaia ID column (defined by the *KW_ GAIA_ ID* keyword) or a valid object name (defined by the *KW_ OBJECTNAME* keyword).

We then attempt to resolve parameters in the following order

1. **If *OBJ_ LIST_ RESOLVE_ FROM_ DATABASE* From a local database**
   a. based on Gaia ID
   b. if Gaia ID is not found based on object name (from a list of aliases)
2. If *OBJ_ LIST_ RESOLVE_ FROM_ COORDS* and if object was not found in local database but we have a Gaia ID then we get the Gaia parameters from the online Gaia catalog - if an object if found the local database is updated.
3. If *OBJ_ LIST_ RESOLVE_ FROM_ GLIST* and if we did not have a Gaia id we then use a google sheet of known objects to match object names and Gaia ids (we can also add extra aliases here). If a Gaia ID/object name combination is found we then cross-match against the online Gaia catalog to get the Gaia parameters and again update the local database.
4. If *OBJ_ LIST_ RESOLVE_ FROM_ COORDS* is True we then use the coordinates from the file header to cross-match with Gaia directly and again the local database is updated.
5. If the Gaia id is still unknown we default to the astrophysical parameters in the header.

Note that the local object database should be updated before doing a full reprocessing and updating at any other time (other than adding new objects as above) may lead to inconsistent data sets.

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2.1.5.8 The tools module

This is where the tools are stored - their recipes and the sub-module functionality to use them.

2.1.6 User tools

This section describes all the default user tools to use with APERO.
For information on how to run these user tools (either individually or with the processing tools) see *here*.

2.1.6.1 apero_astrometric

1. Description

SHORTNAME: ASTROM

The apero astrometrics recipe allows one to add an object or a set of objects to the astrometrics database (pending list) - to allow APERO to get the best possible coordinates, proper motions and parallax as possible.

The online database can be viewed here. (but not edited).

The first thing that is checked is whether the object (or one of its aliases) exists in the database. If it does the code skips this objects.

Note: An object can be forced to be updated with the –overwrite command. This is only recommended if an object currently in the astrometric database is deemed to be suspicious.

Once an object has been found not to be present currently in the database the user is asked whether they with to add the object to the database.

The apero astrometrics recipe then cross-matches the name against SIMBAD, and tries to update the astrometrics with the best possible proper motions (see section 1.1 below) it then produces a print out to the screen similar to the following:

```
=================================================
    {CLEAN_OBJ_NAME} [{ORIGINAL_OBJ_NAME}]
 =================================================
    Aliases:
         - {ALIASES}


    RA:    {RA}                ({COORD_SOURCE})
    DEC:   {DEC}               ({COORD_SOURCE})
    PMRA:  {PMRA} mas/yr       ({PM_SOURCE})
    PMDE:  {PMDE} mas/yr       ({PM_SOURCE})
    PLX:   {PLX} mas           ({PLX_SOURCE})
    RV:    {RV} km/s           ({RV_SOURCE})
    SPT:   {SPT}               ({SPT_SOURCE})
    EPOCH: {EPOCH}
    Jmag: {JMAG}
    Hmag: {HMAG}
    Kmag: {KMAG}
 =================================================
```

where:

- "CLEAN_OBJ_NAME" is a cleaned version of the name (capitalized, white spaces and puntucation removed) used throughout APERO.
- "ORIGINAL_OBJ_NAME" is the name input by the user

- "ALIASES" are SIMBAD (or otherwise) other names that should and can be used for this target (any with cleaned versions of these will use the "CLEAN_OBJ_NAME" throughout APERO.
- "RA"/"DEC" and the "COORD_SOURCE" are the Right ascension, declination and where they come from. .. note:: "COORD_SOURCE" should match "PM_SOURCE" (see section 1.1 below)
- "PMRA/PMDE" and the "PM_SOURCE" are the proper motions and where they come from .. note:: "COORD_SOURCE" should match "PM_SOURCE" (see section 1.1 below)

- "RV" and "RV_SOURCE" are the radial velocity and where it comes from – if available (normally a bib code reference)
- "SPT" and "SPT_SOURCE" are the spectral type and source – if available (normally a bib code reference)
- EPOCH is the JD time of the coordinates and proper motion (see section 1.1 below)
- "Jmag", "Hmag" and "Kmag" are the J/H and K magnitudes from SIMBAD

Warning: You must must check these parameters carefully as this will define these parameters will define this observation throughout APERO. The must describe the astrophysical object for which you are naming. If they are not correct DO NOT add this object.

1.1 SIMBAD, coordinates and proper motions

Crossmatching an object name with SIMBAD is a great way to find the correct astrophysical object against a list of aliases and a large database of coordinates, motions and distances. However the coordinates given by SIMBAD are at 2000.0 but the proper motions are not. Therefore we only use SIMBAD to get a list of aliases for a certain astrophysical object and check against a few proper motion catalogues (matching to the ID from SIMBAD) to get coordinates that match the proper motion epoch.

For example:

Gl699 has the following aliases (from SIMBAD):

- BD+04 3561a
- AC2000 146626
- ASCC 1153178
- CCDM J17578+0441A
- Ci 20 1069
- CSI+04-17554
- CSV 7737
- 1E 1755.3+0438
- GAT 12
- GCRV 10392
- GEN# +0.00403561
- G 140-24
- GJ 699
- GSC 00425-00184
- GSC 00425-02502
- HIC 87937
- HIP 87937
- IRAS 17553+0438
- JP11 18
- Karmn J17578+046
- LFT 1385
- LHS 57
- LSPM J1757+0441
- LTT 15309
- 2MASS J17574849+0441405
- MCC 799
- NAME Barnard's star
- NAME Barnard Star
- NLTT 45718

- NSV 9910
- 8pc 549.01
- PLX 4098
- PLX 4098.00
- PM J17578+0441N
- StKM 2-1355
- TIC 325554331
- TYC 425-2502-1
- UBV 15269
- UCAC2 33428712
- UCAC4 474-068224
- USNO-B1.0 0946-00315199
- USNO 347
- USNO 876
- uvby98 000403561
- V* V2500 Oph
- VVO 6
- WEB 14849
- WISEA J175747.94+044323.8
- Zkh 269
- [RHG95] 2849
- Gaia EDR3 4472832130942575872
- Gaia DR2 4472832130942575872

From this we find Gaia EDR3, Gaia DR2, UAC4 and HIP ids. We then cross match against these proper motion catalogues and obtain coordinates (ra and dec) that match the same epoch (i.e. for Gaia DR2 2015.5). We only match enough catalogues to provide one set of none-null coordaintes and proper motions.

Currently the order of priority with proper motion catalogues is as follows:

- Gaia EDR3
- Gaia DR2
- UCAC4
- HIP

If an astrophysical object does not have an alias in any of these catalogues we return a warning and skip this target.

Once all targets have been matched (or skipped) the online database is updated (in the pending list) waiting the verification of administrators.

Note: that if a astrophyiscal object is in the pending list but not in the main list it will be used in APERO by default (assuming users allow updates from the database). If an astrophyiscal object is both in the main and pending lists, the pending list entry will NOT be used. The main list will be updated at specific times deemed by the administrators (to minimize inconsistencies between large redictions whereby changing a targets astrometrics could induce differences between unreduced and already reduced observations).

1.2 APERO naming convenions

APERO will remove spaces (replace with an underscore) APERO will remove "-" and replace with an "M" APERO will remove "+" and replace with a "P" APERO will force upper case

This means some objects will have poor names or names that are seen as unique when they should not be i.e.

- WASP-107b –> WASPM107B
- WASP107b –> WASP107B
- WASP 107b –> WASP_107B
- WASP107B –> WASP107B

Therefore during the astrometrics code you have the oppotunity to

---

a. define the name apero will use (any white space, "-", "+" and punctuation will be removed as above)

b. add to the aliases (add as many combinations as you feel is necessary to describe the target) i.e. add both WASP 107 and WASP107 and WASP-107

Do not use b, c, d for planets - name by the star, multiple-star-systems use A,B,C,D

Note: we do not change the raw file headers so all original object names will be preserved (i.e. with SPIRou "OBJNAME" and "OBJECT" are preserved)

---

2. Schematic

No schematic set

3. Usage

```
apero_astrometric.py {objects}[STRING] {options}
```

```
{objects}[STRING] // [STRING] A list of object names to check, find and/or add to the online␣
→database. Should be comma separated without white spaces
```

4. Optional Arguments

```
--overwrite // Do not check if object is currently in database. Overwrite old value.
--getteff // Attempt to get Teff from header value. Requires a raw file of this object and␣
→the index database to be up-to-date
--nopmrequired // Do not require proper motion (not recommended)
--test // Run in test mode (do not add to database)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
```

```
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.2 apero_explorer

1. Description

SHORTNAME: EXPLO

The apero_explorer recipe is designed as a graphical user interface (GUI) between the user and the various databases that APERO uses. The script downloads a static copy of the SQL database, changes are not updated or saved in real time (but can be updated/saved by selecting the correct menu options).

Tables within the database currently accessible with the explorer are:

- calib: The calibration database
- tellu: The telluric database
- index: The file index database
- log: The logger database
- object: The object astrometric database
- lang: The text and language database

The GUI allows the user to:

- **Do File operations:**
    - Open a pickle file to replace the current database
    - Import a csv file to replace the current database
    - Save a pickle file of the current database
    - Export a csv file of the current database
- **Edit the current database**

  – Find and replace a string with another value
  – Filter rows by a certain criteria
  – Add rows and columns
- •**Table operations**
  – refresh the current database (with updates since launching the GUI)
  – Save changes for the current database to the main database
  – Clean strings
  – Remove formatting
  – Get some information of the table formatting

Note: No changes will be saved unless you use the "Table>Save to Database" option

---

Note: We do not recommend changing any of the database entries without good reason and without talking to the developers

---

In addition to the GUI explorer, apero_explorer can be run in "flag mode".

This recipes both the –recipe and –flagnum arguments to be used.

```
apero_explorer.py --recipe=PP --flagnum=21
```

Gives the binary flags for "preprocessing" (shortname: PP) when the decimal representation of the flags is set to a value of (21)

The output for apero_explorer is then as follows:

```
Flag mode: PP[21]
recipe = apero_preprocess_spirou.py
  IN_PARALLEL         : True
  RUNNING             : False
  ENDED               : True
  OBJ                 : False
  QCPASSED            : True
```

Showing that the flag number 21 (binary 10101) corresponds to these flags being true or false.

Note the flags are specific to a specific recipe and thus the –recipe argument must be used.

2. Schematic

No schematic set

3. Usage

```
apero_explorer.py {options}
```

No optional arguments

---

4. Optional Arguments

```
--hash // Display all hash columns (hidden by default)
--recipe[STRING] // [STRING] Recipe or shortname for recipe (must be used in combination with␣
↪flagnum)
--flagnum[INT] // [INTEGER] Instead of running explorer converts a binary flagg to a set of␣
↪binary flags for a recipe (must be used in combination with recipe)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.3 apero_get

1. Description

SHORTNAME: GET

The apero_get recipe is a quick and efficient way of copying (or linking to) data from the main data directories of apero.

apero_get allow the user to select a specific file or files based on:

- object name: (using the –objnames argument), this select only files with the given object name (Can use the * to get all objects in separate directories)
- output file type: (using the –outtypes argument), this selects only files with the given output (see file definitions, i.e. *file definitions for SPIROU*) (the name column) for the specific values for each file
- data types (using the –dprtypes argument), this similarly to output file type relates to the input file type (see pre-processing file definitions, i.e. *file definitions for SPIROU*) (the HDR[DPRTYPE] column) for the specific values for each file
- fibers - the fibers to use (i.e. for spirou some combination of AB, A, B, C)

The user can also set the output directory where files should be copied to and whether the copied files are just symlinks or full copies of the data.

Note: We recommend running with –test the first time this is used to make sure you have the files you want (and check whether all the options worked)

The apero_get recipe also allows quick copying of the full raw data set (or symlinks) this is useful when doing a full reduction and wanting a consistent dataset (where a normal raw directory may be getting new files every day)

```
apero_get.py --raw --symlink --outpath /home/test/apero-files/raw/
```

1.1 Some examples

- Example 1: Copy all extracted 2D spectra, telluric corrected 2D spectra and telluric reconstructed absorption files for fiber AB for Gl699 to /home/test/apero-files/

```
apero_get.py --outtypes EXT_E2DS_FF,TELLU_OBJ,TELLU_RECON --fibers=AB --outpath=/
↪home/test/apero-files/ --objnames=Gl699
```

- Example 2: Copy all extracted (non-telluric corrected) 1D spectra files of WASP-127 to /home/test/apero-files/

```
apero_get.py --outtype EXT_S1D_W,EXT_S1D_V,SC1D_W_FILE,SC1D_V_FILE --
↪objnames=WASP-127 --outpath=/home/test/files/
```

- Example 3: Copy all telluric corrected 2D spectra fibers AB, A and B for targets Gl699, Trappist-1 and AuMic to /home/test/apero-files/

```
apero_get.py --outtypes TELLU_OBJ --fibers=AB,A,B --outpath=/home/test/apero-
↪files/ --objnames=Gl699,Trappist-1,AuMic
```

- Example 4: Copy all extracted 2D spectra for fiber AB of DPRTYPE=DARK_DARK_SKY (Sky files) to /home/test/apero-files/

```
apero_get.py --outtypes EXT_E2DS_FF --fibers=AB --outpath=/home/test/apero-files/
↪ --dprtypes=DARK_DARK_SKY
```

- Example 5: Copy all extracted 2D spectra for fibers AB and C of DPRTYPE=FP_FP (FP calibration files) to /home/test/apero-files/

```
apero_get.py --outtypes EXT_E2DS_FF --fibers=AB,C --outpath=/home/test/apero-
↪files/ --dprtypes=FP_FP
```

- **Example 6: Copy all science observations for extracted 2D spectra.**
  Note SPIROU does not use OBJ_SKY and NIRPS does not use POL_FP,POL_DARK but this command covers both instruments. Warning this may copy a LOT of objects. Run with –test first!

```
apero_get.py --objnames=* --outtypes=EXT_E2DS_FF --outpath=/spirou/cook/test --
↪dprtypes=OBJ_FP,OBJ_DARK,OBJ_SKY,POLAR_FP,POL_DARK
```

- Example 7: Copy all telluric corrected 2D spectra for fibers A and B for many objects to /home/test/apero-files/

```
apero_get.py --outtypes TELLU_OBJ --fibers=A,B --outpath=/home/test/apero-files/␣
↪--objnames=EXLUP,V830TAU,BDP23_2063B,HD_96064_BC,G_272M127,J23453034P4104001,
↪ROSS_1050,ROSS_477,TOI1759,G_75M55,TWA25,GL846,HD_207966B,J00372598P5133072,
↪J23181789P4617214,TYC_4384M1735M1,V2247OPH,2MASSJ11021804P1630333,BDP04_4988,
↪BDP08_4887,GJ494,GL270,GL338B,GL536,GL212,GL410,HD_263175B,NLTT46858,OTSER,
↪BDP05_3409,GL412A,GL514,GJ3305,GJ1026A,LP_831M68,HD_154363B,HD_31867B,
↪NLTT45473,GL205,GL686,GL880,WOLF_209,GL378,J20412815P5725473,DHTAUB,DOTAU,
↪TWA13A,TWA13B,AUMIC,G_114M10,NLTT36190,HD_31412B,HD_46375B,LP_733M99,GJ3470,G_
↪145M11,G_230M31,18_PUP_B,G_270M12,GJ3192A,HD_164595B,HD_50281B,L_657M32,
↪NLTT39578,SIGCRBC,JH_223,GL411,XZTAU,GL15A,GL382,TWA7,V347AUR,HD_213519B,WOLF_
↪1450,GL752A,G_270M164,G_28M21,GL687,GL48,GL617B,GJ1026B,ROSS_555,G_106M36,
↪GL317,GL362,GL725B,GL849,GL876,HD_4271B,NLTT44569,NLTT45430,UCAC4_538M053123,V_
↪CW_UMA,G240M52,GJ1105,GJ4333,GL15B,GL480,HD_6660B,PM_J08402P3127,G_275M2,
↪J04510138P3127238,TYC_3980M1081M1,CEBOO,GL251,GL436,GL581,GL725A,PM_
↪J09553M2715,EPIC_248131102,GJ768_1B,TOI732,EV_LAC,G_102M4,G_232M62,NLTT35712,
↪GJ1148,GJ3378,GL169_1A,GL445,LP_128M32,NLTT40692,GJ4338,NLTT37349,GJ1103,
↪GJ1214,GJ1256,GJ1289,GJ490B,GJ669B,GL166C,K2_25,GJ1151,GJ1154,GJ4274,GJ493_1,
↪GJ4063,GL408,GL699,UCAC3_226M217434,GJ3789,HD_183870B,GL905,LP_071M082,PM_
↪J18482P0741,GJ1286,GJ1002,G_139M12,GJ4071,PM_J21463P3813,20_LMI_B,GL412B,
```
(continues on next page)

```
↪GJ3622,GJ1111,1RXSJ173353_5P165515,GJ1245B,TRAPPIST1,J1835379P325954,TVLM_
↪513M46
```

- Example 8: For LBL copy these files (or change the objnames as appropriate)

```
apero_get.py --outpath /space/spirou/obj_fullv07254 --outtypes TELLU_OBJ,TELLU_
↪PCLEAN,TELLU_RECON,TELLU_TEMP_S1D,TELLU_TEMP,EXT_E2DS_FF --objnames GJ4071,
↪GJ4338,DHTAUB,GL686,K2_25,18_PUP_B,1RXSJ173353_5P165515,20_LMI_B,42_PEG,51_PEG,
↪55CNCB,72_OPH,AUMIC,BDP04_4988,BDP05_3409,BDP08_4887,BDP23_2063B,BPTAU,CITAU,
↪DGTAU,DOTAU,2MASS_J04372171P2651014,EV_LAC,EXLUP,FUORI,G240M52,GJ1002,GJ1012,
↪GJ1026A,GJ1026B,GJ1103,GJ1105,GJ1111,GJ1148,GJ1151,GJ1154,GJ1214,GJ1245B,
↪GJ1256,GJ1286,GJ1289,GJ3192A,GJ3305,GJ3378,GJ3470,GJ3622,GJ3789,GJ4063,GJ4274,
↪GJ4333,GJ490B,GJ493_1,GJ494,GJ669B,GJ768_1B,GL15A,GL15B,GL166C,GL169_1A,GL205,
↪GL212,GL251,GL270,GL317,GL338B,GL362,GL378,GL382,GL388,GL406,GL408,GL410,GL411,
↪GL412A,GL412B,GL436,GL445,GL447,GL48,GL480,GL514,GL536,GL581,GL617B,GL687,
↪GL699,GL725A,GL725B,GL752A,GL846,GL849,GL876,GL880,GL905,GMAUR,GQLUP,G_102M4,G_
↪106M36,G_114M10,G_145M11,G_230M31,G_232M62,G_270M12,G_270M164,G_272M127,G_
↪275M2,G_28M21,G_75M55,HATP11,HD_189733,HD_133112,HD_154363B,HD_164595B,HD_
↪183870B,HD_185603,HD_207966B,HD_213519B,HD_263175B,HD_31412B,HD_31867B,HD_
↪4271B,HD_46375B,HD_50281B,HD_6660B,HD_96064_BC,J00372598P5133072,
↪J04510138P3127238,J20412815P5725473,J23181789P4617214,J23453034P4104001,JH_223,
↪K2_33,LKCA4,LP_071M082,LP_128M32,LP_733M99,LP_831M68,L_657M32,NLTT35712,
↪NLTT36190,NLTT37349,NLTT39578,NLTT40692,NLTT44569,NLTT45430,NLTT45473,
↪NLTT46858,PM_J08402P3127,PM_J09553M2715,PM_J18482P0741,PM_J21463P3813,ROSS_
↪1050,ROSS_477,ROSS_555,RULUP,RYLUP,RYTAU,SIGCRBC,TAUBOO,TOI1728,TOI1759,
↪TOI2136,TOI732,TOI1452,TOI1695,TOI442,TOI736,TRAPPIST1,TVLM_513M46,TWA13A,
↪TWA13B,TWA25,TWA7,TW_HYA,TYC_3980M1081M1,TYC_3154M921M1,TYC_4384M1735M1,UCAC3_
↪226M217434,UCAC4_538M053123,V1298TAU,V2129OPH,V2247OPH,V347AUR,V410TAU,V830TAU,
↪WASP127,WASP69,WASP80,WASP11,WASP52,WASP12,WOLF_1450,WOLF_209,XZTAU,TOI727,
↪TOI4860,SKY,WASP33,BDM11_2741,UCAC2_44133324,WASP39

apero_get.py --outpath /space/spirou/obj_fullv07254 --dprtypes FP_FP --outtypes␣
↪EXT_E2DS_FF
```

2. Schematic

No schematic set

3. Usage

```
apero_get.py {options}
```

No optional arguments

4. Optional Arguments

```
--gui // Use a gui to filter files (Currently not ready)
--objnames[STRING] // The object names separated by a comma. Use '' for objects with␣
↪whitespaces i.e 'obj1,obj2,obj 3'
--dprtypes[STRING] // The DPRTYPES to use (multiple dprtypes combined with OR logic) separate␣
↪dprtypes with commas. Leaving blank will not use DPRTYPE to filter files.
--outtypes[STRING] // The drs output file types to use (multiple output type combined  with␣
↪OR logic) separate output types with commas. Leaving blank will not use output type to␣
↪filter files.
--fibers[STRING] // The fibres to use (multiple output type combined  with OR logic) separate␣
↪fibers with commas. Leaving blank will not use fiber to filter files.
--outpath[STRING] // This is the directory where copied files will be placed. Must be a valid␣
↪path and must have permission be able to write.
--symlinks // Create symlinks to the file instead of copying
--test // Does not copy files - prints copy as a debug test. Recommended for first time use.
--failedqc // Include files that failed QC. Highly unrecommended.
--since[STRING] // Only get files processed since a certain date YYYY-MM-DD hh:mm:ss
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.4 apero_go

1. Description

SHORTNAME: GO

apero_go is used to to find current paths set by current profile.

The paths are set via the user_config.py files (in the *DRS_ UCONFIG* directory).

Available paths (reffered to *block_ kind*) are: raw, tmp, red, calib, tellu, out, assets, plot, run and log.

2. Schematic

No schematic set

3. Usage

```
apero_go.py {options}
```

No optional arguments

4. Optional Arguments

```
--data // Find the current data directory
--all // Display all relevant paths
--setup // Display DRS_UCONFIG path
--rawdir // Find the current raw data directory
--tmpdir // Find the current tmp data directory
--reddir // Find the current red data directory
--calibdir // Find the current calib data directory
--telludir // Find the current tellu data directory
--outdir // Find the current out data directory
--assetsdir // Find the current asset data directory
```

```
--plotdir // Find the current plot data directory
--rundir // Find the current run data directory
--logdir // Find the current msg data directory
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.5 apero_listing

1. Description

SHORTNAME: LIST

The apero_listing recipe re-builds the index database. It has various ways of doing this:

- *observation-directory* (using the –obs_dir argument) to select one observation-directory
- *block_kind* (using the –block_kind argument) to select either "raw", "tmp" or "red" data directory
- excluding observation directories: these directories will be ignored (multiple observation-directories should be comma separated)
- including observation directories: these directories will be included and everything else ignored (multiple observation-directories should be comma separated)

2. Schematic

No schematic set

3. Usage

```
apero_listing.py {options}
```

No optional arguments

4. Optional Arguments

```
--obs_dir[STRING] // LISTING_HELP_OBS_DIR
--block_kind[raw,tmp,red,out] // [STRING] The kind of indexs to rebuild (i.e. raw, tmp or␣
↪reduced)
--exclude_obs_dirs[STRING] // PROCESS_EXCLUDE_OBS_DIRS_HELP
--include_obs_dirs[STRING] // PROCESS_INCLUDE_OBS_DIRS_HELP
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.6 apero_precheck

1. Description

SHORTNAME: PRECHECK

The precheck recipe allows the user to check the current raw data stored in the *DRS_DATA_RAW* directory. These checks are split into two parts a file check and a object check. The checks are based on a supplied *run-ini-file* which controls which recipes are and are not being used for a specific apero_processing run.

The file checks are as follows:

1. The number of calibrations in each *observation-directory* and whether this meets the minimum number of calibrations required for the sequence defined in the *run-ini-file*. A list of observation-directories that will cause problems due to missing calibrations is printed during the precheck recipe run.

Note: Note if the observation-directory is sorted by observation night this will correctly flag if there are nights without calibrations within +/- the required time frame (controlled by MAX_CALIB_DTIME) but will not be able to assess whether calibrations pass quality control during processing.

---

2. The number of science and telluric files found (note if the run-in-file has *USE_ENGINEERING = False* any observation-directory without science files will be ignored by the apero_processing recipe. The list of engineering observation-directories is also printed during the precheck recipe run.

The object check is done as follows:

1. The object database is checked for all valid entries (and any ignore entries)
2. All unique object names in raw files are checked against the object database object names (and associated aliases of each object name)
3. Any object name not in the current database and not in the current ignore list are printed for the user to decide whether object must be added to the database or left to use the header values

---

Note: Objects are only required in the database for accurate BERV calculations, as such only objects required precision radial velocity must be in the database, however we recommend all objects be added.

---

2. Schematic

No schematic set

---

3. Usage

```
apero_precheck.py {runfile}[STRING] {options}
```

```
{runfile}[STRING] // [STRING] The run file to use in reprocessing
```

4. Optional Arguments

```
--obs_dir[STRING] // PROCESS_OBS_DIR_HELP
--exclude_obs_dirs[STRING] // PROCESS_EXCLUDE_OBS_DIRS_HELP
--include_obs_dirs[STRING] // PROCESS_INCLUDE_OBS_DIRS_HELP
--no_file_check // Dont check the number of files on disk and dont flag these errors
--no_obj_check // Dont check object database with current set of raw files and dont flag␣
↪these errors
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.7 apero_processing

1. Description

SHORTNAME: PROC

The processing script is the recommended way to run the reduction. It takes a *run-ini-file* which contains parameters specific to the users needs for that processing session. Based on these run-ini-file parameters and the raw data (stored in the *DRS_DATA_RAW* directory) a set of recipes or a recipe-sequences will determine which recipes are run for which raw files.

The run-ini-files are an important part of the processing script and have many options to control the processing run.

Note: Some of the following arguments can also be added to the command-line or python function call (see section 4)

Options are:
- RUN_NAME: the name of the run
- SEND_EMAIL: whether to send an email on start/finish
- EMAIL_ADDRESS: the email address to send an email to
- RUN_OBS_DIR: Whether to limit processing to a single *observation-directory*
- EXCLUDE_OBS_DIRS: Whether to ignore certain observation-directories
- INCLUDE_OBS_DIRS: Whether to limit processing to a set of observation-directories
- PI_NAMES: Whether to limit processing to a single or list of PI_NAMES (must match the header key *KW_PI_NAME*)
- MASTER_OBS_DIR: The *observation-directory* to use as the master

    ---
    Note: this should not be changed in general but does require calibrations from this night to be present in the raw directory.

    > **Warning:**   Currently we do not support multiple master_obs_dir and a full reduction should never mix different master observation-directories

---

- **CORES: The number of cores to use**

> **Warning:**   This should always be at least N-1 less than the total number of cores available

- STOP_AT_EXCEPTION: The processing code will not continue past an error and will stop
- **TEST_RUN: Runs the processing script without running any recipes**

> **Note:**   This is highly recommended, please check that you are reducing the expected data before running without TEST_RUN = False

- **USE_ENGINEERING: If True engineering observation-directories (those without science observation).**

> **Note:**   In general we do not recommend to reduce these nights as they may reduce the quality of reduced data

- TRIGGER_RUN: For use in online reductions only
- USE_REJECTLIST: If True checks that odometer code aren't already flagged as bad files
- **RECAL_TEMPLATES: If True recalculates the templates that are already present.**

> **Warning:**   This should only be done when re-reducing all data for a single object. Recalculating the template for only new observations will greatly affect RV precision and we do not recommend doing any time series analysis with a varying template.

> **Note:**   A template hash key is available in the header of files that have used a template. If unsure check that the template hash matches for all observations.

- **UPDATE_OBJ_DATABASE: If True the locally stored object database is updated from online.**

> **Warning:**   Do not do this unless you are re-reducing all the data. If the object database has updated parameters this could affect RV precision (as the BERV calculation may change).

- **RUN_XXX: For each recipe (or recipe in a sequence) there is a *shortname* associated with it. A user can** turn on and off recipes within a sequence without having to create a new sequence. i.e. setting *RUN_PP = False* will turn of the *PP* recipe (apero_preprocessing) all recipe-runs in an apero_processing run will be skipped.
- **SKIP_XXX: Similar to RUN_XXX there is a *shortname* that can be skipped, if and only if the recipe-run can be** found in the logging database (i.e. all required arguments are identical) and it has successfully completed in a previous apero_processing run, or when run individually
- **TELLURIC_TARGETS: A filter for certain recipes that use hot star observations to only use certain hot star object names** (and thus only use certain observations). The default value is "All" which uses all telluric objects in a pre-configured list of telluric object.
- **SCIENCE_TARGETS: A filter for certain recipes that use science observations. Using this a user can only reduced data** for a single object name or a list of object names (separated by a comma). For example if one sets *SCIENCE_TARGETS=Gl699* and had *RUN_EXTOBJ=True* only extractions of Gl699 would be reduced

The very last piece of information required is the sequences (or individual recipe runs) that are required. The should be numbered id00000, id00001, id00002 etc and should only contain an individual recipe run (with all correct arguments) or a sequence name. For sequence names see the sequences page for an instrument (e.g. for spirou click *here*).

2. Schematic

No schematic set

3. Usage

```
apero_processing.py {runfile}[STRING] {options}
```

```
{runfile}[STRING] // [STRING] The run file to use in reprocessing
```

4. Optional Arguments

```
--obs_dir[STRING] // PROCESS_OBS_DIR_HELP
--filename[STRING] // [STRING] The 'filename' to reprocess (default is None for all files)
--exclude_obs_dirs[STRING] // PROCESS_EXCLUDE_OBS_DIRS_HELP
--include_obs_dirs[STRING] // PROCESS_INCLUDE_OBS_DIRS_HELP
--cores[STRING] // [INTEGER] Number of cores to use in processing
--test[True,False,1,0,None] // [BOOLEAN] If True does not process any files just prints an
↪output of what recipes would be run
--trigger[True/False] // [BOOLEAN] If True activates trigger mode (i.e. will stop processing
↪at the first point we do not find required files). Note one must define --night in trigger
↪mode
--science_targets[STRING] // [STRING] A list of object names to process as science targets
↪(if unsets default to the run.in file) must be separated by a comma and surrounded with
↪speech-marks i.e. 'target1,target2,target3'
--telluric_targets[STRING] // [STRING] A list of object names to process as telluric targets
↪(if unsets default to the run.in file) must be separated by a commas and surrounded with
↪speech-marks i.e. 'target1,target2,target3'
--update_objdb[STRING] // Update the object database - only recommended if doing a full
↪reprocess with all data.
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb
```

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```
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.8 apero_reset

1. Description

SHORTNAME: RESET

The apero_reset recipe resets all (or some) of the data directories defined by the user

> **Warning:** Be very careful using this recipe, you can delete a lot of data very quickly There is no backup generated once apero_reset has been run.

For a normal run no arguments are required.

The reset recipe will guide you through all the data directories that can be reset and ask whether you want to reset the directores. You must type "yes" to reset a directory.

If an directory is already empty it will be skipped.

The data directories that can be reset are as follows:

1. Assets directory
   This resets the *DRS_DATA_ASSETS* directory (removes all files, and all databases)
2. Tmp directory
   This resets the *DRS_DATA_WORKING* directory (removes all files) and the index database with
   block_kind = "tmp"

---

3. Reduced directory

This resets the *DRS_DATA_REDUC* directory (removes all files) and the index database with *block_kind* = "red"

4. Calibration directory

This resets the *DRS_CALIB_DB* directory (removes all files and copies in default ones) and resets the calibration database to its default state

5. Telluric directory

This resets the *DRS_TELLU_DB* directory (removes all files and copies in default ones) and resets the telluric database to its default state

6. Log directory

This reset the *DRS_DATA_MSG* directory (removes all files) and resets the log database.

Note: After this is done, SKIP_XXX in the run-ini-files does not skip files even if they are still on disk

---

7. Run directory

This resets the *DRS_DATA_RUN* directory (removes all files and copies in all default ones)

8. Out directory

This resets the *DRS_DATA_OUT* directory (removes all files) and the index database with *block_kind* = "out"

Note: You can use the *–warn=False* argument to avoid having to type "yes". *–warn=False* will reset everything without any warning (not recommended)

---

2. Schematic

No schematic set

3. Usage

```
apero_reset.py {options}
```

No optional arguments

4. Optional Arguments

```
--log[True/False] // [BOOLEAN] If True logs the reset else is quite
--warn[True/False] // [BOOLEAN] If True asks for user to type 'YES' before each reset
--database_timeout[INT] // [INTEGER] Set the database timeout number of tries
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
```

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```
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.9 apero_stats

1. Description

SHORTNAME: STAT

The apero stats file is usually run during or after a apero_processing run.

There are three modes:

- timing mode: (using –mode=timing)
- quality control mode: (using –mode=qc)
- error mode: (using –mode=error)

If the *–plog* argument is used (with the absolute path to a apero log file group) then only the stats for that apero_processing run are used

1.1 Timing mode

This mode takes all the recipe-runs in the logger database (at this point in time) and measures various timing stats for each recipe.

Warning: timing mode has to read and sort all log entries. This can take quite some time to get the stats of a full run of data

---

Note: The –plog argument is not used for timing mode

The stats are printed per recipe (named by the *shortname*) and are as follows:

- Mean time: the mean time for recipes of this shortname +/- the standard deviation
- Median time: the median time for recipes of this shortname +/- the standard deviation
- The range in times (minimum and maximum) for recipes of this shortname
- The number of runs (*Nruns*) of this recipe attempted
- **The total time recipes of this shortname were running (end of last recipe run minus start of first recipe run)**

    Note: The total time is only correct if all recipes of this shortname were run without interruption with no other recipe runs between - this is the standard apero_processing approach but may not be true if analysing multiple log entries
    ---

- The total cpu time the recipe of this shortname were running (the duration) note if all recipes of this shortname ran in a single block this should be the time taken if done on a single core
- efficiency *(total cpu time)/(total time)*, perfect efficiency would give a value equal to the number of cores used (however a perfect efficiency is impossible)

    Note: If *Nruns* is less than the number of cores the total cpu time and total time should be the same and the efficiency should tend towards (or be exactly 1).

As well as the stats, after all stats have printed a histogram of each recipe with over 10 recipe-runs is plotted. This shows this distribution of timings for each shortname.

1.2 Quality control mode ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^6

This mode takes all the recipe-runs in the logger database and prints statistics on the quality control recorded in each recipe (if present).

Warning: quality control mode has to read and sort all log entries. This can take quite some time to get the stats of a full run of data

---

Note: The –plog argument is not used for timing mode

The stats are printed per recipe (named by the *shortname*) and are as follows:

- The number passed compared to the number that finished in total
- The number failed compared to the number that finished in total
- The Mean/Median/Max/Min and criteria of failure for each quality control
- The number that were still "running" when this report was made (should be zero if not apero_processing is running)

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- The number that ended successfully (i.e. did not encouter an error or exception - handled or otherwise)

As well as this for each shortname that has quality control a plot is produced. This plot should show N+1 panels, where N is the number of quality control criteria. The top panel shows the global pass/fail/ended statistics (taking into account all quality control criteria). The other panels show (if numeric) a value of the quality control criteria measured for each recipe run with that shortname as a function of observation date (from header key *KW_MID_OBS_TIME*). These values should be in blue and in red (as a dashed line) compared to a logic threshold (i.e. points above or below, depending on the criteria fail or pass).

This process is repeated for each shortname and graphs and or stats are shown if quality control criteria are available and numeric.

1.3 Error mode

The error mode takes all errors caught during apero_processing runs. Using the –plog argument one can select just a single apero_processing run.

Note: the only log files that should be used as an argument to –plog are in the *DRS_DATA_MSG* directory, specifically *./tool/other/APEROL-PID-{PID}-apero_processing.log* files (there should be one of these log files for each time apero_processing was run) where *PID* is the unique PID for that apero_processing run.

The error mode groups all found errors into files based on the apero error codes given (i.e. EXX-XXX-XXXXX) and also groups any errors that do not have an apero error code (unexpected exceptions) by the last line of text of that exception (generally these are the same for the same exception).

Statistic of these are printed to the screen and a directory is added to the *DRS_DATA_MSG/report/APEROL-PID-{PID}_apero_processing/* directory.

Files are saved as the error code: E_XX_XXX_XXXXX.log or if they were unexpected exceptions with a E_UNHANDLE_YYYYY.log where YYYYY increases from 0 up to the maximum number of unique unexpected execptions.

Each of these error log files contains all errors that match

```
#================================================
# {i} / {total}
# RUNSTRING = program.py {arguments} {options}
#================================================

ERROR MSG LINE 1
ERROR MSG LINE 2
...
ERROR MSG LINE N
```

Where i is the nth error of this type, total is the total number of errors of this type

2. Schematic

No schematic set

---

3. Usage

```
apero_stats.py {options}
```

No optional arguments

4. Optional Arguments

```
--mode[STRING] // [STRING] Stats mode. Any combination of the following (separated by a comma,
↪ no white spaces). For all use all. For timing statistics use "timing". For quality control␣
↪statistics use "qc". For error statistics use "error". For memory statistics use "memory".␣
↪For file index use findex.  I.e. --mode=qc,memory  runs the qc and memory stats.
--plog[STRING] // [STRING] Specify a certain log file (full path)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--sql[STRING] // [STRING] Specify a SQL WHERE clause to narrow the stats
--limit[INT] // Limit the number of entries in memory plot (any recipe with more than this␣
↪limit is left out of stats)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

```
STATS_TIMING_PLOT
STAT_QC_RECIPE_PLOT
STAT_RAM_PLOT
```

9. Summary plots

No summary plots.

2.1.6.10 apero_trigger

1. Description

SHORTNAME: TRIGGER

The apero trigger runs continuiously and tries to accurately reduces night data.

It requires a master night to be processed BEFORE starting.

How it works

It works as follows:

- copies files from a "live directory" into a sym-linked directory (the live directory is defined be –indir, the sym-lined directory is the raw directory defined in installation – i.e. DRS_DATA_RAW)
- **tries to figure out what has been done previously**
    - this is done in two steps
    - **first step: calibrations**
        * it uses the log database and the *trigger_ night_ calibrun.ini* file to work out (per obs_dir) whether at least one of each recipe has been run (it counts QC failures as done)
        * if all steps are not complete it runs *apero processing* with the *trigger_ night_ calibrun.ini* run.ini file with the standard skips in *apero_ processing*
        * apero_processing will stop if a recipe finds no runs (this is only true in *TRIG-GER_ RUN=True* mode
    - **second step: science**
        * this step is only done once all calibrations are deemed to be completed
        * it uses the log database, index database and the *trigger_ night_ scirun.ini* file to work out whether all recipes with science DPRTYPES have been run (per obs_dir)
        * if there aren't the same number of raw science files as recipe runs (in the log database) it will attempt to re-run *apero processing* with the *trigger_ night_ scirun.ini* run.ini file with the standard skips in *apero_ processing*
        * apero_processing will stop if a recipe finds no runs (this is only true in *TRIG-GER_ RUN=True* mode

Caveats

- results may not be optimal - we recommended running all nights together in an offline manner (after having all nights) for optimal results, for example:
    - calibrations may be sub-optimal (missing/using wrong night etc)
    - telluric correction may not be using all hot stars
    - templates may be sub-optimal
    - polar recipes cannot be produced online
- A master night must be run before running *apero_ trigger.py*
- Adding files for older nights after newer nights could result in unwanted behaviour (especially when it comes to calibrations)
- Removing files may result in new calibrations being generated with less calibrations than before (apero_processing skip only works with the same number of files) and apero will use the most recently reduced calibration
- Once calibrations are finished for a night remove/adding calibration files will not re-trigger the calibration sequence (unless –reset is used)
- All obs_dir and files in the –indir will be processed, use –ignore to remove certain obs_dirs from the obs_dirs list

2. Schematic

No schematic set

3. Usage

```
apero_trigger.py {options}
```

No optional arguments

4. Optional Arguments

```
--indir[STRING] // [STRING] The input directory to scan for new data. (This is not the apero␣
↪defined raw directory)
--reset // Reset the trigger (default is False and thus we use cached files to speed up␣
↪trigger). This means after nights are marked done (calib/sci) they will not be reprocessed.␣
↪Thus --reset to avoid this.
--ignore[STRING] // [STRING] Ignore certain obs_dir (observation directories) by default all␣
↪directories in --indir are reduced. Using ignore will ignore certain directories and not␣
↪add them to the the sym-linked (DRS_DATA_RAW) directory.
--wait[1>INT>3600] // [INTEGER] Number of second to wait between processing runs. Should not␣
↪be too low (below 10s its too fast) unless testing, or too high (above 3600s)
--calib[STRING] // [STRING] The run.ini file to use for calibration trigger run
--sci[STRING] // [STRING] The run.ini file to use for science trigger run
--trigger_test // Active test mode (does not run recipes)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.11 apero_validate

1. Description

SHORTNAME: VALID

The validation recipe confirms that the configuration settings entered during the installation process (or updated manually in the files afterwards) are correct to at least setup APERO.

As part of the validation recipe constants are print to the screen, similarly to when any recipe-run is started.

startup splash

The configuration values printed are as follows:

- The Instrument, *PID* and current version of APERO
- *DRS_DATA_RAW*: the raw directory
- *DRS_DATA_REDUC*: the reduced data directory
- *DRS_DATA_WORKING*: the preprocessed data directory
- *DRS_CALIB_DB*:
- *DRS_TELLU_DB*:
- *DRS_DATA_ASSETS*:
- *DRS_DATA_MSG*:
- *DRS_DATA_RUN*:
- *DRS_DATA_PLOT*:
- DRS_CONFIG: a list of places parameters and constants are taken from (ordered in decending priority
- DATABASE: The database type (MYSQL or SQLITE3)
- DATABASE-CALIB: the address of the calibration database table
- DATABASE-TELLU: the address of the telluric database table
- DATABASE-INDEX: the address of the index database table
- DATABASE-LOG: the address of the log database table
- DATABASE-OBJECT: the address of the object database table
- DATABASE-LANG: the address of the language database table
- *DRS_PRINT_LEVEL*: the standard output (console) level of logging
- *DRS_LOG_LEVEL*: the log file level of logging
- *DRS_PLOT*: the plotting mode (0, 1 or 2)

The splash screen should look similar to this:

2. Schematic

No schematic set

3. Usage

```
apero_validate.py {options}
```

No optional arguments

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
```

```
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

2.1.6.12 apero_visu

1. Description

SHORTNAME: VISU

No description set

2. Schematic

No schematic set

3. Usage

```
apero_visu.py {options}
```

No optional arguments

4. Optional Arguments

```
--mode[e2ds] // [STRING] Which type of graph to plot
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

For instrument specific guide see:

- *SPIROU*
- *NIRPS HA*
- *NIRPS HE*

Chapter 3

Instrument documentation

3.1 SPIRou documentation

SPIRou is a near-infrared (0.98-2.5um) spectro-polarimeter that saw first light at the Canada France Hawaii telescope in April 2018. SPIRou was designed to have spectral resolving power better than 70,000 and achieve a radial-velocity stability better than 1 mps (i.e. precision radial velocity, pRV). The detector is a H4RG-15 HgCdTe array (Manufacturer specifications can be found [here](http://www.teledyne-si.com/products-and-services/imaging-sensors/hawaii-4rg)) with 4096x4096 pixels, with 4 of these pixels at the top, bottom, left and right reserved as reference pixels; they are not light-sensitive and used only for common-mode readout noise rejection. Two science fibers (hereafter fibers A and B or when combined AB) are fed from the Cassegrain unit where light either comes from the telescope or from the calibration unit. The Cassegrain module also has Fresnel rhombs coupled to a Wollaston prism allowing the incoming beam to be split in to two orthogonally polarised beams. As well as the two science fibers, the fiber link also includes a calibration (or reference) fiber (hereafter fiber C). This fiber is connected directly to the calibration unit, providing light from various calibration lamps

- a Flat field exposure (via a halogen lamp), referred to hereafter as a FLAT
- a Uranium Neon Hollow Cathode for arc spectra referred to hereafter as an HC
- a Fabry-Perot etalon with tens of thousands of lines referred to hereafter as an FP

as well as providing an option for an unilluminated dark signal, hereafter referred to as a DARK. All three fibers are passed through a slicer (to increase the spectral resolution for a given fiber size) leading to four closely packed slices per fiber.

The spectrograph itself is cross-dispersed in the perpendicular direction using an R2 echelle grating, this allows the H4RG detector to capture the entire spectral range of SPIRou on the detector with no wavelength gaps but does lead to curved echelle orders with some overlap in wavelength between consecutive orders. For SPIRou we extract 49 orders with each order spread along the 4088 pixels (grating diffraction orders #79 to #31).

The SPIRou detector control software reads the detector continuously every 5.57s and produces a 2D image (4096x4096) constructed from the linear fit of the pixel value versus time (as well as a slope, intercept, error and number of frames used for quality checks). This is the raw 2D `ramp' image used by APERO as an initial input. This software is not provided as part of APERO (but the raw cubes are stored for future use). The `ramp' images are supplied by CFHT (via [CADC](https://www.cadc-ccda.hia-iha.nrc-cnrc.gc.ca/en/)) and are thus referred to as the raw images for input into APERO.

This section can only currently be viewed in the html documentation.

3.1.1 Detailed documentation

3.1.1.1 Sequences (SPIROU)

This section describes all the SPIROU recipe sequences to use with APERO. For information on individual recipes see here.

pp_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 1: Recipes

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE
1	apero_preprocess_spirou.py	PP	pre	No

pp_seq_opt

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 2: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	FILTERS	ARGS
1	apero_preprocess_s]	PP_CAL	pre-cal	No	KW_OBJNAME: CALIB	
2	apero_preprocess_s]	PP_SCI	pre-sci	No	KW_OBJNAME: SCIENCE_TARGETS	
3	apero_preprocess_s]	PP_TEL	pre-tel	No	KW_OBJNAME: TELLURIC_TARGETS	
4	apero_preprocess_s]	PP_HC1]	pre-hchc	No	–	{files}=[RAW_HCONE_HCONE]
5	apero_preprocess_s]	PP_FPF]	pre-fpfp	No	–	{files}=[RAW_FP_FP]
6	apero_preprocess_s]	PP_FF	pre-ff	No	–	{files}=[RAW_FLAT_FLAT]
7	apero_preprocess_s]	PP_DFP	pre-dfp	No	–	{files}=[RAW_DARK_FP]
8	apero_preprocess_s]	PP_FPD	pre-fpd	No	–	{files}=[RAW_FP_DARK]
9	apero_preprocess_s]	PP_SKY	pre-sky	No	–	{files}=[RAW_DARK_DARK_SK
10	apero_preprocess_s]	PP_LFC	pre-lfc	No	–	{files}=[RAW_LFC_LFC]
11	apero_preprocess_s]	PP_LFC]	pre-lfcfp	No	–	{files}=[RAW_LFC_FP]
12	apero_preprocess_s]	PP_FPL]	pre-fplfc	No	–	{files}=[RAW_FP_LFC]
13	apero_preprocess_s]	PP_EVE	pre	No	–	{files}=[DRS_RAW]

full_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_preprocess_spirou.py	PP	pre-all	No	–	–
2	apero_dark_ref_spirou.py	DARKREF	calib-reference	Yes	–	–
3	apero_badpix_spirou.py	BADREF	calib-reference	Yes	–	–
4	apero_loc_spirou.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
5	apero_loc_spirou.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
6	apero_shape_ref_spirou.py	SHAPEREF	calib-reference	Yes	–	–

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
7	apero_shape_spirou.py	SHAPELREF	calib-reference	Yes	–	–
8	apero_flat_spirou.py	FLATREF	calib-reference	Yes	–	–
9	apero_thermal_spirou.py	THERM_REFI	calib-reference-I	Yes	–	–
10	apero_leak_ref_spirou.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_spirou.py	WAVEREF	calib-reference	Yes	–	–
12	apero_thermal_spirou.py	THERM_REFT	calib-reference-T	Yes	–	–
13	apero_badpix_spirou.py	BAD	calib-night	No	–	–
14	apero_loc_spirou.py	LOCCAL	calib-night-CAL	No	–	–
15	apero_loc_spirou.py	LOCSCI	calib-night-SCI	No	–	–
16	apero_shape_spirou.py	SHAPE	calib-night	No	–	–
17	apero_flat_spirou.py	FF	calib-night	No	–	–
18	apero_thermal_spirou.py	THERM_I	calib-night-I	No	–	–
19	apero_wave_night_spirou.py	WAVE	calib-night	No	–	–
20	apero_thermal_spirou.py	THERM_T	calib-night-T	No	–	–
21	apero_extract_spirou.py	EXTALL	extract-ALL	No	–	–
22	apero_mk_tellu_spirou.py	MKTELLU1	tellu-hotstar	No	AB	KW_OBJN
23	apero_mk_model_spirou.py	MKTMOD1	tellu-hotstar	No	–	–
24	apero_fit_tellu_spirou.py	MKTFIT1	tellu-hotstar	No	AB	KW_OBJN
25	apero_mk_template_spirou.py	MKTEMP1	tellu-hotstar	No	AB	KW_OBJN
26	apero_mk_tellu_spirou.py	MKTELLU2	tellu-hotstar	No	AB	KW_OBJN
27	apero_mk_model_spirou.py	MKTMOD2	tellu-hotstar	No	–	–
28	apero_fit_tellu_spirou.py	MKTFIT2	tellu-hotstar	No	AB	KW_OBJN
29	apero_mk_template_spirou.py	MKTEMP2	tellu-hotstar	No	AB	KW_OBJN
30	apero_fit_tellu_spirou.py	FTFIT1	tellu-science	No	AB	KW_OBJN
31	apero_mk_template_spirou.py	FTTEMP1	tellu-science	No	AB	KW_OBJN
32	apero_fit_tellu_spirou.py	FTFIT2	tellu-science	No	AB	KW_OBJN
33	apero_mk_template_spirou.py	FTTEMP2	tellu-science	No	AB	KW_OBJN
34	apero_ccf_spirou.py	CCF	rv-tcorr	No	AB	KW_DPRT
35	apero_pol_spirou.py	POLAR	polar-tcorr	No	AB	KW_DPRT
36	apero_postprocess_spirou.py	POSTALL	post-all	No	–	KW_DPRT

limited_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_preprocess_spirou.py	PP	pre-all	No	–	–
2	apero_dark_ref_spirou.py	DARKREF	calib-reference	Yes	–	–
3	apero_badpix_spirou.py	BADREF	calib-reference	Yes	–	–
4	apero_loc_spirou.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
5	apero_loc_spirou.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
6	apero_shape_ref_spirou.py	SHAPEREF	calib-reference	Yes	–	–
7	apero_shape_spirou.py	SHAPELREF	calib-reference	Yes	–	–

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ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
8	apero_flat_spirou.py	FLATREF	calib-reference	Yes	–	–
9	apero_thermal_spirou.py	THERM_REFI	calib-reference-I	Yes	–	–
10	apero_leak_ref_spirou.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_spirou.py	WAVEREF	calib-reference	Yes	–	–
12	apero_thermal_spirou.py	THERM_REFT	calib-reference-T	Yes	–	–
13	apero_badpix_spirou.py	BAD	calib-night	No	–	–
14	apero_loc_spirou.py	LOCCAL	calib-night-CAL	No	–	–
15	apero_loc_spirou.py	LOCSCI	calib-night-SCI	No	–	–
16	apero_shape_spirou.py	SHAPE	calib-night	No	–	–
17	apero_flat_spirou.py	FF	calib-night	No	–	–
18	apero_thermal_spirou.py	THERM_I	calib-night-I	No	–	–
19	apero_wave_night_spirou.py	WAVE	calib-night	No	–	–
20	apero_thermal_spirou.py	THERM_T	calib-night-T	No	–	–
21	apero_extract_spirou.py	EXTTELL	extract-hotstar	No	–	KW_OBJN
22	apero_extract_spirou.py	EXTOBJ	extract-science	No	–	KW_OBJN
23	apero_mk_tellu_spirou.py	MKTELLU1	tellu-hotstar	No	AB	KW_OBJN
24	apero_mk_model_spirou.py	MKTMOD1	tellu-hotstar	No	–	–
25	apero_fit_tellu_spirou.py	MKTFIT1	tellu-hotstar	No	AB	KW_OBJN
26	apero_mk_template_spirou.py	MKTEMP1	tellu-hotstar	No	AB	KW_OBJN
27	apero_mk_tellu_spirou.py	MKTELLU2	tellu-hotstar	No	AB	KW_OBJN
28	apero_mk_model_spirou.py	MKTMOD2	tellu-hotstar	No	–	–
29	apero_fit_tellu_spirou.py	MKTFIT2	tellu-hotstar	No	A	KW_OBJN
30	apero_mk_template_spirou.py	MKTEMP2	tellu-hotstar	No	AB	KW_OBJN
31	apero_fit_tellu_spirou.py	FTFIT1	tellu-science	No	AB	KW_OBJN
32	apero_mk_template_spirou.py	FTTEMP1	tellu-science	No	AB	KW_OBJN
33	apero_fit_tellu_spirou.py	FTFIT2	tellu-science	No	AB	KW_OBJN
34	apero_mk_template_spirou.py	FTTEMP2	tellu-science	No	AB	KW_OBJN
35	apero_ccf_spirou.py	CCF	rv-tcorr	No	AB	KW_DPRT
36	apero_pol_spirou.py	POLAR	polar-tcorr	No	AB	KW_DPRT
37	apero_postprocess_spirou.py	SCIPOST	post-science	No	–	KW_DPRT

ref_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

Table 5: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS	KWARGS
1	ap-ero_dark_ref_sp	DARK-REF	calib-reference	Yes		
2	ap-ero_badpix_spirc	BADREF	calib-reference	Yes		
3	ap-ero_loc_spirou.p	LOCRE-FCAL	calib-reference-CAL	No	{files}=[DARK_Fl	
4	ap-ero_loc_spirou.p	LOCRE-FSCI	calib-reference-SCI	No	{files}=[FLAT_DA	
5	ap-ero_shape_ref_s	SHAPERE	calib-reference	Yes		
6	ap-ero_shape_spirou	SHAPEL-REF	calib-reference	Yes		
7	ap-ero_flat_spirou.p	FLA-TREF	calib-reference	Yes		
8	ap-ero_thermal_spir	THERM_I	calib-reference-I	Yes	{files}=[DARK_D.	
9	ap-ero_leak_ref_spi	LEAKREF	calib-reference	Yes		
10	ap-ero_wave_ref_sp	WA-VEREF	calib-reference	Yes		–hc-files=[HCONE_HCONE] –fpfiles=[FP_FP]
11	ap-ero_thermal_spir	THERM_I	calib-reference-T	Yes	{files}=[DARK_D.	

calib_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

Table 6: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_badpix_spirou.py	BAD	calib-night	No	
2	apero_loc_spirou.py	LOCCAL	calib-night-CAL	No	{files}=[DARK_FLAT]
3	apero_loc_spirou.py	LOCSCI	calib-night-SCI	No	{files}=[FLAT_DARK]
4	apero_shape_spirou.py	SHAPE	calib-night	No	
5	apero_flat_spirou.py	FF	calib-night	No	{files}=[FLAT_FLAT]
6	apero_thermal_spirou.py	THERM_I	calib-night-I	No	{files}=[DARK_DARK_INT]
7	apero_wave_night_spirou.py	WAVE	calib-night	No	
8	apero_thermal_spirou.py	THERM_T	calib-night-T	No	{files}=[DARK_DARK_TEL]

tellu_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

Table 7: Recipes

OR-DER	RECIPE	SHORT NAME	RECIP KIND	REF RECII	FIBE	FILTERS	ARGS
1	ap-ero_extract	EXT-TELL	extrac hotsta	No	–	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[OBJ_DARK, OBJ_FP, PO-LAR_DARK, PO-LAR_FP]
2	ap-ero_mk_te	MK-TELL	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]
3	ap-ero_mk_m	MK-T-MOD	tellu-hotsta	No	–	–	
4	ap-ero_fit_tell	MK-T-FIT1	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]
5	ap-ero_mk_te	MK-TEMI	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]
6	ap-ero_mk_te	MK-TELL	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]
7	ap-ero_mk_m	MK-T-MOD	tellu-hotsta	No	–	–	
8	ap-ero_fit_tell	MK-T-FIT2	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]
9	ap-ero_mk_te	MK-TEMI	tellu-hotsta	No	AB	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, PO-LAR_DARK, POLAR_FP	{files}=[EXT_E2DS_FF]

science_seq

No description set

2. Schematic

This section can only currently be viewed in the html documentation.

3. Recipes in sequence

Table 8: Recipes

OR-DER	RECIPE	SHORT NAME	RECIPE KIND	REF RECI	FIBE	FILTERS	ARGS	KWARGS
1	ap-ero_extrac	EX-TOB.	extrac scienc	No	–	KW_OBJNAME: SCI-ENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP	{files}=[OBJ_DAR OBJ_FP, PO-LAR_DARK, POLAR_FP]	
2	ap-ero_fit_te	FT-FIT1	tellu-scienc	No	AB	KW_OBJNAME: SCI-ENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP	{files}=[EXT_E2D$	
3	ap-ero_mk_t	FT-TEM	tellu-scienc	No	AB	KW_OBJNAME: SCI-ENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP		
4	ap-ero_fit_te	FT-FIT2	tellu-scienc	No	AB	KW_OBJNAME: SCI-ENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP	{files}=[EXT_E2D$	
5	ap-ero_mk_t	FT-TEM	tellu-scienc	No	AB	KW_OBJNAME: SCI-ENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP		
6	ap-ero_ccf_s	CCF	rv-tcorr	No	AB	KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, PO-LAR_FP KW_OBJNAME: SCI-ENCE_TARGETS	{files}=[TELLU_O]	
7	ap-ero_pol_s	PO-LAR	polar-tcorr	No	AB	KW_DPRTYPE: PO-LAR_FP, POLAR_DARK KW_OBJNAME: SCI-ENCE_TARGETS		–expo-sures=[TELLU_OB]
8	ap-ero_postp	SCI-POST	post-scienc	No	–	KW_DPRTYPE: OBJ_FP, OBJ_DARK, POLAR_DARK, POLAR_FP KW_OBJNAME: SCIENCE_TARGETS	{files}=[DRS_PP]	

quick_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 9: Recipes

OR-DER	RECIPE	SHORT NAME	RECIP KIND	REF RECIF	FILTERS	ARGS
1	ap-ero_extrac	EX-TQUIC	extrac quick	No	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP	{files}=[OBJ_DARK, OBJ_FP, PO-LAR_DARK, PO-LAR_FP]

blank_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

N/A

eng_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 10: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_extract_spirou.py	EXT_HC1HC1	extract-hchc	No	{files}=[HCONE_HCONE]
2	apero_extract_spirou.py	EXT_FPFP	extract-fpfp	No	{files}=[FP_FP]
3	apero_extract_spirou.py	EXT_FF	extract-ff	No	{files}=[FLAT_FLAT]
4	apero_extract_spirou.py	EXT_DFP	extract-dfp	No	{files}=[DARK_FP]
5	apero_extract_spirou.py	EXT_SKY	extract-sky	No	{files}=[DARK_DARK_SKY]
6	apero_extract_spirou.py	EXT_LFC	extract-lfc	No	{files}=[LFC_LFC]
7	apero_extract_spirou.py	EXT_FPD	extract-fpd	No	{files}=[FP_DARK]
8	apero_extract_spirou.py	EXT_LFCFP	extract-lfcfp	No	{files}=[LFC_FP]
9	apero_extract_spirou.py	EXT_FPLFC	extract-fplfc	No	{files}=[FP_LFC]
10	apero_extract_spirou.py	EXT_EVERY	extract-everything	No	{files}=[DRS_PP]

3.1.1.2 Recipes (SPIROU)

This section describes all the SPIROU recipes to use with APERO.
For information on how to run these recipes (either individually or with the processing tools) see *here*.

apero_preprocess_spirou

1. Description

SHORTNAME: PP

Pre-processing

The raw images (those retrieved from the telescope after the ramp fitting algorithm has been run) require some preliminary processing to remove detector artifacts that are due to the detector. These artifacts are documented in this section. Note all frames independent of DPRTYPE are preprocessed in the same manner before any other step of APERO is run.

Header fixes and object resolution

The SPIRou header provides the required information to process files. However, to facilitate data reduction a few header keys are added and updated.

The first header key we add is the APERO object name (DRSOBJN), this header key is the object name used throughout APERO. In general, it is the object name taken from the raw input file but all punctuation and white spaces are removed and replaced with underscores and all characters are capitalized (+ and - are also replaced with *P* and *M* respectively). This avoids names with slightly different names being considered as different objects (e.g., TRAPPIST-1 vs Trappist 1) and allows for use in filenames. Next, the target type (TRG_TYPE) with a value of either TARGET, SKY or a blank string is added. This key exists in the raw file header of newer files (2020 and later) but has been found to be incorrect or missing for older files, especially when dealing with some sky frames (sky frames can usually be identified by a suffix or prefix *sky* in the object name if not already identified as a sky by the target type header key). As well as this a mid-exposure time (MJDMID) is added which is equivalent to the time recorded at the end of exposure minus half the exposure time (MJDEND - EXPTIME/2) this time is used throughout APERO and is the recommended time to use, as opposed to other header keys such as MJSTART, which isn't strictly the start of observation time but the time the observation request is sent. The last two keys added are the DRSMODE and DPRTYPE.

Once the headers are fixed with the above additions and corrections (if the raw files are of DPRTYPE OBJ_FP, OBJ_DARK, POL_FP, or POL_DARK) we cross-match the OBJECTNAME with an object database of object names, positions, motions, parallax, known radial velocity estimates, temperatures and aliases. These are mostly sourced directly from SIMBAD, and cross-matched with the most up-to-date proper motion and parallax catalogues (based on an id cross-match from SIMBAD with Gaia EDR3; DR2; DR1; UCAC4; or Hipparcos; ipp_1997). This ensures the object name given is not already known by another object name, and all astrometric parameters are consistent even from differing PIs. This is important for steps in the telluric process where we combine all objects of the same DRSOBJN where possible. This local database of object names can be updated and is maintained in such a way to keep consistency or inform users when updates have been made. All reductions of a single DRSOBJN should always be done with a single set of astrometric parameters.

File corruption check

Not every raw file contains good data. For example, a rare occurrence where the detector acquisition system has a synchronization issue in retrieving the pixel stream leads to a 1-pixel offset of the readout. Therefore as part of the pre-processing, we check for corrupt files. We do this by comparing images to a list of known hot pixels. We verify that hot pixels are at the expected position. If they are not at the expected position, this is corrected by registering the pixel grid to the nominal pixel position. Missed lines or columns at the edge of the array are replaced by NAN values. This does not lead to a loss in science pixels as the 4-pixel edge of the array consists of non-light-sensitive reference pixels.

Top and bottom pixel correction

The first part of the correlated noise filtering accounts for gradients along the slow axis of the amplifier readout by removing the slope between the first and last read reference pixels within each amplifier. We take a median of the amplifier *bottom* and *top* reference pixels and subtract for each amplifier the slope between these regions. This accounts for fluctuations in the detector electronics on timescales comparable to or longer than the readout time. Higher-frequency noises are handled as a common-mode between amplifiers in the following step. High-frequency readout noise that is not correlated between amplifiers cannot be corrected as it overlaps with science data and cannot be measured independently; it represents the limiting factor for the fainter targets observed with SPIRou.

Median filter dark amplifiers

High-frequency common-mode noise between amplifiers is removed by using side reference pixels. We take *left* and *right* reference pixels and median the 8 lateral reference pixels into a 4088-pixel long *fast axis* reference unilluminated pixel. This measurement of the common noise is a combination of both pixel-to-pixel readout noise and actual 1/f noise that we are attempting to remove. The readout noise component is a high-frequency component while the 1/f dominates on larger spatial scales. We, therefore, median-filter the reference pixel vector in order to minimize the impact of readout noise while maximizing the subtraction of lower frequencies in the 1/f noise. The optimal median filter size was found to be 32 pixels. Once filtered, this common-mode 1/f noise is subtracted from all columns of the science array.

1/f noise correction

While the lower frequency component of the common-mode 1/.f noise is handled using non-light-sensitive reference pixels, the large (~800-pixel wide beyond K-band orders) region of the SPIRou array that is not illuminated by diffraction orders allows for a measurement of the high-frequency component of the common mode. While the region does see some large-scale scattered light from the rest of the array, there are no high-spatial frequency structures illuminating this part of the array. We, therefore, apply high-spatial filtering of this area and take a median along the cross-dispersion axis. We construct the equivalent of a reference pixel column, but with an effective readout noise ~10 times smaller than what can be obtained with the 8 reference pixels (4 on each side) available for each along-the-dispersion-axis position. We replicate this structure and subtract it column-wise, further reducing the contribution of common-mode noise in illuminated pixels.

Cosmic ray rejection

> Cosmic rays hits are easier to flag with infrared arrays than they are with CCD data sets due to the acquisition through multiple

readouts. Pixels without a cosmic ray hit are expected to see an accumulation of electrons in their well that is linear with time while a cosmic ray hit would induce a glitch in that accumulation that can easily be flagged. One could attempt to reconstruct a ramp while including a discontinuity at the moment of the hit; considering that cosmic rays are rare and that this would add a significant burden in terms of data processing, we opt to simply flag pixels hit by a cosmic ray as invalid (NAN values). The flagging of cosmic rays is done in two steps.

> First, we check for the consistency between the total number of photons received over the entire ramp and the formal ramp error

statistics from the linear fit. Discrepant points, even if they remain within the unsaturated regime of the pixel dynamic range, are flagged as invalid. Second, the ramp fitting of the pixel value provides both a slope and an intercept. The slope is the signal used for scientific analysis, and the intercept is discarded. This intercept value corresponds to the state of the detector prior to the first readout, which, for HxRG arrays, is a structured signal. The intercept values have a typical dispersion of ~1000, ADUs, and discrepant values indicate that photons within a given pixel do not follow a linear accumulation with time. The consistency of the intercept value with expected statistics is used to further flag invalid pixels within a ramp.

Rotation of image

The pre-processed images are then rotated to match the HARPS orientation. This is a legacy change left over from when some algorithms shared a common ancestry with the HARPS DRS pipeline. For SPIRou data this is equivalent to a 90-degree clockwise rotation.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_preprocess_spirou.py {obs_dir}[STRING] [FILE:DRS_RAW] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_RAW] // Any raw files are currently allowed. Multiple files inputted are handled␣
↪separately (one after the other).
```

4. Optional Arguments

```
--skip[True/False] // [BOOLEAN] If True skips preprocessed files that are already found
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
```

```
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_WORKING // Default: "tmp" directory
```

7. Output files

Table 11: Outputs

name	description	file type	suffix	input file
DRS_PP	Generic pre-processed file	.fits	_pp	DRS_RAW

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_badpix_spirou

1. Description

SHORTNAME: BAD

Bad pixel calibration

The bad pixel recipe takes preprocessed $DARK\_DARK$ and $FLAT\_FLAT$ files (as many as given by the user or as many as occur on the nights being used via pre-processing). It combines all $DARK\_DARK$ files and all $FLAT\_FLAT$ files into a single $DARK\_DARK$ and a single $FLAT\_FLAT$ (via a median combination of the images). Bad pixels are then identified in the $FLAT\_FLAT$ by using Equation:

$$M_{\text{flat } i,j} = \begin{cases} 1: & FLAT_{i,j} \text{ is not finite} \\ 1: & \mid (FLAT_{i,j}/FLAT_{\text{med } i,j}) - 1 \mid > \text{cut\_ratio} \\ 1: & FLAT_{\text{med } i,j} < \text{illum\_cut} \\ 0: & \text{otherwise} \end{cases}$$

where $FLAT_{i,j}$ is the flux in ith row jth column of the $FLAT\_FLAT$ image; $FLAT_{\text{med}}$ is the median filtered flat image (using a filtering width of 7 pixels) and $M_{\text{flat } i,j}$ is 1 to flag a bad pixel or 0 otherwise, cut_ratio is 0.5 (flagging pixels with a response less than 50 percent of their neighbors or unphysically brighter than neighbors) and illum_cut is 0.05 (flagging pixels at the edge of the blaze response). $FLAT$ and $FLAT_{\text{med}}$ have first been normalized by the $90^{\rm th}$ percentile of flux in the median filtered flat image. Thus M_{flat} is a Boolean flag

map of bad pixels on the flat image. For the $DARK\_DARK$ image, bad pixels are identified using Equation:

$$M_{\text{dark } i,j} = \begin{cases} 1: & DARK_{i,j} \text{ is not finite} \\ 1: & DARK_{i,j} > 5.0\text{ADU/s} \\ 0: & \text{otherwise} \end{cases}$$

where $DARK_{i,j}$ is the flux in the ith row jth column of the dark image. Thus M_{dark} is a Boolean flag map of bad pixels on the dark image. We choose a value of 5.0 ADU/s as it is representative of the pixel flux of a typical science target. Including pixels with a brighter level of dark current than this leads to a loss in SNR rather than a gain. We note that this threshold could be target-dependent but for simplicity we use a single value.

In addition to this bad pixels in a full detector engineering flat (FULLFLAT taken during commissioning) are also identified using Equation:

$$M_{\text{full-flat } i,j} = \begin{cases} 1: & \mid FULLFLAT_{i,j} - 1 \mid > 0.3 \\ 0: & \text{otherwise} \end{cases}$$

where $FULLFLAT_{i,j}$ is the flux in ith row jth column of the full detector engineering flat. Thus $M_{\text{full-flat}}$ is a Boolean flag map of bad pixels on the full detector engineering flat image. We chose 0.3 as this flagged the defective regions identified manually on the detector. The 1σ dispersion of the full detector engineering flat image is 2 percent.

These three bad pixel maps are then combined into a single bad pixel map.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_badpix_spirou.py {obs_dir}[STRING] --flatfiles[FILE:FLAT_FLAT] --darkfiles[FILE:DARK_
↪DARK_TEL,DARK_DARK_INT] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--flatfiles[FILE:FLAT_FLAT] // Current allowed types: FLAT_FLAT
--darkfiles[FILE:DARK_DARK_TEL,DARK_DARK_INT] // Current allowed types: DARK_DARK
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 12: Outputs

name	description	HDR[DRSOUTI]	file type	suffix	dbname	dbkey	input file
BADPIX	Bad pixel map	BADPIX	.fits	_bad-pixel	calibra-tion	BADPIX	FLAT_FLAT
BKGRD_MA	Bad pixel back-ground map	BKGRD_MAI	.fits	_bmap.fit	calibra-tion	BKGRDMA	FLAT_FLAT

8. Debug plots

```
BADPIX_MAP
```

9. Summary plots

```
SUM_BADPIX_MAP
```

apero_dark_spirou

1. Description

SHORTNAME: DARK

No description set

2. Schematic

No schematic set

3. Usage

```
apero_dark_spirou.py {obs_dir}[STRING] [FILE:DARK_DARK_INT,DARK_DARK_TEL,DARK_DARK_SKY]
↪{options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_DARK_INT,DARK_DARK_TEL,DARK_DARK_SKY] // [STRING/STRINGS] A list of fits files to␣
↪use separated by spaces. Current allowed types: DARK_DARK_INT, DARK_DARK_TEL, DARK_DARK_SKY
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
```

```
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪ (normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 13: Outputs

name	description	HDR[DRSOUTID]	file type	suffix	dbname	dbkey	input file
DARKI	Internal dark calibration file	DARKI	.fits	_darki	calibration	DARKI	DARK_DARK_INT
DARKT	Telescope dark calibration file	DARKT	.fits	_darkt	calibration	DARKT	DARK_DARK_TEL
DARKS	Sky dark calibration file	DARKS	.fits	_darks	calibration	DARKS	DARK_DARK_SKY

8. Debug plots

```
DARK_IMAGE_REGIONS
DARK_HISTOGRAM
```

9. Summary plots

```
SUM_DARK_IMAGE_REGIONS
SUM_DARK_HISTOGRAM
```

apero_dark_ref_spirou

1. Description

SHORTNAME: DARKREF

Dark reference calibration

As spirou has no moving internal parts for increased stability, one cannot move the fiber out of view and independently measure the detector's dark current. Thus dark frames are non-trivial to construct, as there are two independent contributions to the `dark' image, one arising from the dark current of the science arrays and the other from thermal emission. This problem is mainly seen in the K band and is shared with any PRV spectrograph for which the fiber thermal emission is commensurate with the per-pixel dark current.

The thermal background manifests itself as a very low-level contribution (typically 0.015 e-/s/pixel), well below the typical target flux, but has a high flux tail of much brighter pixels. As the SPIRou science array has an extremely stable temperature (sub-milli Kelvin), one expects the pixel dark current to be very stable. From all preprocessed $DARK\_DARK$ files, across all nights, we select a subset of 100 $DARK\_DARK$ files, uniformly distributed in time as much as possible using a sorting function. If there are less than 100 $DARK\_DARK$ files across all available nights we use all files; this becomes our reference dark.

One could use this as the single step for dark correction, but a significant challenge arises. The fiber train is always connected and the science array always sees the thermal emission from the fibers and the hermetic feedthrough connecting the fibers to the cryostat. This thermal emission changes with the temperature of the fiber train and moves, at the pixel level, on timescales of months to years following thermal cycles and maintenance of the instrument. Applying a simple scaling of the dark current, including the thermal background from the fiber, would lead to erroneous subtraction in science data, with sometimes an over subtraction of $\sim 2.4\,\mu m$ flux, leading to negative flux. We opt for a decoupling of the two contributions in the data calibration. We construct a high-frequency median dark current, which contains pixel-to-pixel detector contributions and low-frequency components from the thermal background of the fiber train. The high-frequency component can be scaled with integration time while the low-frequency one needs to be adjusted. This high-pass reference dark image is then saved to the calibration database for use throughout APERO.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_dark_ref_spirou.py {options}
```

No optional arguments

4. Optional Arguments

```
--filetype[STRING] // Current allowed types: DARK_DARK
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 14: Outputs

name	description	HDR[DRSOU	file type	suffix	db-name	dbkey	input file
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	calibration	DARK-REF	DARK_DARK_TEL, DARK_DARK_INT

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_loc_spirou

1. Description

SHORTNAME: LOC

Localization calibration

The localization recipe takes preprocessed *DARK_FLAT* or *FLAT_DARK* files (as many as given by the user or as many as occur on the nights being used via Aprocessing). It is run twice, once for the C fiber localization (with a set of *DARK_FLAT*) and once for the AB fiber localization (with a set of *FLAT_DARK*). It combines the *DARK_FLAT* files or the *FLAT_DARK* files into a single *DARK_FLAT* or *FLAT_DARK* (via a median combination of the images). After combining, the images are calibrated using our standard image calibration technique.

The first step in the localization code is to take the combined and calibrated *DARK_FLAT* or *FLAT_DARK* and apply a weighted box median, shown in equation:

$$IM_{\mathrm{orderp}\ j} = \begin{cases} \mathrm{MED}(IM_{j=0:j=k+1}): & k < 5 \\ \mathrm{MED}(IM_{j=k-5:j=4088}): & k > 4088 - 5 \\ \mathrm{MED}(IM_{j=k-5:j=k+5+1}): & \mathrm{otherwise} \end{cases}$$

where $IM_{\mathrm{orderp}\ j}$ is the order profile flux for all rows in the jth column, $IM_{j=x:j=y}$ is the combined, calibrated *DARK_FLAT* or *FLAT_DARK*, that spans all columns from $j = x$ to $j = y$, and k is the column index number and ranges from $j = 0$ to $j = 4088$.

This produces the order profile image of the *DARK_FLAT* or *FLAT_DARK* which is used for the optimal extraction and to locate the orders.

To locate the orders we use the scikit *measure.label* algorithm which labels connected regions. Two pixels are defined as connected when both themselves and their neighbors have the same value. We use a connectivity value of 2 meaning that any of the 8 surrounding pixels can be neighbors if they share the same value.

In order to facilitate the labeling we first perform a 95th percentile of a box (of size 25×25 pixels) across the whole image, as true illuminated pixels' flux is location-dependent. We set a threshold at half that value and label all pixels above this threshold as one and all pixels below this to a value of zero. We then perform the *measure.label*

on this Boolean map (referred to from this point on as $Mask_{orders}$). This is just a first guess of the order positions and usually returns many labeled regions that are not true orders.

To remove bad labels we first remove any labeled region with less than 500 pixels. We then remove any pixel within a labeled region that has a flux value less than 0.05 times the 95th percentile of all pixels in that given labeled region and remove this pixel from $Mask_{orders}$. We then median filter each row of $Mask_{orders}$ to clean up the labeled edges and apply a binary dilation (scipy *ndimage.binary_dilation*) algorithm. This binary dilation essentially merges labeled regions that are close to each other together by expanding regions marked with ones around the edges of these regions. After $Mask_{orders}$ has been updated we re-run the labeling algorithm. As a final filtering step, we remove any region center that does not overlap with the central part of the image in the along-order direction (i.e., the center $\pm$ half the width of the detector, 2044 $\pm$ 1022 pixels).

Once we have the final set of labeled regions we use :math:`Mask_{orders} on each order to fit a polynomial fit (of degree 3) to the pixel positions in that labeled region forcing continuity between orders by fitting each coefficient across the orders. We also use the :math:`Mask_{orders} pixel positions to linearly fit the width of each order.

For a *DARK_FLAT*, this produces polynomial fits and coefficients for 49 orders for the C fiber. For a *FLAT_DARK* input, this produces polynomial fits and coefficients for 98 orders (49 orders for A and 49 orders for B). These polynomial coefficients for the positions of the orders and the widths of the orders are then converted into values as a function of position across each order.

As part of quality control we check that:

- the number of orders is consistent with the required number of orders (49 for fiber C, 98 for fibers A+B).
- the across-order value at the center of the detector is always larger than the value of the previous order

The order profile (ORDERP), locations of the orders (LOCO), and widths of the orders are saved to the calibration database (if both quality control criteria are met) for use throughout APERO.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_loc_spirou.py {obs_dir}[STRING] [FILE:DARK_FLAT,FLAT_DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_FLAT,FLAT_DARK] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Current allowed types: DARK_FLAT OR FLAT_DARK but not both (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
```

```
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 15: Outputs

name	description	HDR[DRS	file type	suffix	fibers	db-name	dbkey	input file
LOC_OF	Localisation: Order profile calibration file	LOC_OR	.fits	_order_profi	AB, C	cali-bra-tion	OR-DER_PRC	FLAT_DARK, DARK_FLAT
LOC_LC	Localisation: Position polynomial calibration file	LOC_LO	.fits	_loco	AB, C	cali-bra-tion	LOC	FLAT_DARK, DARK_FLAT
LOC_FV	Localisation: Width polynomial calibration file	LOC_FW	.fits	_fwhm-order	AB, C	–	–	FLAT_DARK, DARK_FLAT
LOC_SU	Localisation: Position superpositionimage calibration file	LOC_SU	.fits	_with-order	AB, C	–	–	FLAT_DARK, DARK_FLAT
DE-BUG_BA	Individual file background map	DE-BUG_BA	.fits	_back-ground.fit	–	–	–	DRS_PP

8. Debug plots

```
LOC_WIDTH_REGIONS
LOC_FIBER_DOUBLET_PARITY
LOC_GAP_ORDERS
LOC_IMAGE_FIT
LOC_IM_CORNER
LOC_IM_REGIONS
```

9. Summary plots

```
SUM_LOC_IM_FIT
SUM_LOC_IM_CORNER
```

apero_shape_ref_spirou

1. Description

SHORTNAME: SHAPEREF

Shape reference calibration

In PRV measurements, constraining the exact position of orders on the science array, both in the spectral and spatial dimensions, is key as the position of our spectra on this science array encodes the sought-after velocity of the star. The diffraction orders of SPIRou, and nearly all PRV spectrographs, follow curved lines, and the image slicer has a 4-point structure that is not parallel to the pixel grid.

Within the APERO framework, we decided to split the problem into two parts: a reference shape calibration and a nightly shape calibration. For the reference step, we constrain the bulk motion, as defined through an affine transformation and register all frames to a common pixel grid to well below the equivalent of $1\ ms^{-1}$. We perform the order localization and subsequent steps on a nightly basis as it has the significant advantage that

registered frames have all orders at the same position to a very small fraction of a pixel. Furthermore, having registered frames allows for better error handling within APERO; one does not expect pixel-level motions between calibrations after this step.

The reference shape recipe takes preprocessed *FP_FP* and *HC_HC* files (as many as given by the user or as many as occur on the nights being used via *apero_processing*). The reference shape recipe combines the *FP_FP* files into a single *FP_FP* file and the *HC_HC* files into a single *HC_HC* file (via a median combination of the images). After combining, the *FP_FP* and *HC_HC* images are calibrated using our standard image calibration technique. In addition to the combined *FP_FP* and *HC_HC*, we create a reference FP image. This reference FP image is created by selecting a subset of 100 *FP_FP* files (uniformly distributed across nights) and combining these with a median. This reference FP image is then saved to the calibration database for use throughout APERO.

The registration through affine transformations is done using the`FP_FP` calibrations. We take the combined *FP_FP* files and localize in the 2D frame the position of each FP peak and measure the position of the peak maxima. Considering the 3 SPIRou fibers and 4 slices (i.e., 12 2D peaks per FP line), this means there are >100000 peaks on the science array. These are taken as reference positions. For each calibration sequence, we then find the affine transformation that minimizes the RMS between the position of the FP and the FP reference image calibration. The resulting affine transformation consists of a bulk shift in dx, dy, and a 2×2 matrix that encodes rotation, scale, and shear. These values are kept and can be useful to identify shifts in the optics (e.g., after earthquakes or thermal cycles) as well as very slight changes in plate scale and angular position of the array which can be of interest in understanding the impact of engineering work onto the science data products. For example, we can readily measure a 10^{-5} fractional change in the SPIRou plate scale following a maintenance thermal cycle of the instrument; the ratio of the point-to-point RMS to the median of the plate scale value is at the 1.7×10^{-7} level. The interpolations between pixel grids are done with a 3rd order spline. We note that changes in the FP cavity length arise from a number of reasons such as gas leakage and temperature and will lead to a motion of FP peaks on the array that is not due to a physical motion of the array or optical elements within the cryostat. Considering that typical drifts are at the ~ 0.3,m/s/day level, to first order this leads to a typical 10^{-9}/day fractional increase in the plate scale along the dispersion direction. This effectively leads to a minute change in the effective dispersion of the extracted file wavelength solution. As this change is common to both the FP, the HC, and the science data, it is accounted for when computing the wavelength solution and cavity length change.

Once the affine transformation has been applied, images are registered to a common grid (the reference FP image). We then construct a transform that makes the orders straight and corrects for slicer structure in the dispersion direction. This leads to the construction of two maps corresponding to x and y offsets that need to be applied to an image to transform it into a rectified image from which a trace extraction can be performed directly through a 1-D collapse in the direction perpendicular to the dispersion of a rectangular box around the order. The y direction map is computed from the order-localization polynomials. The x direction map is determined by first collapsing the straightened orders of a *FP_FP* calibration and cross-correlating each of the spectral direction pixel rows to find its offset relative to the collapsed-extracted spectrum. The x and y offsets are then saved to the calibration database for use throughout APERO.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_shape_ref_spirou.py {obs_dir}[STRING] --fpfiles[FILE:FP_FP] --hcfiles[FILE:HCONE_HCONE]
↪{options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC_HC
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 16: Outputs

name	description	HDR[DRSOU	file type	suffix	db-name	dbkey	input file
REF_FP	Reference shape master FP calibration file	REF_FP	.fits	_fpref	cali-bra-tion	FPREI	FP_FP
SHAPE_X	Reference shape dx calibration file	SHAPE_X	.fits	_shapex	cali-bra-tion	SHAPI	FP_FP
SHAPE_Y	Reference shape dy calibration file	SHAPE_Y	.fits	_shapey	cali-bra-tion	SHAPI	FP_FP
SHAPE_IN_	Input FP file for shape comparison	SHAPE_IN_	.fits	_shape_in_	–	–	FP_FP
SHAPE_IN_	Input Hollow Cathode file for shape comparison	SHAPE_IN_	.fits	_shape_in_	–	–	HCONE_HCONE
SHAPE_OU	Output FP file for shape comparison	SHAPE_OU	.fits	_shape_out	–	–	FP_FP
SHAPE_OU	Output Hollow Cathode file for shape comparison	SHAPE_OU	.fits	_shape_out	–	–	HCONE_HCONE
SHAPE_BD	Shape transformed dx comparison file	SHAPE_BD	.fits	_shape_out	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPE_DX
SHAPE_ANGLE_OFFSET_ALL
SHAPE_ANGLE_OFFSET
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPE_ANGLE_OFFSET
```

apero_shape_spirou

1. Description

SHORTNAME: SHAPE

Nightly shape calibration

Before extracting the spectrum, we need to transform the image into a format that is amenable to a simple 1-dimensional collapse. Given our reference FP grid and the x and y displacements maps, on a given night, we only need to find the affine transform that registers FP peaks onto the reference FP image and updates the x and y transform maps within the affine contribution. This assumes that the order curvature is constant through the life of the instrument and that the slicer shape is stable. We note that as the order profiles are determined in each nightly calibration, a slight (sub-pixel) modification of the position of orders would have no impact on the extracted spectra which are extracted with the profile measured for the corresponding night.

The nightly shape recipe takes preprocessed *FP_FP* files (as many as given by the user or as many as occur on each of the nights being used via *apero_processing*). It combines the *FP_FP* files into a single *FP_FP* per night (via a median combination of the images). After combining, the *FP_FP* images are calibrated using our standard image calibration technique. We take the *REFFP*, *SHAPEX* and *SHAPEY* calibrations from the calibration database. If multiple exist we use the closest in time (using the header key *MIDEXPOSURE* from the header). To find the linear transform parameters (dx, dy, A, B, C, and D) between the reference *FP_FP* and this night's *FP_FP* we find all the FP peaks in the reference *FP_FP* image and in the nightly *FP_FP* image. Once we have the linear transform parameters we shift and transform the combined and calibrated nightly *FP_FP* via our shape transform algorithm and save the transformed image and un-transformed image to disk (for manual comparison to the input *FP_FP* image).

As part of quality control, we check that the RMS of the residuals in both directions (across order and along the order) are less than 0.1 pixel, which has been found to be optimal to flag pathological cases. The transformation parameters (dx, dy, A, B, C, and D, henceforth *SHAPELOCAL*) are then saved to the calibration database (if both quality control criteria are met) for use throughout APERO.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_shape_spirou.py {obs_dir}[STRING] [FILE:FP_FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 17: Outputs

name	description	HDR[DRSOUT	file type	suffix	db-name	dbkey	input file
SHAPEL	Nightly shape calibration files	SHAPEL	.fits	_shapel	cali-bra-tion	SHAPE	FP_FP
SHAPEL_IN_	Input FP file for nightly shape comparison	SHAPEL_IN_	.fits	_shapel_in_f	–	–	FP_FP
SHAPEL_OU	Output FP file for nightly shape comparison	SHAPEL_OU	.fits	_shapel_out_	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPEL_ZOOM_SHIFT
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPEL_ZOOM_SHIFT
```

apero_flat_spirou

1. Description

SHORTNAME: FF

Flat and Blaze calibration

An essential part of the extraction process is calibrating the flat field response (removing the effect of the pixel-to-pixel sensitivity variations) and calculating the blaze function. The blaze can be seen visually in the raw and preprocessed images as a darkening of the orders, especially at the blue end, towards the sides of the detector (in the along-order direction).

The nightly flat recipe takes preprocessed *FLAT_FLAT* files (as many as given by the user or as many as occur on each night being used via *apero_processing*). It combines the *FLAT_FLAT* files into a single *FLAT_FLAT* per night (via a median combination of the images). After combining, the *FLAT_FLAT* images are calibrated using our standard image calibration technique. The combined, calibrated *FLAT_FLAT* file is then extracted (using the same extraction algorithms presented in Section ref{sec:extraction}). The rest of the flat and blaze recipe is handled per order. Once extracted, the *E2DS* (49×4088) is median filtered (with a width of 25 pixels) and all

pixels with flux less than 0.05 the 95th percentile flux value or greater than 2 times the 95th percentile flux value are removed. Each *FLAT_FLAT E2DS* order is then fit with a sinc function:

$$B_i = AS(sin(\theta)/\theta)^2$$

$$S = 1 + s(x_i - L)$$

$$\theta = \pi \bar{x}_i / P$$

$$\bar{x}_i = (x_i - L) + Q(x_i - L)^2 + C(x_i - L)^3$$

where B_i is the blaze model for the ith *E2DS* order, A is the amplitude of the sinc function, P is the period of the sinc function, s is the slope of the sinc function, x_i is the flux vector of the *E2DS* order, L is the linear center of the sinc function, Q is a quadratic scale term, and C is a cubic scale term. The terms fit in the sinc function are A, P, L, Q, C and s as a function of x_i.

Once we have a set of parameters the blaze function for this order is B_i for all values of the flux for this order. The original *E2DS* order is then divided by the blaze function and this is used as the flat profile. A standard deviation of the flat is also calculated for quality control purposes. This process is repeated for each order producing a full blaze and flat profile (49×4088) for the input *FLAT_FLAT* files. To avoid erroneous contributions to the flat any outlier pixels (outside 10:math:*sigma* or within :math:`pm`0.2 of unity) are set to NaN. Note that the multiplication of the blaze and the flat is equivalent to the full response function of the detector. For some orders (#34 and #74), there is a large residual at one edge of the blaze falloff. This is due to the mismatch between the analytical function used and the actual profile; the flat-field correction accounts for this mismatch.

For quality control, we check that the standard deviation of the flat for each order is less than 0.05. The flat (*FLAT*) and blaze (*BLAZE*) profiles are then saved to the calibration database (if the quality control criteria are met) for use throughout APERO.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_flat_spirou.py {obs_dir}[STRING] [FILE:FLAT_FLAT] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FLAT_FLAT] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
↪allowed types: FLAT_FLAT or DARK_FLAT or FLAT_DARK but not a mixture (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,AB,A,B,C] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
```

(continues on next page)

```
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 18: Outputs

name	description	HDR[DRSOU⌐	file type	suffix	fibers	db-name	dbkey	input file
FF_FLAT	Flat calibration file	FF_FLAT	.fits	_flat	AB, A, B, C	cali-bra-tion	FLAT	FLAT_FLAT
FF_BLAZE	Blaze calibration file	FF_BLAZE	.fits	_blaze	AB, A, B, C	cali-bra-tion	BLAZ	FLAT_FLAT
EXT_E2DS_	Pre-extracted straighted stacked spectrum	EXT_E2DS_	.fits	_e2dsll	AB, A, B, C	–	–	DRS_PP, FLAT_FLAT
OR-DERP_STR,	Straightened order pro-file for an individual im-age	OR-DERP_STR,	.fits	_or-derps	AB, A, B, C	–	–	SHAPEL
DE-BUG_BACK	Individual file back-ground map	DE-BUG_BACK	.fits	_back-ground.fit	–	–	–	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_FLAT_BLAZE_ORDER
```

apero_thermal_spirou

1. Description

SHORTNAME: THERM

Thermal calibration

The nightly thermal recipe takes preprocessed *DARK_DARK_INT* files or *DARK_DARK_TEL* files (as many as given by the user or as many as occur on each of the nights being used via *apero_processing*). It combines the *DARK_DARK_INT* or *DARK_DARK_TEL* files into a single *DARK_DARK_INT* or *DARK_DARK_TEL* respectively (via a median combination of the images). These combined *DARK_DARK_INT* or *DARK_DARK_TEL* files are then extracted.

The thermal background seen by SPIRou in a science exposure is the sum of the black body contribution of the sky, the Cassegrain unit (at the temperature of the telescope), the calibration unit (for the reference channel), and the thermal emission of the hermetic feedthroughs that connect the fibers into the cryostat. A small contribution also arises from the Earth's atmosphere itself. This emissivity is proportional to one minus the telluric transmission at the corresponding wavelength and if left unaccounted for in the thermal model would lead to emission-like features in the thermal-corrected spectrum in the strongest absorption lines. From a series of sky-dark frames, we measured that the median additional emissivity from the saturated absorption line is at the 4% level of the black body envelope. We account for the additional contribution by using a median sky absorption spectrum and adding a small contribution proportional to the excess emissivity due to the Earth's atmosphere in strong absorption lines. Note this contribution is only added for the *DARK_DARK_TEL* files (as the *DARK_DARK_INT* images do not see the sky). For this reason, we split generating the thermal calibration files into two steps: we generate the *DARK_DARK_INT* thermal calibration files, then after a wavelength solution has been generated we generate the *DARK_DARK_TEL* thermal calibration files (which require a nightly wavelength solution to add the contribution due to the emission-like features).

Considering that the telescope and front-end temperature change through the night, one needs to apply a thermal correction that is adjusted per frame (this is done as part of the extraction recipe). While the slope of the black body contribution changes very little over the $2.1 - 2.5\mu m$ domain, within which the thermal background is significant, the amplitude of the contribution varies by a factor of >2 between nights (typically a factor 2 for every 8° C) and needs to be adjusted for individual observations. While we have no external measurement of the thermal background, there are a number of completely saturated telluric water absorption features $2.4 - 2.5\mu m$ that provide a measure of the total thermal emission seen by SPIRou. These regions are used to scale the thermal background model such that they have a median flux of zero.

The thermal calibration files (*THERMALI* and *THERMALT*) are then saved to the calibration database for use throughout APERO. The *THERMALI* calibrations are used for correcting internal lamp spectra (i.e., other calibrations) and *THERMALT* calibrations are used to correct all science spectra.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_thermal_spirou.py {obs_dir}[STRING] [FILE:DARK_DARK_INT,DARK_DARK_TEL] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_DARK_INT,DARK_DARK_TEL] // [STRING/STRINGS] A list of fits files to use separated␣
→by spaces. Current accepts all preprocessed filetypes. All files used will be combined into␣
→a single frame.
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,AB,A,B,C] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
--forceext[True/False] // THERMAL_EXTRACT_HELP
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
```

```
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 19: Outputs

name	description	HDR[DRS	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2l	Extracted + flat-fielded 2D spectrum	EXT_E2l	.fits	_e2dsff	AB, A, B, C	–	–	DRS_PP
THER-MALI_E	Extracted sci=DARK calib=DARK thermal calibration file, where dark is an internal dark	THER-MALI_E	.fits	_thermal_e2ds	AB, A, B, C	cali-bra-tion	THER MALI	DARK_DARK_INT
THER-MALT_E	Extracted sci=DARK calib=DARK thermal calibration file, where dark is a telescope dark	THER-MALT_E	.fits	_thermal_e2ds	AB, A, B, C	cali-bra-tion	THER MALT	DARK_DARK_TEL

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_leak_ref_spirou

1. Description

SHORTNAME: LEAKREF

Leak reference calibration

For PRV observations, the observational setup is most often one with a science object in the A and B fibers and an FP illumination in the C fiber (i.e., *OBJ_FP* or *POLAR_FP*). Considering that the SPIRou slicer has sharp edges in its pupil, there is a diffraction pattern that leads to a spike in the cross-fiber direction and a modest cross-fiber component in the leakage. The leakage of the FP spectrum onto the science spectrum is constant through time as it is solely due to pupil geometry, and can therefore be calibrated and subtracted. The reference leak recipe finds all *DARK_FP* files in the raw directory (from the reference night). Each *DARK_FP* file is then extracted. Once all *DARK_FP* files are extracted they are combined for each fiber: AB, A, B, and C (via a median across all extracted ETDS files) creating one image (49×4088) per fiber. Conceptually, the leak correction is straightforward: take the combined *DARK_FP*, normalize each C fiber FP to unity (using the 5th percentile of FP flux within the order) and measure the recovered spectrum in the A and B fibers. For any given *OBJ_FP* or *POLAR_FP* observation, one simply measures the C fiber FP flux and scales the leakage in A and B accordingly.

The method has been tested over the lifetime of SPIRou and subtracts the high-frequency component of the leakage at a level better than 1 in 100 in the most contaminated orders. The reference leak calibration file (*REFLEAK*) is then saved to the calibration database for use throughout APERO.

2. Schematic

No schematic set

3. Usage

```
apero_leak_ref_spirou.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--filetype[STRING] // [STRING] Specify the DPRTYPE for DARK_FP files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
```

```
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 20: Outputs

name	description	HDR[DRSO	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	AB, A, B, C	–	–	DRS_PP
LEAKREF	Reference leak correction calibration file	LEAKREF	.fits	_leak_	AB, A, B, C	cali-bra-tion	LEAKF	EXT_E2DS, EXT_E2DS_FF

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_extract_spirou

1. Description

SHORTNAME: EXT

Extraction

The extraction recipe takes any preprocessed file (as many as given by the user but in general just one single file). The files are combined (if requested) and are calibrated using our standard image calibration technique. Once calibrated, the correct (closest in time) order profile ($ORDERP$), positions of the orders ($LOCO$), $SHAPELOCAL$, shape reference (x and y maps), and wavelength solution are loaded for each fiber (AB, A, B, and C). The order profiles and input image are transformed to the reference FP grid using the affine transformation, and using the shape x and y maps the image is corrected for the slicer geometry, the tilt and the bending due to the echelle orders.

The extraction recipe then extracts the flux (using optimal extraction), calculates the barycentric correction, corrects contamination from the reference fiber (if an FP is present in the reference fiber), corrects for the flat, corrects for the thermal contribution and generates the 1D spectrum.

Optimal extraction

Once the image and the order profile (from localization) have been corrected for the slicer geometry and curvature of the echelle orders we extract out the combined flux in the science channels (fibers A and B) to create a fiber AB, as well as extracting out the flux in A and B (for polarization work) and C separately (for the reference fiber calibrations). As the orders are already straightened we use just the localization coefficient value at the center of the image to extract vertically along each order. We then divide the image by the order profile to provide a weighting across the order (i.e., an optimal extraction, Horne et al. 1986}). The final step of the optimal extraction is to sum vertically across the columns accounting for cosmic rays by using a sigma clip $|flux| > 10\sigma$ away from the median value for that column. This creates our $E2DS$ (extracted 2D spectrum) and for SPIRou, this leads to images with 49 orders and 4088 pixels along the orders.

BERV correction

Ideally, any stellar spectrum observed would be measured from a point stationary with respect to the barycenter of the Solar System (Wright et al. 2014). However, ground-based observations are subject to: the orbit of the Earth, the rotation of the Earth, precession and other Earth motions, and to a lesser extent gravitation time dilation, leap-second offsets, and factors affecting the star itself (i.e., parallax, proper motions, etc). We use the term BERV (Barycentric Earth Radial Velocity) hereinafter to collect all these terms into a single measurement which can be used to correct a specific spectrum at a specific point in time. We calculate the BERV using the barycorrpy package, which uses the astrometric parameters fed in at the preprocessing level. The calculation from barycorrpy includes the estimate for the BERV itself and the corrected or barycentric Julian Date (BJD) at the mid-exposure time. barycorrpy has a precision better than the cms^{-1} level. We also estimate the maximum BERV value for this object across the year. If for any reason the BERV calculation fails with barycorrpy we calculate an estimate of the BERV (precise to $\sim 10ms^{-1}$, modified from PyAstronomy.pyasl.baryvel; a python implementation of helcorr) and flag that an estimated BERV correction was calculated. This estimated BERV is not precise enough for PRV work but is sufficient to allow for acceptable telluric correction.

Leak Correction

For scientific observations, the reference fiber either has a DARK or an FP illuminating the pixels in this fiber. For PRV an FP allows a simultaneous RV measurement of an FP alongside the measurement of the stellar RV; this allows precise tracking of the instrumental drift when the simultaneous FP is compared to the FP_FP from the nightly wavelength solution calibration. However, light from the FP has been shown to slightly contaminate the science fibers and thus we provide a correction for such calibration.

During the reference sequence many $DARK\_FP$ are combined (and extracted) to form a model of the light seen in the science fibers when no light (other than the contribution from the DARK) was present as well as an extracted reference fiber measurement of the FP flux that caused said contamination in the science fibers. Using these models, the contamination measured in the science channels of the reference leak recipe is then scaled to the flux of the simultaneous FP of the observation (using the extracted flux from this scientific observation we are trying to correct). Then, this model is subtracted from the original science observation for each of the science fibers (AB or A or B), order-by-order:

$$ratio_i = \frac{\Sigma(L[C]_i S[C]_i)}{\Sigma(S[C]_i^2)}$$

$$scale_i = \frac{L[AB, A, B]_i}{ratio_i}$$

$$S[AB, A, B]_{i,corr} = S[AB, A, B]_i - scale_i$$

where L[C] is the model of the FP from the leak reference recipe, S[C] is the 2D extracted spectrum in the reference fiber (fiber C), L[AB,A,B] is the model of the contamination from the FP from the leak reference recipe in the science fibers (either AB or A or B), S[AB,A,B] is the 2D extracted flux in the science fibers (either AB or A or B), S[AB,A,B]_{corr} denotes the leak-corrected 2D extracted spectrum in the science fibers (either AB or A or B) and i denotes that this is done order-by-order.

Thermal correction

The reference dark, applied during the standard image calibration phase, removes the high-frequency components of the dark; however, the thermal contribution still remains (and varies on a night-by-night basis). For this reason, we use nightly extracted $DARK\_DARK$ files to model the thermal contribution present in an observation during the night. The thermal correction model comes in two flavors, one for science observations where we assume there is some sort of continuum to the spectrum and telluric contamination as well as a small contribution arising from the Earth's atmosphere itself, and one for HC or FP extractions where these assumptions are not true.

In the case where we have a scientific observation, a $DARK\_DARK\_TEL$ (where the calibration fiber sees the cold source and the science fibers see the mirror covers) is used. The extracted $DARK\_DARK\_TEL$ is then median filtered with a width of 101 pixels (on a per-order basis). This width was chosen to be big enough to capture large-scale structures in the dark and not be significantly affected by readout noise. A fit is then made to the red most orders ($> 2450nm$) using only flux lower than 0.01 from a transmission spectrum from the Transmissions of the AtmosPhere for AStromomical data tool (TAPAS) – i.e., a domain where transmission is basically zero. We assume that we can safely use any flux with a transmission of order zero to scale the thermal background to this zero transmission value.

$$mask = \left\{ \begin{array}{ll} 1: & TAPAS < 0.01 \\ 0: & \text{otherwise} \end{array} \right.$$

$$ratio = median\left(\frac{TT[AB, A, B, C] \times mask}{S[AB, A, B, C] \times mask}\right)$$

$$S[AB, A, B, C]_{corr} = S[AB, A, B, C] - \frac{TT[AB, A, B, C]}{ratio}$$

where TAPAS is the TAPAS spectrum, TT[AB,A,B,C] is a nightly extracted $DARK\_DARK\_TEL$ spectrum, S[AB,A,B,C] denotes the 2D extracted spectrum prior to correction and $S[AB, A, B]_{corr}$ denotes the thermally corrected 2D extracted spectrum.

In the case where we have an HC or an FP observation, a $DARK\_DARK\_INT$ (where all three fibers see only the cold source, not the sky nor the mirror covers) is used. The extracted $DARK\_DARK\_INT$ is then median filtered (again with a width of 101 pixels on a per-order basis) and a fit is made using an envelope to measure the thermal background in the reddest orders ($> 2450\,nm$). The envelope is constructed by using the flux below the 10th percentile (i.e., not in the HC or FP peaks). This is then converted into a ratio and scaled to the observation we are correcting.

$$ratio = median\left(\frac{TI[AB, A, B, C]}{P_{10}(TI[AB, A, B, C])}\right)$$

$$S[AB, A, B, C]_{corr} = S[AB, A, B, C] - \frac{TI[AB, A, B, C]}{ratio}$$

where P_{10} is the 10th percentile value, TI[AB,A,B,C] is a nightly extracted $DARK\_DARK\_INT$ spectrum (median filtered with a width of 101 pixels), S[AB,A,B,C] denotes the 2D extracted spectrum prior to correction and $S[AB, A, B]_{corr}$ denotes the thermally corrected 2D extracted spectrum.

S1D generation

The $E2DS$ and $E2DSFF$ formats are not necessarily the most convenient for science analysis, having duplicated wavelength coverage at order overlap and slightly varying velocity sampling with each order and between orders. We therefore transform the $E2DSFF$ file into the $S1D$ format. The $S1D$ is sampled on a constant grid for all objects. We have two differing $S1D$ formats, one with a uniform step in wavelength (0.05 nm/pixel) and one with a constant step in velocity (1 kms^{-1}/pixel), both being sampled between 965 nm and 2500 nm. Numerically, to construct the $S1D$, we use as an input the $E2DSFF$ file prior to blaze correction and the blaze file as inputs. We create two $S1D$ vectors, one corresponding to the total flux and one corresponding to the total blaze on the destination wavelength grid. We use a 5th order polynomial spline to project the flux of a given order onto the flux grid and perform the same operation with the blaze onto the weight vector. We do not consider the blaze below 20% of the peak blaze value and values on the destination wavelength grids that are out of the order's range are set to zero. We loop through orders and sum the contribution of each order onto the respective destination grids for the $E2DSFF$ science flux and blaze. Note that the $S1D$ generation only depends on the blaze calibration. As such any spectrum (regardless of emission lines, low flux, or strong bands) can be converted to $S1D$ format and we generate $S1D$ for HC_HC and FP_FP as well as science targets.

2. Schematic

No schematic set

3. Usage

```
apero_extract_spirou.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
→accepts all preprocessed filetypes. All files used will be combined into a single frame.
```

4. Optional Arguments

```
--quicklook[True/False] // [BOOLEAN] Sets whether extraction done in quick look mode
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--combine_method[STRING] // Method to combine files (if --combine=True)
--objname[STRING] // Sets the object name to extract (filters input files)
--dprtype[STRING] // [STRING] Sets the DPRTYPE to extract (filters input files)
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,AB,A,B,C] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--flatfile[FILE:FF_FLAT] // [STRING] Define a custom file to use for flat correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--leakcorr[True/False] // [BOOLEAN] Sets whether to do the leak correction (else defaults to␣
↪CORRECT_LEAKAGE value in constants)
--thermal[True/False] // [BOOLEAN] Sets whether to do the thermal correction (else defaults␣
↪to THERMAL_CORRECT value in constants)
--thermalfile[FILE:THERMALI_E2DS,THERMALT_E2DS] // [STRING] Sets the Thermal correction file␣
↪to use (CAILBDB = THERMAL_{fiber})
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--force_ref_wave[True/False] // Force using the reference wave solution
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 21: Outputs

name	description	HDR[DRSOUT]	file type	suffix	fibers	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	AB, A, B, C	DRS_PP
EXT_E2DS_I	Extracted + flat-fielded 2D spectrum	EXT_E2DS_I	.fits	_e2dsff	AB, A, B, C	DRS_PP
EXT_E2DS_I	Pre-extracted straighted stacked spectrum	EXT_E2DS_I	.fits	_e2dsll	AB, A, B, C	DRS_PP, FLAT_FLAT
EXT_S1D_W	1D stitched spectrum (constant wavelength binning)	EXT_S1D_W	.fits	_s1d_w	AB, A, B, C	DRS_PP
EXT_S1D_V	1D stitched spectrum (constant velocity binning)	EXT_S1D_V	.fits	_s1d_v	AB, A, B, C	DRS_PP
OR-DERP_STRA	Straightened order profile for an individual image	OR-DERP_STRA	.fits	_orderps	AB, A, B, C	SHAPEL
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	DRS_PP
EXT_FPLIST	FP lines identified from extracted FP fiber	EXT_FPLIST	.fits	_ext_fplin	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
QL_E2DS	Extracted 2D spectrum (quick output)	QL_E2DS	.fits	_q2ds	AB, A, B, C	DRS_PP
QL_E2DS_FI	Extracted + flat-fielded 2D spectrum (quick output)	QL_E2DS_FI	.fits	_q2dsff	AB, A, B, C	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
THERMAL_BACKGROUND
EXTRACT_SPECTRAL_ORDER1
EXTRACT_SPECTRAL_ORDER2
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVEREF_EXPECTED
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_EXTRACT_SP_ORDER
SUM_EXTRACT_S1D
```

apero_wave_ref_spirou

1. Description

SHORTNAME: WAVEREF

Wavelength solution reference calibration

The wavelength solution generation follows the general idea of (Hobson et al 2021) however since publication there has been an overall reshuffling of the logic. As such we present an overview of the process here but refer the reader to (Hobson et al 2021) for further specific details.

The reference wavelength solution recipe takes preprocessed *FP_FP* and *HC_HC* files (as many as given by the user or as many as occur on the nights being used via *apero_processing*) from the reference night. It combines the *FP_FP* and *HC_HC* files into a single *FP_FP* and a single *HC_HC* file (via a median combination of the images). These combined *FP_FP* and *HC_HC* files are then extracted.

We first consider the combined flux in fibers A and B (the AB fiber). We locate the *HC_HC* lines, starting with a line list generated as in (Hobson et al 2021), fitting each peak with a Gaussian and measuring the position of the peak, and inferring peak wavelength from an initial guess at the wavelength solution from physical models. The first time this HC finding is performed we allow for a global offset between the current *HC_HC* file and the initial guess at the wavelength solution (this is important when our reference night is far in time from when our initial wavelength solution data was taken).

For the *FP_FP* AB fiber, a similar process is followed. However, instead of a single Gaussian, an Airy function is used (to account for the previous and following FP peak in the fitting process):

$$F_{airy} = A \left(0.5 \left(1 + \frac{2\pi(x - x_0)}{w} \right) \right)^{\beta} + DC$$

where F is the modeled flux of the FP, A is the amplitude of the FP peak, x_0 is the central position of the FP peak, w is the period of the FP in pixel space, β is the shape factor of the FP peak and DC is a constant offset. Once we have found all HC and FP lines in the AB fiber we calculate the wavelength solution.

The accurate wavelength solution for reference night is then found through the following steps:

- From FP peak spacing within each order, derive an effective cavity length per order.
- Fit the chromatic dependency of the cavity with a 5th order polynomial and keep that cavity in a reference file; through the life of the instrument, we will assume that cavity changes are achromatic relative to this polynomial.
- From the chromatic cavity solution, we find the FP order value of each peak, typically numbering from ~600 to ~24500 respectively at long and short wavelength ends of the SPIRou domain.
- From the peak numbering, which is known to be an integer, we can refine the wavelength solution within each order. This solution is kept as a reference wavelength solution.

The finding of the fiber AB HC and FP lines and the calculation of the wavelength solution is repeated multiple times (in an iterative process). We essentially forget the locations of the HC and FP lines and re-find them as if we hadn't found them before, only this time instead of the initial guess wavelength solution we use the previous iteration's calculated solution and the previous iterations calculated cavity width fit as a starting point.

Finally, after three iterations, which is sufficient to converge to floating point accuracy, we re-find the HC and FP lines for the AB fiber one last time using the final reference wavelength solution and final cavity width fit. We also

make an estimate of the resolution, splitting the detector into a grid of 3$\times$3 and using all HC lines in each sector to estimate the line profile and thus the resolution of each sector. We then process each fiber (A, B, and C) in a similar manner to the AB fiber (finding HC and FP lines from the extracted images and calculating the wavelength solution) the only difference being we do not fit the cavity width nor do we fit the chromatic term; we force the coefficients to be the ones found with the AB fiber.

For quality control purposes we calculate an FP binary mask using the cavity width fit and use this to perform a cross-correlation function between the mask and the extracted FP for all fibers (AB, A, B, and C). We use the cross-correlation function to measure the shift of the wavelength solutions measured in fiber AB compared to fibers A, B, and C and confirm that this is less than 2 ms^{-1}. As a second quality control, we match FP lines (found previously) between the fibers and directly calculate the difference in velocity between these lines as a second metric on the radial velocity shift between the fibers' wavelength solutions. Note that typically for the reference night the value of these quality control metrics is around 10-20 cms^{-1} between fibers (i.e. $AB - A$, $AB - B$, $AB - C$).

The reference wavelength solution file ($REFWAVE$) for each fiber, a cavity fit file, and a table of all HC and FP lines found are then saved to the calibration database for use throughout APERO. A resolution map is also saved. The HC_HC and FP_FP extracted files have their headers updated with the reference wavelength solution.

2. Schematic

This section can only currently be viewed in the html documentation.

3. Usage

```
apero_wave_ref_spirou.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_FP]
↪{options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,AB,A,B,C] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
```

```
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--cavityfile[FILE:WAVEREF_CAV] // WAVEREF_CAVFILE_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 22: Outputs

name	description	HDR[DRSO	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2D	Extracted + flat-fielded 2D spectrum	EXT_E2D	.fits	_e2dsff	AB, A, B, C	–	–	DRS_PP
WAVESOL	Reference wavelength solution calibration file	WAVESOL	.fits	_wavesol	AB, A, B, C	cali-bra-tion	WAVES(	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_C	Reference wavelength cavity width polynomial calibration file	WA-VEREF_C	.fits	_wa-veref_cav	AB	cali-bra-tion	WAVE-CAV	EXT_E2DS, EXT_E2DS_FF
WAVE_HC	Reference list of Hollow cathode lines calibration file	WAVE_HC	.fits	_wa-veref_hcl	AB, A, B, C	cali-bra-tion	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_FP	Reference list of FP liens calibration file	WAVE_FP	.fits	_wa-veref_fpli	AB, A, B, C	cali-bra-tion	WAVEFl	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength resolution map file	WAVE_RE	.fits	_wa-veref_res	AB, A, B, C	–	–	EXT_E2DS, EXT_E2DS_FF
WAVEM_I	Reference wavelength resolution e2ds file	WAVEM_I	.fits	_wa-veref_res	AB, A, B, C	cali-bra-tion	WAVR_	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	AB, A, B, C	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_wave_night_spirou

1. Description

SHORTNAME: WAVE

Nightly wavelength solution calibration

Considering that the wavelength solution is central in the anchoring of PRV measurement and that the instrument will drift through time, one needs to obtain a wavelength solution as close as possible in time to the science exposures, ideally on a nightly basis. The nightly wavelength solution captures sub-μm level motions within the optical train and high-order changes in the focal plane that are not captured by the affine transform used to register frames as described in sections ref{subsec:ref_shape} and ref{subsec:night_shape}. The nightly wavelength solution recipe takes preprocessed *FP_FP* files and *HC_HC* files (as many as given by the user or as many as occur on each of the nights being used via *apero_processing*). It combines the *FP_FP* and *HC_HC* files into a single`FP_FP` and a single *HC_HC* file (via a median combination of the images). These combined *FP_FP* and *HC_HC* files are then extracted.

The rest of the process is similar to the reference wavelength solution. The wavelength solution is determined as follows:

- Under the assumption that the reference wavelength solution is correct at the pixel level, identify HC lines (catalog wavelength) and FP peaks (FP order).
- By combining the reference chromatic FP cavity length and position of FP peaks of known FP order, fit a per-order wavelength solution.
- Using that wavelength solution, measure the velocity offset in the position of HC lines (Δv_{HC}) and derive an achromatic increment to be applied to the FP cavity
- Scale the 0th order term of the Nth order cavity polynomial by $1 - \frac{\Delta v_{\mathrm{HC}}}{c}$, where c is the speed of light in the units of Δv_{HC}.
- Iterate the last two steps until Δv_{HC} is consistent with zero.

The main difference with the reference wavelength solution for fiber AB is that while we start the calculation of the wavelength solution with the cavity fit and wavelength solution from the reference wavelength solution calibration, we only allow for changes in the achromatic term. This is because the chromatic dependence of the cavity width is related to the coating of the FP etalon, and is therefore not expected to change rapidly. An achromatic shift, on the other hand, corresponds to a change in the cavity length of the FP, due in part to pressure or temperature variations, which may happen between nights. Meanwhile, for fibers A, B, and C we fit nothing and use the fiber AB wavelength cavity coefficients. The FP mask for quality control is also not re-generated. Therefore all cross-correlations between fibers AB and A, B, and C are done relative to the reference night wavelength solution (however we only check quality control on $AB - A$, $AB - B$, $AB - C$). As with the reference wavelength solution recipe, a wavelength solution for each fiber, and the FP and HC lines founds during the process, are then saved to the calibration database for use throughout APERO.

2. Schematic

No schematic set

3. Usage

```
apero_wave_night_spirou.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_
↪FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,AB,A,B,C] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 23: Outputs

name	description	HDR[DRSC	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2I	Extracted + flat-fielded 2D spectrum	EXT_E2I	.fits	_e2dsff	AB, A, B, C	–	–	DRS_PP
WAVE_N	Nightly wavelength solution calibration file	WAVE_N	.fits	_wave_n	AB, A, B, C	cali-bra-tion	WAV	EXT_E2DS, EXT_E2DS_FF
WAVE_H	Nightly wavelength Hollow cathodeline-list table	WAVE_H	.fits	_wave_h	AB, A, B, C	–	–	EXT_E2DS, EXT_E2DS_FF
WAVE_F	Nightly wavelength FP line-list calibration file	WAVE_F	.fits	_wave_f	AB, A, B, C	–	–	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	AB, A, B, C	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_ccf_spirou

1. Description

SHORTNAME: CCF

Radial velocity via CCF

The CCF method is very often used for PRV work, particularly in the optical domain. In the early APERO effort, it was the main tool to derive precise RV values. When implementing a near-infrared version of the CCF, a number of challenges appeared. The near-infrared domain is plagued with telluric absorption, and even after telluric correction, some wavelength domains are expected to have significant excess noise levels. Deep or saturated telluric lines cannot be corrected and are better left as gaps (represented as NAN) in the spectrum that are fixed for the entire time series considered. When computing a CCF, how does one account for gaps in the data? The star's yearly line of sight variations will cause this gap to shift against the stellar spectrum by up to $\pm 32 kms^{-1}$ depending on ecliptic latitude. In the optical, one can simply reject the entire domain affected by the gap (64 kms^{-1} plus the gap width); however, at optical wavelengths, deep absorption lines are sufficiently sparse that the overall loss in wavelength domain due to telluric absorption is small, which is not the case in the near-infrared.

To further obfuscate the issue, telluric absorption varies between nights, so if one went down this path of masking, it would end with the masking of a large window affected by any line that gets deeper than a given threshold, even if only once in a time-series that may include hundreds of visits. The combination of varying conditions and yearly BERV excursions leads to a loss of domain that is simply unacceptable, especially considering that the parts of the near-infrared that are richest in sharp spectroscopic features (See Figure 4 in Artigau et al. 2022) are at the blue and red edges of the H band, which are affected by telluric water absorption.

We opted for a CCF that correlates weighted delta functions against the spectrum but set the weight to zero when reaching a point below 0.5 telluric transmission (where unity is no telluric absorption). This is done on a spectrum-to-spectrum basis, to minimize the effective throughput losses. This CCF measurement is performed per spectrum using one of the 3 standard masks available in APERO depending on the star's temperature (GL846, Gl699, Gl905 respectively for Teff >3500 K, 3000-3500 K, <3000 K. We derive per-order as well as global CCFs. These data products are useful to confirm the systemic velocity of the star, avoiding eventual target misidentifying, as well as for flagging spectroscopic binaries. For time-series analysis, it can be significantly improved upon by using all observations to perform a spectral cleaning to obtain a much cleaner CCF or through completely different methods, such as the line-by-line algorithm.

2. Schematic

No schematic set

3. Usage

```
apero_ccf_spirou.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] // [STRING/STRINGS] A list of fits files to use␣
↪separated by spaces. Currently allowed types: E2DS, E2DSFF, TELLU_OBJ (For dprtype = OBJ_FP,
↪ OBJ_DARK)
```

4. Optional Arguments

```
--mask[FILE:CCF_MASK] // [STRING] Define the filename to the CCF mask to use. Can be full␣
↪path or a file in the ./data/spirou/ccf/ folder
--rv[FLOAT] // [FLOAT] The target RV to use as a center for the CCF fit (in km/s)
--width[FLOAT] // [FLOAT] The CCF width to use for the CCF fit (in km/s)
--step[FLOAT] // [FLOAT] The CCF step to use for the CCF fit (in km/s)
--masknormmode[None,all,order] // [STRING] Define the type of normalization to apply to ccf␣
↪masks, all normalized across all orders, order normalizes independently for each order,␣
↪None applies no mask normalization
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
```

(continues on next page)

```
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 24: Outputs

name	description	HDR[DRSOUTID]	file type	suf-fix	fibers	input file
CCF_RV	Cross-correlation RV re-sults file	CCF_RV	.fits	_ccf	AB, A, B, C	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
CCF_RV_FIT
CCF_RV_FIT_LOOP
CCF_SWAVE_REF
CCF_PHOTON_UNCERT
```

9. Summary plots

```
SUM_CCF_PHOTON_UNCERT
SUM_CCF_RV_FIT
```

apero_mk_skymodel_spirou

1. Description

SHORTNAME: MKSKY

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_skymodel_spirou.py {options}
```

No optional arguments

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 25: Outputs

name	description	HDR[DRSOUTI	file type	suffix	db-name	dbkey	input file
SKY_MODE	Telluric model file	sky	SKY_MODEL	.fits	_sky_mod	tel-luric	SKY_MODE	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKYMODEL_REGION_PLOT
TELLU_SKYMODEL_MED
TELLU_SKYMODEL_LINEFIT
```

9. Summary plots

No summary plots.

apero_mk_tellu_spirou

1. Description

SHORTNAME: MKTELL

Residual transmission of hot stars (mktellu)

The residual transmission recipe takes a single hot star observation (an extracted, flat-fielded 2D spectrum). The first step is a pre-cleaning correction which essentially removes the bulk of the telluric absorption, producing a corrected 2D spectrum as well as an absorption spectrum, sky model, and an estimate of the water and dry components of the absorption (Artigau in prep). The pre-cleaning uses a stellar template, if available, to better measure the water and dry components. The corrected 2D spectrum is then normalized by the 95th percentile of the blaze per order and the residual transmission map is created by using a low-pass filter (per order) on the hot star (and dividing by a template if present).

We make sure the pre-cleaning was successful (i.e., the water component exponent is between 0.1 and 15 and the dry component exponent is between 0.8 and 3.0) and check that the SNR for each order is above a 100; subsequently, the hot star residual transmission maps are added to the telluric database.

2. Schematic

No schematic set

3. Usage

```
apero_mk_tellu_spirou.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 26: Outputs

name	description	HDR[DRSC	file type	suffix	fibers	db-name	dbkey	input file
TELLU_C	–	–	.npy	_tellu_cc	AB, A, B	tel-luric	TELLU_C	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_T	Telluric transmission file	TELLU_T	.fits	_tellu_tr	AB, A, B	tel-luric	TELLU_T	EXT_E2DS_FF
TELLU_S	Sky-cleaning file	TELLU_S	.fits	_tellu_sc	–	–	–	EXT_E2DS_FF
TELLU_F	Telluric pre-cleaning file	TELLU_F	.fits	_tellu_pc	AB, A, B	tel-luric	TELLU_F	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
MKTELLU_WAVE_FLUX1
MKTELLU_WAVE_FLUX2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RECON_SPLINE2
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_MKTELLU_WAVE_FLUX
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
```

apero_mk_model_spirou

1. Description

SHORTNAME: MKMODEL

Water and dry component models (mkmodel)

During the pre-cleaning process (Artigau in prep.) for the hot stars (done as part of Amktellu) we calculate the water and dry exponents of absorption. Once we have observed a sufficiently large library of telluric hot stars, typically a few tens under varying airmass and water column conditions, we take all of the residual transmission maps that passed quality control and calculate a linear minimization of the parameters. The linear minimization is done per pixel per order, across all transmission maps (removing outliers with a sigma clipping approach) against a three-vector sample (the bias level of the residual, the water absorption exponent, and the dry absorption exponent). The output is three vectors each the same size as the input 2D spectrum (49×4088), one for each of the three vector samples. These are used in every ftellu recipe run to correct the telluric residuals after telluric cleaning. The three vectors are saved and added to the telluric database.

2. Schematic

No schematic set

3. Usage

```
apero_mk_model_spirou.py {options}
```

No optional arguments

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 27: Outputs

name	description	HDR[DRSOUT	file type	basename	fibers	db-name	dbkey
TRANS_MOI	Telluric transmission model file	TRANS_MOI	.fits	trans_model_	AB, A, B	tel-luric	TELLU_MODEL

8. Debug plots

```
MKTELLU_MODEL
```

9. Summary plots

```
SUM_MKTELLU_MODEL
```

apero_fit_tellu_spirou

1. Description

SHORTNAME: FTELLU

Correcting telluric absorption (ftellu)

All hot stars and science targets are corrected for telluric absorption. The first step, as with mktellu, is the pre-cleaning correction. Then, we correct the residuals of the pre-cleaning at any given wavelength by fitting a linear combination of water and dry components. We assume that any given absorption line in the TAPAS absorption spectrum has a strength that is over or underestimated relative to reality, the residuals after correction will scale, as a first order, with the absorption of the chemical species. The same is true with line profiles; if the wings of a line are over or underestimated, the residuals will scale with absorption We correct the telluric absorption on the combined AB extracted spectrum and subsequently use the same reconstructed absorption (for fiber AB) to correct the extracted spectra for fibers A and B individually.

2. Schematic

No schematic set

3. Usage

```
apero_fit_tellu_spirou.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--onlypreclean // Only run the precleaning steps (not recommended - for debugging ONLY)
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
```

```
→(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
→use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
→setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 28: Outputs

name	description	HDR[DRS	file type	suffix	base-name	fibers	db-name	dbkey	input file
ABSO_N	–	–	.npy	–	tellu_sa	–	–	–	–
ABSO1_	–	–	.npy	–	tellu_sa	–	–	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff_	–	AB, A, B	tel-luric	TELLU_	EXT_E2DS_FF
SC1D_W	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_W	.fits	_s1d_w_	–	AB, A, B	–	–	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v_	–	AB, A, B	–	–	EXT_E2DS_FF
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff_	–	AB, A, B	tel-luric	TELLU_	EXT_E2DS_FF
RC1D_W	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_W	.fits	_s1d_w_	–	AB, A, B	–	–	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_V	.fits	_s1d_v_	–	AB, A, B	–	–	EXT_E2DS_FF
TELLU_	Sky-cleaning file	TELLU_	.fits	_tellu_s	–	–	–	–	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_p	–	AB, A, B	tel-luric	TELLU_	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
FTELLU_PCA_COMP1
FTELLU_PCA_COMP2
FTELLU_RECON_SPLINE1
FTELLU_RECON_SPLINE2
FTELLU_WAVE_SHIFT1
FTELLU_WAVE_SHIFT2
FTELLU_RECON_ABSO1
FTELLU_RECON_ABSO2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RES_MODEL
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_FTELLU_RECON_ABSO
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
SUM_FTELLU_RES_MODEL
```

apero_mk_template_spirou

1. Description

SHORTNAME: MKTEMP

Template generation (mktemp)

Templates for each astrophysical object are created simply by shifting all observations (in BERV) from their nightly wavelength solution to the reference wavelength solution. This effectively creates a cube (In practice some astrophysical objects have thousands of observations so a median is done in parts, splitting into bins in time, combining the median cubes together to produce one final cube, to reduce computational requirements) of observations for specific astrophysical objects which are then normalized (per observation) by the median for each order.

We pass a low-pass filter over this cube and then the cube is reduced to a single 2D (extracted and telluric-corrected) spectrum by taking a median in the time dimension (across observations). The same process is done for the 1D spectrum. The 2D templates are copied to the telluric database for use in the rest of the telluric cleaning process (the second iterations of mktellu and ftellu), except if the BERV change throughout all epochs is below 8 kms^{-1}. The 1D spectrum is saved as a useful output of APERO.

2. Schematic

No schematic set

3. Usage

```
apero_mk_template_spirou.py {objname}[STRING] {options}
```

```
{objname}[STRING] // [STRING] The object name to process
```

4. Optional Arguments

```
--filetype[EXT_E2DS,EXT_E2DS_FF] // [STRING] optional, the filetype (KW_OUTPUT) to use when␣
↪processing files
--fiber[AB,A,B,C] // [STRING] optional, the fiber type to use when processing files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
```

```
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 29: Outputs

name	description	HDR[DRSOUT	file type	base-name	fibers	db-name	dbkey	input file
TELLU_TEI	Telluric 2D template file	TELLU_TEI	.fits	Template	AB, A, B	tel-luric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (star frame)	TELLU_BIG	.fits	BigCube	AB, A, B	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	AB, A, B	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEI	Telluric 1D template file	TELLU_TEI	.fits	Template_s1	AB, A, B	tel-luric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEI	Telluric 1D template file	TELLU_TEI	.fits	Template_s1	AB, A, B	tel-luric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 1D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	AB, A, B	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
EXTRACT_S1D
MKTEMP_BERV_COV
MKTEMP_S1D_DECONV
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_MKTEMP_BERV_COV
```

apero_pol_spirou

1. Description

SHORTNAME: POLAR

Polarimetry

The polarimetry module for APERO was adapted from the [spirou-polarimetry](https://github.com/edermartioli/spirou-polarimetry). SPIRou as a polarimeter can measure either circular (Stokes V) or linear (Stokes Q or U) polarization in the line profiles. Each polarimetric measurement is performed by 4 exposures obtained with the Fresnel rhombs set at different orientations (see Section 3.1 of Donati et al. 2020).

Table 30: Index positions of the Fresnel rhombs (RHB1 and RHB2) for exposures taken in each observing mode of SPIRou.

Observing mode	Exp1 RHB1	Exp1 RHB2	Exp2 RHB1	Exp2 RHB2	Exp3 RHB1	Exp3 RHB2	Exp4 RHB1	Exp4 RHB2
Stokes IU	P16	P2	P16	P14	P4	P2	P4	P14
Stokes IQ	P2	P14	P2	P2	P14	P14	P14	P2
Stokes IV	P14	P16	P2	P16	P2	P4	P14	P4

In the Table above we provide the index position of each Fresnel rhomb, as they appear in the FITS header, for each exposure in the corresponding polarimetric mode.

These indices are used by APERO to recognize exposures within a polarimetric sequence, and then correctly apply the method introduced by Donati et al. 1997 to calculate polarimetric spectra.

The polarization spectra of SPIrou are calculated using the technique introduced by Donati et al. 1997, which is summarized as follows. Let $f_{i\parallel}$ and $f_{i\perp}$ be the extracted flux in a given spectral element of fiber A and B channels, where $i = \{1, 2, 3, 4\}$ gives the exposure number in the polarimetric sequence. Note that the extracted flux can be either the extracted spectrum or the extracted telluric corrected spectrum; by default in APERO, we use the telluric corrected spectrum. The total flux of unpolarized light (Stokes I) is calculated by the sum of fluxes in the two channels and in all exposures, i.e.,

$$F_I = \sum_{i=1}^{4} \left(f_{i\parallel} + f_{i\perp} \right)$$

Let us define the ratio of polarized fluxes as

$$r_i = \frac{f_{i\parallel}}{f_{i\perp}}$$

which gives a relative measurement of the flux between the two orthogonal polarization states. In an ideal system, :math`r=1` means completely unpolarized light, and other values provide the amount (or the degree) of polarization that can be calculated as in Equation 1 of Donati et al. 1997, i.e.,

$$P = \frac{f_\parallel - f_\perp}{f_\parallel + f_\perp} = \frac{r - 1}{r + 1}$$

Therefore, in principle, one could obtain the amount of polarization with a single exposure. However, this measurement is not optimal, since it only records the two states of polarization at the same time but not at the same pixel. To obtain a measurement that records the same state of polarization at the same pixel, it suffices to take a second exposure with one of the quarter-wave analyzers rotated by 90° with respect to the first exposure, consisting of the 2-exposure mode. One can also use the 4-exposure (2 pairs) mode, where the polarization state in the two channels is swapped between pairs, which better corrects for slight deviations of retarders from nominal characteristics (retardance and orientation) and also corrects for the differences in transmission between the two channels caused, for example, by different throughput of the two fibers, or by a small optical misalignment. For this reason,

SPIRou only operates in the 4-exposure mode, which is accomplished by rotating the analyzers accordingly in each exposure, as detailed in the table above. The equation to calculate the degree of polarization for the 4-exposure mode can be obtained in two different ways, by using the Difference method or by the Ratio method, as defined in sections 3.3 and 3.4 of Bagnulo et al. 2009 and also in Equation 3 of Donati et al. 1997. The degree of polarization for a given Stokes parameter $X = \{U, Q, V\}$ in the Difference method is calculated by

$$P_X = \frac{1}{4} \sum_{k=1}^{2} \left(\frac{r_{2k-1} - 1}{r_{2k-1} + 1} - \frac{r_{2k} - 1}{r_{2k} + 1} \right)$$

and for the Ratio method the degree of polarization is given by

$$P_X = \frac{(\prod_{k=1}^{2} r_{2k-1}/r_{2k})^{1/4} - 1}{(\prod_{k=1}^{2} r_{2k-1}/r_{2k})^{1/4} + 1}$$

Another advantage of using two pairs of exposures is that one can calculate the null polarization (NULL1 and NULL2) as in equations 20 and 26 of Bagnulo et al. 2009, which provides a way to quantify the amount of spurious polarization. The null polarization for the Difference method is given by

$$NULL_X = \frac{1}{4} \sum_{k=1}^{2} \left[(-1)^{k-1} \left(\frac{r_{2k-1} - 1}{r_{2k-1} + 1} - \frac{r_{2k} - 1}{r_{2k} + 1} \right) \right]$$

and for the Ratio method the null polarization is given by

$$NULL_X = \frac{\left(\prod_{k=1}^{2} r_{2k-1}/r_{2k} \right)^{\frac{(-1)^{k-1}}{4}} - 1}{\left(\prod_{k=1}^{2} r_{2k-1}/r_{2k} \right)^{\frac{(-1)^{k-1}}{4}} + 1}$$

Finally, the uncertainties of polarimetric measurements can be calculated from the extracted fluxes and their uncertainties (denoted here by σ) by equations A3 and A10 of Bagnulo et al. 2009. In the Difference method, the variance for each spectral element is given by

$$\sigma_X^2 = \frac{1}{16} \sum_{i=1}^{4} \left\{ \left[\frac{2 f_{i\parallel} f_{i\perp}}{(f_{i\parallel} + f_{i\perp})^2} \right]^2 \left[\frac{\sigma_{i\parallel}^2}{f_{i\parallel}^2} + \frac{\sigma_{i\perp}^2}{f_{i\perp}^2} \right] \right\}$$

and in the Ratio method the variance is given in terms of the flux ratio r_{i}, i.e.,

$$\sigma_X^2 = \frac{\left(\frac{r_1}{r_2} \frac{r_4}{r_3} \right)^{1/2}}{4 \left[\left(\frac{r_1}{r_2} \frac{r_4}{r_3} \right)^{1/4} + 1 \right]^4} \sum_{i=1}^{4} \left[\frac{\sigma_{i\parallel}^2}{f_{i\parallel}^2} + \frac{\sigma_{i\perp}^2}{f_{i\perp}^2} \right]$$

Applying this formalism to SPIRou spectra, we obtain values that vary continuously throughout the spectrum and are systematically above or below zero for each spectrum, which we refer to here as the `continuum polarization'. For general scientific applications with SPIRou, this continuum polarization is actually spurious as it reflects small differences in the injection between beams, and must therefore be fitted and removed. This step is mandatory before performing measurements in spectral lines. APERO applies an iterative sigma-clip algorithm to fit either a polynomial or a spline to model the continuum polarization.

Least-Squares Deconvolution

The least-squares deconvolution method (LSD) is an efficient technique that combines the signal from thousands of spectral lines retaining the same line profile information to obtain a mean velocity profile for the intensity, polarization, and null spectra. A common application of this technique concerns the measurement of the Zeeman split into Stokes V (circularly polarized) profiles. The Zeeman split is a physical process where electronic transitions occurring in the presence of a magnetic field have their main energy transition level split into two additional levels, forming a double line in the intensity spectrum. An interesting feature of these lines is that they are circularly polarized and their polarizations have opposite signs. Therefore, by observing the circularly polarized spectrum one can obtain a characteristic Stokes V profile that provides a way to detect and characterize the magnetism in stellar photospheres with great sensitivity.

APERO implements the LSD calculations using the formalism introduced by Donati et al. 1997, summarized as follows. Let us first consider the weight of a given spectral line i, $w_i = g_i \lambda_i d_i$, where g is the Landé factor (magnetic sensitivity), λ is the central wavelength, and d is the line depth. Then one can construct the line pattern function

$$M(v) = \sum_{i=1}^{N_l} w \delta(v - v_i)$$

where N_l is the number of spectral lines considered in the analysis, δ is the Dirac function, and v is the velocity. The transformation from wavelength (λ) to velocity space is performed by the relation $dv/d\lambda = c/\lambda$, where c is the speed of light.

The LSD profile is calculated by the following matrix equation:

$$\mathbf{Z} = \left(\mathbf{M}^\mathrm{t}.\mathbf{S}^2.\mathbf{M}\right)^{-1}\mathbf{M}^\mathrm{t}.\mathbf{S}^2.\mathbf{P}$$

where $\mathbf{P}$ is the polarimetric spectrum, and $\mathbf{S}$ is the covariance matrix, a diagonal matrix where each element in the diagonal is given by $S_{jj} = 1/\sigma_j$, with σ_j being the uncertainty in the polarimetric spectrum.

Note that one can also calculate the null polarization LSD profile by substituting the polarimetric spectrum $\mathbf{P}$ by the null spectrum $\mathbf{N}$. The intensity LSD is also possible, by using the flux spectrum $\mathbf{F}$, but in this case the line weight is simply given by the line depth, i.e, $w_i = d_i$.

In practice, LSD requires a few important steps to be executed by APERO. First, each individual spectrum is cleaned using a sigma-clip rejection algorithm to minimize the impact of outliers in the LSD profile. Then we set a grid of velocities to calculate the LSD profile, where the grid is defined by the following parameters: an initial velocity, v_0, a final velocity, v_f, and the total number of points in the grid, N_v.

Next, a fast and accurate method is necessary to project the spectral values onto the velocity grid. Finally, an appropriate catalog of spectral lines (line mask) needs to be adopted for the LSD calculations. APERO selects the line mask from a repository of masks, where the selection is based on the proximity to the effective temperature of the star observed. The APERO masks are computed using the VALD catalog (Piskunov et al. 1995) and a MARCS model atmosphere (Gustafsson et al. 2008) with an effective temperature ranging from 2500 to 5000 K in steps of 500 K, and the same surface gravity of $\log g = 5.0$ dex. The lines that are effectively used in the LSD analysis are selected with line depths above a given threshold, which is set to 3% by default and with a Lande factor of $g_\mathrm{eff} > 0$, resulting in a total of approximately 2500 atomic lines that cover the full spectral range of SPIRou.

The LSD analysis is not computed in a standard automated run of APERO but the module is supplied and can be activated with the use of a single keyword in the APERO profiles or run after processing.

2. Schematic

No schematic set

3. Usage

```
apero_pol_spirou.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--exposures[FILE:EXT_E2DS_FF,TELLU_OBJ] // List of exposures to add (order determined by␣
↪recipe)
--exp1[FILE:EXT_E2DS_FF,TELLU_OBJ] // Override input exposure 1
--exp2[FILE:EXT_E2DS_FF,TELLU_OBJ] // Override input exposure 2
--exp3[FILE:EXT_E2DS_FF,TELLU_OBJ] // Override input exposure 3
--exp4[FILE:EXT_E2DS_FF,TELLU_OBJ] // Override input exposure 4
--objrv[FLOAT] // Object radial velocity [km/s]
--lsdmask[STRING] // LSD mask
--output[STRING] // Output file
--output_lsd[STRING] // Output LSD file
--lsd // Run LSD analysis
--noqccheck // Do not check quality control of inputs
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
```

```
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 31: Outputs

name	description	HDR[DRSOU	file type	suffix	input file
POL_DEG	Polarimetry 2D degree of polarisation file	POL_DEG	.fits	_pol	EXT_E2DS_FF, TELLU_OBJ
NULL_POI	2D Null polarisation 1 file	NULL_POI	.fits	_null1_pol	EXT_E2DS_FF, TELLU_OBJ
NULL_POI	2D Null polarisation 2 file	NULL_POI	.fits	_null2_pol	EXT_E2DS_FF, TELLU_OBJ
STOKESI_	Polarimetry 2D stokes I polarisation file	STOKESI_	.fits	_StokesI	EXT_E2DS_FF, TELLU_OBJ
LSD_POL	Least squares deconvolution file	LSD_POL	.fits	_lsd_pol	EXT_E2DS_FF, TELLU_OBJ
POL_CALI	Polarimetry 2D shifted wavelength solution and blaze calibration file	POL_CALI	.fits	_pol_calib	EXT_E2DS_FF, TELLU_OBJ
S1DW_POl	Polarimetry 2D degree of polarisation file (constant wavelength binning)	S1DW_POl	.fits	_s1d_w_p	EXT_E2DS_FF, TELLU_OBJ
S1DV_POL	Polarimetry 2D degree of polarisation file (constant velocity binning)	S1DV_POL	.fits	_s1d_v_p	EXT_E2DS_FF, TELLU_OBJ
S1DW_NUl	1D Null polarisation 1 file (constant wavelength binning)	S1DW_NUl	.fits	_s1d_w_n	EXT_E2DS_FF, TELLU_OBJ
S1DV_NUl	1D Null polarisation 1 file (constant velocity binning)	S1DV_NUl	.fits	_s1d_v_n	EXT_E2DS_FF, TELLU_OBJ
S1DW_NUl	1D Null polarisation 2 file (constant wavelength binning)	S1DW_NUl	.fits	_s1d_w_n	EXT_E2DS_FF, TELLU_OBJ
S1DV_NUl	1D Null polarisation 2 file (constant velocity binning)	S1DV_NUl	.fits	_s1d_v_n	EXT_E2DS_FF, TELLU_OBJ
S1DW_STC	Polarimetry 1D stokes I polarisation file (constant wavelength binning)	S1DW_STC	.fits	_s1d_w_s	EXT_E2DS_FF, TELLU_OBJ
S1DV_STO	Polarimetry 1D stokes I polarisation file (constant velocity binning)	S1DV_STO	.fits	_s1d_v_st	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
POLAR_FIT_CONT
POLAR_CONTINUUM
POLAR_RESULTS
POLAR_STOKES_I
POLAR_LSD
EXTRACT_S1D_WEIGHT
EXTRACT_S1D
```

9. Summary plots

```
SUM_EXTRACT_S1D
```

apero_postprocess_spirou

1. Description

SHORTNAME: OBJPOST

Post processing

The final data products that go to PIs are composite files of many of the outputs of APERO. For SPIRou, these are sent to the Canadian Data Astronomy Center (CADC, accessible from https://www.cadc-ccda.hia-iha.nrc-cnrc.gc.ca/) but are only produced for science targets and hot stars (i.e., *OBJ_FP*, *OBJ_DARK*, *POLAR_FP*, and *POLAR_DARK*) and not for calibrations by default. There are currently five post-processing files each linked to a single odometer code. These are the 2D extracted output (e.fits), the 2D telluric corrected output (t.fits), the 1D output (s.fits), the velocity output (v.fits), and the polarimetric outputs (p.fits). A summary of the CADC output files is available in table below.

Table 32: Science ready outputs sent to the Canadian Data Astronomy Center, CADC).

File	Description
(odometer)e.fits	2D extracted spectrum for fibers AB, A, B, C, wavelength solution, and blaze
(odometer)s.fits	1D extracted spectrum for fibers AB, A, B, C, and telluric corrected spectrum if available
(odometer)t.fits	2D telluric corrected spectrum for fiber AB, A, B, wavelength solution, blaze, and reconstructed atmospheric transmission
(odometer)v.fits	combined and per order CCFs for fitting the radial velocity of the star
(odometer)p.fits	polarimetric products (Polarimetric flux, Stokes I, Null vectors, wavelength solution, and blaze)

2D extraction product (e.fits)

These are the combined extracted products. All extensions are two-dimensional spectra of size 4088×49. The e.fits file contains the extracted spectrum for each order for each fiber and the matching wavelength and blaze solution for each order and each fiber. The files are identified with a single odometer generated at the time of observation followed by an e.fits suffix.

2D telluric corrected product (t.fits)

These are the combined telluric-corrected products. All extensions are two-dimensional spectra of size 4088×49. The t.fits file contains the telluric corrected spectrum for each order and each fiber and the matching wavelength and blaze solution for each order and each fiber. The files are identified with a single odometer code at the time of observation followed by a t.fits suffix.

1D extraction and 1D telluric corrected product (s.fits)

These are the combined 1D spectrum products and consist of two tables. The two tables consist of the 1D spectrum in 1. velocity units and 2. wavelength units. They each consist of the following columns: the wavelength solution, the extracted flux in AB, A, B, and C, the telluric corrected flux in fibers AB, A, and B (if available), and the associated uncertainties for each flux column. The files are identified with a single odometer code at the time of observation followed by an s.fits suffix.

Velocity product (v.fits)

The velocity products are packaged into the v.fits file. Currently, only the CCF values are added as an extension as the LBL products are computed separately. The CCF file consists of the CCF generated for each radial velocity element (by default this is between $\pm 300 ms^{-1}$ in steps of $0.5\ ms^{-1}$) for each order and a combined CCF for the same radial velocity elements. The files are identified with a single odometer code at the time of observation followed by a v.fits suffix. Once the LBL module is able to be used with APERO it will add an extension to the v.fits (the rdb extension described in the LBL documentation).

Polarimetric product (p.fits)

These are the combined polarimetric products. The p.fits file consists of eight image extensions and three table extensions. The first two tables are the 1D representations of the 2D polarimetric products (listed in the extensions above) in 1. velocity units and 2. wavelength units. They each consist of the following columns: the wavelength solution, the polarimetric flux, the Stokes I flux, the Null 1 and 2 fluxes, and the associated uncertainties on each flux column. The third table lists the configuration parameters used to run APERO. Although polarimetric products are the combination of at least 4 odometer codes, files are associated with a single odometer code (the first in the sequence at the time of observation) followed by a p.fits suffix.

2. Schematic

No schematic set

3. Usage

```
apero_postprocess_spirou.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces.
```

4. Optional Arguments

```
--skip // Overwrites post processed files if they exist (default is False)
--clear // Clear the reduced folder after post-processing. WARNING removes all files from the
↪reduced directory.
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_OUT // Default: "out" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

3.1.1.3 User tools (spirou)

There are currently no documented user tools for SPIROU

3.1.1.4 File definitions (SPIROU)

Contents

1. Raw Files

1.1 File definition table

Table 33: 1. Raw Files file definition table

name	description	HDR[OB	HDR[SB	HDR[SB	HDR[SB	HDR[INS	HDR[TR	HDR[DRSMODE]*
RAW_I	Raw sci=DARK calib=DARK file, where dark is an internal dark	DARK	pos_pk	pos_pk	P4	SPIRou	–	–
RAW_I	Raw sci=DARK calib=DARK file, where dark is a telescope dark	DARK	pos_pk	pos_pk	P5	SPIRou	–	–
RAW_I	Raw sci=DARK calib=DARK file, where dark is a sky dark	OB-JECT	pos_pk	pos_pk	–	SPIRou	SKY	–
RAW_I	Raw sci=DARK calib=FP file, where dark is an internal dark	OB-JECT	pos_pk	pos_fp	–	SPIRou	SKY	–
RAW_I	Raw sci=DARK calib=FLAT file, where dark is an internal dark	FLAT	pos_pk	pos_wl	–	SPIRou	–	–
RAW_I	Raw sci=FLAT calib=DARK file, where dark is an internal dark	FLAT	pos_wl	pos_pk	–	SPIRou	–	–

continues on next page

Table 33 – continued from previous page

name	description	HDR[OE	HDR[SB	HDR[SB	HDR[SB	HDR[INS	HDR[TR	HDR[DRS	MODE]*
RAW_F	Raw sci=FLAT calib=FLAT file	FLAT	pos_wl	pos_wl	–	SPIRou	–	–	
RAW_F	Raw sci=FLAT calib=FP file	FLAT	pos_wl	pos_fp	–	SPIRou	–	–	
RAW_F	Raw sci=DARK calib=FP file, where dark is an internal dark	ALIGN	pos_pk	pos_fp	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=DARK file, where dark is an internal dark	ALIGN	pos_fp	pos_pk	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=FLAT file	ALIGN	pos_fp	pos_wl	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=FP file	ALIGN	pos_fp	pos_fp	–	SPIRou	–	–	
RAW_I	Raw sci=LFC calib=LFC file	ALIGN	pos_rs	pos_rs	–	SPIRou	–	–	
RAW_I	Raw sci=LFC calib=FP file	ALIGN	pos_rs	pos_fp	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=LFC file	ALIGN	pos_fp	pos_rs	–	SPIRou	–	–	
RAW_O	Raw sci=OBJ calib=DARK file, where dark is an internal dark	OB-JECT	pos_pk	pos_pk	–	SPIRou	TAR-GET	SPEC-TROSCOPY	
RAW_O	Raw sci=OBJ calib=FP file	OB-JECT	pos_pk	pos_fp	–	SPIRou	TAR-GET	SPEC-TROSCOPY	
RAW_O	Raw sci=OBJ calib=Hollow Cathode file, Uranium Neon lamp	OB-JECT	pos_pk	pos_hc1	–	SPIRou	TAR-GET	–	
RAW_O	Raw sci=OBJ calib=Hollow Cathode file, Thorium Argon lamp	OB-JECT	pos_pk	pos_hc2	–	SPIRou	TAR-GET	–	
RAW_P	Raw sci=POLAR calib=DARK, where dark is an internal dark	OB-JECT	pos_pk	pos_pk	–	SPIRou	TAR-GET	PO-LAR	
RAW_P	Raw sci=POLAR calib=FP	OB-JECT	pos_pk	pos_fp	–	SPIRou	TAR-GET	PO-LAR	
RAW_I	Raw sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Uranium Neon lamp	COM-PARI-SON	pos_pk	pos_hc1	–	SPIRou	–	–	
RAW_I	Raw sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Thorium Argon lamp	COM-PARI-SON	pos_pk	pos_hc2	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=Hollow Cathode file, Uranium Neon lamp	COM-PARI-SON	pos_fp	pos_hc1	–	SPIRou	–	–	
RAW_F	Raw sci=FP calib=Hollow Cathode file, Thorium Argon lamp	COM-PARI-SON	pos_fp	pos_hc2	–	SPIRou	–	–	
RAW_F	Raw sci=Hollow Cathode calib=FP file, Uranium Neion lamp	COM-PARI-SON	pos_hc1	pos_fp	–	SPIRou	–	–	
RAW_F	Raw sci=Hollow Cathode calib=FP file, Thorium Argon lamp	COM-PARI-SON	pos_hc2	pos_fp	–	SPIRou	–	–	
RAW_F	Raw sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	COM-PARI-SON	pos_hc1	pos_hc1	–	SPIRou	–	–	
RAW_F	Raw sci=Hollow Cathode calib=Hollow Cathode file, Thorium Argon lamp	COM-PARI-SON	pos_hc2	pos_hc2	–	SPIRou	–	–	
RAW_F	Raw sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Uranium Neon lamp	COM-PARI-SON	pos_hc1	pos_pk	–	SPIRou	–	–	

Table 33 – continued from previous page

name	description	HDR[OE	HDR[SB	HDR[SB	HDR[SB	HDR[IN!	HDR[TF	HDR[DRSMODE]*
RAW_F	Raw sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Thorium Argon lamp	COM-PARI-SON	pos_hc2	pos_pk	–	SPIRou	–	–

* these columns may be added/updated by APERO before use.

"HDR[XXX]" denotes key from file header

1.2 APERO definition of DRSMODE

For "DRSMODE" we use the following header keys

- SBRHB1_P
- SBRHB2_P

and DRSMODE is defined as following:

DRSMODE	SBRHB1_P	SBRHB2_P
SPECTROSCOPY	P16	P16
POLAR	P2 or P4 or P14 or P16	P2 or P4 or P14 or P16
UNKNOWN	anything else	anything else

1.3 APERO definition of TRG_TYPE

TRG_TYPE may be in the header, in which case it is used.

If TRG_TYPE is not in header we assign it based on the following keys:

- OBSTYPE
- OBJECT
- OBJNAME

Then TRG_TYPE is set as follows:

- If OBSTYPE is not "OBJECT" then TRG_TYPE = ''
- If OBSTYPE is "OBJECT" and "SKY" in OBJECT or OBJNAME then TRG_TYPE = 'SKY'
- else if OBSTYPE is "OBJECT" then TRG_TYPE = 'TARGET'

2. Preprocesed files

2.1 File definition table

Table 34: 2. Preprocesed files file definition table

name	description	HDR[DPR1	file type	suffix	input file
DARK_D/	Preprocessed sci=DARK calib=DARK file, where dark is an internal dark	DARK_D/	.fits	_pp	RAW_DARK_DARK_INT
DARK_D/	Preprocessed sci=DARK calib=DARK file, where dark is a telescope dark	DARK_D/	.fits	_pp	RAW_DARK_DARK_TEL
DARK_D/	Preprocessed sci=DARK calib=DARK file, where dark is a sky dark	DARK_D/	.fits	_pp	RAW_DARK_DARK_SKY

Table 34 – continued from previous page

name	description	HDR[DPR]	file type	suffix	input file
DARK_FI	Preprocessed sci=DARK calib=FP file, where dark is an internal dark	DARK_FI	.fits	_pp	RAW_DARK_FP_SKY
FLAT_DA	Preprocessed sci=FLAT calib=DARK file, where dark is an internal dark	FLAT_DA	.fits	_pp	RAW_FLAT_DARK
DARK_FI	Preprocessed sci=DARK calib=FLAT file, where dark is an internal dark	DARK_FI	.fits	_pp	RAW_DARK_FLAT
FLAT_FL	Preprocessed sci=FLAT calib=FLAT file	FLAT_FL	.fits	_pp	RAW_FLAT_FLAT
FLAT_FP	Preprocessed sci=FLAT calib=FP file	FLAT_FP	.fits	_pp	RAW_FLAT_FP
DARK_FI	Preprocessed sci=DARK calib=FP file, where dark is an internal dark	DARK_FI	.fits	_pp	RAW_DARK_FP
FP_DARF	Preprocessed sci=FP calib=DARK file, where dark is an internal dark	FP_DARF	.fits	_pp	RAW_FP_DARK
FP_FLAT	Preprocessed sci=FP calib=FLAT file	FP_FLAT	.fits	_pp	RAW_FP_FLAT
FP_FP	Preprocessed sci=FP calib=FP file	FP_FP	.fits	_pp	RAW_FP_FP
LFC_LFC	Preprocessed sci=LFC calib=LFC file	LFC_LFC	.fits	_pp	RAW_LFC_LFC
LFC_FP	Preprocessed sci=LFC calib=FP file	LFC_FP	.fits	_pp	RAW_LFC_FP
FP_LFC	Preprocessed sci=FP calib=LFC file	FP_LFC	.fits	_pp	RAW_FP_LFC
OBJ_DAF	Preprocessed sci=OBJ calib=DARK file, where dark is an internal dark	OBJ_DAF	.fits	_pp	RAW_OBJ_DARK
OBJ_FP	Preprocessed sci=OBJ calib=FP file	OBJ_FP	.fits	_pp	RAW_OBJ_FP
OBJ_HCC	Preprocessed sci=OBJ calib=Hollow Cathode file, Uranium Neon lamp	OBJ_HCC	.fits	_pp	RAW_OBJ_HCONE
OBJ_HCT	Preprocessed sci=OBJ calib=Hollow Cathode file, Thorium Argon lamp	OBJ_HCT	.fits	_pp	RAW_OBJ_HCTWO
PO-LAR_DAF	Preprocessed sci=POLAR calib=DARK, where dark is an internal dark	PO-LAR_DAF	.fits	_pp	RAW_POLAR_DARK
PO-LAR_FP	Preprocessed sci=POLAR calib=FP	PO-LAR_FP	.fits	_pp	RAW_POLAR_FP
DARK_HC	Preprocessed sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Uranium Neon lamp	DARK_HC	.fits	_pp	RAW_DARK_HCONE
DARK_HC	Preprocessed sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Thorium Argon lamp	DARK_HC	.fits	_pp	RAW_DARK_HCTWO
FP_HCON	Preprocessed sci=FP calib=Hollow Cathode file, Uranium Neon lamp	FP_HCON	.fits	_pp	RAW_FP_HCONE
FP_HCTV	Preprocessed sci=FP calib=Hollow Cathode file, Thorium Argon lamp	FP_HCTV	.fits	_pp	RAW_FP_HCTWO
HCONE_I	Preprocessed sci=Hollow Cathode calib=FP file, Uranium Neion lamp	HCONE_I	.fits	_pp	RAW_HCONE_FP
HCTWO_	Preprocessed sci=Hollow Cathode calib=FP file, Thorium Argon lamp	HCTWO_	.fits	_pp	RAW_HCTWO_FP
HCONE_I	Preprocessed sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	HCONE_I	.fits	_pp	RAW_HCONE_HCONE
HCTWO_	Preprocessed sci=Hollow Cathode calib=Hollow Cathode file, Thorium Argon lamp	HCTWO_	.fits	_pp	RAW_HCTWO_HCTWO
HCONE_I	Preprocessed sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Uranium Neon lamp	HCONE_I	.fits	_pp	RAW_HCONE_DARK
HCTWO_	Preprocessed sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Thorium Argon lamp	HCTWO_	.fits	_pp	RAW_HCTWO_DARK

"HDR[XXX]" denotes key from file header

3. Reduced Files

3.1 File definition table

Table 35: 3. Reduced Files file definition table

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	–	DARK_DARK_INT
DARKT	Telescope dark calibration file	DARKT	.fits	_darkt	–	–	DARK_DARK_TEL
DARKS	Sky dark calibration file	DARKS	.fits	_darks	–	–	DARK_DARK_SKY
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	–	–	DARK_DARK_TEL, DARK_DARK_INT
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	–	FLAT_FLAT
BKGRD	Bad pixel background map	BKGRD	.fits	_bmap.f	–	–	FLAT_FLAT
DE-BUG_B	Individual file background map	DE-BUG_B	.fits	_back-ground.fi	–	–	DRS_PP
LOC_O	Localisation: Order profile calibration file	LOC_O	.fits	_order_pro	–	AB, C	FLAT_DARK, DARK_FLAT
LOC_L(	Localisation: Position polynomial calibration file	LOC_L(	.fits	_loco	–	AB, C	FLAT_DARK, DARK_FLAT
LOC_F'	Localisation: Width polynomial calibration file	LOC_F'	.fits	_fwhm-order	–	AB, C	FLAT_DARK, DARK_FLAT
LOC_SI	Localisation: Position superpositionimage calibration file	LOC_SI	.fits	_with-order	–	AB, C	FLAT_DARK, DARK_FLAT
SHAPE_	Reference shape dx calibration file	SHAPE_	.fits	_shapex	–	–	FP_FP
SHAPE_	Reference shape dy calibration file	SHAPE_	.fits	_shapey	–	–	FP_FP
REF_FI	Reference shape master FP calibration file	REF_FI	.fits	_fpref	–	–	FP_FP
SHAPE_	Input FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Output FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Input Hollow Cathode file for shape comparison	SHAPE_	.fits	_shape_	–	–	HCONE_HCONE
SHAPE_	Output Hollow Cathode file for shape comparison	SHAPE_	.fits	_shape_	–	–	HCONE_HCONE
SHAPE_	Shape transformed dx comparison file	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPEI	Nightly shape calibration files	SHAPEI	.fits	_shapel	–	–	FP_FP
SHAPEI	Input FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
SHAPEI	Output FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
FF_BL/	Blaze calibration file	FF_BL/	.fits	_blaze	–	AB, A, B, C	FLAT_FLAT
FF_FL/	Flat calibration file	FF_FL/	.fits	_flat	–	AB, A, B, C	FLAT_FLAT
OR-DERP_	Straightened order profile for an individual image	OR-DERP_	.fits	_or-derps	–	AB, A, B, C	SHAPEL
EXT_E:	Extracted 2D spectrum	EXT_E:	.fits	_e2ds	–	AB, A, B, C	DRS_PP

Table 35 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
EXT_E:	Extracted + flat-fielded 2D spectrum	EXT_E:	.fits	_e2dsff	–	AB, A, B, C	DRS_PP
EXT_E:	Pre-extracted straighted stacked spectrum	EXT_E:	.fits	_e2dsll	–	AB, A, B, C	DRS_PP, FLAT_FLAT
EXT_L(	Straightened localisation file	EXT_L(	.fits	_e2dsloc	–	AB, A, B, C	DRS_PP
EXT_S1	1D stitched spectrum (constant wavelength binning)	EXT_S1	.fits	_s1d_w	–	AB, A, B, C	DRS_PP
EXT_S1	1D stitched spectrum (constant velocity binning)	EXT_S1	.fits	_s1d_v	–	AB, A, B, C	DRS_PP
EXT_F1	FP lines identified from extracted FP fiber	EXT_F1	.fits	_ext_fp	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
THER-MALI_F	Extracted sci=DARK calib=DARK thermal calibration file, where dark is an internal dark	THER-MALI_F	.fits	_thermal_e2d	–	AB, A, B, C	DARK_DARK_INT
THER-MALT_	Extracted sci=DARK calib=DARK thermal calibration file, where dark is a telescope dark	THER-MALT_	.fits	_thermal_e2d	–	AB, A, B, C	DARK_DARK_TEL
LEAKRI	Reference leak correction calibration file	LEAKRI	.fits	_leak_r	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVES(	Reference wavelength solution calibration file	WAVES(	.fits	_waveso	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cathode lines calibration file	WAVE_	.fits	_waveref_hc	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of FP liens calibration file	WAVE_	.fits	_waveref_fp	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_	Reference wavelength cavity width polynomial calibration file	WA-VEREF_	.fits	_waveref_ca	–	AB	EXT_E2DS, EXT_E2DS_FF
WAVES(	Default wavelength solution calibration file	WAVES(	.fits	_wave_(	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength resolution map file	WAVE_	.fits	_waveref_re	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength resolution table	–	.tbl	–	apero_wav	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength FP line-list table	–	.tbl	_mhc_l	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVEM	Reference wavelength resolution e2ds file	WAVEM	.fits	_waveref_re	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength solution calibration file	WAVE_	.fits	_wave_	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE-HCLL	Nightly HC line list calibration file	–	.dat	_linelist	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Nightly wavelength resolution map file	WAVE_	.fits	_wave_	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength resolutiontable	–	.tbl	–	apero_wav	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list table	–	.tbl	_hc_lin	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength Hollow cathodeline-list table	WAVE_	.fits	_wave_	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list calibration file	WAVE_	.fits	_wave_	–	AB, A, B, C	EXT_E2DS, EXT_E2DS_FF

Table 35 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
SKY_M	Telluric sky model file	SKY_M	.fits	_sky_m	–	–	EXT_E2DS_FF
TELLU_	Sky-cleaning file	TELLU_	.fits	_tellu_s	–	–	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_p	–	AB, A, B	EXT_E2DS_FF
TELLU_	–	–	.npy	_tellu_c	–	AB, A, B	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_	Telluric transmission file	TELLU_	.fits	_tellu_t	–	AB, A, B	EXT_E2DS_FF
TELLU_	–	–	.npy	–	tapas_sp	–	–
TRANS_	Telluric transmission model file	TRANS_	.fits	–	trans_m	AB, A, B	–
ABSO_I	–	–	.npy	–	tellu_sav	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff_	–	AB, A, B	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_V	.fits	_s1d_w	–	AB, A, B	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v	–	AB, A, B	EXT_E2DS_FF
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff_	–	AB, A, B	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_V	.fits	_s1d_w	–	AB, A, B	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_V	.fits	_s1d_v	–	AB, A, B	EXT_E2DS_FF
TELLU_	Telluric 2D template file	TELLU_	.fits	–	Template	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (star frame)	TELLU_	.fits	–	BigCube	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (Earth frame)	TELLU_	.fits	–	BigCube	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 1D stack file (Earth frame)	TELLU_	.fits	–	BigCube	AB, A, B	EXT_E2DS_FF, TELLU_OBJ
CCF_R\	Cross-correlation RV results file	CCF_R\	.fits	_ccf	–	AB, A, B, C	EXT_E2DS_FF, TELLU_OBJ
POL_D	Polarimetry 2D degree of polarisation file	POL_D	.fits	_pol	–	–	EXT_E2DS_FF, TELLU_OBJ
STOKE!	Polarimetry 2D stokes I polarisation file	STOKE!	.fits	_StokesI	–	–	EXT_E2DS_FF, TELLU_OBJ
NULL_I	2D Null polarisation 1 file	NULL_I	.fits	_null1_	–	–	EXT_E2DS_FF, TELLU_OBJ
NULL_I	2D Null polarisation 2 file	NULL_I	.fits	_null2_	–	–	EXT_E2DS_FF, TELLU_OBJ
LSD_P(	Least squares deconvolution file	LSD_P(	.fits	_lsd_pc	–	–	EXT_E2DS_FF, TELLU_OBJ

Table 35 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
S1DW_]	Polarimetry 2D degree of polarisation file (constant wavelength binning)	S1DW_]	.fits	_s1d_w	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DV_F	Polarimetry 2D degree of polarisation file (constant velocity binning)	S1DV_F	.fits	_s1d_v	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DW_]	1D Null polarisation 1 file (constant wavelength binning)	S1DW_]	.fits	_s1d_w	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DV_N	1D Null polarisation 1 file (constant velocity binning)	S1DV_N	.fits	_s1d_v	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DW_]	1D Null polarisation 2 file (constant wavelength binning)	S1DW_]	.fits	_s1d_w	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DV_N	1D Null polarisation 2 file (constant velocity binning)	S1DV_N	.fits	_s1d_v	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DW_!	Polarimetry 1D stokes I polarisation file (constant wavelength binning)	S1DW_!	.fits	_s1d_w	–	–	EXT_E2DS_FF, TELLU_OBJ
S1DV_S	Polarimetry 1D stokes I polarisation file (constant velocity binning)	S1DV_S	.fits	_s1d_v	–	–	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

4. Calibration files

4.1 File definition table

Table 36: 4. Calibration files file definition table

name	description	HDR[DF	file type	suffix	fibers	db-name	dbkey	input file
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	cali-bra-tion	DARKI	DARK_DARK_INT
DARKT	Telescope dark calibration file	DARKT	.fits	_darkt	–	cali-bra-tion	DARKT	DARK_DARK_TEL
DARKS	Sky dark calibration file	DARKS	.fits	_darks	–	cali-bra-tion	DARKS	DARK_DARK_SKY
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	–	cali-bra-tion	DARK-REF	DARK_DARK_TEL, DARK_DARK_INT
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	cali-bra-tion	BAD-PIX	FLAT_FLAT
BKGRI	Bad pixel background map	BKGRI	.fits	_bmap.	–	cali-bra-tion	BKGRI	FLAT_FLAT
LOC_C	Localisation: Order profile cal-ibration file	LOC_C	.fits	_or-der_pro	AB, C	cali-bra-tion	OR-DER_F	FLAT_DARK, DARK_FLAT
LOC_I	Localisation: Position polyno-mial calibration file	LOC_I	.fits	_loco	AB, C	cali-bra-tion	LOC	FLAT_DARK, DARK_FLAT
SHAPE	Reference shape dx calibration file	SHAPE	.fits	_shape	–	cali-bra-tion	SHAPE	FP_FP
SHAPE	Reference shape dy calibration file	SHAPE	.fits	_shape	–	cali-bra-tion	SHAPE	FP_FP
REF_F	Reference shape master FP cal-ibration file	REF_F	.fits	_fpref	–	cali-bra-tion	FPREF	FP_FP
SHAPE	Nightly shape calibration files	SHAPE	.fits	_shapel	–	cali-bra-tion	SHAPE	FP_FP
FF_BL	Blaze calibration file	FF_BL	.fits	_blaze	AB, A, B, C	cali-bra-tion	BLAZE	FLAT_FLAT
FF_FL	Flat calibration file	FF_FL	.fits	_flat	AB, A, B, C	cali-bra-tion	FLAT	FLAT_FLAT
THER-MALI_	Extracted sci=DARK calib=DARK thermal cali-bration file, where dark is an internal dark	THER-MALI_	.fits	_ther-mal_e2	AB, A, B, C	cali-bra-tion	THER-MALI	DARK_DARK_INT
THER-MALT_	Extracted sci=DARK calib=DARK thermal cali-bration file, where dark is a telescope dark	THER-MALT_	.fits	_ther-mal_e2	AB, A, B, C	cali-bra-tion	THER-MALT	DARK_DARK_TEL
LEAKR	Reference leak correction cali-bration file	LEAKR	.fits	_leak_	AB, A, B, C	cali-bra-tion	LEAKR	EXT_E2DS, EXT_E2DS_FF
WAVES	Reference wavelength solution calibration file	WAVES	.fits	_waves	AB, A, B, C	cali-bra-tion	WAVES	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cath-ode line calibration file	WAVE_	.fits	_wa-fch	AB, A, B	cali-bra-tion	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF

"HDR[XXX]" denotes key from file header

5. Telluric files

5.1 File definition table

Table 37: 5. Telluric files file definition table

name	description	HDR[D	file type	suffix	base-name	fibers	db-name	dbkey	input file
SKY_	Telluric sky model file	SKY_	.fits	_sky_	–	–	tel-luric	SKY_	EXT_E2DS_FF
TELLl	Sky-cleaning file	TELLl	.fits	_tellu_	–	–	–	–	EXT_E2DS_FF
TELLl	Telluric pre-cleaning file	TELLl	.fits	_tellu_	–	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF
TELLl	–	–	.npy	_tellu_	–	AB, A, B	tel-luric	TELLl	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLl	Telluric transmission file	TELLl	.fits	_tellu_	–	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF
TELLl	–	–	.npy	–	tapas_	–	tel-luric	TELLl	–
TRAN	Telluric transmission model file	TRAN	.fits	–	trans_	AB, A, B	tel-luric	TELLl	–
TELLl	Telluric corrected extracted 2D spectrum	TELLl	.fits	_e2dsf	–	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF
TELLl	Telluric reconstructed 2D absorption file	TELLl	.fits	_e2dsf	–	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF
TELLl	Telluric 2D template file	TELLl	.fits	–	Template	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF, TELLU_OBJ
TELLl	Telluric 1D template file	TELLl	.fits	–	Template_	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF, TELLU_OBJ
TELLl	Telluric 1D template file	TELLl	.fits	–	Template_	AB, A, B	tel-luric	TELLl	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

6. Post-processed files

6.1 File definition table

Table 38: 6. Post-processed files file definition table

name	description	HDR[KW	suffix	ext name	ext input	col names	col input
DRS_PC	Post process 2D extracted spectrum collection	OBJ_FP OBJ_DA PO- LAR_FF PO- LAR_DA	e.fits	Pri- mary: PP FluxAB FluxA FluxB FluxC WaveAB WaveA WaveB WaveC BlazeAB BlazeA BlazeB BlazeC	DRS_PF EXT_E2 EXT_E2 EXT_E2 EXT_E2 WAVE_1 WAVE_1 WAVE_1 WAVE_1 FF_BLA FF_BLA FF_BLA FF_BLA	– – – – – – – – – – – – –	– – – – – – – – – – – – –
DRS_PC	Post process 1D spectrum collection	OBJ_FP OBJ_DA PO- LAR_FF PO- LAR_DA	s.fits	Pri- mary: PP Uni- formWav length – Unifor- mVe- locity – – – – – – – – – – – – –	DRS_PF –	– Wave FluxAB Flux- ErrAB FluxA Flux- ErrA FluxB Flux- ErrB FluxC Flux- ErrC Flux- ABTel- luCor- rected Flux- ErrABTe luCor- rected Flux- ATel- luCor- rected Flux- Er- rATel- luCor- rected FluxBTel luCor- rected Flux- Er- rBTel- luCor- rected Recon Re- conErr Sky-	– EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W SC1D_W_FILE SC1D_W_FILE SC1D_W_FILE SC1D_W_FILE SC1D_W_FILE SC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V SC1D_V_FILE SC1D_V_FILE SC1D_V_FILE SC1D_V_FILE SC1D_V_FILE SC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE

"HDR[XXX]" denotes key from file header

6.2 Definition of WAVE_FILES

Here "WAVE_FILES" denotes either a wave solution from the nightly solution (WAVE_NIGHT) or the master wave solution (WAVESOL_MASTER) or the default wave solution (WAVESOL_DEFAULT)

3.2 NIRPS HE documentation

3.2.1 Detailed documentation

3.2.1.1 Sequences (NIRPS_HE)

This section describes all the NIRPS_HE recipe sequences to use with APERO. For information on individual recipes see here.

pp_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 39: Recipes

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE
1	apero_pp_ref_nirps_he.py	PPREF	pre-reference	Yes
2	apero_preprocess_nirps_he.py	PP	pre	No

pp_seq_opt

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 40: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	FILTERS	ARGS
1	apero_pp_ref_nirps_	PPREF	pre-reference	Yes	–	
2	apero_preprocess_nir	PP_CAL	pre-cal	No	KW_RAW_DPRCATG: CALIB	
3	apero_preprocess_nir	PP_SCI	pre-sci	No	KW_OBJNAME: SCIENCE_TARGETS	
4	apero_preprocess_nir	PP_TEL	pre-tel	No	KW_OBJNAME: TELLURIC_TARGETS	
5	apero_preprocess_nir	PP_HC1	pre-hchc	No	–	{files}=[RAW_HCONE_HCONE]
6	apero_preprocess_nir	PP_FPF	pre-fpfp	No	–	{files}=[RAW_FP_FP]
7	apero_preprocess_nir	PP_FF	pre-ff	No	–	{files}=[RAW_FLAT_FLAT]
8	apero_preprocess_nir	PP_DFP	pre-dfp	No	–	{files}=[RAW_DARK_FP]
9	apero_preprocess_nir	PP_FPD	pre-fpd	No	–	{files}=[RAW_FP_DARK]
10	apero_preprocess_nir	PP_SKY	pre-sky	No	–	{files}=[RAW_NIGHT_SKY_SK
11	apero_preprocess_nir	PP_LFC	pre-lfc	No	–	{files}=[RAW_LFC_LFC]
12	apero_preprocess_nir	PP_LFC	pre-lfcfp	No	–	{files}=[RAW_LFC_FP]
13	apero_preprocess_nir	PP_FPL	pre-fplfc	No	–	{files}=[RAW_FP_LFC]
14	apero_preprocess_nir	PP_EVE	pre	No	–	{files}=[DRS_RAW]

full_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_pp_ref_nirps_he.py	PPREF	pre-reference	Yes	–	–
2	apero_preprocess_nirps_he.py	PP	pre-all	No	–	–
3	apero_dark_ref_nirps_he.py	DARKREF	calib-reference	Yes	–	–
4	apero_badpix_nirps_he.py	BADREF	calib-reference	Yes	–	–

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
5	apero_loc_nirps_he.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
6	apero_loc_nirps_he.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
7	apero_shape_ref_nirps_he.py	SHAPEREF	calib-reference	Yes	–	–
8	apero_shape_nirps_he.py	SHAPELREF	calib-reference	Yes	–	–
9	apero_flat_nirps_he.py	FLATREF	calib-reference	Yes	–	–
10	apero_leak_ref_nirps_he.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_nirps_he.py	WAVEREF	calib-reference	Yes	–	–
12	apero_badpix_nirps_he.py	BAD	calib-night	No	–	–
13	apero_loc_nirps_he.py	LOCCAL	calib-night-CAL	No	–	–
14	apero_loc_nirps_he.py	LOCSCI	calib-night-SCI	No	–	–
15	apero_shape_nirps_he.py	SHAPE	calib-night	No	–	–
16	apero_flat_nirps_he.py	FF	calib-night	No	–	–
17	apero_wave_night_nirps_he.py	WAVE	calib-night	No	–	–
18	apero_extract_nirps_he.py	EXTALL	extract-ALL	No	–	–
19	apero_mk_tellu_nirps_he.py	MKTELLU1	tellu-hotstar	No	A	KW_OBJN
20	apero_mk_model_nirps_he.py	MKTMOD1	tellu-hotstar	No	–	–
21	apero_fit_tellu_nirps_he.py	MKTFIT1	tellu-hotstar	No	A	KW_OBJN
22	apero_mk_template_nirps_he.py	MKTEMP1	tellu-hotstar	No	A	KW_OBJN
23	apero_mk_tellu_nirps_he.py	MKTELLU2	tellu-hotstar	No	A	KW_OBJN
24	apero_mk_model_nirps_he.py	MKTMOD2	tellu-hotstar	No	–	–
25	apero_fit_tellu_nirps_he.py	MKTFIT2	tellu-hotstar	No	A	KW_OBJN
26	apero_mk_template_nirps_he.py	MKTEMP2	tellu-hotstar	No	A	KW_OBJN
27	apero_fit_tellu_nirps_he.py	FTFIT1	tellu-science	No	A	KW_OBJN
28	apero_mk_template_nirps_he.py	FTTEMP1	tellu-science	No	A	KW_OBJN
29	apero_fit_tellu_nirps_he.py	FTFIT2	tellu-science	No	A	KW_OBJN
30	apero_mk_template_nirps_he.py	FTTEMP2	tellu-science	No	A	KW_OBJN
31	apero_ccf_nirps_he.py	CCF	rv-tcorr	No	AB	KW_DPRT
32	apero_postprocess_nirps_he.py	POSTALL	post-all	No	–	KW_DPRT

limited_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_pp_ref_nirps_he.py	PPREF	pre-reference	Yes	–	–
2	apero_preprocess_nirps_he.py	PP	pre-all	No	–	–
3	apero_dark_ref_nirps_he.py	DARKREF	calib-reference	Yes	–	–
4	apero_badpix_nirps_he.py	BADREF	calib-reference	Yes	–	–
5	apero_loc_nirps_he.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
6	apero_loc_nirps_he.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
7	apero_shape_ref_nirps_he.py	SHAPEREF	calib-reference	Yes	–	–
8	apero_shape_nirps_he.py	SHAPELREF	calib-reference	Yes	–	–
9	apero_flat_nirps_he.py	FLATREF	calib-reference	Yes	–	–

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
10	apero_leak_ref_nirps_he.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_nirps_he.py	WAVEREF	calib-reference	Yes	–	–
12	apero_badpix_nirps_he.py	BAD	calib-night	No	–	–
13	apero_loc_nirps_he.py	LOCCAL	calib-night-CAL	No	–	–
14	apero_loc_nirps_he.py	LOCSCI	calib-night-SCI	No	–	–
15	apero_shape_nirps_he.py	SHAPE	calib-night	No	–	–
16	apero_flat_nirps_he.py	FF	calib-night	No	–	–
17	apero_wave_night_nirps_he.py	WAVE	calib-night	No	–	–
18	apero_extract_nirps_he.py	EXTTELL	extract-hotstar	No	–	KW_OBJN
19	apero_extract_nirps_he.py	EXTOBJ	extract-science	No	–	KW_OBJN
20	apero_mk_tellu_nirps_he.py	MKTELLU1	tellu-hotstar	No	A	KW_OBJN
21	apero_mk_model_nirps_he.py	MKTMOD1	tellu-hotstar	No	–	–
22	apero_fit_tellu_nirps_he.py	MKTFIT1	tellu-hotstar	No	A	KW_OBJN
23	apero_mk_template_nirps_he.py	MKTEMP1	tellu-hotstar	No	A	KW_OBJN
24	apero_mk_tellu_nirps_he.py	MKTELLU2	tellu-hotstar	No	A	KW_OBJN
25	apero_mk_model_nirps_he.py	MKTMOD2	tellu-hotstar	No	–	–
26	apero_fit_tellu_nirps_he.py	MKTFIT2	tellu-hotstar	No	A	KW_OBJN
27	apero_mk_template_nirps_he.py	MKTEMP2	tellu-hotstar	No	A	KW_OBJN
28	apero_fit_tellu_nirps_he.py	FTFIT1	tellu-science	No	A	KW_OBJN
29	apero_mk_template_nirps_he.py	FTTEMP1	tellu-science	No	A	KW_OBJN
30	apero_fit_tellu_nirps_he.py	FTFIT2	tellu-science	No	A	KW_OBJN
31	apero_mk_template_nirps_he.py	FTTEMP2	tellu-science	No	A	KW_OBJN
32	apero_ccf_nirps_he.py	CCF	rv-tcorr	No	A	KW_DPRT
33	apero_postprocess_nirps_he.py	SCIPOST	post-science	No	–	KW_DPRT

ref_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 43: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS	KWARGS
1	apero_dark_ref_nirps	DARK-REF	calib-reference	Yes		
2	apero_badpix_nirps_	BADREF	calib-reference	Yes		
3	apero_loc_nirps_he.p	LOCRE-FCAL	calib-reference-CAL	No	{files}=[DARK_	
4	apero_loc_nirps_he.p	LOCRE-FSCI	calib-reference-SCI	No	{files}=[FLAT_	
5	apero_shape_ref_nirp	SHAPERI	calib-reference	Yes		
6	apero_shape_nirps_h	SHAPEL-REF	calib-reference	Yes		
7	apero_flat_nirps_he.p	FLA-TREF	calib-reference	Yes		
8	apero_leak_ref_nirps	LEAKRE	calib-reference	Yes		
9	apero_wave_ref_nirp:	WA-VEREF	calib-reference	Yes		–hc-files=[HCONE_HCONE] –fpfiles=[FP_FP]

calib_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 44: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_badpix_nirps_he.py	BAD	calib-night	No	
2	apero_loc_nirps_he.py	LOCCAL	calib-night-CAL	No	{files}=[DARK_FLAT]
3	apero_loc_nirps_he.py	LOCSCI	calib-night-SCI	No	{files}=[FLAT_DARK]
4	apero_shape_nirps_he.py	SHAPE	calib-night	No	
5	apero_flat_nirps_he.py	FF	calib-night	No	{files}=[FLAT_FLAT]
6	apero_wave_night_nirps_he.py	WAVE	calib-night	No	

tellu_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 45: Recipes

OR-DER	RECIPE	SHOF NAM	RECII KIND	REF RECI	FIBE	FILTERS	ARGS
1	ap-ero_extrac	EXT-TELl	extra hotst:	No	–	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]
2	ap-ero_mk_t	MK-TELl	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
3	ap-ero_mk_n	MK-T-MOD	tellu-hotst:	No	–	–	
4	ap-ero_fit_te	MK-T-FIT1	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
5	ap-ero_mk_t	MK-TEM	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
6	ap-ero_mk_t	MK-TELl	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
7	ap-ero_mk_n	MK-T-MOD	tellu-hotst:	No	–	–	
8	ap-ero_fit_te	MK-T-FIT2	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
9	ap-ero_mk_t	MK-TEM	tellu-hotst:	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]

science_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 46: Recipes

OR-DER	RECIPE	SHORT NAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS	ARGS
1	ap-ero_extract	EX-TOBJ	extract science	No	–	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]
2	ap-ero_fit_te	FT-FIT1	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
3	ap-ero_mk_t	FT-TEM	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	
4	ap-ero_fit_te	FT-FIT2	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
5	ap-ero_mk_t	FT-TEM	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	
6	ap-ero_ccf_n	CCF	rv-tcorr	No	AB	KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP KW_OBJNAME: SCIENCE_TARGETS	{files}=[TELLU_OBJ]
7	ap-ero_postpr	SCI-POST	post-science	No	–	KW_DPRTYPE: OBJ_FP, OBJ_DARK, POLAR_DARK, POLAR_FP KW_OBJNAME: SCIENCE_TARGETS	{files}=[DRS_PP]

quick_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 47: Recipes

OR-DER	RECIPE NAME	SHORT NAME	RECIPE KIND	REF RECIPE	FILTERS	ARGS
1	ap-ero_extra	EX-TQUI	extrac quick	No	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]

blank_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

N/A

eng_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 48: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_extract_nirps_he.py	EXT_HC1HC1	extract-hchc	No	{files}=[HCONE_HCONE]
2	apero_extract_nirps_he.py	EXT_FPFP	extract-fpfp	No	{files}=[FP_FP]
3	apero_extract_nirps_he.py	EXT_FF	extract-ff	No	{files}=[FLAT_FLAT]
4	apero_extract_nirps_he.py	EXT_DFP	extract-dfp	No	{files}=[DARK_FP]
5	apero_extract_nirps_he.py	EXT_SKY	extract-sky	No	{files}=[NIGHT_SKY_SKY]
6	apero_extract_nirps_he.py	EXT_LFC	extract-lfc	No	{files}=[LFC_LFC]
7	apero_extract_nirps_he.py	EXT_FPD	extract-fpd	No	{files}=[FP_DARK]
8	apero_extract_nirps_he.py	EXT_LFCFP	extract-lfcfp	No	{files}=[LFC_FP]
9	apero_extract_nirps_he.py	EXT_FPLFC	extract-fplfc	No	{files}=[FP_LFC]
10	apero_extract_nirps_he.py	EXT_EVERY	extract-everything	No	{files}=[DRS_PP]

helios_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 49: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_preprocess_nirps_he	PP_SUN	pre-sun	No	{files}=[RAW_SUN_FP, RAW_SUN_DARK]
2	apero_extract_nirps_he.py	EXT_SUN	extract-sun	No	{files}=[SUN_FP, SUN_DARK]

3.2.1.2 Recipes (NIRPS_HE)

This section describes all the NIRPS_HE recipes to use with APERO.

For information on how to run these recipes (either individually or with the processing tools) see *here*.

apero_pp_ref_nirps_he

1. Description

SHORTNAME: PPREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_pp_ref_nirps_he.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--filetype[STRING] // PP_REF_FILETYPE_HELP
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
```

(continues on next page)

```
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 50: Outputs

name	description	HDR[DRSOUT]	file type	suffix	dbname	dbkey	input file
PP_REF	PP Reference flat calibration file	PP_REF	.fits	_ppref	calibration	PP_RE	RAW_FLAT_FLAT
PP_LED_FI	Reference LED flat calibration file	PP_LED_FI	.fits	_led_fla	calibration	PP_LEI	RAW_LED_LED

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_preprocess_nirps_he

1. Description

SHORTNAME: PP

No description set

2. Schematic

No schematic set

3. Usage

```
apero_preprocess_nirps_he.py {obs_dir}[STRING] [FILE:DRS_RAW] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_RAW] // Any raw files are currently allowed. Multiple files inputted are handled␣
↪separately (one after the other).
```

4. Optional Arguments

```
--skip[True/False] // [BOOLEAN] If True skips preprocessed files that are already found
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_WORKING // Default: "tmp" directory
```

7. Output files

Table 51: Outputs

name	description	file type	suffix	input file
DRS_PP	Generic pre-processed file	.fits	_pp	DRS_RAW

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_badpix_nirps_he

1. Description

SHORTNAME: BAD

No description set

2. Schematic

No schematic set

3. Usage

```
apero_badpix_nirps_he.py {obs_dir}[STRING] --flatfiles[FILE:FLAT_FLAT] --darkfiles[FILE:DARK_
↪DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--flatfiles[FILE:FLAT_FLAT] // Current allowed types: FLAT_FLAT
--darkfiles[FILE:DARK_DARK] // Current allowed types: DARK_DARK
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 52: Outputs

name	description	HDR[DRSOUTI	file type	suffix	dbname	dbkey	input file
BADPIX	Bad pixel map	BADPIX	.fits	_bad-pixel	calibra-tion	BADPIX	FLAT_FLAT
BKGRD_MA	Bad pixel back-ground map	BKGRD_MAF	.fits	_bmap.fit	calibra-tion	BKGRDMA	FLAT_FLAT

8. Debug plots

```
BADPIX_MAP
```

9. Summary plots

```
SUM_BADPIX_MAP
```

apero_dark_nirps_he

1. Description

SHORTNAME: DARK

No description set

2. Schematic

No schematic set

3. Usage

```
apero_dark_nirps_he.py {obs_dir}[STRING] [FILE:DARK_DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_DARK] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
↪allowed types: DARK_DARK_INT, DARK_DARK_TEL, DARK_DARK_SKY
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 53: Outputs

name	description	HDR[DRSOUTID]	file type	suffix	dbname	dbkey	input file
DARKI	Internal dark calibration file	DARKI	.fits	_darki	calibration	DARKI	DARK_DARK
DARKI	Internal dark calibration file	DARKI	.fits	_darki	calibration	DARKI	DARK_DARK

8. Debug plots

```
DARK_IMAGE_REGIONS
DARK_HISTOGRAM
```

9. Summary plots

```
SUM_DARK_IMAGE_REGIONS
SUM_DARK_HISTOGRAM
```

apero_dark_ref_nirps_he

1. Description

SHORTNAME: DARKREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_dark_ref_nirps_he.py {options}
```

No optional arguments

4. Optional Arguments

```
--filetype[STRING] // Current allowed types: DARK_DARK
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 54: Outputs

name	description	HDR[DRSOUTI	file type	suffix	dbname	dbkey	input file
DARK-REF	Reference dark calibration file	DARKREF	.fits	_dark_re	calibration	DARK-REF	DARK_DARK

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_loc_nirps_he

1. Description

SHORTNAME: LOC

No description set

2. Schematic

No schematic set

3. Usage

```
apero_loc_nirps_he.py {obs_dir}[STRING] [FILE:DARK_FLAT,FLAT_DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_FLAT,FLAT_DARK] // [STRING/STRINGS] A list of fits files to use separated by␣
→spaces. Current allowed types: DARK_FLAT OR FLAT_DARK but not both (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
```

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```
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 55: Outputs

name	description	HDR[DRS	file type	suffix	fibers	db-name	dbkey	input file
LOC_OF	Localisation: Order profile calibration file	LOC_OR	.fits	_order_profi	A, B	cali-bra-tion	OR-DER_PRC	FLAT_DARK, DARK_FLAT
LOC_LC	Localisation: Position polynomial calibration file	LOC_LO	.fits	_loco	A, B	cali-bra-tion	LOC	FLAT_DARK, DARK_FLAT
LOC_FV	Localisation: Width polynomial calibration file	LOC_FW	.fits	_fwhm-order	A, B	–	–	FLAT_DARK, DARK_FLAT
LOC_SU	Localisation: Position superpositionimage calibration file	LOC_SU	.fits	_with-order	A, B	–	–	FLAT_DARK, DARK_FLAT
DE-BUG_BA	Individual file background map	DE-BUG_BA	.fits	_back-ground.fit	–	–	–	DRS_PP

8. Debug plots

```
LOC_WIDTH_REGIONS
LOC_FIBER_DOUBLET_PARITY
LOC_GAP_ORDERS
LOC_IMAGE_FIT
LOC_IM_CORNER
LOC_IM_REGIONS
```

9. Summary plots

```
SUM_LOC_IM_FIT
SUM_LOC_IM_CORNER
```

apero_shape_ref_nirps_he

1. Description

SHORTNAME: SHAPEREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_shape_ref_nirps_he.py {obs_dir}[STRING] --fpfiles[FILE:FP_FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
```

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```
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 56: Outputs

name	description	HDR[DRSOUT	file type	suffix	db-name	dbkey	input file
REF_FP	Reference shape master FP calibration file	REF_FP	.fits	_fpref	cali-bra-tion	FPREF	FP_FP
SHAPE_X	Reference shape dx calibration file	SHAPE_X	.fits	_shapex	cali-bra-tion	SHAPE	FP_FP
SHAPE_Y	Reference shape dy calibration file	SHAPE_Y	.fits	_shapey	cali-bra-tion	SHAPE	FP_FP
SHAPE_IN_]	Input FP file for shape comparison	SHAPE_IN_]	.fits	_shape_in_f	–	–	FP_FP
SHAPE_OUT	Output FP file for shape comparison	SHAPE_OUT	.fits	_shape_out_	–	–	FP_FP
SHAPE_BDX	Shape transformed dx comparison file	SHAPE_BDX	.fits	_shape_out_	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPE_DX
SHAPE_ANGLE_OFFSET_ALL
SHAPE_ANGLE_OFFSET
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPE_ANGLE_OFFSET
```

apero_shape_nirps_he

1. Description

SHORTNAME: SHAPE

No description set

2. Schematic

No schematic set

3. Usage

```
apero_shape_nirps_he.py {obs_dir}[STRING] [FILE:FP_FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 57: Outputs

name	description	HDR[DRSOUT	file type	suffix	db-name	dbkey	input file
SHAPEL	Nightly shape calibration files	SHAPEL	.fits	_shapel	cali-bra-tion	SHAPE	FP_FP
SHAPEL_IN_	Input FP file for nightly shape comparison	SHAPEL_IN_	.fits	_shapel_in_f	–	–	FP_FP
SHAPEL_OU	Output FP file for nightly shape comparison	SHAPEL_OU	.fits	_shapel_out_	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPEL_ZOOM_SHIFT
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPEL_ZOOM_SHIFT
```

apero_flat_nirps_he

1. Description

SHORTNAME: FF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_flat_nirps_he.py {obs_dir}[STRING] [FILE:FLAT_FLAT] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FLAT_FLAT] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
→allowed types: FLAT_FLAT or DARK_FLAT or FLAT_DARK but not a mixture (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
→(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
→coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
```

```
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 58: Outputs

name	description	HDR[DRSOUT]	file type	suffix	fibers	db-name	dbkey	input file
FF_FLAT	Flat calibration file	FF_FLAT	.fits	_flat	A, B	cali-bra-tion	FLAT	FLAT_FLAT
FF_BLAZE	Blaze calibration file	FF_BLAZE	.fits	_blaze	A, B	cali-bra-tion	BLAZ	FLAT_FLAT
EXT_E2DS_	Pre-extracted straighted stacked spectrum	EXT_E2DS_	.fits	_e2dsll	A, B	–	–	DRS_PP, FLAT_FLAT
OR-DERP_STRA	Straightened order profile for an individual image	OR-DERP_STRA	.fits	_or-derps	A, B	–	–	SHAPEL
DE-BUG_BACK	Individual file back-ground map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	–	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_FLAT_BLAZE_ORDER
```

apero_leak_ref_nirps_he

1. Description

SHORTNAME: LEAKREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_leak_ref_nirps_he.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--filetype[STRING] // [STRING] Specify the DPRTYPE for DARK_FP files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 59: Outputs

name	description	HDR[DRSOl	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	A, B	–	–	DRS_PP
LEAKREF_	Reference leak correction calibration file	LEAKREF_	.fits	_leak_	A, B	calibration	LEAKR	EXT_E2DS, EXT_E2DS_FF

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_extract_nirps_he

1. Description

SHORTNAME: EXT

No description set

2. Schematic

No schematic set

3. Usage

```
apero_extract_nirps_he.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
↪accepts all preprocessed filetypes. All files used will be combined into a single frame.
```

4. Optional Arguments

```
--quicklook[True/False] // [BOOLEAN] Sets whether extraction done in quick look mode
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--combine_method[STRING] // Method to combine files (if --combine=True)
--objname[STRING] // Sets the object name to extract (filters input files)
--dprtype[STRING] // [STRING] Sets the DPRTYPE to extract (filters input files)
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--flatfile[FILE:FF_FLAT] // [STRING] Define a custom file to use for flat correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--leakcorr[True/False] // [BOOLEAN] Sets whether to do the leak correction (else defaults to␣
↪CORRECT_LEAKAGE value in constants)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--force_ref_wave[True/False] // Force using the reference wave solution
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
```

```
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 60: Outputs

name	description	HDR[DRSOUTI	file type	suffix	fibers	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	A, B	DRS_PP
EXT_E2DS_F	Extracted + flat-fielded 2D spectrum	EXT_E2DS_F	.fits	_e2dsff	A, B	DRS_PP
EXT_E2DS_L	Pre-extracted straighted stacked spectrum	EXT_E2DS_L	.fits	_e2dsll	A, B	DRS_PP, FLAT_FLAT
EXT_S1D_W	1D stitched spectrum (constant wavelength binning)	EXT_S1D_W	.fits	_s1d_w	A, B	DRS_PP
EXT_S1D_V	1D stitched spectrum (constant velocity binning)	EXT_S1D_V	.fits	_s1d_v	A, B	DRS_PP
OR-DERP_STRAI	Straightened order profile for an individual image	OR-DERP_STRAI	.fits	_orderps	A, B	SHAPEL
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	DRS_PP
EXT_FPLIST	FP lines identified from extracted FP fiber	EXT_FPLIST	.fits	_ext_fplin	A, B	EXT_E2DS, EXT_E2DS_FF
QL_E2DS	Extracted 2D spectrum (quick output)	QL_E2DS	.fits	_q2ds	A, B	DRS_PP
QL_E2DS_FF	Extracted + flat-fielded 2D spectrum (quick output)	QL_E2DS_FF	.fits	_q2dsff	A, B	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
THERMAL_BACKGROUND
EXTRACT_SPECTRAL_ORDER1
EXTRACT_SPECTRAL_ORDER2
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVEREF_EXPECTED
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_EXTRACT_SP_ORDER
SUM_EXTRACT_S1D
```

apero_wave_ref_nirps_he

1. Description

SHORTNAME: WAVEREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_wave_ref_nirps_he.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_
↪FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
```

(continues on next page)

```
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--cavityfile[FILE:WAVEREF_CAV] // WAVEREF_CAVFILE_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
```

```
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 61: Outputs

name	description	HDR[DRSO	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2DS	Extracted + flat-fielded 2D spectrum	EXT_E2DS	.fits	_e2dsff	A, B	–	–	DRS_PP
WAVESOL	Reference wavelength solution calibration file	WAVESOL	.fits	_wavesol_	A, B	cali-bra-tion	WAVESC	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_C	Reference wavelength cavity width polynomial calibration file	WA-VEREF_C	.fits	_wa-veref_cav	A	cali-bra-tion	WAVE-CAV	EXT_E2DS, EXT_E2DS_FF
WAVE_HC	Reference list of Hollow cathode lines calibration file	WAVE_HC	.fits	_wa-veref_hcli	A, B	cali-bra-tion	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_FP	–	WAVE_FP	.fits	_wa-veref_fpli	A, B	cali-bra-tion	WAVEFI	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength resolution map file	WAVE_RE	.fits	_wa-veref_resi	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
WAVEM_I	Reference wavelength resolution e2ds file	WAVEM_I	.fits	_wa-veref_res_	A, B	cali-bra-tion	WAVR_I	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	A, B	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_wave_night_nirps_he

1. Description

SHORTNAME: WAVE

No description set

2. Schematic

No schematic set

3. Usage

```
apero_wave_night_nirps_he.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_
↪FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
```

```
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 62: Outputs

name	description	HDR[DRSC	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2D	Extracted + flat-fielded 2D spectrum	EXT_E2D	.fits	_e2dsff	A, B	–	–	DRS_PP
WAVE_NI	Nightly wavelength solution calibration file	WAVE_NI	.fits	_wave_n	A, B	cali-bra-tion	WAV	EXT_E2DS, EXT_E2DS_FF
WAVE_H(	Nightly wavelength Hollow cathodeline-list table	WAVE_H(	.fits	_wave_h	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
WAVE_FI	Nightly wavelength FP line-list calibration file	WAVE_FI	.fits	_wave_f	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	A, B	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_ccf_nirps_he

1. Description

SHORTNAME: CCF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_ccf_nirps_he.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] // [STRING/STRINGS] A list of fits files to use␣
↪separated by spaces. Currently allowed types: E2DS, E2DSFF, TELLU_OBJ (For dprtype = OBJ_FP,
↪ OBJ_DARK)
```

4. Optional Arguments

```
--mask[FILE:CCF_MASK] // [STRING] Define the filename to the CCF mask to use. Can be full␣
↪path or a file in the ./data/spirou/ccf/ folder
--rv[FLOAT] // [FLOAT] The target RV to use as a center for the CCF fit (in km/s)
--width[FLOAT] // [FLOAT] The CCF width to use for the CCF fit (in km/s)
--step[FLOAT] // [FLOAT] The CCF step to use for the CCF fit (in km/s)
--masknormmode[None,all,order] // [STRING] Define the type of normalization to apply to ccf␣
↪masks, all normalized across all orders, order normalizes independently for each order,␣
↪None applies no mask normalization
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
```

```
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 63: Outputs

name	description	HDR[DRSOUTID	file type	suf-fix	fibers	input file
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	A, B	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
CCF_RV_FIT
CCF_RV_FIT_LOOP
CCF_SWAVE_REF
CCF_PHOTON_UNCERT
```

9. Summary plots

```
SUM_CCF_PHOTON_UNCERT
SUM_CCF_RV_FIT
```

apero_mk_skymodel_nirps_he

1. Description

SHORTNAME: MKSKY

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_skymodel_nirps_he.py {options}
```

No optional arguments

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 64: Outputs

name	description	HDR[DRSOUTI	file type	suffix	db-name	dbkey	input file
SKY_MODE	Telluric sky model file	SKY_MODEL	.fits	_sky_mod	tel-luric	SKY_MODE	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKYMODEL_REGION_PLOT
TELLU_SKYMODEL_MED
TELLU_SKYMODEL_LINEFIT
```

9. Summary plots

No summary plots.

apero_mk_tellu_nirps_he

1. Description

SHORTNAME: MKTELL

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_tellu_nirps_he.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 65: Outputs

name	description	HDR[DRSC	file type	suffix	fibers	db-name	dbkey	input file
TELLU_C	–	–	.npy	_tellu_cc	A	tel-luric	TELLU_C	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_T	Telluric transmis-sion file	TELLU_T	.fits	_tellu_tr	A	tel-luric	TELLU_T	EXT_E2DS_FF
TELLU_S	Sky-cleaning file	TELLU_S	.fits	_tellu_sc	–	–	–	EXT_E2DS_FF
TELLU_F	Telluric pre-cleaning file	TELLU_F	.fits	_tellu_pc	A	tel-luric	TELLU_F	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
MKTELLU_WAVE_FLUX1
MKTELLU_WAVE_FLUX2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RECON_SPLINE2
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_MKTELLU_WAVE_FLUX
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
```

apero_mk_model_nirps_he

1. Description

SHORTNAME: MKMODEL

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_model_nirps_he.py {options}
```

No optional arguments

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
```

```
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 66: Outputs

name	description	HDR[DRSOUT]	file type	basename	fibers	db-name	dbkey
TRANS_MOD	Telluric transmission model file	TRANS_MOD	.fits	trans_model_	A	tel-luric	TELLU_MODEL

8. Debug plots

```
MKTELLU_MODEL
```

9. Summary plots

```
SUM_MKTELLU_MODEL
```

apero_fit_tellu_nirps_he

1. Description

SHORTNAME: FTELLU

No description set

2. Schematic

No schematic set

3. Usage

```
apero_fit_tellu_nirps_he.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--onlypreclean // Only run the precleaning steps (not recommended - for debugging ONLY)
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
```

```
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 67: Outputs

name	description	HDR[DRS	file type	suffix	base-name	fibers	db-name	dbkey	input file
ABSO_N	–	–	.npy	–	tellu_sa	–	–	–	–
ABSO1_	–	–	.npy	–	tellu_sa	–	–	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff_	–	A	telluric	TELLU_	EXT_E2DS_FF
SC1D_W	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_W	.fits	_s1d_w_	–	A	–	–	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v_	–	A	–	–	EXT_E2DS_FF
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff_	–	A	telluric	TELLU_	EXT_E2DS_FF
RC1D_W	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_W	.fits	_s1d_w_	–	A	–	–	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_V	.fits	_s1d_v_	–	A	–	–	EXT_E2DS_FF
TELLU_	Sky-cleaning file	TELLU_	.fits	_tellu_s	–	–	–	–	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_p	–	A	telluric	TELLU_	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
FTELLU_PCA_COMP1
FTELLU_PCA_COMP2
FTELLU_RECON_SPLINE1
FTELLU_RECON_SPLINE2
FTELLU_WAVE_SHIFT1
FTELLU_WAVE_SHIFT2
FTELLU_RECON_ABSO1
FTELLU_RECON_ABSO2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RES_MODEL
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_FTELLU_RECON_ABSO
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
SUM_FTELLU_RES_MODEL
```

apero_mk_template_nirps_he

1. Description

SHORTNAME: MKTEMP

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_template_nirps_he.py {objname}[STRING] {options}
```

```
{objname}[STRING] // [STRING] The object name to process
```

4. Optional Arguments

```
--filetype[EXT_E2DS,EXT_E2DS_FF] // [STRING] optional, the filetype (KW_OUTPUT) to use when␣
↪processing files
--fiber[A,B] // [STRING] optional, the fiber type to use when processing files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 68: Outputs

name	description	HDR[DRSOUT]	file type	base-name	fibers	db-name	dbkey	input file
TELLU_TEM	Telluric 2D template file	TELLU_TEM	.fits	Template	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (star frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEM	Telluric 1D template file	TELLU_TEM	.fits	Template_s1	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEM	Telluric 1D template file	TELLU_TEM	.fits	Template_s1	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 1D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
EXTRACT_S1D
MKTEMP_BERV_COV
MKTEMP_S1D_DECONV
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_MKTEMP_BERV_COV
```

apero_postprocess_nirps_he

1. Description

SHORTNAME: OBJPOST

No description set

2. Schematic

No schematic set

3. Usage

```
apero_postprocess_nirps_he.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces.
```

4. Optional Arguments

```
--skip // Overwrites post processed files if they exist (default is False)
--clear // Clear the reduced folder after post-processing. WARNING removes all files from the␣
↪reduced directory.
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_OUT // Default: "out" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

3.2.1.3 User tools (nirps_he)

There are currently no documented user tools for NIRPS_HE

3.2.1.4 File definitions (NIRPS_HE)

Contents

- *1. Raw Files*
- *2. Preprocesed files*
- *3. Reduced Files*
- *4. Calibration files*
- *5. Telluric files*
- *6. Post-processed files*

1. Raw Files

1.1 File definition table

Table 69: 1. Raw Files file definition table

name	description	HDR[HIER ESO DPR TYPE]	HDR[HIER ESO DPR CATG]	HDR[INS	HDR[HIER ESO INS MODE]	HDR[DRS	HDR[TRG_TYPE]*
RAW_D	Raw sci=DARK calib=DARK file	DARK	CALIB	NIRPS	HE	–	–
RAW_F	Raw sci=DARK calib=DARK file	EFF,SKY	CALIB	NIRPS	HE	–	–
RAW_N	Raw night sci=SKY calib=SKY file	OB-JECT,SK	SCI-ENCE	NIRPS	HE	1	–
RAW_D	Raw sci=DARK calib=FP file	OR-DERDEF	CALIB	NIRPS	HE	–	–
RAW_F	Raw sci=FLAT calib=DARK file	OR-DERDEF	CALIB	NIRPS	HE	–	–

<div align="right">continues on next page</div>

Table 69 – continued from previous page

name	description	HDR[HIE ESO DPR TYPE]	HDR[HIE ESO DPR CATG]	HDR[INS	HDR[HIE ESO INS MODE]	HDR[DR!	HDR[TRG_TYPE]*
RAW_F.	Raw sci=FLAT calib=FLAT file	FLAT,L/	CALIB	NIRPS	HE	–	–
RAW_D	Raw sci=DARK calib=FP file	CON-TAM,DA	CALIB	NIRPS	HE	–	–
RAW_F.	Raw sci=FP calib=DARK file	CON-TAM,FP,	CALIB	NIRPS	HE	–	–
RAW_F.	Raw sci=FP calib=FP file	WAVE,F	CALIB	NIRPS	HE	–	–
RAW_LI	Raw sci=LFC calib=LFC file	WAVE,L'	CALIB	NIRPS	HE	–	–
RAW_LI	Raw sci=LFC calib=FP file	WAVE,L'	CALIB	NIRPS	HE	–	–
RAW_F.	Raw sci=FP calib=LFC file	WAVE,F	CALIB	NIRPS	HE	–	–
RAW_LI	–	LED,LAI	CALIB	NIRPS	HE	–	–
RAW_F.	–	FLAT,LI	CALIB	NIRPS	HE	–	–
RAW_O	Raw sci=OBJ calib=DARK file	OB-JECT,D/	–	NIRPS	HE	–	TAR-GET
RAW_O	Raw sci=OBJ calib=FP file	OB-JECT,FI	–	NIRPS	HE	–	TAR-GET
RAW_O	Raw sci=OBJ calib=Hollow Cathode file, Uranium Neon lamp	OB-JECT,UI	–	NIRPS	HE	–	TAR-GET
RAW_O	Raw sci=OBJ calib=Sky file	OB-JECT,SK	–	NIRPS	HE	–	TAR-GET
RAW_O	–	OB-JECT,TI	–	NIRPS	HE	–	TAR-GET
RAW_SI	Raw sci=SUN calib=FP file	SUN,FP,(	–	NIRPS	HE	–	–
RAW_SI	Raw sci=SUN calib=DARK file	SUN,DAI	–	NIRPS	HE	–	–
RAW_F.	Raw sci=flux standard star calib=DARK file	FLUX,S1	–	NIRPS	HE	–	–
RAW_T	Raw sci=hot star calib=DARK file	TEL-LURIC,S	–	NIRPS	HE	–	–
RAW_D	Raw sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Uranium Neon lamp	WAVE,D	CALIB	NIRPS	HE	–	–
RAW_F.	Raw sci=FP calib=Hollow Cathode file, Uranium Neon lamp	WAVE,F	CALIB	NIRPS	HE	–	–
RAW_H	Raw sci=Hollow Cathode calib=FP file, Uranium Neion lamp	WAVE,U	CALIB	NIRPS	HE	–	–
RAW_H	Raw sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	WAVE,U	CALIB	NIRPS	HE	–	–
RAW_H	Raw sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Uranium Neon lamp	WAVE,U	CALIB	NIRPS	HE	–	–
RAW_C	Raw sci=DARK calib=FLAT test file	FLAT,D/	CALIB	NIRPS	HE	–	–
RAW_C	Raw sci=FLAT calib=DARK test file	FLAT,L/	CALIB	NIRPS	HE	–	–
RAW_T	Raw sci=DARK calib=FP test file	CON-TAM,DA	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=DARK calib=FLAT test file	FLAT,D/	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=FLAT calib=DARK test file	FLAT,L/	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=FP calib=FP test file	WAVE,F	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=LED calib=LED test file	LED,LAI	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=Hollow Cathode calib=Hollow Cathode test file	WAVE,U	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=FP calib=Hollow Cathode test file	WAVE,F	TEST	NIRPS	HE	–	–

Table 69 – continued from previous page

name	description	HDR[HIERARCH ESO DPR TYPE]	HDR[HIERARCH ESO DPR CATG]	HDR[INS	HDR[HIERARCH ESO INS MODE]	HDR[DRS	HDR[TRG_TYPE]*
RAW_T	Raw sci=Hollow Cathode calib=FP test file	WAVE,U	TEST	NIRPS	HE	–	–
RAW_D	Raw sci=SKY calib=SKY test file	EFF,SKY	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=DARK calib=DARK test file	DARK	TEST	NIRPS	HE	–	–
RAW_T	Raw sci=FP calib=DARK test file	CON-TAM,FP	TEST	NIRPS	HE	–	–

* these columns may be added/updated by APERO before use.

"HDR[XXX]" denotes key from file header

1.2 APERO definition of TRG_TYPE

TRG_TYPE may be in the header, in which case it is used.

If TRG_TYPE is not in header we assign it based on the following key:

- HIERARCH ESO DPR TYPE

Then TRG_TYPE is set as follows:

- If HIERARCH ESO DPR TYPE contains "SKY" then TRG_TYPE = 'SKY'
- If HIERARCH ESO DPR TYPE contains "OBJECT" or "STAR" then TRG_TYPE = 'TARGET'
- Else TRG_TYPE = ''

2. Preprocesed files

2.1 File definition table

Table 70: 2. Preprocesed files file definition table

name	description	HDR[DPR]	file type	suffix	input file
DARK_D	Preprocessed sci=DARK calib=DARK file	DARK_D	.fits	_pp	RAW_DARK_DARK
FLUX_SK	Preprocessed flux sci=SKY calib=SKY file	FLUX_SK	.fits	_pp	RAW_FLUX_SKY_SKY
NIGHT_S	Preprocessed night sci=SKY calib=SKY file	NIGHT_S	.fits	_pp	RAW_NIGHT_SKY_SKY
FLAT_DA	Preprocessed sci=FLAT calib=DARK file	FLAT_DA	.fits	_pp	RAW_FLAT_DARK
DARK_FI	Preprocessed sci=DARK calib=FLAT file	DARK_FI	.fits	_pp	RAW_DARK_FLAT
FLAT_FL	Preprocessed sci=FLAT calib=FLAT file	FLAT_FL	.fits	_pp	RAW_FLAT_FLAT
DARK_FI	Preprocessed sci=DARK calib=FP file	DARK_FI	.fits	_pp	RAW_DARK_FP
FP_DARK	Preprocessed sci=FP calib=DARK file	FP_DARK	.fits	_pp	RAW_FP_DARK
FP_FP	Preprocessed sci=FP calib=FP file	FP_FP	.fits	_pp	RAW_FP_FP
LFC_LFC	Preprocessed sci=LFC calib=LFC file	LFC_LFC	.fits	_pp	RAW_LFC_LFC
LFC_FP	Preprocessed sci=LFC calib=FP file	LFC_FP	.fits	_pp	RAW_LFC_FP
FP_LFC	Preprocessed sci=FP calib=LFC file	FP_LFC	.fits	_pp	RAW_FP_LFC
LED_LED	Preprocessed sci=LED calib=LED file	LED_LED	.fits	_pp	RAW_LED_LED
FLAT_LE	Preprocessed sci=FLAT calib=LED file	FLAT_LE	.fits	_pp	RAW_FLAT_LED
OBJ_DAR	Preprocessed sci=OBJ calib=DARK file	OBJ_DAR	.fits	_pp	RAW_OBJ_DARK
OBJ_FP	Preprocessed sci=OBJ calib=FP file	OBJ_FP	.fits	_pp	RAW_OBJ_FP

Table 70 – continued from previous page

name	description	HDR[DPRT	file type	suffix	input file
OBJ_HCC	Preprocessed sci=OBJ calib=Hollow Cathode	OBJ_HCC	.fits	_pp	RAW_OBJ_HCONE
OBJ_SKY	Preprocessed sci=OBJ calib=SKY	OBJ_SKY	.fits	_pp	RAW_OBJ_SKY
OBJ_TUN	Preprocessed sci=OBJ calib=Tungston lamp	OBJ_TUN	.fits	_pp	RAW_OBJ_TUN
SUN_FP	Preprocessed sci=SUN calib=FP	SUN_FP	.fits	_pp	RAW_SUN_FP
SUN_DAF	Preprocessed sci=SUN calib=DARK	SUN_DAF	.fits	_pp	RAW_SUN_DARK
FLUXSTD	Preprocessed sci=Flux standard star calib=SKY	FLUXSTD	.fits	_pp	RAW_FLUXSTD_SKY
TELLU_S	Preprocessed sci=Telluric hot star calib=SKY	TELLU_S	.fits	_pp	RAW_TELLU_SKY
DARK_HC	Preprocessed sci=DARK calib=Hollow Cathode file, Uranium Neon lamp	DARK_HC	.fits	_pp	RAW_DARK_HCONE
FP_HCON	Preprocessed sci=FP calib=Hollow Cathode file, Uranium Neon lamp	FP_HCON	.fits	_pp	RAW_FP_HCONE
HCONE_I	Preprocessed sci=Hollow Cathode calib=FP file, Uranium Neion lamp	HCONE_I	.fits	_pp	RAW_HCONE_FP
HCONE_I	Preprocessed sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	HCONE_I	.fits	_pp	RAW_HCONE_HCONE
HCONE_I	–	HCONE_I	.fits	_pp	RAW_HCONE_DARK
CALIB_D	Preprocessed sci=DARK calib=FLAT test file	CALIB_D	.fits	_pp	RAW_CALIB_DARK_FLAT
CALIB_F	Preprocessed sci=FLAT calib=DARK test file	CALIB_F	.fits	_pp	RAW_CALIB_FLAT_DARK
TEST_DA	Preprocessed sci=DARK calib=FLAT test file	TEST_DA	.fits	_pp	RAW_TEST_DARK_FLAT
TEST_FL	Preprocessed sci=FLAT calib=DARK test file	TEST_FL	.fits	_pp	RAW_TEST_FLAT_DARK
TEST_DA	Preprocessed sci=DARK calib=FP test file	TEST_DA	.fits	_pp	RAW_TEST_DARK_FP
TEST_FP	Preprocessed sci=FP calib=FP test file	TEST_FP	.fits	_pp	RAW_TEST_FP_FP
TEST_LE	Preprocessed sci=LED calib=LED test file	TEST_LE	.fits	_pp	RAW_TEST_LED_LED
TEST_HC	Preprocessed sci=Hollow Cathode calib=Hollow Cathode test file	TEST_HC	.fits	_pp	RAW_TEST_HCONE_HCON
TEST_FP	Preprocessed sci=FP calib=Hollow Cathode test file	TEST_FP	.fits	_pp	RAW_TEST_FP_HCONE
TEST_HC	Preprocessed sci=Hollow Cathode calib=FP test file	TEST_HC	.fits	_pp	RAW_TEST_HCONE_FP
TEST_DA	Preprocessed sci=SKY calib=SKY test file	TEST_DA	.fits	_pp	RAW_DARK_DARK_SKY
TEST_DA	Preprocessed sci=DARK calib=DARK test file	TEST_DA	.fits	_pp	RAW_TEST_DARK
TEST_FP	Preprocessed sci=FP calib=DARK test file	TEST_FP	.fits	_pp	RAW_TEST_FP_DARK

"HDR[XXX]" denotes key from file header

3. Reduced Files

3.1 File definition table

Table 71: 3. Reduced Files file definition table

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
PP_REl	PP Reference flat calibration file	PP_REl	.fits	_ppref	–	–	RAW_FLAT_FLAT
PP_LEI	Reference LED flat calibration file	PP_LEI	.fits	_led_fla	–	–	RAW_LED_LED
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	–	DARK_DARK
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_i	–	–	DARK_DARK
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	–	FLAT_FLAT
BKGRD	Bad pixel background map	BKGRD	.fits	_bmap.f	–	–	FLAT_FLAT
DE-BUG_B	Individual file background map	DE-BUG_B	.fits	_back-ground.f	–	–	DRS_PP
LOC_O	Localisation: Order profile calibration file	LOC_O	.fits	_order_prof	–	A, B	FLAT_DARK, DARK_FLAT
LOC_L(	Localisation: Position polynomial calibration file	LOC_L(	.fits	_loco	–	A, B	FLAT_DARK, DARK_FLAT
LOC_F`	Localisation: Width polynomial calibration file	LOC_F`	.fits	_fwhm-order	–	A, B	FLAT_DARK, DARK_FLAT
LOC_SI	Localisation: Position superpositionimage calibration file	LOC_SI	.fits	_with-order	–	A, B	FLAT_DARK, DARK_FLAT
SHAPE_	Reference shape dx calibration file	SHAPE_	.fits	_shapex	–	–	FP_FP
SHAPE_	Reference shape dy calibration file	SHAPE_	.fits	_shapey	–	–	FP_FP
REF_FI	Reference shape master FP calibration file	REF_FI	.fits	_fpref	–	–	FP_FP
SHAPE_	Input FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Output FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Shape transformed dx comparison file	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPEI	Nightly shape calibration files	SHAPEI	.fits	_shapel	–	–	FP_FP
SHAPEI	Input FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
SHAPEI	Output FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
FF_BL/	Blaze calibration file	FF_BL/	.fits	_blaze	–	A, B	FLAT_FLAT
FF_FL/	Flat calibration file	FF_FL/	.fits	_flat	–	A, B	FLAT_FLAT
OR-DERP_	Straightened order profile for an individual image	OR-DERP_	.fits	_or-derps	–	A, B	SHAPEL
EXT_E:	Extracted 2D spectrum	EXT_E:	.fits	_e2ds	–	A, B	DRS_PP
EXT_E:	Extracted + flat-fielded 2D spectrum	EXT_E:	.fits	_e2dsff	–	A, B	DRS_PP
EXT_E:	Pre-extracted straighted stacked spectrum	EXT_E:	.fits	_e2dsll	–	A, B	DRS_PP, FLAT_FLAT
EXT_L(	Straightened localisation file	EXT_L(	.fits	_e2dsloc	–	A, B	DRS_PP
EXT_S1	1D stitched spectrum (constant wavelength binning)	EXT_S1	.fits	_s1d_w	–	A, B	DRS_PP
EXT_S1	1D stitched spectrum (constant velocity binning)	EXT_S1	.fits	_s1d_v	–	A, B	DRS_PP

Table 71 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
EXT_F]	FP lines identified from extracted FP fiber	EXT_F]	.fits	_ext_fp	–	A, B	EXT_E2DS, EXT_E2DS_FF
LEAKRl	Reference leak correction calibration file	LEAKRl	.fits	_leak_r	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVES(	Reference wavelength solution calibration file	WAVES(	.fits	_waveso	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cathode lines calibration file	WAVE_	.fits	_wa-veref_hc	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	–	WAVE_	.fits	_wa-veref_fp	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_	Reference wavelength cavity width polynomial calibration file	WA-VEREF_	.fits	_wa-veref_ca	–	A	EXT_E2DS, EXT_E2DS_FF
WAVES(	Default wavelength solution calibration file	WAVES(	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength resolution map file	WAVE_	.fits	_wa-veref_re	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength resolution table	–	.tbl	–	ap-ero_wav	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength FP line-list table	–	.tbl	_mhc_l	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVEM	Reference wavelength resolution e2ds file	WAVEM	.fits	_wa-veref_re	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength solution calibration file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE-HCLL	Nightly HC line list calibration file	–	.dat	_linelist	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Nightly wavelength resolution map file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength resolutiontable	–	.tbl	–	ap-ero_wav	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list table	–	.tbl	_hc_lin	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength Hollow cathodeline-list table	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list calibration file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
SKY_M	Telluric sky model file	SKY_M	.fits	_sky_m	–	–	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_r	–	A	EXT_E2DS_FF
TELLU_	–	–	.npy	_tellu_c	–	A	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_	Telluric transmission file	TELLU_	.fits	_tellu_t	–	A	EXT_E2DS_FF
TELLU_	–	–	.npy	–	tapas_sp	–	–
TRANS_	Telluric transmission model file	TRANS_	.fits	–	trans_m	A	–
ABSO_]	–	–	.npy	–	tellu_sa	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff_	–	A	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_V	.fits	_s1d_w	–	A	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v	–	A	EXT_E2DS_FF

continues on next page

Table 71 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff_	–	A	EXT_E2DS_FF
RC1D_\	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_\	.fits	_s1d_w	–	A	EXT_E2DS_FF
RC1D_\	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_\	.fits	_s1d_v	–	A	EXT_E2DS_FF
TELLU_	Telluric 2D template file	TELLU_	.fits	–	Template	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (star frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (Earth frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 1D stack file (Earth frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
CCF_R\	Cross-correlation RV results file	CCF_R\	.fits	_ccf	–	A, B	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

4. Calibration files

...

4.1 File definition table

Table 72: 4. Calibration files file definition table

name	description	HDR[DP]	file type	suffix	fibers	db-name	dbkey	input file
PP_RE	PP Reference flat calibration file	PP_RE	.fits	_ppref	–	calibration	PP_RE	RAW_FLAT_FLAT
PP_LE	Reference LED flat calibration file	PP_LE	.fits	_led_fl	–	calibration	PP_LE	RAW_LED_LED
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	calibration	DARKI	DARK_DARK
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	–	calibration	DARK-REF	DARK_DARK
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	calibration	BAD-PIX	FLAT_FLAT
BKGRI	Bad pixel background map	BKGRI	.fits	_bmap.	–	calibration	BKGRI	FLAT_FLAT
LOC_O	Localisation: Order profile calibration file	LOC_O	.fits	_order_pro	A, B	calibration	ORDER_P	FLAT_DARK, DARK_FLAT
LOC_L	Localisation: Position polynomial calibration file	LOC_L	.fits	_loco	A, B	calibration	LOC	FLAT_DARK, DARK_FLAT
SHAPE	Reference shape dx calibration file	SHAPE	.fits	_shape	–	calibration	SHAPE	FP_FP
SHAPE	Reference shape dy calibration file	SHAPE	.fits	_shapey	–	calibration	SHAPE	FP_FP
REF_F	Reference shape master FP calibration file	REF_F	.fits	_fpref	–	calibration	FPREF	FP_FP
SHAPE	Nightly shape calibration files	SHAPE	.fits	_shapel	–	calibration	SHAPE	FP_FP
FF_BL	Blaze calibration file	FF_BL	.fits	_blaze	A, B	calibration	BLAZE	FLAT_FLAT
FF_FL	Flat calibration file	FF_FL	.fits	_flat	A, B	calibration	FLAT	FLAT_FLAT
LEAKR	Reference leak correction calibration file	LEAKR	.fits	_leak_	A, B	calibration	LEAKR	EXT_E2DS, EXT_E2DS_FF
WAVES	Reference wavelength solution calibration file	WAVES	.fits	_waves	A, B	calibration	WAVES	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cathode lines calibration file	WAVE_	.fits	_waveref_h	A, B	calibration	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_	–	WAVE_	.fits	_waveref_fp	A, B	calibration	WAVEF	EXT_E2DS, EXT_E2DS_FF
WA-VEREF	Reference wavelength cavity width polynomial calibration file	WA-VEREF HDR[REF	.fits	_waveref_c	A	calibration	WAVE-CAV	EXT_E2DS, EXT_E2DS_FF

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4.1 File definition table

Table 72: 4. Calibration files file definition table

name	description	HDR[DP	file type	suffix	fibers	db-name	dbkey	input file
PP_RE	PP Reference flat calibration file	PP_RE	.fits	_ppref	–	calibration	PP_RE	RAW_FLAT_FLAT
PP_LE	Reference LED flat calibration file	PP_LE	.fits	_led_fl	–	calibration	PP_LE	RAW_LED_LED
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	calibration	DARKI	DARK_DARK
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	–	calibration	DARK-REF	DARK_DARK
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	calibration	BAD-PIX	FLAT_FLAT
BKGRI	Bad pixel background map	BKGRI	.fits	_bmap.	–	calibration	BKGRI	FLAT_FLAT
LOC_O	Localisation: Order profile calibration file	LOC_O	.fits	_order_pro	A, B	calibration	ORDER_P	FLAT_DARK, DARK_FLAT
LOC_L	Localisation: Position polynomial calibration file	LOC_L	.fits	_loco	A, B	calibration	LOC	FLAT_DARK, DARK_FLAT
SHAPE	Reference shape dx calibration file	SHAPE	.fits	_shape	–	calibration	SHAPE	FP_FP
SHAPE	Reference shape dy calibration file	SHAPE	.fits	_shapey	–	calibration	SHAPE	FP_FP
REF_F	Reference shape master FP calibration file	REF_F	.fits	_fpref	–	calibration	FPREF	FP_FP
SHAPE	Nightly shape calibration files	SHAPE	.fits	_shapel	–	calibration	SHAPE	FP_FP
FF_BL	Blaze calibration file	FF_BL	.fits	_blaze	A, B	calibration	BLAZE	FLAT_FLAT
FF_FL	Flat calibration file	FF_FL	.fits	_flat	A, B	calibration	FLAT	FLAT_FLAT
LEAKR	Reference leak correction calibration file	LEAKR	.fits	_leak_	A, B	calibration	LEAKR	EXT_E2DS, EXT_E2DS_FF
WAVES	Reference wavelength solution calibration file	WAVES	.fits	_waves	A, B	calibration	WAVES	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cathode lines calibration file	WAVE_	.fits	_waveref_h	A, B	calibration	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_	–	WAVE_	.fits	_waveref_fp	A, B	calibration	WAVEF	EXT_E2DS, EXT_E2DS_FF

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| WA-VEREF | Reference wavelength cavity width polynomial calibration file | WA-VEREF HDR[REF | .fits | _waveref_c | A | calibration | WAVE-CAV | EXT_E2DS, EXT_E2DS_FF |

"HDR[XXX]" denotes key from file header

5. Telluric files

5.1 File definition table

Table 73: 5. Telluric files file definition table

name	description	HDR[D	file type	suffix	base-name	fibers	db-name	dbkey	input file
SKY_	Telluric sky model file	SKY_	.fits	_sky_	–	–	tel-luric	SKY_	EXT_E2DS_FF
TELLU	Telluric pre-cleaning file	TELLU	.fits	_tellu_	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	–	–	.npy	_tellu_	–	A	tel-luric	TELLU	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU	Telluric transmission file	TELLU	.fits	_tellu_	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	–	–	.npy	–	tapas_	–	tel-luric	TELLU	–
TRAN	Telluric transmission model file	TRAN	.fits	–	trans_	A	tel-luric	TELLU	–
TELLU	Telluric corrected extracted 2D spectrum	TELLU	.fits	_e2dsf	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	Telluric reconstructed 2D absorption file	TELLU	.fits	_e2dsf	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	Telluric 2D template file	TELLU	.fits	–	Template	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ
TELLU	Telluric 1D template file	TELLU	.fits	–	Template_	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ
TELLU	Telluric 1D template file	TELLU	.fits	–	Template_	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

6. Post-processed files

6.1 File definition table

Table 74: 6. Post-processed files file definition table

name	description	HDR[KW	suffix	ext name	ext input	col names	col input
DRS_PC	Post process 2D extracted spectrum collection	OBJ_FP OBJ_DA PO- LAR_FF PO- LAR_D/	e.fits	Pri- mary: PP FluxA FluxB WaveA WaveB BlazeA BlazeB	DRS_PF EXT_E2 EXT_E2 WAVE_1 WAVE_1 FF_BLA FF_BLA	– – – – – – –	– – – – – – –
DRS_PC	Post process 1D spectrum collection	OBJ_FP OBJ_DA PO- LAR_FF PO- LAR_D/	s.fits	Pri- mary: PP Uni- formWav length – – – – – – – – – – UniFor- mVe- locity – – – – – – – – –	DRS_PF – – – – – – – – – – – – – – – – – –	– Wave FluxA Flux- ErrA FluxB Flux- ErrB Flux- ATel- luCor- rected Flux- Er- rATel- luCor- rected Sky- Corr Sky- Cor- rErr FiniteRes FiniteRe- sErr Wave FluxA Flux- ErrA FluxB Flux- ErrB Flux- ATel- luCor- rected Flux- Er- rATel- luCor- rected Sky- Corr Sky- Cor-	– EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W SC1D_W_FILE SC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V SC1D_V_FILE SC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE

rErr
FiniteRes
FiniteRe-
sErr

"HDR[XXX]" denotes key from file header

3.3 NIRPS HA documentation

3.3.1 Detailed documentation

3.3.1.1 Sequences (NIRPS_HA)

This section describes all the NIRPS_HA recipe sequences to use with APERO. For information on individual recipes see here.

pp_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 75: Recipes

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE
1	apero_pp_ref_nirps_ha.py	PPREF	pre-reference	Yes
2	apero_preprocess_nirps_ha.py	PP	pre	No

pp_seq_opt

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 76: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	FILTERS	ARGS
1	apero_pp_ref_nirps_	PPREF	pre-reference	Yes	–	
2	apero_preprocess_nir	PP_CAL	pre-cal	No	KW_RAW_DPRCATG: CALIB	
3	apero_preprocess_nir	PP_SCI	pre-sci	No	KW_OBJNAME: SCIENCE_TARGETS	
4	apero_preprocess_nir	PP_TEL	pre-tel	No	KW_OBJNAME: TELLURIC_TARGETS	
5	apero_preprocess_nir	PP_HC1	pre-hchc	No	–	{files}=[RAW_HCONE_HCONE]
6	apero_preprocess_nir	PP_FPF	pre-fpfp	No	–	{files}=[RAW_FP_FP]
7	apero_preprocess_nir	PP_FF	pre-ff	No	–	{files}=[RAW_FLAT_FLAT]
8	apero_preprocess_nir	PP_DFP	pre-dfp	No	–	{files}=[RAW_DARK_FP]
9	apero_preprocess_nir	PP_FPD	pre-fpd	No	–	{files}=[RAW_FP_DARK]
10	apero_preprocess_nir	PP_SKY	pre-sky	No	–	{files}=[RAW_NIGHT_SKY_SK
11	apero_preprocess_nir	PP_LFC	pre-lfc	No	–	{files}=[RAW_LFC_LFC]
12	apero_preprocess_nir	PP_LFC	pre-lfcfp	No	–	{files}=[RAW_LFC_FP]
13	apero_preprocess_nir	PP_FPL	pre-fplfc	No	–	{files}=[RAW_FP_LFC]
14	apero_preprocess_nir	PP_EVE	pre	No	–	{files}=[DRS_RAW]

full_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_pp_ref_nirps_ha.py	PPREF	pre-reference	Yes	–	–
2	apero_preprocess_nirps_ha.py	PP	pre-all	No	–	–
3	apero_dark_ref_nirps_ha.py	DARKREF	calib-reference	Yes	–	–
4	apero_badpix_nirps_ha.py	BADREF	calib-reference	Yes	–	–

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
5	apero_loc_nirps_ha.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
6	apero_loc_nirps_ha.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
7	apero_shape_ref_nirps_ha.py	SHAPEREF	calib-reference	Yes	–	–
8	apero_shape_nirps_ha.py	SHAPELREF	calib-reference	Yes	–	–
9	apero_flat_nirps_ha.py	FLATREF	calib-reference	Yes	–	–
10	apero_leak_ref_nirps_ha.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_nirps_ha.py	WAVEREF	calib-reference	Yes	–	–
12	apero_badpix_nirps_ha.py	BAD	calib-night	No	–	–
13	apero_loc_nirps_ha.py	LOCCAL	calib-night-CAL	No	–	–
14	apero_loc_nirps_ha.py	LOCSCI	calib-night-SCI	No	–	–
15	apero_shape_nirps_ha.py	SHAPE	calib-night	No	–	–
16	apero_flat_nirps_ha.py	FF	calib-night	No	–	–
17	apero_wave_night_nirps_ha.py	WAVE	calib-night	No	–	–
18	apero_extract_nirps_ha.py	EXTALL	extract-ALL	No	–	–
19	apero_mk_tellu_nirps_ha.py	MKTELLU1	tellu-hotstar	No	A	KW_OBJN
20	apero_mk_model_nirps_ha.py	MKTMOD1	tellu-hotstar	No	–	–
21	apero_fit_tellu_nirps_ha.py	MKTFIT1	tellu-hotstar	No	A	KW_OBJN
22	apero_mk_template_nirps_ha.py	MKTEMP1	tellu-hotstar	No	A	KW_OBJN
23	apero_mk_tellu_nirps_ha.py	MKTELLU2	tellu-hotstar	No	A	KW_OBJN
24	apero_mk_model_nirps_ha.py	MKTMOD2	tellu-hotstar	No	–	–
25	apero_fit_tellu_nirps_ha.py	MKTFIT2	tellu-hotstar	No	A	KW_OBJN
26	apero_mk_template_nirps_ha.py	MKTEMP2	tellu-hotstar	No	A	KW_OBJN
27	apero_fit_tellu_nirps_ha.py	FTFIT1	tellu-science	No	A	KW_OBJN
28	apero_mk_template_nirps_ha.py	FTTEMP1	tellu-science	No	A	KW_OBJN
29	apero_fit_tellu_nirps_ha.py	FTFIT2	tellu-science	No	A	KW_OBJN
30	apero_mk_template_nirps_ha.py	FTTEMP2	tellu-science	No	A	KW_OBJN
31	apero_ccf_nirps_ha.py	CCF	rv-tcorr	No	AB	KW_DPRT
32	apero_postprocess_nirps_ha.py	POSTALL	post-all	No	–	KW_DPRT

limited_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
1	apero_pp_ref_nirps_ha.py	PPREF	pre-reference	Yes	–	–
2	apero_preprocess_nirps_ha.py	PP	pre-all	No	–	–
3	apero_dark_ref_nirps_ha.py	DARKREF	calib-reference	Yes	–	–
4	apero_badpix_nirps_ha.py	BADREF	calib-reference	Yes	–	–
5	apero_loc_nirps_ha.py	LOCREFCAL	calib-reference-CAL	Yes	–	–
6	apero_loc_nirps_ha.py	LOCREFSCI	calib-reference-SCI	Yes	–	–
7	apero_shape_ref_nirps_ha.py	SHAPEREF	calib-reference	Yes	–	–
8	apero_shape_nirps_ha.py	SHAPELREF	calib-reference	Yes	–	–
9	apero_flat_nirps_ha.py	FLATREF	calib-reference	Yes	–	–

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ORDER	RECIPE	SHORTNAME	RECIPE KIND	REF RECIPE	FIBER	FILTERS
10	apero_leak_ref_nirps_ha.py	LEAKREF	calib-reference	Yes	–	–
11	apero_wave_ref_nirps_ha.py	WAVEREF	calib-reference	Yes	–	–
12	apero_badpix_nirps_ha.py	BAD	calib-night	No	–	–
13	apero_loc_nirps_ha.py	LOCCAL	calib-night-CAL	No	–	–
14	apero_loc_nirps_ha.py	LOCSCI	calib-night-SCI	No	–	–
15	apero_shape_nirps_ha.py	SHAPE	calib-night	No	–	–
16	apero_flat_nirps_ha.py	FF	calib-night	No	–	–
17	apero_wave_night_nirps_ha.py	WAVE	calib-night	No	–	–
18	apero_extract_nirps_ha.py	EXTTELL	extract-hotstar	No	–	KW_OBJN
19	apero_extract_nirps_ha.py	EXTOBJ	extract-science	No	–	KW_OBJN
20	apero_mk_tellu_nirps_ha.py	MKTELLU1	tellu-hotstar	No	A	KW_OBJN
21	apero_mk_model_nirps_ha.py	MKTMOD1	tellu-hotstar	No	–	–
22	apero_fit_tellu_nirps_ha.py	MKTFIT1	tellu-hotstar	No	A	KW_OBJN
23	apero_mk_template_nirps_ha.py	MKTEMP1	tellu-hotstar	No	A	KW_OBJN
24	apero_mk_tellu_nirps_ha.py	MKTELLU2	tellu-hotstar	No	A	KW_OBJN
25	apero_mk_model_nirps_ha.py	MKTMOD2	tellu-hotstar	No	–	–
26	apero_fit_tellu_nirps_ha.py	MKTFIT2	tellu-hotstar	No	A	KW_OBJN
27	apero_mk_template_nirps_ha.py	MKTEMP2	tellu-hotstar	No	A	KW_OBJN
28	apero_fit_tellu_nirps_ha.py	FTFIT1	tellu-science	No	A	KW_OBJN
29	apero_mk_template_nirps_ha.py	FTTEMP1	tellu-science	No	A	KW_OBJN
30	apero_fit_tellu_nirps_ha.py	FTFIT2	tellu-science	No	A	KW_OBJN
31	apero_mk_template_nirps_ha.py	FTTEMP2	tellu-science	No	A	KW_OBJN
32	apero_ccf_nirps_ha.py	CCF	rv-tcorr	No	A	KW_DPRT
33	apero_postprocess_nirps_ha.py	SCIPOST	post-science	No	–	KW_DPRT

ref_seq

No description set

2. Schematic

No schematic set

---

3. Recipes in sequence

Table 79: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS	KWARGS
1	ap-ero_dark_ref_nirps	DARK-REF	calib-reference	Yes		
2	ap-ero_badpix_nirps_	BADREF	calib-reference	Yes		
3	ap-ero_loc_nirps_ha.p	LOCRE-FCAL	calib-reference-CAL	No	{files}=[DARK	
4	ap-ero_loc_nirps_ha.p	LOCRE-FSCI	calib-reference-SCI	No	{files}=[FLAT_	
5	ap-ero_shape_ref_nirp	SHAPERl	calib-reference	Yes		
6	ap-ero_shape_nirps_h	SHAPEL-REF	calib-reference	Yes		
7	ap-ero_flat_nirps_ha.p	FLA-TREF	calib-reference	Yes		
8	ap-ero_leak_ref_nirps	LEAKREl	calib-reference	Yes		
9	ap-ero_wave_ref_nirp:	WA-VEREF	calib-reference	Yes		–hc-files=[HCONE_HCONE] –fpfiles=[FP_FP]

calib_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 80: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_badpix_nirps_ha.py	BAD	calib-night	No	
2	apero_loc_nirps_ha.py	LOCCAL	calib-night-CAL	No	{files}=[DARK_FLAT]
3	apero_loc_nirps_ha.py	LOCSCI	calib-night-SCI	No	{files}=[FLAT_DARK]
4	apero_shape_nirps_ha.py	SHAPE	calib-night	No	
5	apero_flat_nirps_ha.py	FF	calib-night	No	{files}=[FLAT_FLAT]
6	ap-ero_wave_night_nirps_ha.py	WAVE	calib-night	No	

tellu_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 81: Recipes

OR-DER	RECIPE	SHOR NAM	RECII KIND	REF RECI	FIBE	FILTERS	ARGS
1	ap-ero_extrac	EXT-TELI	extra hotsta	No	–	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]
2	ap-ero_mk_t	MK-TELI	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
3	ap-ero_mk_n	MK-T-MOL	tellu-hotsta	No	–	–	
4	ap-ero_fit_te	MK-T-FIT1	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
5	ap-ero_mk_t	MK-TEM	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
6	ap-ero_mk_t	MK-TELI	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
7	ap-ero_mk_n	MK-T-MOL	tellu-hotsta	No	–	–	
8	ap-ero_fit_te	MK-T-FIT2	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
9	ap-ero_mk_t	MK-TEM	tellu-hotsta	No	A	KW_OBJNAME: TEL-LURIC_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]

science_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 82: Recipes

OR-DER	RECIPE	SHOR NAM	RECII KIND	REF RECI	FIBE	FILTERS	ARGS
1	ap-ero_extrac	EX-TOB	extra science	No	–	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]
2	ap-ero_fit_te	FT-FIT1	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
3	ap-ero_mk_t	FT-TEM	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	
4	ap-ero_fit_te	FT-FIT2	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[EXT_E2DS_FF]
5	ap-ero_mk_t	FT-TEM	tellu-science	No	A	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	
6	ap-ero_ccf_n	CCF	rv-tcorr	No	AB	KW_DPRTYPE: OBJ_DARK, OBJ_FP, POLAR_DARK, POLAR_FP KW_OBJNAME: SCIENCE_TARGETS	{files}=[TELLU_OBJ]
7	ap-ero_postpı	SCI-POST	post-science	No	–	KW_DPRTYPE: OBJ_FP, OBJ_DARK, POLAR_DARK, POLAR_FP KW_OBJNAME: SCIENCE_TARGETS	{files}=[DRS_PP]

quick_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 83: Recipes

OR-DER	RECIPE NAME	SHORT NAME	RECIPE KIND	REF RECI	FILTERS	ARGS
1	ap-ero_extra	EX-TQUI	extrac quick	No	KW_OBJNAME: SCIENCE_TARGETS KW_DPRTYPE: OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY	{files}=[OBJ_DARK, OBJ_FP, OBJ_SKY, OBJ_TUN, FLUXSTD_SKY, TELLU_SKY]

blank_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

N/A

eng_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 84: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_extract_nirps_ha.py	EXT_HC1HC1	extract-hchc	No	{files}=[HCONE_HCONE]
2	apero_extract_nirps_ha.py	EXT_FPFP	extract-fpfp	No	{files}=[FP_FP]
3	apero_extract_nirps_ha.py	EXT_FF	extract-ff	No	{files}=[FLAT_FLAT]
4	apero_extract_nirps_ha.py	EXT_DFP	extract-dfp	No	{files}=[DARK_FP]
5	apero_extract_nirps_ha.py	EXT_SKY	extract-sky	No	{files}=[NIGHT_SKY_SKY]
6	apero_extract_nirps_ha.py	EXT_LFC	extract-lfc	No	{files}=[LFC_LFC]
7	apero_extract_nirps_ha.py	EXT_FPD	extract-fpd	No	{files}=[FP_DARK]
8	apero_extract_nirps_ha.py	EXT_LFCFP	extract-lfcfp	No	{files}=[LFC_FP]
9	apero_extract_nirps_ha.py	EXT_FPLFC	extract-fplfc	No	{files}=[FP_LFC]
10	apero_extract_nirps_ha.py	EXT_EVERY	extract-everything	No	{files}=[DRS_PP]

helios_seq

No description set

2. Schematic

No schematic set

3. Recipes in sequence

Table 85: Recipes

OR-DER	RECIPE	SHORT-NAME	RECIPE KIND	REF RECIPE	ARGS
1	apero_preprocess_nirps_ha	PP_SUN	pre-sun	No	{files}=[RAW_SUN_FP, RAW_SUN_DARK]
2	apero_extract_nirps_ha.py	EXT_SUN	extract-sun	No	{files}=[SUN_FP, SUN_DARK]

3.3.1.2 Recipes (NIRPS_HA)

This section describes all the NIRPS_HA recipes to use with APERO.

For information on how to run these recipes (either individually or with the processing tools) see *here*.

apero_pp_ref_nirps_ha

1. Description

SHORTNAME: PPREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_pp_ref_nirps_ha.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--filetype[STRING] // PP_REF_FILETYPE_HELP
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
```

```
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 86: Outputs

name	description	HDR[DRSOUT	file type	suffix	dbname	dbkey	input file
PP_REF	PP Reference flat calibration file	PP_REF	.fits	_ppref	calibration	PP_RE	RAW_FLAT_FLAT
PP_LED_FI	Reference LED flat calibration file	PP_LED_FI	.fits	_led_fla	calibration	PP_LEI	RAW_LED_LED

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_preprocess_nirps_ha

1. Description

SHORTNAME: PP

No description set

2. Schematic

No schematic set

3. Usage

```
apero_preprocess_nirps_ha.py {obs_dir}[STRING] [FILE:DRS_RAW] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_RAW] // Any raw files are currently allowed. Multiple files inputted are handled␣
↪separately (one after the other).
```

4. Optional Arguments

```
--skip[True/False] // [BOOLEAN] If True skips preprocessed files that are already found
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_WORKING // Default: "tmp" directory
```

7. Output files

Table 87: Outputs

name	description	file type	suffix	input file
DRS_PP	Generic pre-processed file	.fits	_pp	DRS_RAW

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_badpix_nirps_ha

1. Description

SHORTNAME: BAD

No description set

2. Schematic

No schematic set

3. Usage

```
apero_badpix_nirps_ha.py {obs_dir}[STRING] --flatfiles[FILE:FLAT_FLAT] --darkfiles[FILE:DARK_
↪DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--flatfiles[FILE:FLAT_FLAT] // Current allowed types: FLAT_FLAT
--darkfiles[FILE:DARK_DARK] // Current allowed types: DARK_DARK
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 88: Outputs

name	description	HDR[DRSOUTI	file type	suffix	dbname	dbkey	input file
BADPIX	Bad pixel map	BADPIX	.fits	_bad-pixel	calibra-tion	BADPIX	FLAT_FLAT
BKGRD_MA	Bad pixel back-ground map	BKGRD_MAF	.fits	_bmap.fit	calibra-tion	BKGRDMA	FLAT_FLAT

8. Debug plots

```
BADPIX_MAP
```

9. Summary plots

```
SUM_BADPIX_MAP
```

apero_dark_nirps_ha

1. Description

SHORTNAME: DARK

No description set

2. Schematic

No schematic set

3. Usage

```
apero_dark_nirps_ha.py {obs_dir}[STRING] [FILE:DARK_DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_DARK] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
→allowed types: DARK_DARK_INT, DARK_DARK_TEL, DARK_DARK_SKY
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 89: Outputs

name	description	HDR[DRSOUTID]	file type	suffix	dbname	dbkey	input file
DARKI	Internal dark calibration file	DARKI	.fits	_darki	calibration	DARKI	DARK_DARK
DARKI	Internal dark calibration file	DARKI	.fits	_darki	calibration	DARKI	DARK_DARK

8. Debug plots

```
DARK_IMAGE_REGIONS
DARK_HISTOGRAM
```

9. Summary plots

```
SUM_DARK_IMAGE_REGIONS
SUM_DARK_HISTOGRAM
```

apero_dark_ref_nirps_ha

1. Description

SHORTNAME: DARKREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_dark_ref_nirps_ha.py {options}
```

No optional arguments

4. Optional Arguments

```
--filetype[STRING] // Current allowed types: DARK_DARK
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 90: Outputs

name	description	HDR[DRSOUTI	file type	suffix	dbname	dbkey	input file
DARK-REF	Reference dark calibration file	DARKREF	.fits	_dark_re	calibration	DARK-REF	DARK_DARK

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_loc_nirps_ha

1. Description

SHORTNAME: LOC

No description set

2. Schematic

No schematic set

3. Usage

```
apero_loc_nirps_ha.py {obs_dir}[STRING] [FILE:DARK_FLAT,FLAT_DARK] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DARK_FLAT,FLAT_DARK] // [STRING/STRINGS] A list of fits files to use separated by
→spaces. Current allowed types: DARK_FLAT OR FLAT_DARK but not both (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
```

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```
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 91: Outputs

name	description	HDR[DRS	file type	suffix	fibers	db-name	dbkey	input file
LOC_OF	Localisation: Order profile calibration file	LOC_OR	.fits	_order_profi	A, B	cali-bra-tion	OR-DER_PRC	FLAT_DARK, DARK_FLAT
LOC_LC	Localisation: Position polynomial calibration file	LOC_LO	.fits	_loco	A, B	cali-bra-tion	LOC	FLAT_DARK, DARK_FLAT
LOC_FV	Localisation: Width polynomial calibration file	LOC_FW	.fits	_fwhm-order	A, B	–	–	FLAT_DARK, DARK_FLAT
LOC_SU	Localisation: Position superpositionimage calibration file	LOC_SU	.fits	_with-order	A, B	–	–	FLAT_DARK, DARK_FLAT
DE-BUG_BA	Individual file background map	DE-BUG_BA	.fits	_back-ground.fit	–	–	–	DRS_PP

8. Debug plots

```
LOC_WIDTH_REGIONS
LOC_FIBER_DOUBLET_PARITY
LOC_GAP_ORDERS
LOC_IMAGE_FIT
LOC_IM_CORNER
LOC_IM_REGIONS
```

9. Summary plots

```
SUM_LOC_IM_FIT
SUM_LOC_IM_CORNER
```

apero_shape_ref_nirps_ha

1. Description

SHORTNAME: SHAPEREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_shape_ref_nirps_ha.py {obs_dir}[STRING] --fpfiles[FILE:FP_FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
→(CALIBDB=LOC_{fiber})
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--no_in_qc // Disable checking the quality control of input files
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
```

```
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 92: Outputs

name	description	HDR[DRSOUT	file type	suffix	db-name	dbkey	input file
REF_FP	Reference shape master FP calibration file	REF_FP	.fits	_fpref	cali-bra-tion	FPREF	FP_FP
SHAPE_X	Reference shape dx calibra-tion file	SHAPE_X	.fits	_shapex	cali-bra-tion	SHAPE	FP_FP
SHAPE_Y	Reference shape dy calibra-tion file	SHAPE_Y	.fits	_shapey	cali-bra-tion	SHAPE	FP_FP
SHAPE_IN_l	Input FP file for shape com-parison	SHAPE_IN_l	.fits	_shape_in_l	–	–	FP_FP
SHAPE_OUT	Output FP file for shape comparison	SHAPE_OUT	.fits	_shape_out_	–	–	FP_FP
SHAPE_BDX	Shape transformed dx com-parison file	SHAPE_BDX	.fits	_shape_out_	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPE_DX
SHAPE_ANGLE_OFFSET_ALL
SHAPE_ANGLE_OFFSET
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPE_ANGLE_OFFSET
```

apero_shape_nirps_ha

1. Description

SHORTNAME: SHAPE

No description set

2. Schematic

No schematic set

3. Usage

```
apero_shape_nirps_ha.py {obs_dir}[STRING] [FILE:FP_FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--fpref[FILE:REF_FP] // [STRING] Sets the FP reference file to use (CALIBDB = FPREF)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 93: Outputs

name	description	HDR[DRSOUT	file type	suffix	db-name	dbkey	input file
SHAPEL	Nightly shape calibration files	SHAPEL	.fits	_shapel	cali-bra-tion	SHAPE	FP_FP
SHAPEL_IN_	Input FP file for nightly shape comparison	SHAPEL_IN_	.fits	_shapel_in_f	–	–	FP_FP
SHAPEL_OU	Output FP file for nightly shape comparison	SHAPEL_OU	.fits	_shapel_out_	–	–	FP_FP
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	DRS_PP

8. Debug plots

```
SHAPEL_ZOOM_SHIFT
SHAPE_LINEAR_TPARAMS
```

9. Summary plots

```
SUM_SHAPEL_ZOOM_SHIFT
```

apero_flat_nirps_ha

1. Description

SHORTNAME: FF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_flat_nirps_ha.py {obs_dir}[STRING] [FILE:FLAT_FLAT] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:FLAT_FLAT] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
→allowed types: FLAT_FLAT or DARK_FLAT or FLAT_DARK but not a mixture (exclusive)
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
→(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
→coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
```

```
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 94: Outputs

name	description	HDR[DRSOU⁻	file type	suffix	fibers	db-name	dbkey	input file
FF_FLAT	Flat calibration file	FF_FLAT	.fits	_flat	A, B	cali-bra-tion	FLAT	FLAT_FLAT
FF_BLAZE	Blaze calibration file	FF_BLAZE	.fits	_blaze	A, B	cali-bra-tion	BLAZ	FLAT_FLAT
EXT_E2DS_	Pre-extracted straighted stacked spectrum	EXT_E2DS_	.fits	_e2dsll	A, B	–	–	DRS_PP, FLAT_FLAT
OR-DERP_STR/	Straightened order profile for an individual image	OR-DERP_STR/	.fits	_or-derps	A, B	–	–	SHAPEL
DE-BUG_BACK	Individual file back-ground map	DE-BUG_BACK	.fits	_back-ground.fits	–	–	–	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_FLAT_BLAZE_ORDER
```

apero_leak_ref_nirps_ha

1. Description

SHORTNAME: LEAKREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_leak_ref_nirps_ha.py {obs_dir}[STRING] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
```

4. Optional Arguments

```
--filetype[STRING] // [STRING] Specify the DPRTYPE for DARK_FP files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 95: Outputs

name	description	HDR[DRSOU	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	A, B	–	–	DRS_PP
LEAKREF_	Reference leak correction calibration file	LEAKREF_	.fits	_leak_	A, B	calibration	LEAKR	EXT_E2DS, EXT_E2DS_FF

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_extract_nirps_ha

1. Description

SHORTNAME: EXT

No description set

2. Schematic

No schematic set

3. Usage

```
apero_extract_nirps_ha.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces. Current␣
↪accepts all preprocessed filetypes. All files used will be combined into a single frame.
```

4. Optional Arguments

```
--quicklook[True/False] // [BOOLEAN] Sets whether extraction done in quick look mode
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
→unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
→(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--combine_method[STRING] // Method to combine files (if --combine=True)
--objname[STRING] // Sets the object name to extract (filters input files)
--dprtype[STRING] // [STRING] Sets the DPRTYPE to extract (filters input files)
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--flatfile[FILE:FF_FLAT] // [STRING] Define a custom file to use for flat correction. If␣
→unset uses closest file from calibDB. Checks for an absolute path and then checks directory
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
→(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
→coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
→map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
→map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
→(CALIBDB = SHAPEL)
--leakcorr[True/False] // [BOOLEAN] Sets whether to do the leak correction (else defaults to␣
→CORRECT_LEAKAGE value in constants)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
→use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
→setup). Checks for an absolute path and then checks directory
--force_ref_wave[True/False] // Force using the reference wave solution
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
```

```
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 96: Outputs

name	description	HDR[DRSOUTI	file type	suffix	fibers	input file
EXT_E2DS	Extracted 2D spectrum	EXT_E2DS	.fits	_e2ds	A, B	DRS_PP
EXT_E2DS_F	Extracted + flat-fielded 2D spectrum	EXT_E2DS_F	.fits	_e2dsff	A, B	DRS_PP
EXT_E2DS_L	Pre-extracted straighted stacked spectrum	EXT_E2DS_L	.fits	_e2dsll	A, B	DRS_PP, FLAT_FLAT
EXT_S1D_W	1D stitched spectrum (constant wavelength binning)	EXT_S1D_W	.fits	_s1d_w	A, B	DRS_PP
EXT_S1D_V	1D stitched spectrum (constant velocity binning)	EXT_S1D_V	.fits	_s1d_v	A, B	DRS_PP
OR-DERP_STRAI	Straightened order profile for an individual image	OR-DERP_STRAI	.fits	_orderps	A, B	SHAPEL
DE-BUG_BACK	Individual file background map	DE-BUG_BACK	.fits	_back-ground.fits	–	DRS_PP
EXT_FPLIST	FP lines identified from extracted FP fiber	EXT_FPLIST	.fits	_ext_fplin	A, B	EXT_E2DS, EXT_E2DS_FF
QL_E2DS	Extracted 2D spectrum (quick output)	QL_E2DS	.fits	_q2ds	A, B	DRS_PP
QL_E2DS_FF	Extracted + flat-fielded 2D spectrum (quick output)	QL_E2DS_FF	.fits	_q2dsff	A, B	DRS_PP

8. Debug plots

```
FLAT_ORDER_FIT_EDGES1
FLAT_ORDER_FIT_EDGES2
FLAT_BLAZE_ORDER1
FLAT_BLAZE_ORDER2
THERMAL_BACKGROUND
EXTRACT_SPECTRAL_ORDER1
EXTRACT_SPECTRAL_ORDER2
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVEREF_EXPECTED
```

9. Summary plots

```
SUM_FLAT_ORDER_FIT_EDGES
SUM_EXTRACT_SP_ORDER
SUM_EXTRACT_S1D
```

apero_wave_ref_nirps_ha

1. Description

SHORTNAME: WAVEREF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_wave_ref_nirps_ha.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_
→FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
→Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
→unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
```

(continues on next page)

```
→(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
→them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
→(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
→coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
→map (CALIBDB=SHAPEX)
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
→map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
→(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
→use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
→setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--cavityfile[FILE:WAVEREF_CAV] // WAVEREF_CAVFILE_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
```

```
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 97: Outputs

name	description	HDR[DRSO	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2D!	Extracted + flat-fielded 2D spectrum	EXT_E2D!	.fits	_e2dsff	A, B	–	–	DRS_PP
WAVESOL	Reference wavelength solution calibration file	WAVESOL	.fits	_wavesol_	A, B	cali-bra-tion	WAVESC	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_C	Reference wavelength cav-ity width polynomial cali-bration file	WA-VEREF_C	.fits	_wa-veref_cav	A	cali-bra-tion	WAVE-CAV	EXT_E2DS, EXT_E2DS_FF
WAVE_HC	Reference list of Hollow cathode lines calibration file	WAVE_HC	.fits	_wa-veref_hcli	A, B	cali-bra-tion	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_FP	–	WAVE_FP	.fits	_wa-veref_fpli	A, B	cali-bra-tion	WAVEFI	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength reso-lution map file	WAVE_RE	.fits	_wa-veref_resi	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
WAVEM_I	Reference wavelength reso-lution e2ds file	WAVEM_I	.fits	_wa-veref_res_	A, B	cali-bra-tion	WAVR_I	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV re-sults file	CCF_RV	.fits	_ccf	A, B	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_wave_night_nirps_ha

1. Description

SHORTNAME: WAVE

No description set

2. Schematic

No schematic set

3. Usage

```
apero_wave_night_nirps_ha.py {obs_dir}[STRING] --hcfiles[FILE:HCONE_HCONE] --fpfiles[FILE:FP_
↪FP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
--hcfiles[FILE:HCONE_HCONE] // Current allowed types: HC1_HC1
--fpfiles[FILE:FP_FP] // Current allowed types: FP_FP
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--badpixfile[FILE:BADPIX] // [STRING] Define a custom file to use for bad pixel correction.␣
↪Checks for an absolute path and then checks directory
--badcorr[True/False] // [BOOLEAN] Whether to correct for the bad pixel file
--backsub[True/False] // [BOOLEAN] Whether to do background subtraction
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--combine[True/False] // [BOOLEAN] Whether to combine fits files in file list or to process␣
↪them separately
--darkfile[FILE:DARKREF] // [STRING] The Dark file to use (CALIBDB=DARKM)
--darkcorr[True/False] // [BOOLEAN] Whether to correct for the dark file
--fiber[ALL,A,B] // [STRING] Define which fibers to extract
--flipimage[None,x,y,both] // [BOOLEAN] Whether to flip fits image
--fluxunits[ADU/s,e-] // [STRING] Output units for flux
--locofile[FILE:LOC_LOCO] // [STRING] Sets the LOCO file used to get the coefficients␣
↪(CALIBDB=LOC_{fiber})
--orderpfile[FILE:LOC_ORDERP] // [STRING] Sets the Order Profile file used to get the␣
↪coefficients (CALIBDB=ORDER_PROFILE_{fiber}
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--resize[True/False] // [BOOLEAN] Whether to resize image
--shapex[FILE:SHAPE_X] // [STRING] Sets the SHAPE DXMAP file used to get the dx correction␣
↪map (CALIBDB=SHAPEX)
```

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```
--shapey[FILE:SHAPE_Y] // [STRING] Sets the SHAPE DYMAP file used to get the dy correction␣
↪map (CALIBDB=SHAPEY)
--shapel[FILE:SHAPEL] // [STRING] Sets the SHAPE local file used to get the local transforms␣
↪(CALIBDB = SHAPEL)
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--forceext[True/False] // WAVE_EXTRACT_HELP
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 98: Outputs

name	description	HDR[DRSC	file type	suffix	fibers	db-name	dbkey	input file
EXT_E2D	Extracted + flat-fielded 2D spectrum	EXT_E2D	.fits	_e2dsff	A, B	–	–	DRS_PP
WAVE_NI	Nightly wavelength solution calibration file	WAVE_NI	.fits	_wave_n	A, B	calibration	WAV	EXT_E2DS, EXT_E2DS_FF
WAVE_H(	Nightly wavelength Hollow cathodeline-list table	WAVE_H(	.fits	_wave_h	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
WAVE_FI	Nightly wavelength FP line-list calibration file	WAVE_FI	.fits	_wave_f	A, B	–	–	EXT_E2DS, EXT_E2DS_FF
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	A, B	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
WAVE_WL_CAV
WAVE_FIBER_COMPARISON
WAVE_FIBER_COMP
WAVE_HC_DIFF_HIST
WAVEREF_EXPECTED
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
WAVE_RESMAP
CCF_RV_FIT
CCF_RV_FIT_LOOP
```

9. Summary plots

```
SUM_WAVE_FIBER_COMP
SUM_CCF_RV_FIT
```

apero_ccf_nirps_ha

1. Description

SHORTNAME: CCF

No description set

2. Schematic

No schematic set

3. Usage

```
apero_ccf_nirps_ha.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF,TELLU_OBJ] // [STRING/STRINGS] A list of fits files to use␣
→separated by spaces. Currently allowed types: E2DS, E2DSFF, TELLU_OBJ (For dprtype = OBJ_FP,
→ OBJ_DARK)
```

4. Optional Arguments

```
--mask[FILE:CCF_MASK] // [STRING] Define the filename to the CCF mask to use. Can be full␣
→path or a file in the ./data/spirou/ccf/ folder
--rv[FLOAT] // [FLOAT] The target RV to use as a center for the CCF fit (in km/s)
--width[FLOAT] // [FLOAT] The CCF width to use for the CCF fit (in km/s)
--step[FLOAT] // [FLOAT] The CCF step to use for the CCF fit (in km/s)
--masknormmode[None,all,order] // [STRING] Define the type of normalization to apply to ccf␣
→masks, all normalized across all orders, order normalizes independently for each order,␣
→None applies no mask normalization
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
→unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
→(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
```

```
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 99: Outputs

name	description	HDR[DRSOUTID	file type	suf-fix	fibers	input file
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	A, B	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
CCF_RV_FIT
CCF_RV_FIT_LOOP
CCF_SWAVE_REF
CCF_PHOTON_UNCERT
```

9. Summary plots

```
SUM_CCF_PHOTON_UNCERT
SUM_CCF_RV_FIT
```

apero_mk_skymodel_nirps_ha

1. Description

SHORTNAME: MKSKY

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_skymodel_nirps_ha.py {options}
```

No optional arguments

4. Optional Arguments

```
--filetype[EXT_E2DS,EXT_E2DS_FF] // [STRING] optional, the filetype (KW_OUTPUT) to use when␣
↪processing files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 100: Outputs

name	description	HDR[DRSOUTI	file type	suffix	db-name	dbkey	input file
SKY_MODE	Telluric sky model file	SKY_MODEL	.fits	_sky_mode	tel-luric	SKY_MODE	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKYMODEL_REGION_PLOT
TELLU_SKYMODEL_MED
TELLU_SKYMODEL_LINEFIT
```

9. Summary plots

No summary plots.

apero_mk_tellu_nirps_ha

1. Description

SHORTNAME: MKTELL

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_tellu_nirps_ha.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 101: Outputs

name	description	HDR[DRS	file type	suffix	fibers	db-name	dbkey	input file
TELLU_C	–	–	.npy	_tellu_c	A	tel-luric	TELLU_C	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_T	Telluric transmission file	TELLU_T	.fits	_tellu_t	A	tel-luric	TELLU_T	EXT_E2DS_FF
TELLU_S	Sky-cleaning file	TELLU_S	.fits	_tellu_s	A	–	–	EXT_E2DS_FF
TELLU_P	Telluric pre-cleaning file	TELLU_P	.fits	_tellu_p	A	tel-luric	TELLU_P	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
MKTELLU_WAVE_FLUX1
MKTELLU_WAVE_FLUX2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RECON_SPLINE2
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_MKTELLU_WAVE_FLUX
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
```

apero_mk_model_nirps_ha

1. Description

SHORTNAME: MKMODEL

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_model_nirps_ha.py {options}
```

No optional arguments

4. Optional Arguments

```
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
→greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
→a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
→up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
→without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
→purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
→apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
→(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
→runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
→or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
→calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
→require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
→successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 102: Outputs

name	description	HDR[DRSOUT]	file type	basename	fibers	db-name	dbkey
TRANS_MOD	Telluric transmission model file	TRANS_MOD	.fits	trans_model_	A	tel-luric	TELLU_MODEL

8. Debug plots

```
MKTELLU_MODEL
```

9. Summary plots

```
SUM_MKTELLU_MODEL
```

apero_fit_tellu_nirps_ha

1. Description

SHORTNAME: FTELLU

No description set

2. Schematic

No schematic set

3. Usage

```
apero_fit_tellu_nirps_ha.py {obs_dir}[STRING] [FILE:EXT_E2DS,EXT_E2DS_FF] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:EXT_E2DS,EXT_E2DS_FF] // [STRING/STRINGS] A list of fits files to use separated by␣
↪spaces. Currently  allowed types: E2DS, E2DSFF
```

4. Optional Arguments

```
--use_template[True/False] // Whether to use the template provided from the telluric database
--template[FILE:TELLU_TEMP] // Filename of the custom template to use (instead of from␣
↪telluric database)
--finiteres[True/False] // Whether to do the finite resolution correction (Always false if no␣
↪template)
--onlypreclean // Only run the precleaning steps (not recommended - for debugging ONLY)
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 103: Outputs

name	description	HDR[DRS	file type	suffix	base-name	fibers	db-name	dbkey	input file
ABSO_N	–	–	.npy	–	tellu_sa	–	–	–	–
ABSO1_	–	–	.npy	–	tellu_sa	–	–	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff	–	A	tel-luric	TELLU_	EXT_E2DS_FF
SC1D_W	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_W	.fits	_s1d_w	–	A	–	–	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v	–	A	–	–	EXT_E2DS_FF
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff	–	A	tel-luric	TELLU_	EXT_E2DS_FF
RC1D_W	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_W	.fits	_s1d_w	–	A	–	–	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_V	.fits	_s1d_v	–	A	–	–	EXT_E2DS_FF
TELLU_	Sky-cleaning file	TELLU_	.fits	_tellu_	–	A	–	–	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_	–	A	tel-luric	TELLU_	EXT_E2DS_FF

8. Debug plots

```
TELLU_SKY_CORR_PLOT
EXTRACT_S1D
EXTRACT_S1D_WEIGHT
FTELLU_PCA_COMP1
FTELLU_PCA_COMP2
FTELLU_RECON_SPLINE1
FTELLU_RECON_SPLINE2
FTELLU_WAVE_SHIFT1
FTELLU_WAVE_SHIFT2
FTELLU_RECON_ABSO1
FTELLU_RECON_ABSO2
TELLUP_WAVE_TRANS
TELLUP_ABSO_SPEC
TELLUP_CLEAN_OH
FTELLU_RES_MODEL
TELLU_FINITE_RES_CORR
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_FTELLU_RECON_ABSO
SUM_TELLUP_WAVE_TRANS
SUM_TELLUP_ABSO_SPEC
SUM_FTELLU_RES_MODEL
```

apero_mk_template_nirps_ha

1. Description

SHORTNAME: MKTEMP

No description set

2. Schematic

No schematic set

3. Usage

```
apero_mk_template_nirps_ha.py {objname}[STRING] {options}
```

```
{objname}[STRING] // [STRING] The object name to process
```

4. Optional Arguments

```
--filetype[EXT_E2DS,EXT_E2DS_FF] // [STRING] optional, the filetype (KW_OUTPUT) to use when␣
↪processing files
--fiber[A,B] // [STRING] optional, the fiber type to use when processing files
--database[True/False] // [BOOLEAN] Whether to add outputs to calibration database
--blazefile[FILE:FF_BLAZE] // [STRING] Define a custom file to use for blaze correction. If␣
↪unset uses closest file from calibDB. Checks for an absolute path and then checks directory␣
↪(CALIBDB=BADPIX)
--plot[0>INT>4] // [INTEGER] Plot level. 0 = off, 1 = interactively, 2 = save to file
--wavefile[FILE:WAVESOL_REF,WAVE_NIGHT,WAVESOL_DEFAULT] // [STRING] Define a custom file to␣
↪use for the wave solution. If unset uses closest file from header or calibDB (depending on␣
↪setup). Checks for an absolute path and then checks directory
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

Table 104: Outputs

name	description	HDR[DRSOU	file type	base-name	fibers	db-name	dbkey	input file
TELLU_TEM	Telluric 2D template file	TELLU_TEM	.fits	Template	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (star frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 2D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEM	Telluric 1D template file	TELLU_TEM	.fits	Template_s1	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_TEM	Telluric 1D template file	TELLU_TEM	.fits	Template_s1	A	telluric	TELLU_TE	EXT_E2DS_FF, TELLU_OBJ
TELLU_BIG	Telluric object 1D stack file (Earth frame)	TELLU_BIG	.fits	BigCube	A	–	–	EXT_E2DS_FF, TELLU_OBJ

8. Debug plots

```
EXTRACT_S1D
MKTEMP_BERV_COV
MKTEMP_S1D_DECONV
```

9. Summary plots

```
SUM_EXTRACT_S1D
SUM_MKTEMP_BERV_COV
```

apero_postprocess_nirps_ha

1. Description

SHORTNAME: OBJPOST

No description set

2. Schematic

No schematic set

3. Usage

```
apero_postprocess_nirps_ha.py {obs_dir}[STRING] [FILE:DRS_PP] {options}
```

```
{obs_dir}[STRING] // OBS_DIR_HELP
[FILE:DRS_PP] // [STRING/STRINGS] A list of fits files to use separated by spaces.
```

4. Optional Arguments

```
--skip // Overwrites post processed files if they exist (default is False)
--clear // Clear the reduced folder after post-processing. WARNING removes all files from the
↪reduced directory.
--no_in_qc // Disable checking the quality control of input files
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features
↪ (normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_OUT // Default: "out" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

3.3.1.3 User tools (nirps_ha)

There are currently no documented user tools for NIRPS_HA

3.3.1.4 File definitions (NIRPS_HA)

Contents

- *1. Raw Files*
- *2. Preprocesed files*
- *3. Reduced Files*
- *4. Calibration files*
- *5. Telluric files*
- *6. Post-processed files*

1. Raw Files

1.1 File definition table

Table 105: 1. Raw Files file definition table

name	description	HDR[HIERARCH ESO DPR TYPE]	HDR[HIERARCH ESO DPR CATG]	HDR[INS	HDR[HIERARCH ESO INS MODE]	HDR[DRS	HDR[TRG_TYPE]*
RAW_D	Raw sci=DARK calib=DARK file	DARK	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=DARK calib=DARK file	EFF,SKY	CALIB	NIRPS	HA	–	–
RAW_N	Raw night sci=SKY calib=SKY file	OBJECT,SK	SCIENCE	NIRPS	HA	1	–
RAW_D	Raw sci=DARK calib=FP file	ORDERDEF	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=FLAT calib=DARK file	ORDERDEF	CALIB	NIRPS	HA	–	–

Table 105 – continued from previous page

name	description	HDR[HIE ESO DPR TYPE]	HDR[HIE ESO DPR CATG]	HDR[INS	HDR[HIE ESO INS MODE]	HDR[DR!	HDR[TRG_TYPE]*
RAW_F	Raw sci=FLAT calib=FLAT file	FLAT,L/	CALIB	NIRPS	HA	–	–
RAW_D	Raw sci=DARK calib=FP file	CON-TAM,DA	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=FP calib=DARK file	CON-TAM,FP	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=FP calib=FP file	WAVE,F	CALIB	NIRPS	HA	–	–
RAW_L|	Raw sci=LFC calib=LFC file	WAVE,L	CALIB	NIRPS	HA	–	–
RAW_L|	Raw sci=LFC calib=FP file	WAVE,L	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=FP calib=LFC file	WAVE,F	CALIB	NIRPS	HA	–	–
RAW_L|	–	LED,LAl	CALIB	NIRPS	HA	–	–
RAW_F	–	FLAT,LI	CALIB	NIRPS	HA	–	–
RAW_O	Raw sci=OBJ calib=DARK file	OB-JECT,D/	–	NIRPS	HA	–	TAR-GET
RAW_O	Raw sci=OBJ calib=FP file	OB-JECT,FI	–	NIRPS	HA	–	TAR-GET
RAW_O	Raw sci=OBJ calib=Hollow Cathode file, Uranium Neon lamp	OB-JECT,UI	–	NIRPS	HA	–	TAR-GET
RAW_O	Raw sci=OBJ calib=Sky file	OB-JECT,SI	–	NIRPS	HA	–	TAR-GET
RAW_O	–	OB-JECT,TU	–	NIRPS	HA	–	TAR-GET
RAW_SI	Raw sci=SUN calib=FP file	SUN,FP,	–	NIRPS	HA	–	–
RAW_SI	Raw sci=SUN calib=DARK file	SUN,DAI	–	NIRPS	HA	–	–
RAW_F	Raw sci=flux standard star calib=DARK file	FLUX,ST	–	NIRPS	HA	–	–
RAW_T	Raw sci=hot star calib=DARK file	TEL-LURIC,S	–	NIRPS	HA	–	–
RAW_D	Raw sci=DARK calib=Hollow Cathode file, where dark is an internal dark, Uranium Neon lamp	WAVE,D	CALIB	NIRPS	HA	–	–
RAW_F	Raw sci=FP calib=Hollow Cathode file, Uranium Neon lamp	WAVE,F	CALIB	NIRPS	HA	–	–
RAW_H	Raw sci=Hollow Cathode calib=FP file, Uranium Neion lamp	WAVE,U	CALIB	NIRPS	HA	–	–
RAW_H	Raw sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	WAVE,U	CALIB	NIRPS	HA	–	–
RAW_H	Raw sci=Hollow Cathode calib=DARK file, where dark is an internal dark, Uranium Neon lamp	WAVE,U	CALIB	NIRPS	HA	–	–
RAW_C	Raw sci=DARK calib=FLAT test file	FLAT,D/	CALIB	NIRPS	HA	–	–
RAW_C	Raw sci=FLAT calib=DARK test file	FLAT,L/	CALIB	NIRPS	HA	–	–
RAW_T	Raw sci=DARK calib=FP test file	CON-TAM,DA	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=DARK calib=FLAT test file	FLAT,D/	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=FLAT calib=DARK test file	FLAT,L/	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=FP calib=FP test file	WAVE,F	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=LED calib=LED test file	LED,LAl	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=Hollow Cathode calib=Hollow Cathode test file	WAVE,U	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=FP calib=Hollow Cathode test file	WAVE,F	TEST	NIRPS	HA	–	–

3.3. NIRPS HA documentation

Table 105 – continued from previous page

name	description	HDR[HIE ESO DPR TYPE]	HDR[HIE ESO DPR CATG]	HDR[INS	HDR[HIE ESO INS MODE]	HDR[DR!	HDR[TRG_TYPE]*
RAW_T	Raw sci=Hollow Cathode calib=FP test file	WAVE,U	TEST	NIRPS	HA	–	–
RAW_D	Raw sci=SKY calib=SKY test file	EFF,SKY	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=DARK calib=DARK test file	DARK	TEST	NIRPS	HA	–	–
RAW_T	Raw sci=FP calib=DARK test file	CON-TAM,FP	TEST	NIRPS	HA	–	–

* these columns may be added/updated by APERO before use.

"HDR[XXX]" denotes key from file header

1.2 APERO definition of TRG_TYPE

TRG_TYPE may be in the header, in which case it is used.

If TRG_TYPE is not in header we assign it based on the following key:

- HIERARCH ESO DPR TYPE

Then TRG_TYPE is set as follows:

- If HIERARCH ESO DPR TYPE contains "SKY" then TRG_TYPE = 'SKY'
- If HIERARCH ESO DPR TYPE contains "OBJECT" or "STAR" then TRG_TYPE = 'TARGET'
- Else TRG_TYPE = ''

2. Preprocesed files

2.1 File definition table

Table 106: 2. Preprocesed files file definition table

name	description	HDR[DPR]	file type	suffix	input file
DARK_D,	Preprocessed sci=DARK calib=DARK file	DARK_D,	.fits	_pp	RAW_DARK_DARK
FLUX_SK	Preprocessed flux sci=SKY calib=SKY file	FLUX_SK	.fits	_pp	RAW_FLUX_SKY_SKY
NIGHT_S	Preprocessed night sci=SKY calib=SKY file	NIGHT_S	.fits	_pp	RAW_NIGHT_SKY_SKY
FLAT_DA	Preprocessed sci=FLAT calib=DARK file	FLAT_DA	.fits	_pp	RAW_FLAT_DARK
DARK_FI	Preprocessed sci=DARK calib=FLAT file	DARK_FI	.fits	_pp	RAW_DARK_FLAT
FLAT_FL	Preprocessed sci=FLAT calib=FLAT file	FLAT_FL	.fits	_pp	RAW_FLAT_FLAT
DARK_FI	Preprocessed sci=DARK calib=FP file	DARK_FI	.fits	_pp	RAW_DARK_FP
FP_DARI	Preprocessed sci=FP calib=DARK file	FP_DARI	.fits	_pp	RAW_FP_DARK
FP_FP	Preprocessed sci=FP calib=FP file	FP_FP	.fits	_pp	RAW_FP_FP
LFC_LFC	Preprocessed sci=LFC calib=LFC file	LFC_LFC	.fits	_pp	RAW_LFC_LFC
LFC_FP	Preprocessed sci=LFC calib=FP file	LFC_FP	.fits	_pp	RAW_LFC_FP
FP_LFC	Preprocessed sci=FP calib=LFC file	FP_LFC	.fits	_pp	RAW_FP_LFC
LED_LED	Preprocessed sci=LED calib=LED file	LED_LED	.fits	_pp	RAW_LED_LED
FLAT_LE	Preprocessed sci=FLAT calib=LED file	FLAT_LE	.fits	_pp	RAW_FLAT_LED
OBJ_DAF	Preprocessed sci=OBJ calib=DARK file	OBJ_DAF	.fits	_pp	RAW_OBJ_DARK
OBJ_FP	Preprocessed sci=OBJ calib=FP file	OBJ_FP	.fits	_pp	RAW_OBJ_FP

continues on next page

Table 106 – continued from previous page

name	description	HDR[DPR]	file type	suffix	input file
OBJ_HCC	Preprocessed sci=OBJ calib=Hollow Cathode	OBJ_HCC	.fits	_pp	RAW_OBJ_HCONE
OBJ_SKY	Preprocessed sci=OBJ calib=SKY	OBJ_SKY	.fits	_pp	RAW_OBJ_SKY
OBJ_TUN	Preprocessed sci=OBJ calib=Tungston lamp	OBJ_TUN	.fits	_pp	RAW_OBJ_TUN
SUN_FP	Preprocessed sci=SUN calib=FP	SUN_FP	.fits	_pp	RAW_SUN_FP
SUN_DAF	Preprocessed sci=SUN calib=DARK	SUN_DAF	.fits	_pp	RAW_SUN_DARK
FLUXSTD	Preprocessed sci=Flux standard star calib=SKY	FLUXSTD	.fits	_pp	RAW_FLUXSTD_SKY
TELLU_S	Preprocessed sci=Telluric hot star calib=SKY	TELLU_S	.fits	_pp	RAW_TELLU_SKY
DARK_HC	Preprocessed sci=DARK calib=Hollow Cathode file, Uranium Neon lamp	DARK_HC	.fits	_pp	RAW_DARK_HCONE
FP_HCON	Preprocessed sci=FP calib=Hollow Cathode file, Uranium Neon lamp	FP_HCON	.fits	_pp	RAW_FP_HCONE
HCONE_I	Preprocessed sci=Hollow Cathode calib=FP file, Uranium Neion lamp	HCONE_I	.fits	_pp	RAW_HCONE_FP
HCONE_I	Preprocessed sci=Hollow Cathode calib=Hollow Cathode file, Uranium Neon lamp	HCONE_I	.fits	_pp	RAW_HCONE_HCONE
HCONE_I	–	HCONE_I	.fits	_pp	RAW_HCONE_DARK
CALIB_D	Preprocessed sci=DARK calib=FLAT test file	CALIB_D	.fits	_pp	RAW_CALIB_DARK_FLAT
CALIB_F	Preprocessed sci=FLAT calib=DARK test file	CALIB_F	.fits	_pp	RAW_CALIB_FLAT_DARK
TEST_DA	Preprocessed sci=DARK calib=FLAT test file	TEST_DA	.fits	_pp	RAW_TEST_DARK_FLAT
TEST_FL	Preprocessed sci=FLAT calib=DARK test file	TEST_FL	.fits	_pp	RAW_TEST_FLAT_DARK
TEST_DA	Preprocessed sci=DARK calib=FP test file	TEST_DA	.fits	_pp	RAW_TEST_DARK_FP
TEST_FP	Preprocessed sci=FP calib=FP test file	TEST_FP	.fits	_pp	RAW_TEST_FP_FP
TEST_LE	Preprocessed sci=LED calib=LED test file	TEST_LE	.fits	_pp	RAW_TEST_LED_LED
TEST_HC	Preprocessed sci=Hollow Cathode calib=Hollow Cathode test file	TEST_HC	.fits	_pp	RAW_TEST_HCONE_HCON
TEST_FP	Preprocessed sci=FP calib=Hollow Cathode test file	TEST_FP	.fits	_pp	RAW_TEST_FP_HCONE
TEST_HC	Preprocessed sci=Hollow Cathode calib=FP test file	TEST_HC	.fits	_pp	RAW_TEST_HCONE_FP
TEST_DA	Preprocessed sci=SKY calib=SKY test file	TEST_DA	.fits	_pp	RAW_DARK_DARK_SKY
TEST_DA	Preprocessed sci=DARK calib=DARK test file	TEST_DA	.fits	_pp	RAW_TEST_DARK
TEST_FP	Preprocessed sci=FP calib=DARK test file	TEST_FP	.fits	_pp	RAW_TEST_FP_DARK

"HDR[XXX]" denotes key from file header

3. Reduced Files

3.1 File definition table

Table 107: 3. Reduced Files file definition table

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
PP_REI	PP Reference flat calibration file	PP_REI	.fits	_ppref	–	–	RAW_FLAT_FLAT
PP_LEI	Reference LED flat calibration file	PP_LEI	.fits	_led_fla	–	–	RAW_LED_LED
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	–	DARK_DARK
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_i	–	–	DARK_DARK
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	–	FLAT_FLAT
BKGRD	Bad pixel background map	BKGRD	.fits	_bmap.f	–	–	FLAT_FLAT
DE-BUG_B	Individual file background map	DE-BUG_B	.fits	_back-ground.fi	–	–	DRS_PP
LOC_O	Localisation: Order profile calibration file	LOC_O	.fits	_order_prof	–	A, B	FLAT_DARK, DARK_FLAT
LOC_L(	Localisation: Position polynomial calibration file	LOC_L(	.fits	_loco	–	A, B	FLAT_DARK, DARK_FLAT
LOC_F'	Localisation: Width polynomial calibration file	LOC_F'	.fits	_fwhm-order	–	A, B	FLAT_DARK, DARK_FLAT
LOC_SI	Localisation: Position superpositionimage calibration file	LOC_SI	.fits	_with-order	–	A, B	FLAT_DARK, DARK_FLAT
SHAPE_	Reference shape dx calibration file	SHAPE_	.fits	_shapex	–	–	FP_FP
SHAPE_	Reference shape dy calibration file	SHAPE_	.fits	_shapey	–	–	FP_FP
REF_FI	Reference shape master FP calibration file	REF_FI	.fits	_fpref	–	–	FP_FP
SHAPE_	Input FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Output FP file for shape comparison	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPE_	Shape transformed dx comparison file	SHAPE_	.fits	_shape_	–	–	FP_FP
SHAPEI	Nightly shape calibration files	SHAPEI	.fits	_shapel	–	–	FP_FP
SHAPEI	Input FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
SHAPEI	Output FP file for nightly shape comparison	SHAPEI	.fits	_shapel_	–	–	FP_FP
FF_BL/	Blaze calibration file	FF_BL/	.fits	_blaze	–	A, B	FLAT_FLAT
FF_FL/	Flat calibration file	FF_FL/	.fits	_flat	–	A, B	FLAT_FLAT
OR-DERP_	Straightened order profile for an individual image	OR-DERP_	.fits	_orderps	–	A, B	SHAPEL
EXT_E:	Extracted 2D spectrum	EXT_E:	.fits	_e2ds	–	A, B	DRS_PP
EXT_E:	Extracted + flat-fielded 2D spectrum	EXT_E:	.fits	_e2dsff	–	A, B	DRS_PP
EXT_E:	Pre-extracted straighted stacked spectrum	EXT_E:	.fits	_e2dsll	–	A, B	DRS_PP, FLAT_FLAT
EXT_L(	Straightened localisation file	EXT_L(	.fits	_e2dsloc	–	A, B	DRS_PP
EXT_S1	1D stitched spectrum (constant wavelength binning)	EXT_S1	.fits	_s1d_w	–	A, B	DRS_PP
EXT_S1	1D stitched spectrum (constant velocity binning)	EXT_S1	.fits	_s1d_v	–	A, B	DRS_PP

Table 107 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
EXT_FI	FP lines identified from extracted FP fiber	EXT_FI	.fits	_ext_fp	–	A, B	EXT_E2DS, EXT_E2DS_FF
LEAKRI	Reference leak correction calibration file	LEAKRI	.fits	_leak_r	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVESC	Reference wavelength solution calibration file	WAVESC	.fits	_waveso	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cathode lines calibration file	WAVE_	.fits	_wa-veref_hc	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	–	WAVE_	.fits	_wa-veref_fp	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VEREF_	Reference wavelength cavity width polynomial calibration file	WA-VEREF_	.fits	_wa-veref_ca	–	A	EXT_E2DS, EXT_E2DS_FF
WAVESC	Default wavelength solution calibration file	WAVESC	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Reference wavelength resolution map file	WAVE_	.fits	_wa-veref_re	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength resolution table	–	.tbl	–	ap-ero_wav	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference wavelength FP line-list table	–	.tbl	_mhc_l	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVEM	Reference wavelength resolution e2ds file	WAVEM	.fits	_wa-veref_re	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength solution calibration file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE-HCLL	Nightly HC line list calibration file	–	.dat	_linelist	–	A, B	EXT_E2DS, EXT_E2DS_FF
WA-VERES	Nightly wavelength resolution map file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength resolutiontable	–	.tbl	–	ap-ero_wav	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list table	–	.tbl	_hc_lin	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength Hollow cathodeline-list table	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
WAVE_	Nightly wavelength FP line-list calibration file	WAVE_	.fits	_wave_	–	A, B	EXT_E2DS, EXT_E2DS_FF
SKY_M	Telluric sky model file	SKY_M	.fits	_sky_m	–	–	EXT_E2DS_FF
TELLU_	Sky-cleaning file	TELLU_	.fits	_tellu_s	–	A	EXT_E2DS_FF
TELLU_	Telluric pre-cleaning file	TELLU_	.fits	_tellu_p	–	A	EXT_E2DS_FF
TELLU_	–	–	.npy	_tellu_c	–	A	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU_	Telluric transmission file	TELLU_	.fits	_tellu_t	–	A	EXT_E2DS_FF
TELLU_	–	–	.npy	–	tapas_sp	–	–
TRANS_	Telluric transmission model file	TRANS_	.fits	–	trans_m	A	–
ABSO_	–	–	.npy	–	tellu_sav	–	–
TELLU_	Telluric corrected extracted 2D spectrum	TELLU_	.fits	_e2dsff_	–	A	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant wavelength binning)	SC1D_V	.fits	_s1d_w	–	A	EXT_E2DS_FF
SC1D_V	Telluric corrected extracted 1D spectrum (constant velocity binning)	SC1D_V	.fits	_s1d_v	–	A	EXT_E2DS_FF

continues on next page

Table 107 – continued from previous page

name	description	HDR[DR	file type	suffix	base-name	fibers	input file
TELLU_	Telluric reconstructed 2D absorption file	TELLU_	.fits	_e2dsff_	–	A	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant wavelength binning)	RC1D_V	.fits	_s1d_w	–	A	EXT_E2DS_FF
RC1D_V	Telluric reconstructed 1D absorption file (constant velocity binning)	RC1D_V	.fits	_s1d_v_	–	A	EXT_E2DS_FF
TELLU_	Telluric 2D template file	TELLU_	.fits	–	Template	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (star frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 2D stack file (Earth frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric 1D template file	TELLU_	.fits	–	Template_s1	A	EXT_E2DS_FF, TELLU_OBJ
TELLU_	Telluric object 1D stack file (Earth frame)	TELLU_	.fits	–	BigCube	A	EXT_E2DS_FF, TELLU_OBJ
CCF_RV	Cross-correlation RV results file	CCF_RV	.fits	_ccf	–	A, B	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

4. Calibration files

4.1 File definition table

Table 108: 4. Calibration files file definition table

name	description	HDR[DF	file type	suffix	fibers	db-name	dbkey	input file
PP_RE	PP Reference flat calibration file	PP_RE	.fits	_ppref	–	cali-bra-tion	PP_RE	RAW_FLAT_FLAT
PP_LE	Reference LED flat calibration file	PP_LE	.fits	_led_fl	–	cali-bra-tion	PP_LE	RAW_LED_LED
DARKI	Internal dark calibration file	DARKI	.fits	_darki	–	cali-bra-tion	DARKI	DARK_DARK
DARK-REF	Reference dark calibration file	DARK-REF	.fits	_dark_	–	cali-bra-tion	DARK-REF	DARK_DARK
BAD-PIX	Bad pixel map	BAD-PIX	.fits	_bad-pixel	–	cali-bra-tion	BAD-PIX	FLAT_FLAT
BKGRI	Bad pixel background map	BKGRI	.fits	_bmap.	–	cali-bra-tion	BKGRI	FLAT_FLAT
LOC_C	Localisation: Order profile cal-ibration file	LOC_C	.fits	_or-der_pro	A, B	cali-bra-tion	OR-DER_F	FLAT_DARK, DARK_FLAT
LOC_I	Localisation: Position polyno-mial calibration file	LOC_I	.fits	_loco	A, B	cali-bra-tion	LOC	FLAT_DARK, DARK_FLAT
SHAPE	Reference shape dx calibration file	SHAPE	.fits	_shape:	–	cali-bra-tion	SHAPE	FP_FP
SHAPE	Reference shape dy calibration file	SHAPE	.fits	_shape;	–	cali-bra-tion	SHAPE	FP_FP
REF_F	Reference shape master FP cal-ibration file	REF_F	.fits	_fpref	–	cali-bra-tion	FPREF	FP_FP
SHAPE	Nightly shape calibration files	SHAPE	.fits	_shapel	–	cali-bra-tion	SHAPE	FP_FP
FF_BL	Blaze calibration file	FF_BL	.fits	_blaze	A, B	cali-bra-tion	BLAZE	FLAT_FLAT
FF_FL	Flat calibration file	FF_FL	.fits	_flat	A, B	cali-bra-tion	FLAT	FLAT_FLAT
LEAKR	Reference leak correction cali-bration file	LEAKR	.fits	_leak_:	A, B	cali-bra-tion	LEAKR	EXT_E2DS, EXT_E2DS_FF
WAVES	Reference wavelength solution calibration file	WAVES	.fits	_waves	A, B	cali-bra-tion	WAVES	EXT_E2DS, EXT_E2DS_FF
WAVE_	Reference list of Hollow cath-ode lines calibration file	WAVE_	.fits	_wa-veref_h	A, B	cali-bra-tion	WAVE-HCL	EXT_E2DS, EXT_E2DS_FF
WAVE_	–	WAVE_	.fits	_wa-veref_f	A, B	cali-bra-tion	WAVEF	EXT_E2DS, EXT_E2DS_FF
WA-VEREF	Reference wavelength cavity width polynomial calibration file	WA-VEREF HDR[REF	.fits	_wa-veref_c	A	cali-bra-tion	WAVE-CAV	EXT_E2DS, EXT_E2DS_FF

3.3. NIRPS HA documentation   256

"HDR[XXX]" denotes key from file header

5. Telluric files

5.1 File definition table

Table 109: 5. Telluric files file definition table

name	description	HDR[D	file type	suffix	base-name	fibers	db-name	dbkey	input file
SKY_	Telluric sky model file	SKY_	.fits	_sky_	–	–	tel-luric	SKY_	EXT_E2DS_FF
TELLU	Sky-cleaning file	TELLU	.fits	_tellu_	–	A	–	–	EXT_E2DS_FF
TELLU	Telluric pre-cleaning file	TELLU	.fits	_tellu_	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	–	–	.npy	_tellu_	–	A	tel-luric	TELLU	WAVESOL_REF, WAVE_NIGHT, WAVESOL_DEFAULT
TELLU	Telluric transmission file	TELLU	.fits	_tellu_	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	–	–	.npy	–	tapas_	–	tel-luric	TELLU	–
TRAN	Telluric transmission model file	TRAN	.fits	–	trans_	A	tel-luric	TELLU	–
TELLU	Telluric corrected extracted 2D spectrum	TELLU	.fits	_e2dsf	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	Telluric reconstructed 2D absorption file	TELLU	.fits	_e2dsf	–	A	tel-luric	TELLU	EXT_E2DS_FF
TELLU	Telluric 2D template file	TELLU	.fits	–	Template	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ
TELLU	Telluric 1D template file	TELLU	.fits	–	Template_	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ
TELLU	Telluric 1D template file	TELLU	.fits	–	Template_	A	tel-luric	TELLU	EXT_E2DS_FF, TELLU_OBJ

"HDR[XXX]" denotes key from file header

6. Post-processed files

6.1 File definition table

Table 110: 6. Post-processed files file definition table

name	description	HDR[KW	suffix	ext name	ext in-put	col names	col input
DRS_PC	Post process 2D extracted spectrum collection	OBJ_FP OBJ_DA PO-LAR_FF PO-LAR_D/	e.fits	Pri-mary: PP FluxA FluxB WaveA WaveB BlazeA BlazeB	DRS_PF EXT_E2 EXT_E2 WAVE_1 WAVE_1 FF_BLA FF_BLA	– – – – – – –	– – – – – – –
DRS_PC	Post process 1D spectrum collection	OBJ_FP OBJ_DA PO-LAR_FF PO-LAR_D/	s.fits	Pri-mary: PP Uni-formWav length – – – – – – – – – – Unifor-mVe-locity – – – – – – – – –	DRS_PF – – – – – – – – – – – – – – – – – –	– Wave FluxA Flux-ErrA FluxB Flux-ErrB Flux-ATel-luCor-rected Flux-Er-rATel-luCor-rected Sky-Corr Sky-Cor-rErr FiniteRes FiniteRe-sErr Wave FluxA Flux-ErrA FluxB Flux-ErrB Flux-ATel-luCor-rected Flux-Er-rATel-luCor-rected Sky-Corr Sky-Cor-	– EXT_S1D_W EXT_S1D_W EXT_S1D_W EXT_S1D_W SC1D_W_FILE SC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE RC1D_W_FILE EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V EXT_S1D_V SC1D_V_FILE SC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE RC1D_V_FILE

rErr
FiniteRes
FiniteRe-
sErr

DRS_PC Post process 2D telluric corrected col OBJ_FP t.fits Primary DRS_PF

"HDR[XXX]" denotes key from file header

Chapter 4

Developer documentation

4.1 Developer how to guide

Below is a guide for those developing APERO for the current set of instruments and for future instruments.

4.1.1 Developer tools

4.1.1.1 Dev tools

This section describes all the default dev tools to use with APERO.
For information on how to run these dev tools (either individually or with the processing tools) see *here*.

apero_changelog

1. Description

SHORTNAME: CLOG

apero_changelog is used to prouce a nicly formatted change log from the git commits (requires git commits to have messages).

The developer is asked whether a new version is required. Versions must be in the form X.X.XXX where X is a number.

The recipe then updates the change log as well as update several files throughout APERO and the documentation to update the version and date.

A git tag is also created to mark a new version.

Warning: This change is hard to undo. Please use carefully and check the current version well before making a new version

---

Note: This will add all untagged commits to this tag and version. For multiple commits see section 1.1.

1.1 Adding a few versions at one time

If there are many commits and a few versions are required one can add tags using *git tag {version} {commit number}* at the points where a new version is required. Using *git log –since {date} > log.txt* will produce a log of commit numbers since a date (set this date to the previous verseion date). Do all but the most recent "version" this way and then do the last one using apero_changelog and it will have the desired affect.

i.e.

```
git log --since 2020-09-03 > log.txt

git tag 0.1.234 3f95c84d1f54ae70c067aa2d253de31972abe93b
git tag 0.1.235 3f95c84d1f54ae70c067aa2d253de31972abe93b
git tag 0.1.236 4fea06752d89151896c5258caecfd3fe12e0c64d

apero_changelog.py      # for version 0.1.237
```

2. Schematic

No schematic set

3. Usage

```
apero_changelog.py {preview}[True/False] {options}
```

```
{preview}[True/False] // [BOOLEAN] If True previews the changelog before making any changes␣
↪if False makes changes without preview
```

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
```

```
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_database

1. Description

SHORTNAME: DBMGR

The apero_database recipe gives some ways to manage the local SQL/MySQL databases and tables.

The options are:

- kill all database operations (–kill): Rarely the database completely freezes the –kill option should free this up if this is not possible use the apero_database_kill recipe.
- update object database (–objdb): Use the online google sheet to update the local object database

---
Note: This requires an internet connection

- update (–update) the calibration, telluric, log and index database using the files on disk in all the current apero profile data directories (raw/tmp/red/calib/tellu)
- import (–importdb) a csv file into either the calibration, telluric, index, log or object database

---
Note: Columns must conform with current database definitions

> **Note:** You must also give the –csv argument with the absolute path to the csv file

> **Note:** The language database can also be imported but this is not recommended

> **Note:** use the –join option to decide how to add the database (replace removes current database, append adds the csv contents to the end)

- export (–exportdb) a csv file for the calibration, telluric, index, log or object database.

> **Note:** You must also give the –csv argument with the absolute path to the csv file

> **Note:** The language database can also be imported but this is not recommended

- manage all apero tables i.e. delete (–delete) a database using a GUI to select which tables (across all APERO profiles)

> **Warning:** Only remove databases you are sure are not being used. This is not backed up

2. Schematic

No schematic set

3. Usage

```
apero_database.py {options}
```

No optional arguments

4. Optional Arguments

```
--kill // Use this when database is stuck and you have no other opens (mysql only)
--calibdb // Update calibration database
--telludb // Update telluric database
--logdb // Update log database
--findexdb // Update file index database
--astromdb // Update astrometric database
--rejectdb // Update rejection database
--update // Use this to update the database based on files on disk in the correct directories␣
↪(Currently updates calib/tellu/log and index databases)
--csv[STRING] // Path to csv file. For --importdb this is the csv file you wish to add. For --
↪exportdb this is the csv file that will be saved.
--exportdb[calib,tellu,findex,log,astrom,lang,reject] // Export a database to a csv file
--importdb[calib,tellu,findex,log,astrom,lang,reject] // Import a csv file into a database
--join[replace,append] // How to add the csv file to database: append adds all lines to the␣
↪end of current database, replace removes all previous lines from database. Default is␣
↪replace.
--delete // Load up the delete table GUI (MySQL only)
--reset // Reset current databases
--keys[STRING] // Keyname of entries to remove (used in combination with --telludb or --
```

```
↪calibdb)
--since[STRING] // Date to remove entries since (used in combination with --telludb or --
↪calibdb) format is YYYY-MM-DD or YYYY-MM-DD hh:mm:ss
--before[STRING] // Date to remove entries before (used in combination with --telludb or --
↪calibdb) format is YYYY-MM-DD or YYYY-MM-DD hh:mm:ss
--deletefiles // Whether to delete files from disk when removing entries (using in␣
↪combination with --telludb or --calibdb and --since / --keys)
--test // Run the removal of entries in test mode
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_langdb

1. Description

SHORTNAME: LANG

apero_langdb is used to view, update or reload the language database.

The view option (–find) loads a GUI that provides a search of all message codes in APERO.

Message codes have the form XX-XXX-XXXXX where each X is a digit.

One can search a code and find all python files which have that message code and locate some other information about that message code.

The update option (–update or –upgrade) takes the current database.xsl file and writes various csv files and update the local language database.

Similarly the reload optoin (–reload) just updates the local language database (with the current csv files) this option is useful if updating APEROs version.

2. Schematic

No schematic set

3. Usage

```
apero_langdb.py {options}
```

No optional arguments

4. Optional Arguments

```
--find // Displays the message locator GUI
--update // Updates local language database and local text files with any changes
--reload // Reloads the local language database (with text file changes)
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_documentation

1. Description

SHORTNAME: DOC

The apero_documentation recipe allows updatings, compiling and uploading of this documenation (via Sphinx).

One can do this for all instruments (–instruments=ALL) or for an individual instrument (however the compile and upload will re-compile/re-upload all local files).

If the file_definitions.py has been updated one can use the –filedef argument to update the documentation file definitions.

If the recipes within recipe_definitions.py has been updated one can use the –recipedef argument to update the documentation and if the sequences within recipe_definitions.py has been updated one can use the –recipeseq argument to update the docuementation.

The safest option is to use –filedef –recipedef –recipeseq to update all automatically created definitions.

One can compile the html and/or latex documents by using –compile and change between compiling html/latex/both with the –mode option.

Finally one can –upload the changes to the webserver (password will be required for the rsync)

> **Warning:** you must make sure –compile has been done before this otherwise you could sync a empty directory and remove all files from the webserver

In general one probably runs this command with all arguments. i.e.

```
apero_documentation.py --filedef --recipedef --recipeseq --compile --upload --mode=html
```

2. Schematic

No schematic set

3. Usage

```
apero_documentation.py {options}
```

No optional arguments

4. Optional Arguments

```
--instruments[STRING] // [STRING] Which instrument(s) to run this for (default is current␣
↪instrument) can also write ALL to get all instruments or list instruments separated by a␣
↪comma
--compile // Compile all rst pages
--upload // [Bool] If True upload documentation to defined server (for web access)
--all // --filedef --recipedef and --recipeseq
--filedef // Compile the docs for file definitions
--recipedef // Compile the docs for recipe definitions
--recipeseq // Compile the docs for recipe sequences
--mode[both,html,latex] // [STRING] Which mode to output in "html", "latex" or "both".␣
↪Default is "both".
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_dependencies

1. Description

SHORTNAME: DEPEND

The apero_dependencies recipe takes no arguments.

It scans through all valid python scripts within the apero module and prints stats on:

- the number of lines
- the number of empty lines (no text)
- the number of comments
- the number of code lines (not comments)

We aim to have at least as many comments as lines of code, the text will display in yellow for any script that this is not true for.

At the end the total number of these stats is printed.

i.e. for 2022-01-24

```
00:48:19.152-  |DEPEND|     total lines: 156638
00:48:19.171-  |DEPEND|     total empty lines: 11270
00:48:19.192-  |DEPEND|     total lines of comments: 67476
00:48:19.220-  |DEPEND|     total lines of code: 77892
```

Below this the modules that are used (and the current system versions) is printed - standard modules have no version but this can be used as a quick check of which modules should be in the requirements files.

i.e. for 2022-01-24

```
traceback       (No version info)
IPython         (8.0.1)
ipdb            (No version info)
pdb             (No version info)
ctypes          (1.1.0)
mpl_toolkits    (No version info)
tqdm            (4.62.3)
barycorrpy      (0.4.4)
```

(continues on next page)

```
matplotlib      (3.5.1)
struct          (No version info)
astropy         (5.0)
sqlalchemy      (1.4.28)
yagmail         (0.14.260)
multiprocessing (No version info)
numba           (0.54.1)
tkinter         (No version info)
Tkinter         (NOT INSTALLED)
bottleneck      (1.3.2)
mysql           (No version info)
string          (No version info)
tkFileDialog    (NOT INSTALLED)
tkFileFialog    (NOT INSTALLED)
tkFont          (NOT INSTALLED)
ttk             (NOT INSTALLED)
PIL             (9.0.0)
astroquery      (0.4.4)
collections     (No version info)
contextlib      (No version info)
copy            (No version info)
datetime        (No version info)
hashlib         (No version info)
pandasql        (No version info)
pandastable     (0.12.2)
pathlib         (No version info)
scipy           (1.7.3)
setuptools      (58.0.4)
signal          (No version info)
skimage         (0.19.1)
time            (No version info)
ttkthemes       (No version info)
typing          (No version info)
argparse        (1.1)
getpass         (No version info)
glob            (No version info)
gspread_pandas  (3.0.4)
importlib       (No version info)
itertools       (No version info)
numpy           (1.20.3)
os              (No version info)
pandas          (1.3.5)
pkg_resources   (No version info)
random          (No version info)
re              (2.2.1)
requests        (2.27.1)
shutil          (No version info)
socket          (No version info)
sqlite3         (No version info)
sys             (No version info)
textwrap        (No version info)
threading       (No version info)
warnings        (No version info)
yaml            (6.0)
```

2. Schematic

No schematic set

3. Usage

```
apero_dependencies.py {options}
```

No optional arguments

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_run_ini

1. Description

SHORTNAME: RUN_INI

The apero_run_ini re-generates all run-ini-files for all instruments using the current file_definitions and recipe_definitions for each instrument.

This does not update the users run.ini files only the ones within the package. Run apero_reset to update user run.ini files.

2. Schematic

No schematic set

3. Usage

```
apero_run_ini.py {options}
```

No optional arguments

4. Optional Arguments

```
--instrument[SPIROU,NIRPS_HA,NIRPS_HE,None] // [STRING] Instrument or instruments to create␣
↪run.ini files for
```

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

apero_static

1. Description

SHORTNAME: STATIC

2. Schematic

No schematic set

3. Usage

```
apero_static.py --mode[LED_FLAT] {options}
```

```
--mode[LED_FLAT] // [STRING] Chooses the static file to create
```

4. Optional Arguments

No optional arguments

5. Special Arguments

```
--xhelp[STRING] // Extended help menu (with all advanced arguments)
--debug[STRING] // Activates debug mode (Advanced mode [INTEGER] value must be an integer␣
↪greater than 0, setting the debug level)
--listing[STRING] // Lists the night name directories in the input directory if used without␣
↪a 'directory' argument or lists the files in the given 'directory' (if defined). Only lists␣
↪up to 15 files/directories
--listingall[STRING] // Lists ALL the night name directories in the input directory if used␣
↪without a 'directory' argument or lists the files in the given 'directory' (if defined)
--version[STRING] // Displays the current version of this recipe.
--info[STRING] // Displays the short version of the help menu
--program[STRING] // [STRING] The name of the program to display and use (mostly for logging␣
↪purpose) log becomes date | {THIS STRING} | Message
--recipe_kind[STRING] // [STRING] The recipe kind for this recipe run (normally only used in␣
↪apero_processing.py)
--parallel[STRING] // [BOOL] If True this is a run in parellel - disable some features␣
↪(normally only used in apero_processing.py)
--shortname[STRING] // [STRING] Set a shortname for a recipe to distinguish it from other␣
↪runs - this is mainly for use with apero processing but will appear in the log database
--idebug[STRING] // [BOOLEAN] If True always returns to ipython (or python) at end (via ipdb␣
```

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```
↪or pdb)
--ref[STRING] // If set then recipe is a reference recipe (e.g. reference recipes write to␣
↪calibration database as reference calibrations)
--crunfile[STRING] // Set a run file to override default arguments
--quiet[STRING] // Run recipe without start up text
--nosave[STRING] // Do not save any outputs (debug/information run). Note some recipes␣
↪require other recipesto be run. Only use --nosave after previous recipe runs have been run␣
↪successfully at least once.
--force_indir[STRING] // [STRING] Force the default input directory (Normally set by recipe)
--force_outdir[STRING] // [STRING] Force the default output directory (Normally set by recipe)
```

6. Output directory

```
DRS_DATA_REDUC // Default: "red" directory
```

7. Output files

N/A

8. Debug plots

No debug plots.

9. Summary plots

No summary plots.

4.1.1.2 Dev tools (spirou)

There are currently no documented dev tools for SPIROU

4.1.1.3 Dev tools (nirps_ha)

There are currently no documented dev tools for NIRPS_HA

4.1.1.4 Dev tools (nirps_he)

There are currently no documented dev tools for NIRPS_HE

4.1.2 Quick add developer tutorials

4.1.2.1 Adding a new constant

4.1.2.2 Adding a new keyword

4.1.2.3 Adding a new recipe

4.1.2.4 Adding a new filetype

4.1.2.5 Adding a new plot

4.1.3 Full tutorials

- Const and Keyword
- ParamDict
- DrsRecipe, DrsArgument
- DrsInputFile, DrsFitsFile, DrsNpyFile
- Database
- Logger
- Debug Modes (linked to Logger)
- Plotter
- Git hub interface
- Writing documentation

4.1.4 Other

4.1.4.1 MySQL example commands

If using the MySQL database one can make use of direct access to the databases

To accesing mysql (i.e. from bash):

```
mysql -h rali -u spirou -p
```

Get/Show to database/tables

```sql
SHOW databases;
USE spirou;
SHOW tables;
```

Show columns in a table

```
SHOW COLUMNS FROM {table name}
```

Note: *{index table name}* is the correct index database and {object table name} is the correct object index database from the *SHOW tables;* command above

---

Specific example commands:

Get count of each object (in raw directory) with counts over 100

```
SELECT KW_OBJNAME, COUNT(KW_OBJNAME)
FROM {index table name}
WHERE BLOCK_KIND="raw"
GROUP BY KW_OBJNAME
HAVING COUNT(KW_OBJNAME) > 100;
```

Get all raw files for a specific night:

```
SELECT ABSPATH, OBS_DIR, FILENAME, KW_OBJNAME
FROM {index table name}
WHERE BLOCK_KIND="raw" AND OBS_DIR="2019-06-15";
```

Count the number of e2dsff entries for GL699

```
SELECT COUNT(*)
FROM {index table name}
WHERE block_kind="red" and KW_OBJNAME="GL699" and KW_OUTPUT="EXT_E2DS_FF";
```

Current local object astrometric database

```
SELECT OBJNAME, ORIGINAl_NAME, SP_TYPE, TEFF
FROM {object table name};
```

Combining the INDEX and OBJECT database to find the number of raw files and adding the temperature and spectral type for each from the object database

```
SELECT m.KW_OBJNAME as name, COUNT(KW_OBJNAME) as counter, c.TEFF, c.SP_TYPE
FROM {index table name} AS m
INNER JOIN {object table name} c ON c.OBJNAME = m.KW_OBJNAME
WHERE m.BLOCK_KIND="raw"
GROUP BY m.KW_OBJNAME;
```

Combining the INDEX and OBJECT database to find the number of e2dsff AB files and adding the temperature and spectral type for each from the object database

```
SELECT m.KW_OBJNAME as name, COUNT(KW_OBJNAME) as counter, c.TEFF, c.SP_TYPE
FROM {index table name} AS m
INNER JOIN {object table name} AS c ON c.OBJNAME = m.KW_OBJNAME
WHERE m.BLOCK_KIND="red" AND m.KW_OUTPUT="EXT_E2DS_FF" AND m.KW_FIBER="AB"
GROUP BY m.KW_OBJNAME;
```

Getting average timings from the LOG database

```
SELECT RECIPE, SHORTNAME, AVG(UNIX_TIMESTAMP(STR_TO_DATE(END_TIME, '%Y-%m-%d %T.%f')) - UNIX_
→TIMESTAMP(STR_TO_DATE(START_TIME, '%Y-%m-%d %T.%f'))) as dt
FROM {log table name}
WHERE ENDED=1
GROUP BY SHORTNAME;
```

Getting the recipe count, average start/end RAM/CPU usage

```
SELECT RECIPE, SHORTNAME, COUNT(SHORTNAME), AVG(RAM_USAGE_START), AVG(RAM_USAGE_END), AVG(CPU_
→USAGE_START), AVG(CPU_USAGE_END)
FROM {log table name}
```

```
WHERE ENDED=1
GROUP BY SHORTNAME;
```

Counting recipes that did not finish

```
SELECT RECIPE, SHORTNAME, COUNT(SHORTNAME) as count
FROM {log table name}
WHERE ENDED=0
GROUP BY SHORTNAME;
```

Finding the number of telluric stars that were used in making transmission measurements and show their RA and Dec

```
SELECT m.OBJECT as object, COUNT(m.OBJECT) as count, c.RA_DEG as ra, c.DEC_DEG as de
FROM {tellu table name} AS m
INNER JOIN {object table name} AS c ON c.OBJNAME = m.OBJECT
WHERE KEYNAME='TELLU_TRANS' GROUP BY m.OBJECT;
```

4.1.4.2 Useful guide on conda and git

conda

Conda is a package manager. We use conda specifically to install a python environment where all python pacakges are managed and contained to ensure maximum compatibility. For python conda comes in two main flavours "anaconda" and "miniconda". Anaconda has many built in packages that are shipped with it, miniconda only contains standard python packages. We only use and recommend miniconda throughout APERO.

miniconda installation

Miniconda can be installed as follows:

1. download miniconda from here: https://docs.conda.io/en/latest/miniconda.html for your OS. I.e. for linux 64 bit

```
wget https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh
```

2. Install, following all instructions. The last step asks you to add the conda initialization to your profile (e.g. *source ~/.bashrc). You should make sure you do this (or run `conda init before any other steps)*

```
bash Miniconda3-latest-Linux-x86_64.sh
```

3. Make sure to source your profile (e.g. `source ~/.bashrc) before using conda

useful conda commands

The main commands you may want to use with conda are:

```
conda deactivate
```

which stops/unloads (deactivating) the current conda environment, but not all environments. Run this may times over to get out of all environments before starting/loading (activating) a new environment. You cannot break anything from running the deactivation command many times, so use as many times as you like!

```
conda activate {env name}
```

which starts/loads/activates the environment "env name". You must be in this environment to use and install python modules.

```
conda create --name {env name} python=3.9.7
```

which creates a new environment (called "env name") for python version 3.9.7 in this case. Replace the 3.9.7 with your chosen python version (use 3.9 for the most recent version of 3.9 etc) leaving this out will use the most recent version of python for your conda (conda update conda may be required to get the most recent version of python).

```
conda env remove --name {env name}
```

which deletes the environment called "env name". You cannot do this if you are inside this environment (so must use the deactivate comment first).

```
conda env list
```

which shows you which environment you are in and which conda environments exist

```
conda update conda
```

which updates conda to the most recent version.

git

Git is a version management system. Github is an online platform using git. Git is set up in a "tree" system where you have the *main* or *master* branch which is the default version, and then there are branches coming off the main branch which contain (in general) newer code and newer versions, that can be merged into the main branch at some point in the future. Note branches can also have branches coming off them.

some git commands

```
git clone {url}
git clone {url} {directory name}
git clone {ur} -branch {branch name}
```

where url is taken from a github repository, directory name is the directory name on disk to call the top level directory taken from github and branch name is the name of the branch you wish to start at (by default this is *master* or *main*.

```
git branch
```

shows which branches are currently available locally and which branch you are currently on

```
git checkout {branch name}
```

moves from your current branch to a new branch (called "branch name"). You can only do this if there are no uncommited changes.

```
git add {filename}
```

add a new file to be tracked by git

```
git commit -m "message"
```

commit changes to the current branch

```
git push
```

Send changes to github (from the local git repository)

```
git pull
```

Get changes from github and update the local git repository

```
git stash
```

Remove all local uncommited changes and reset to the last commited local version this can be useful to allow pulling from github.

Chapter 5

Other

- genindex
- modindex
- search

5.1 Python installation

You can install the modules required to run APERO in three ways (eventually there will be a *setup.py* but not yet!

Currently supported options are:

- *install miniconda* (recommended)
- *install anaconda*
- *install via pip only (i.e. in a venv)*

Once python and the required modules are correctly installed you can install APERO - see *here*.

Warning: We do not recommend ever using the base environment or the system python for installing modules or running the APERO codes.

5.1.1 Installing miniconda (with supplied environment)

This is recommended for maximum compatibility

If you already use miniconda (with python 3) skip to step 3

Note: Make sure the miniconda you download/have is miniconda3

---

1. Download miniconda3, i.e. in bash and wget (or go to the anaconda website https:/repo.anaconda.com/miniconda/)
   i.e. the current latest version of Miniconda3 for Linux is this:

   ```
   wget https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh
   ```

2. Install miniconda, i.e. with bash

   ```
   bash Miniconda3-latest-Linux-x86_64.sh
   ```

3. Create a conda environment

```
conda env create --name {YOUR ENV NAME} python=3.9
```

where *{YOUR ENV NAME}* should be a suitable name for the apero conda environemnt (e.g. *setup_07XXX_mini1* or *full_07111*)

You should now have an environment called *{YOUR ENV NAME}*.

Before running or installing APERO you must be in this conda environment, i.e. type:

```
conda activate {YOUR ENV NAME}
```

You can now install APERO (see *here*)

5.1.2 Using anaconda (with supplied environment)

If you already use anaconda (with python 3) skip to step 3

Note: Make sure the anaconda you download/have is anaconda3

---

1. Download anaconda3, i.e. in bash and wget (or go to the anaconda website https:/repo.anaconda.com/archive/)
   i.e. the current latest version of Anaconda3 for Linux is this:

   ```
   wget https://repo.anaconda.com/archive/Anaconda3-2020.07-Linux-x86_64.sh
   ```

2. Install anaconda, i.e. with bash

   ```
   bash Anaconda3-2020.07-Linux-x86_64.sh
   ```

3. Create a conda environment

   ```
   conda env create --name {YOUR ENV NAME} python=3.9
   ```

   where *{YOUR ENV NAME}* should be a suitable name for the apero conda environemnt (e.g. *setup_07XXX_mini1* or *full_07111*)

You should now have an environment called *{YOUR ENV NAME}*.

Before running or installing APERO you must be in this conda environment, i.e. type:

```
conda activate {YOUR ENV NAME}
```

You can now install APERO (see *here*)

5.1.3 Manually using pip

Setup your python and install the pip module and create a environement as required, we do not give instructions how to do this here.

We recommend typing *which pip* to verify you are using the correct pip.

You can now install APERO (see *here*)

Warning: We do not recommend ever using the base environment or the system python for installing modules or running the APERO codes.

5.2 Glossary

5.2.1 Detailed Constants

These are usually defined in the instruments `default_config.py` and `default_constants.py` scripts and are overwritten in the `user_config.ini` and :file`user_constant.ini` files.

DRS_ROOT
- This is the path where apero-drs was installed (via github)
- a suggested directory is `/home/user/bin/apero-drs`

DRS_UCONFIG
- The directory containing the users configurations files
- default is `/home/user/apero/PROFILE`

DrsInputFile
- This is a class controlling how files are defined - it comes in three flavors - a generic file type (`apero.core.core.drs_file.DrsInputFile()`), a fits file type (`apero.core.core.drs_file.DrsFitsFile()`) and a temporary numpy file type (`apero.core.core.drs_file.DrsNPYFile()`)

5.2.2 Detailed Keywords

These are usually defined in the instruments `default_keywords.py` script. These keywords control what keys are read from fits headers and also what keys and comments are saved to fits headers.

KW_GAIA_ID
- This is the gaia id key from the header
- The header value should contain a valid gaia id
- This key is used to cross-match with the object database and with gaia online database to get position and velocity data precise enough for a good BERV correction
- If key is missing or invalid the BERV calculation defers to the header values for position and velocity (may be less precise).

KW_OBJECTNAME
- This is the object name used from the header
- This is the unmodified value from the fits file creation
- It is cleaned and then added to a new header key (*KW_OBJNAME*)

KW_OBJNAME
- This is the cleaned object name - suitable for use throughout APERO.
- Currently it is cleaned using and instruments *PseudoConst* cleaning function e.g. `apero.core.instruments.spirou.pseudo_const.clean_obj_name()`

5.2.3 General

block_kind
- this is the type of file we have related to the various data directories
- valid block kinds are: "raw", "tmp", "red", "calib", "tellu"

ds9
- An astronomical imaging and data visualization application
- see ds9.si.edu

engineering-directories
- This are directories without science observations in
- In general we do not recommend to reduce these nights as they may reduce the quality of reduced data

file-definitions
- This is an instrument specific python script that defines all the file types for use with this instrument (raw, preprocessed, output).
- Each file definition is a *DrsInputFile* instance

INSTRUMENT
- This is the instrument used at a specific telescope. Some settings are instrument specific.

- Currently supported instruments are:: SPIROU, NIRPS_HA, NIRPS_HE

observation-directory

- This is the sub-directories within the raw directory (define by *DRS_DATA_RAW*) that individual observations are separated into, this is recommended to be on a night-by-night basis but can be split in other ways (for example by object name).

PID

- The unique process id for this specific *recipe-run*
- Stored in the header using *KW_PID*

pdflatex

- The pdf latex compiler
- see www.latex-project.org

pre-processing-coordinate-system

- This is the standard coordinate system for pre-processed images
- It consists of the bluest wavelength at the top right and the reddest order in the bottom left

PROFILE

- This is a short descriptive name given to a specific set of installation configurations
- Each profile contains setup files: `PROFILE`.bash.setup file, `PROFILE`.sh.setup file
- Each profile contains an instrument directory for each instrument. These contain user_config.ini and user_constant.ini files for said instrument.

PseudoConst

- This is an instrument specific class that has functions that cannot be simply defined by an integer, float or string
- Sometimes pseudo constant methods require input and are hence dynamic
- They are located in the instrument directory e.g. `apero.core.instruments.spirou.psuedo_const()`
- There is also a default psuedo constant class which all instruments inherit from - if no instrument is defined, or a method is not defined for a specific instrument it will default to this method - this is stored in `apero.core.instruments.default.psuedo_const()`

recipe

- a python script for use directly by the user

recipe-run

- An individual, single, run of a given recipe, all required arguments for a single recipe-run should be given before running

recipe-sequence, recipe-sequences

- A recipe sequence is a set of recipes to be run in a certain order, with certain parameters, the sequences are set up such that the apero_processing recipe can take all files in the raw directory (or a sub-set of these) and figure out all recipe-runs in a recipe-sequence for all the valid raw files. A sequence can be only a few different recipes or all recipes required for the full reduction of the raw data from start to finish.

run-ini-file

- This is the file used in apero_processing recipe to switch on and off recipes in sequences, to skip recipes, and indicate other processing features (such as the number of cores) these are also used in the apero_precheck to give some indication on what will happen when the apero_processing recipe is run. If no sequences are given one can use the run.ini files as a batch processor where individual recipe-runs can be given

shortname

- a shortened name for a specific recipe, these are used in log files, when turning off and skipping recipes in a :term:run-ini-file and elsewhere to reference a specific recipe, please check the recipe definitions for the link between short name and recipe names (Note some sequences alter shortnames when they need to be unique from the recipes themselves).

5.2.4 Constants (Autogen)

ALLOWED_DARK_TYPES
- Description: Define the allowed DPRTYPES for finding files for DARK_MASTER will only find those types define by filetype but filetype must be one of theses (strings separated by commas)
- Type: str

ALLOWED_FP_TYPES
- Description: Define the allowed DPRTYPES for finding files for SHAPE_MASTER will only find those types define by filetype but filetype must be one of theses (strings separated by commas)
- Type: str

ALLOWED_LEAKM_TYPES
- Description: Define the types of input file allowed by the leakage master recipe
- Type: str

ALLOWED_LEAK_TYPES
- Description: Define the types of input extracted files to correct for leakage
- Type: str

ALLOWED_PPM_TYPES
- Description: Define allowed preprocess master filetypes (PP DPRTYPE)
- Type: str

ALLOW_BREAKPOINTS
- Description: whether to allow break points
- Type: bool

AUTHORS
- Description: Authors
- Type: list

BADPIX_FLAT_CUT_RATIO
- Description: Define the maximum differential pixel cut ratio
- Type: float
- Minimum: 0.0

BADPIX_FLAT_MED_WID
- Description: Define the median image in the x dimension over a boxcar of this width
- Type: int
- Minimum: 0

BADPIX_FULL_FLAT
- Description: Defines the full detector flat file (located in the data folder)
- Type: str

BADPIX_FULL_THRESHOLD
- Description: Defines the threshold on the full detector flat file to deem pixels as good
- Type: float
- Minimum: 0.0

BADPIX_ILLUM_CUT
- Description: Define the illumination cut parameter
- Type: float
- Minimum: 0.0

BADPIX_MAX_HOTPIX
- Description: Define the maximum flux in ADU/s to be considered too hot to be used
- Type: float
- Minimum: 0.0

BADPIX_NORM_PERCENTILE
- Description: Percentile to normalise to when normalising and median filtering image [percentage]
- Type: float
- Minimum: 0.0
- Maximum: 100.0

BKGR_BOXSIZE
- Description: Width of the box to produce the background mask
- Type: int
- Minimum: 0

BKGR_KER_AMP

- Description: Kernel amplitude determined from drs_local_scatter.py
- Type: float

BKGR_KER_SIG
- Description: construct   a   convolution   kernel.   We   go   from   -IC_BKGR_KER_SIG   to +IC_BKGR_KER_SIG sigma in each direction. Its important no to make the kernel too big as this slows-down the 2D convolution. Do NOT make it a -10 to +10 sigma gaussian!
- Type: float

BKGR_KER_WX
- Description: Background kernel width in in x and y [pixels]
- Type: int

BKGR_KER_WY
- Description:
- Type: int

BKGR_MASK_CONVOLVE_SIZE
- Description: Size in pixels of the convolve tophat for the background mask
- Type: int
- Minimum: 0

BKGR_NO_SUBTRACTION
- Description: Do not correct for background measurement (True or False)
- Type: bool

BKGR_N_BAD_NEIGHBOURS
- Description: If a pixel has this or more "dark" neighbours, we consider it dark regardless of its initial value
- Type: int
- Minimum: 0

BKGR_PERCENTAGE
- Description: Do background percentile to compute minimum value (%)
- Type: float
- Minimum: 0.0
- Maximum: 100.0

CALIB_CHECK_FP_CENT_SIZE
- Description: define the check FP center image size [px]
- Type: int
- Minimum: 0

CALIB_CHECK_FP_PERCENTILE
- Description: define the check FP percentile level
- Type: int
- Minimum: 0

CALIB_CHECK_FP_THRES
- Description: define the check FP threshold qc parameter
- Type: float
- Minimum: 0.0

CALIB_DB_FORCE_WAVESOL
- Description: Define whether to force wave solution from calibration database (instead of using header wave solution if available)
- Type: bool

CALIB_DB_MATCH
- Description: Define the match type for calibDB filesmatch = older when more than one file for each key will select the newest file that is OLDER than time in fitsfilename match = closest when more than on efile for each key will select the file that is closest to time in fitsfilename if two files match with keys and time the key lower in the calibDB file will be used
- Type: str

CAVITY_1M_FILE
- Description: Define the coefficients of the fit of 1/m vs d
- Type: str

CAVITY_LL_FILE
- Description: Define the coefficients of the fit of wavelength vs d
- Type: str

CCF_ALLOWED_DPRTYPES
- Description: Allowed input DPRTYPES for input for CCF recipe
- Type: str

CCF_BLAZE_NORM_PERCENTILE
- Description: Define the percentile the blaze is normalised by before using in CCF calc
- Type: float
- Minimum: 0
- Maximum: 100

CCF_CORRECT_TELLU_TYPES
- Description: Define the KW_OUTPUT types that are valid telluric corrected spectra
- Type: str

CCF_DEFAULT_MASK
- Description: Define the default CCF MASK to use
- Type: str

CCF_DEFAULT_STEP
- Description: Define the computations steps of the CCF [km/s]
- Type: float
- Minimum: 0.0

CCF_DEFAULT_WIDTH
- Description: Define the width of the CCF range [km/s]
- Type: float
- Minimum: 0.0

CCF_DET_NOISE
- Description: Define the detector noise to use in the ccf
- Type: float

CCF_FILL_NAN_KERN_RES
- Description: the step size (in pixels) of the smoothing box used to calculate what value should replace the NaNs in the E2ds before CCF is calculated
- Type: float

CCF_FILL_NAN_KERN_SIZE
- Description: The half size (in pixels) of the smoothing box used to calculate what value should replace the NaNs in the E2ds before CCF is calculated
- Type: float

CCF_FIT_TYPE
- Description: Define the fit type for the CCF fit if 0 then we have an absorption line if 1 then we have an emission line
- Type: int

CCF_MASK_FMT
- Type: str

CCF_MASK_MIN_WEIGHT
- Type: float
- Minimum: 0.0

CCF_MASK_NORMALIZATION
- Type: str

CCF_MASK_PATH
- Type: str

CCF_MASK_UNITS
- Description: Define the wavelength units for the mask
- Type: str

CCF_MASK_WIDTH
- Type: float
- Minimum: 0.0

CCF_MAX_CCF_WID_STEP_RATIO
- Description: Define the maximum allowed ratio between input CCF STEP and CCF WIDTH i.e. error will be generated if CCF_STEP > (CCF_WIDTH / RATIO)
- Type: float
- Minimum: 1.0

CCF_NOISE_BOXSIZE

- Type: int
- Minimum: 0.0

CCF_NOISE_SIGDET
- Type: float
- Minimum: 0.0

CCF_NOISE_THRES
- Type: float
- Minimum: 0.0

CCF_NO_RV_VAL
- Description: Define target rv the null value for CCF (only change if changing code)
- Type: float

CCF_N_ORD_MAX
- Type: int
- Minimum: 1

CCF_OBJRV_NULL_VAL
- Description: Define target rv header null value (values greater than absolute value are set to zero)
- Type: float

CCF_TELLU_THRES
- Description: The transmission threshold for removing telluric domain (if and only if we have a telluric corrected input file
- Type: float

COMBINE_METRIC1_TYPES
- Description: Define the DPRTYPES allowed for the combine metric 1 comparison
- Type: str

COMBINE_METRIC_THRESHOLD1
- Description: Define the threshold under which a file should not be combined (metric is compared to the median of all files 1 = perfect, 0 = noise)
- Type: float
- Minimum: 0
- Maximum: 1

DARK_CUTLIMIT
- Description: Define a bad pixel cut limit (in ADU/s)
- Type: float

DARK_MASTER_MATCH_TIME
- Description: Define the maximum time span to combine dark files over (in hours)
- Type: float

DARK_MASTER_MED_SIZE
- Description: median filter size for dark master
- Type: int

DARK_QMAX
- Description:
- Type: int
- Minimum: 0
- Maximum: 100

DARK_QMIN
- Description: Defines the lower and upper percentiles when measuring the dark
- Type: int
- Minimum: 0
- Maximum: 100

DATABASE_DIR
- Description: Define database directory (relative to assets directory)
- Type: str

DATA_CORE
- Description: Define core data path
- Type: str

DATA_ENGINEERING
- Description: Define the data engineering path
- Type: str

DEBUG_MODE_FUNC_PRINT
- Description: The debug number to print function definitions
- Type: int

DEBUG_MODE_LOG_PRINT
- Description: The debug number to print debug log messages
- Type: int

DEBUG_MODE_TEXTNAME_PRINT
- Description: The debug number to print text entry names on all messages
- Type: int

DRIFT_DPRTYPES
- Description: Define the types of file allowed for drift measurement
- Type: str

DRIFT_DPR_FIBER_TYPE
- Description: Define the fiber dprtype allowed for drift measurement (only FP)
- Type: str

DRS_BADPIX_DATA
- Description: where the bad pixel data are stored (within assets directory)
- Type: str

DRS_CALIB_DATA
- Description: where the calibration data are stored (within assets directory)
- Type: str

DRS_CALIB_DB
- Description: Define the directory that the calibration files should be saved to/read from
- Type: path

DRS_COLOURED_LOG
- Description: Coloured logging to standard output (console)
- Type: bool

DRS_DATA_ASSETS
- Description: Define the assets directory
- Type: path

DRS_DATA_MSG
- Description: Define the directory that the log messages are stored in
- Type: path

DRS_DATA_MSG_FULL
- Description: Define the full data message path (set after group name known)
- Type: path

DRS_DATA_OUT
- Description: Define the directory that the post processed data should be saved to
- Type: path

DRS_DATA_PLOT
- Description: Define the plotting directory
- Type: path

DRS_DATA_RAW
- Description: Define the folder with the raw data files in
- Type: path

DRS_DATA_REDUC
- Description: Define the directory that the reduced data should be saved to/read from
- Type: path

DRS_DATA_RUN
- Description: Define the run directory
- Type: path

DRS_DATA_WORKING
- Description: Define the working directory
- Type: path

DRS_DATE
- Description: Date
- Type: str

DRS_DEBUG

- Description: Debug mode: 0: no debug 1: some debug output + python debugging 100: all in (1) and Language DB codes on all text 200: all in (100) + function entry printouts
- Type: int

DRS_DEFAULT_RECIPE_PATH
- Description: where the default recipes are stored
- Type: str

DRS_DS9_PATH
- Description: Define ds9 path (optional)
- Type: str

DRS_GROUP
- Description: The group this target is set as (set in drs_setup)
- Type: str

DRS_HEADER
- Description: DRS Header string
- Type: str

DRS_INDEX_FILE
- Description: Define the name of the index file (in each working/reduced directory)
- Type: str

DRS_INDEX_FILENAME
- Description: Define the filename column of the index file
- Type: str

DRS_INSTRUMENTS
- Description: Currently supported instruments
- Type: list

DRS_INSTRUMENT_RECIPE_PATH
- Description: where the instrument recipes are stored
- Type: str

DRS_LOG_CAUGHT_WARNINGS
- Description: Defines a master switch, whether to report warnings that are caught in
- Type: bool

DRS_LOG_EXIT_TYPE
- Description: Defines how python exits, when an exit is required after logging, string input fed into spirouConst.EXIT() if sys exits via sys.exit - soft exit (ipython Exception) if os exits via os._exit - hard exit (complete exit)
- Type: str

DRS_LOG_FITS_NAME
- Description: Define the log fits file name
- Type: str

DRS_LOG_FORMAT
- Description: Defines the DRS log format
- Type: str

DRS_LOG_LEVEL
- Description: Level at which to log in log file, values can be: all - to print all events info - to print info/warning/error events warning - to print warning/error eventserror - to print only error events
- Type: str

DRS_MAX_IO_DISPLAY_LIMIT
- Description: Maximum display limit for files/directory when argument error raise
- Type: int

DRS_MOD_CORE_CONFIG
- Description: where the core configuration files are stored (do not change here)
- Type: str

DRS_MOD_DATA_PATH
- Description: where to store internal data
- Type: str

DRS_MOD_INSTRUMENT_CONFIG
- Description: where instrument configuration files are stored (do not change here)
- Type: str

DRS_PACKAGE

- Description: The top-level package name (i.e. import PACKAGE)
- Type: str

DRS_PDB_RC_FILE
- Description: where the pdb rc file is (do not change - just here for use)
- Type: str

DRS_PDB_RC_FILENAME
- Description: what the pdb file should be called (do not change - just here for use)
- Type: str

DRS_PDFLATEX_PATH
- Description: Define latex path (optional)
- Type: str

DRS_PLOT
- Description: Plotting mode: 0: only summary plots 1: debug plots at end of code 2: debug plots at time of creation (pauses code)
- Type: int

DRS_PLOT_EXT
- Description: Set the plot file extension
- Type: str

DRS_PLOT_FONT_FAMILY
- Description: Set the default font family for all graphs (i.e. monospace) "None" for not set
- Type: str

DRS_PLOT_FONT_SIZE
- Description: Set the default font size for all graphs (-1 for not set)
- Type: int

DRS_PLOT_FONT_WEIGHT
- Description: Set the default font weight for all graphs (i.e. bold/normal) "None" for not set
- Type: str

DRS_PLOT_STYLE
- Description: Set the default plotting style (i.e. seaborn or dark_background) "None" for not set
- Type: str

DRS_PRINT_LEVEL
- Description: Level at which to print, values can be: all - to print all events info - to print info/warning/error events warning - to print warning/error events error - to print only error events
- Type: str

DRS_RECIPE_KIND
- Description: The recipe kind that this parameter dictionary is associated with
- Type: str

DRS_RELEASE
- Description: Release version
- Type: str

DRS_RESET_ASSETS_PATH
- Description: where the assets directory is (relative to apero module)
- Type: str

DRS_RESET_CALIBDB_PATH
- Description: where the reset data are stored (within assets directory) for calibDB (within assets directory)
- Type: str

DRS_RESET_RUN_PATH
- Description: for run files (within assets directory)
- Type: str

DRS_RESET_TELLUDB_PATH
- Description: for telluDB (within assets directory)
- Type: str

DRS_ROOT
- Description: Define the root installation directory
- Type: path

DRS_SUMMARY_EXT
- Description: Set the summary document extension

- Type: str

DRS_SUMMARY_STYLE
- Description: Set the summary document style
- Type: str

DRS_TELLU_DB
- Description: Define the directory that the calibration files should be saved to/read from
- Type: path

DRS_THEME
- Description: Theme (DARK or LIGHT)
- Type: str

DRS_USERENV
- Description: User-config environmental variable
- Type: str

DRS_USER_DEFAULT
- Description: User-config default location (if environmental variable not set) this is relative to the package level
- Type: str

DRS_USER_PROGRAM
- Description: User-defined program name (overwrite logging program)
- Type: str

DRS_VERSION
- Description: Version
- Type: str

DRS_WAVE_DATA
- Description: where the wave data are stored (within assets directory)
- Type: str

EXPMETER_MAX_LAMBDA
- Description: Define exposure meter maximum wavelength for mask
- Type: float

EXPMETER_MIN_LAMBDA
- Description: Define exposure meter minimum wavelength for mask
- Type: float

EXPMETER_TELLU_THRES
- Description: Define exposure meter telluric threshold (minimum tapas transmission)
- Type: float

EXTRACT_PLOT_ORDER
- Description: Define the order to plot in summary plots
- Type: int

EXTRACT_S1D_PLOT_ZOOM1
- Description: Define the wavelength lower bounds for s1d plots (must be a string list of floats) defines the lower wavelength in nm
- Type: str

EXTRACT_S1D_PLOT_ZOOM2
- Description: Define the wavelength upper bounds for s1d plots (must be a string list of floats) defines the upper wavelength in nm
- Type: str

EXT_ALLOWED_BERV_DPRTYPES
- Description: Define dprtypes to calculate berv for
- Type: str

EXT_BERV_BARYCORRPY_DIR
- Description: Define the barycorrpy data directory
- Type: str

EXT_BERV_EST_ACC
- Description: Define the accuracy of the estimate (for logging only) [m/s]
- Type: float

EXT_BERV_IERSFILE
- Description: Define the barycorrpy iers file
- Type: str

EXT_BERV_IERS_A_URL
- Description: Define the barycorrpy iers a url
- Type: str

EXT_BERV_KIND
- Description: Define which BERV calculation to use (barycorrpy or estimate or None)
- Type: str

EXT_BERV_LEAPDIR
- Description: Define barycorrpy leap directory
- Type: str

EXT_BERV_LEAPUPDATE
- Description: Define whether to update leap seconds if older than 6 months
- Type: bool

EXT_COSMIC_CORRETION
- Description: Defines whether to run extraction with cosmic correction
- Type: bool

EXT_COSMIC_SIGCUT
- Description: Define the percentage of flux above which we use to cut
- Type: float

EXT_COSMIC_THRESHOLD
- Description: Defines the maximum number of iterations we use to check for cosmics (for each pixel)
- Type: int

EXT_END_ORDER
- Description: End order of the extraction in cal_ff if None ends at last order
- Type: int

EXT_QUICK_LOOK
- Description: Whether extraction code is done in quick look mode (do not use for final products)
- Type: bool

EXT_RANGE1
- Description: Half-zone extraction width left side (formally plage1)
- Type: str

EXT_RANGE2
- Description: Half-zone extraction width right side (formally plage2)
- Type: str

EXT_S1D_BIN_UVELO
- Description: Define the s1d spectral bin for S1D spectra (km/s) when uniform in velocity
- Type: float
- Minimum: 0.0

EXT_S1D_BIN_UWAVE
- Description: Define the s1d spectral bin for S1D spectra (nm) when uniform in wavelength
- Type: float
- Minimum: 0.0

EXT_S1D_EDGE_SMOOTH_SIZE
- Description: Define the s1d smoothing kernel for the transition between orders in pixels
- Type: int
- Minimum: 0

EXT_S1D_INFILE
- Description: Define which extraction file (recipe definitons) linked to EXT_S1D_INTYPE
- Type: str

EXT_S1D_INTYPE
- Description: Define which extraction file to use for s1d creation
- Type: str

EXT_S1D_WAVEEND
- Description: Define the end s1d wavelength (in nm)
- Type: float
- Minimum: 0.0

EXT_S1D_WAVESTART
- Description: Define the start s1d wavelength (in nm)
- Type: float

- Minimum: 0.0

EXT_SKIP_ORDERS
- Description: Define the orders to skip extraction on (will set all order values to NaN. If None no orders are skipped. If Not None should be a string (valid python list)
- Type: str

EXT_START_ORDER
- Description: Start order of the extraction in cal_ff if None starts from 0
- Type: int

FF_BLAZE_BPERCENTILE
- Type: int
- Minimum: 0

FF_BLAZE_DEGREE
- Description: The blaze polynomial fit degree
- Type: int

FF_BLAZE_HALF_WINDOW
- Description: Half size blaze smoothing window
- Type: int

FF_BLAZE_SCUT
- Description: Define the threshold, expressed as the fraction of the maximum peak, below this threshold the blaze (and e2ds) is set to NaN
- Type: float

FF_BLAZE_SIGFIT
- Description: Define the rejection threshold for the blaze sinc fit
- Type: float

FF_BLAZE_THRESHOLD
- Description: Minimum relative e2ds flux for the blaze computation
- Type: float

FF_PLOT_ORDER
- Description: Define the order to plot in summary plots
- Type: int

FF_RMS_SKIP_ORDERS
- Description: Define the orders not to plot on the RMS plot should be a string containing a list of integers
- Type: str

FIBER_FIRST_ORDER_JUMP_A
- Description:
- Type: int
- Minimum: 0

FIBER_FIRST_ORDER_JUMP_AB
- Description: Number of orders to skip at start of image
- Type: int
- Minimum: 0

FIBER_FIRST_ORDER_JUMP_B
- Description:
- Type: int
- Minimum: 0

FIBER_FIRST_ORDER_JUMP_C
- Description:
- Type: int
- Minimum: 0

FIBER_MAX_NUM_ORDERS_A
- Description:
- Type: int
- Minimum: 1

FIBER_MAX_NUM_ORDERS_AB
- Description: Maximum number of order to use
- Type: int
- Minimum: 1

FIBER_MAX_NUM_ORDERS_B

- Description:
- Type: int
- Minimum: 1

FIBER_MAX_NUM_ORDERS_C
- Description:
- Type: int
- Minimum: 1

FIBER_SET_NUM_FIBERS_A
- Description:
- Type: int
- Minimum: 1

FIBER_SET_NUM_FIBERS_AB
- Description: Number of fibers
- Type: int
- Minimum: 1

FIBER_SET_NUM_FIBERS_B
- Description:
- Type: int
- Minimum: 1

FIBER_SET_NUM_FIBERS_C
- Description:
- Type: int
- Minimum: 1

FIBER_TYPES
- Description: Define the fibers
- Type: str

FP_MASTER_MATCH_TIME
- Description: Define the maximum time span to combine fp files over (in hours)
- Type: float

FP_MASTER_PERCENT_THRES
- Description: Define the percentile at which the FPs are normalised when getting the fp master in shape master
- Type: float
- Minimum: 0
- Maximum: 100

FTELLU_ADD_DERIV_PC
- Description: Define whether to add the first derivative and broadening factor to the principal components this allows a variable resolution and velocity offset of the PCs this is performed in the pixel space and NOT the velocity space as this is should be due to an instrument shift
- Type: bool

FTELLU_FIT_DERIV_PC
- Description: Define whether to fit the derivatives instead of the principal components
- Type: bool

FTELLU_FIT_ITERS
- Description: The number of iterations to use in the reconstructed absorption calculation
- Type: int

FTELLU_FIT_KEEP_NUM
- Description: The number of pixels required (per order) to be able to interpolate the template on to a berv shifted wavelength grid
- Type: int

FTELLU_FIT_MIN_TRANS
- Description: The minimium transmission allowed to define good pixels (for reconstructed absorption calculation)
- Type: float

FTELLU_FIT_RECON_LIMIT
- Description: The minimum log absorption the is allowed in the molecular absorption calculation
- Type: float

FTELLU_KERNEL_VSINI

- Description: The gaussian kernel used to smooth the template and residual spectrum [km/s]
- Type: float

FTELLU_LAMBDA_MAX
- Description: The maximum wavelength constraint (in nm) to calculate reconstructed absorption
- Type: float

FTELLU_LAMBDA_MIN
- Description: The minimum wavelength constraint (in nm) to calculate reconstructed absorption
- Type: float

FTELLU_NUM_PRINCIPLE_COMP
- Description: The number of principle components to use in PCA fit
- Type: int
- Minimum: 1

FTELLU_NUM_TRANS
- Description: The number of transmission files to use in the PCA fit (use this number of trans files closest in expo_h20 and expo_water
- Type: int
- Minimum: 1

FTELLU_PLOT_ORDER_NUMS
- Description: Define the orders to plot (not too many) for recon abso plot values should be a string list separated by commas
- Type: str

FTELLU_QC_SNR_MIN
- Description: Define the minimum SNR for order "QC_TELLU_SNR_ORDER" that will be accepted to the telluDB
- Type: float
- Minimum: 0.0

FTELLU_QC_SNR_ORDER
- Description: Define the order to use for SNR check when accepting tellu files to the telluDB
- Type: int
- Minimum: 0

FTELLU_SPLOT_ORDER
- Description: Define the selected fit telluric order for debug plots (when not in loop)
- Type: int

FWHM_PIXEL_LSF
- Description: Define mean line width expressed in pix
- Type: float

GL_ALIAS_COL_NAME
- Description: alias col name in google sheet
- Type: str

GL_GAIA_COL_NAME
- Description: gaia col name in google sheet
- Type: str

GL_OBJ_COL_NAME
- Description: object col name in google sheet
- Type: str

GL_RVREF_COL_NAME
- Description:
- Type: str

GL_RV_COL_NAME
- Description: rv col name in google sheet
- Type: str

GL_R_ODO_COL
- Description: Reject like google columns
- Type: str

GL_R_PP_COL
- Description:
- Type: str

GL_R_RV_COL

- Description:
- Type: str

GL_TEFFREF_COL_NAME
- Description:
- Type: str

GL_TEFF_COL_NAME
- Description: teff col name in google sheet
- Type: str

HISTO_BINS
- Description: The number of bins in dark histogram
- Type: int
- Minimum: 1

HISTO_RANGE_LOW
- Type: int

IMAGE_PIXEL_SIZE
- Description: Define the pixel size in km/s / pix also used for the median sampling size in tellu correction
- Type: float

IMAGE_X_BLUE_HIGH
- Description:
- Type: int
- Minimum: 0

IMAGE_X_BLUE_LOW
- Description: Defines the resized blue image
- Type: int
- Minimum: 0

IMAGE_X_FULL
- Description: Define raw image size (mostly just used as a check and in places where we dont have access to this information) in x dim
- Type: int

IMAGE_X_HIGH
- Description:
- Type: int
- Minimum: 0

IMAGE_X_LOW
- Description: Defines the resized image
- Type: int
- Minimum: 0

IMAGE_X_RED_HIGH
- Description:
- Type: int
- Minimum: 0

IMAGE_X_RED_LOW
- Description: Defines the resized red image
- Type: int
- Minimum: 0

IMAGE_Y_BLUE_HIGH
- Description:
- Type: int
- Minimum: 0

IMAGE_Y_BLUE_LOW
- Description:
- Type: int
- Minimum: 0

IMAGE_Y_FULL
- Description: Define raw image size (mostly just used as a check and in places where we dont have access to this information) in y dim
- Type: int

IMAGE_Y_HIGH

- Description:
- Type: int
- Minimum: 0

IMAGE_Y_LOW
- Description:
- Type: int
- Minimum: 0

IMAGE_Y_RED_HIGH
- Description:
- Type: int
- Minimum: 0

IMAGE_Y_RED_LOW
- Description:
- Type: int
- Minimum: 0

INPUT_COMBINE_IMAGES
- Description: Defines whether to by default combine images that are inputted at the same time
- Type: bool

INPUT_FLIP_IMAGE
- Description: Defines whether to, by default, flip images that are inputted
- Type: bool

INPUT_RESIZE_IMAGE
- Description: Defines whether to, by default, resize images that are inputted
- Type: bool

INSTRUMENT
- Description: Instrument Name
- Type: str

IPYTHON_RETURN
- Description: whether to be in ipython return mode (always exits to ipdb via pdbrc)
- Type: bool

IS_MASTER
- Description: Flag for master recipe associated with this param set
- Type: bool

KW_EXPTIME_UNITS
- Description: This is the units for the exposure time
- Type: str

LANGUAGE
- Description: Language for DRS messages (if translated)
- Type: str

LEAKM_ALWAYS_EXTRACT
- Description: define whether to always extract leak master files (i.e. overwrite existing files)
- Type: bool

LEAKM_EXTRACT_TYPE
- Description: define the type of file to use for leak master solution (currently allowed are E2DSFF) - must match with LEAK_EXTRACT_FILE
- Type: str

LEAKM_KERSIZE
- Description: define the kernel size for leak master
- Type: float
- Minimum: 0.0

LEAKM_WSMOOTH
- Description: define the e-width of the smoothing kernel for leak master
- Type: int
- Minimum: 0

LEAK_1D_EXTRACT_FILES
- Description: define the extraction files which are 1D spectra
- Type: str

LEAK_2D_EXTRACT_FILES

- Description: define the extraction files which are 2D images (i.e. order num x nbpix)
- Type: str

LEAK_BAD_RATIO_OFFSET
- Description: define the limit on surpious FP ratio (1 +/- limit)
- Type: float
- Minimum: 0.0

LEAK_BCKGRD_PERCENTILE
- Description: define the thermal background percentile for the leak and leak master
- Type: float

LEAK_EXTRACT_FILE
- Description: define the type of file to use for the leak correction (currently allowed are E2DS_FILE or E2DSFF_FILE (linked to recipe definition outputs) must match with LEAKM_EXTRACT_TYPE
- Type: str

LEAK_LOW_PERCENTILE
- Type: float
- Minimum: 0.0
- Maximum: 100.0

LEAK_NORM_PERCENTILE
- Description: define the normalisation percentile for the leak and leak master
- Type: float

LEAK_SAVE_UNCORRECTED
- Description: Define whether to save uncorrected files
- Type: bool

LOC_BKGRD_THRESHOLD
- Description: Normalised amplitude threshold to accept pixels for background calculation
- Type: float
- Minimum: 0.0

LOC_CENTRAL_COLUMN
- Description: Definition of the central column for use in localisation
- Type: int
- Minimum: 0

LOC_CENT_POLY_DEG
- Description: Order of polynomial to fit for positions
- Type: int
- Minimum: 1

LOC_COEFFSIG_DEG
- Description: Defines the fit degree to fit in the coefficient cleaning
- Type: int
- Minimum: 1

LOC_COEFF_SIGCLIP
- Description: set the sigma clipping cut off value for cleaning coefficients
- Type: float
- Minimum: 0

LOC_COLUMN_SEP_FITTING
- Description: Define the jump size when finding the order position (jumps in steps of this from the center outwards)
- Type: int
- Minimum: 1

LOC_EXT_WINDOW_SIZE
- Description: Definition of the extraction window size (half size)
- Type: int
- Minimum: 1

LOC_HALF_ORDER_SPACING
- Description: Half spacing between orders
- Type: int
- Minimum: 0

LOC_IMAGE_GAP
- Description: Definition of the gap index in the selected area

- Type: int
- Minimum: 0

LOC_MAX_PTP_CENT
- Description: Maximum peak-to-peak for sigma-clip order fit (center positions)
- Type: float
- Minimum: 0.0

LOC_MAX_PTP_WID
- Description: Maximum fractional peak-to-peak for sigma-clip order fit (width)
- Type: float
- Minimum: 0.0

LOC_MAX_RMS_CENT
- Description: Maximum rms for sigma-clip order fit (center positions)
- Type: float
- Minimum: 0.0

LOC_MAX_RMS_WID
- Description: Maximum rms for sigma-clip order fit (width)
- Type: float
- Minimum: 0.0

LOC_MINPEAK_AMPLITUDE
- Description: Minimum amplitude to accept (in e-)
- Type: float
- Minimum: 0.0

LOC_NOISE_MULTIPLIER_THRES
- Description: Define the noise multiplier threshold in order to accept an order center as usable i.e. max(pixel value) - min(pixel value) > THRES * RDNOISE
- Type: float
- Minimum: 0.0

LOC_ORDERP_BOX_SIZE
- Description: Size of the order_profile smoothed box (from pixel - size to pixel + size)
- Type: int

LOC_ORDER_CURVE_DROP
- Description: Define the amount we drop from the centre of the order when previous order center is missed (in finding the position)
- Type: float
- Minimum: 0.0

LOC_ORDER_WIDTH_MIN
- Description: Define minimum width of order to be accepted
- Type: float
- Minimum: 0.0

LOC_PLOT_CORNER_XZOOM1
- Description: set the zoom in levels for the plots (xmin values)
- Type: str

LOC_PLOT_CORNER_XZOOM2
- Description: set the zoom in levels for the plots (xmax values)
- Type: str

LOC_PLOT_CORNER_YZOOM1
- Description: set the zoom in levels for the plots (ymin values)
- Type: str

LOC_PLOT_CORNER_YZOOM2
- Description: set the zoom in levels for the plots (ymax values)
- Type: str

LOC_PTPORMS_CENT
- Description: Maximum frac ptp/rms for sigma-clip order fit (center positions)
- Type: float
- Minimum: 0.0

LOC_SAT_THRES
- Description: Saturation threshold for localisation
- Type: float

- Minimum: 0.0

LOC_SAVE_SUPERIMP_FILE
- Description: Option for archiving the location image
- Type: bool

LOC_START_ROW_OFFSET
- Description: row number of image to start localisation processing at
- Type: int
- Minimum: 0

LOC_WIDTH_POLY_DEG
- Description: Order of polynomial to fit for widths
- Type: int
- Minimum: 1

MKTELLU_BLAZE_PERCENTILE
- Description: value below which the blaze in considered too low to be useful for all blaze profiles, we normalize to the 95th percentile. Thats pretty much the peak value, but it is resistent to eventual outliers
- Type: float

MKTELLU_CUT_BLAZE_NORM
- Description:
- Type: float

MKTELLU_DEFAULT_CONV_WIDTH
- Description: define the default convolution width [in pixels]
- Type: int

MKTELLU_PLOT_ORDER_NUMS
- Description: Define the orders to plot (not too many) values should be a string list separated by commas
- Type: str

MKTELLU_QC_AIRMASS_DIFF
- Description: Define the allowed difference between recovered and input airmass
- Type: float

MKTELLU_QC_SNR_MIN
- Description: Define the minimum SNR for order "QC_TELLU_SNR_ORDER" that will be accepted to the telluDB
- Type: float
- Minimum: 0.0

MKTELLU_QC_SNR_ORDER
- Description: Define the order to use for SNR check when accepting tellu files to the telluDB
- Type: int
- Minimum: 0

MKTELLU_TAU_WATER_ULIMIT
- Description: Set an upper limit for the allowed line-of-sight optical depth of water
- Type: float

MKTELLU_TEMP_MED_FILT
- Description: median-filter the template. we know that stellar features are very broad. this avoids having spurious noise in our templates [pixel]
- Type: int

MKTELLU_THRES_TRANSFIT
- Description: minimum transmission required for use of a given pixel in the TAPAS and SED fitting
- Type: float

MKTELLU_TRANS_FIT_UPPER_BAD
- Description: Defines the bad pixels if the spectrum is larger than this value. These values are likely an OH line or a cosmic ray
- Type: float

MKTELLU_TRANS_MAX_WATERCOL
- Description: Defines the maximum allowed value for the recovered water vapor optical depth
- Type: float

MKTELLU_TRANS_MIN_WATERCOL
- Description: Defines the minimum allowed value for the recovered water vapor optical depth (should not be able 1)

- Type: float

MKTEMPLATE_BERVCOR_QCMIN
- Description: Define the minimum allowed berv coverage to construct a template in km/s (default is double the resolution in km/s)
- Type: float
- Minimum: 0.0

MKTEMPLATE_BERVCOV_CSNR
- Description: Define the core SNR in order to calculate required BERV coverage
- Type: float
- Minimum: 0.0

MKTEMPLATE_BERVCOV_RES
- Description: Defome the resolution in km/s for calculating BERV coverage
- Type: float
- Minimum: 0.0

MKTEMPLATE_E2DS_ITNUM
- Description: The number of iterations to filter low frequency noise before medianing the template "big cube" to the final template spectrum
- Type: int
- Minimum: 1

MKTEMPLATE_E2DS_LOWF_SIZE
- Description: The size (in pixels) to filter low frequency noise before medianing the template "big cube" to the final template spectrum
- Type: int
- Minimum: 1

MKTEMPLATE_FIBER_TYPE
- Description: the fiber required for input template files
- Type: str

MKTEMPLATE_FILESOURCE
- Description: the order to use for signal to noise cut requirement
- Type: str

MKTEMPLATE_FILETYPE
- Description: the OUTPUT type (KW_OUTPUT header key) and DrsFitsFile name required for input template files
- Type: str

MKTEMPLATE_S1D_ITNUM
- Description: The number of iterations to filter low frequency noise before medianing the s1d template "big cube" to the final template spectrum
- Type: int
- Minimum: 1

MKTEMPLATE_S1D_LOWF_SIZE
- Description: The size (in pixels) to filter low frequency noise before medianing the s1d template "big cube" to the final template spectrum
- Type: int
- Minimum: 1

MKTEMPLATE_SNR_ORDER
- Description: the order to use for signal to noise cut requirement
- Type: int
- Minimum: 0

OBJ_LIST_CROSS_MATCH_RADIUS
- Description: Define the radius for crossmatching objects (in both lookup table and query) in arcseconds
- Type: float
- Minimum: 0.0

OBJ_LIST_GAIA_EPOCH
- Description: Define the gaia epoch to use in the gaia query
- Type: float
- Minimum: 2000.0
- Maximum: 2100.0

OBJ_LIST_GAIA_MAG_CUT

- Description: Define the gaia magnitude cut to use in the gaia query
- Type: float
- Minimum: 10.0
- Maximum: 25.0

OBJ_LIST_GAIA_PLX_LIM
- Description: Define the gaia parallax limit for using gaia point
- Type: float
- Minimum: 0.0

OBJ_LIST_GAIA_URL
- Description: Define the TAP Gaia URL (for use in crossmatching to Gaia via astroquery)
- Type: str

OBJ_LIST_GOOGLE_SHEET_URL
- Description: Define the google sheet to use for crossmatch
- Type: str

OBJ_LIST_GOOGLE_SHEET_WNUM
- Description: Define the google sheet workbook number
- Type: int
- Minimum: 0

OBJ_LIST_RESOLVE_FROM_COORDS
- Description: Define whether to get Gaia ID from header RA and Dec (basically if all other option fails) - WARNING - this is a crossmatch so may lead to a bad identification of the gaia id - not recommended
- Type: bool

OBJ_LIST_RESOLVE_FROM_DATABASE
- Description: Define whether to resolve from local database (via drs_database / drs_db)
- Type: bool

OBJ_LIST_RESOLVE_FROM_GAIAID
- Description: Define whether to resolve from gaia id (via TapPlus to Gaia) if False ra/dec/pmra/pmde/plx will always come from header
- Type: bool

OBJ_LIST_RESOLVE_FROM_GLIST
- Description: Define whether to get Gaia ID / Teff / RV from google sheets if False will try to resolve if gaia ID given otherwise will use ra/dec if OBJ_LIST_RESOLVE_FROM_COORDS = True else will default to header values
- Type: bool

OBS_LAT
- Type: float

OBS_LONG
- Description: Defines the longitude West is negative
- Type: float

ODOCODE_REJECT_GSHEET_ID
- Description: Define the odometer code rejection google sheet id
- Type: str

ODOCODE_REJECT_GSHEET_NUM
- Description: Define the odmeter code rejection google sheet workbook
- Type: str
- Minimum: 0

PLOT_BADPIX_MAP
- Description: turn on badpix map debug plot
- Type: bool

PLOT_CCF_PHOTON_UNCERT
- Description: turn on the ccf photon uncertainty debug plot
- Type: bool

PLOT_CCF_RV_FIT
- Description: turn on the ccf rv fit debug plot (for the mean order value)
- Type: bool

PLOT_CCF_RV_FIT_LOOP
- Description: turn on the ccf rv fit debug plot (in a loop around orders)
- Type: bool

PLOT_CCF_SWAVE_REF
- Description: turn on the ccf spectral order vs wavelength debug plot
- Type: bool

PLOT_DARK_HISTOGRAM
- Description: turn on dark histogram debug plot
- Type: bool

PLOT_DARK_IMAGE_REGIONS
- Description: turn on dark image region debug plot
- Type: bool

PLOT_EXTRACT_S1D
- Description: turn on the extraction 1d spectrum debug plot
- Type: bool

PLOT_EXTRACT_S1D_WEIGHT
- Description: turn on the extraction 1d spectrum weight (before/after) debug plot
- Type: bool

PLOT_EXTRACT_SPECTRAL_ORDER1
- Description: turn on the extraction spectral order debug plot (loop)
- Type: bool

PLOT_EXTRACT_SPECTRAL_ORDER2
- Description: turn on the extraction spectral order debug plot (selected order)
- Type: bool

PLOT_FLAT_BLAZE_ORDER1
- Description: turn on the flat blaze order debug plot (loop)
- Type: bool

PLOT_FLAT_BLAZE_ORDER2
- Description: turn on the flat blaze order debug plot (selected order)
- Type: bool

PLOT_FLAT_ORDER_FIT_EDGES1
- Description: turn on the flat order fit edges debug plot (loop)
- Type: bool

PLOT_FLAT_ORDER_FIT_EDGES2
- Description: turn on the flat order fit edges debug plot (selected order)
- Type: bool

PLOT_FTELLU_PCA_COMP1
- Description: turn on the fit tellu pca component debug plot (in loop)
- Type: bool

PLOT_FTELLU_PCA_COMP2
- Description: turn on the fit tellu pca component debug plot (single order)
- Type: bool

PLOT_FTELLU_RECON_ABSO1
- Description: turn on the fit tellu reconstructed absorption debug plot (in loop)
- Type: bool

PLOT_FTELLU_RECON_ABSO12
- Description: turn on the fit tellu reconstructed absorption debug plot (single order)
- Type: bool

PLOT_FTELLU_RECON_SPLINE1
- Description: turn on the fit tellu reconstructed spline debug plot (in loop)
- Type: bool

PLOT_FTELLU_RECON_SPLINE2
- Description: turn on the fit tellu reconstructed spline debug plot (single order)
- Type: bool

PLOT_FTELLU_WAVE_SHIFT1
- Description: turn on the fit tellu wave shift debug plot (in loop)
- Type: bool

PLOT_FTELLU_WAVE_SHIFT2
- Description: turn on the fit tellu wave shift debug plot (single order)
- Type: bool

PLOT_LOC_CHECK_COEFFS

- Description: turn on the localisation check coeffs debug plot
- Type: bool

PLOT_LOC_FINDING_ORDERS
- Description: turn on the localisation finding orders debug plot
- Type: bool

PLOT_LOC_FIT_RESIDUALS
- Description: turn on the localisation fit residuals plot (warning: done many times)
- Type: bool

PLOT_LOC_IM_SAT_THRES
- Description: turn on the image above saturation threshold debug plot
- Type: bool

PLOT_LOC_MINMAX_CENTS
- Description: turn on the localisation cent min max debug plot
- Type: bool

PLOT_LOC_MIN_CENTS_THRES
- Description: turn on the localisation cent/thres debug plot
- Type: bool

PLOT_LOC_ORD_VS_RMS
- Description: turn on the order number vs rms debug plot
- Type: bool

PLOT_MKTELLU_WAVE_FLUX1
- Description: turn on the make tellu wave flux debug plot (in loop)
- Type: bool

PLOT_MKTELLU_WAVE_FLUX2
- Description: turn on the make tellu wave flux debug plot (single order)
- Type: bool

PLOT_MKTEMP_BERV_COV
- Description: turn on the berv coverage debug plot
- Type: bool

PLOT_POLAR_CONTINUUM
- Description: turn on the polar continuum debug plot
- Type: bool

PLOT_POLAR_LSD
- Description: turn on the polar lsd debug plot
- Type: bool

PLOT_POLAR_RESULTS
- Description: turn on the polar results debug plot
- Type: bool

PLOT_POLAR_STOKES_I
- Description: turn on the polar stokes i debug plot
- Type: bool

PLOT_SHAPEL_ZOOM_SHIFT
- Description: turn on the shape local zoom plot
- Type: bool

PLOT_SHAPE_ANGLE_OFFSET
- Description: turn on the shape angle offset (one selected order) debug plot
- Type: bool

PLOT_SHAPE_ANGLE_OFFSET_ALL
- Description: turn on the shape angle offset (all orders in loop) debug plot
- Type: bool

PLOT_SHAPE_DX
- Description: turn on the shape dx debug plot
- Type: bool

PLOT_SHAPE_LINEAR_TPARAMS
- Description: turn on the shape linear transform params plot
- Type: bool

PLOT_TELLUP_ABSO_SPEC
- Description: turn on the telluric pre-cleaning result debug plot

- Type: bool

PLOT_TELLUP_WAVE_TRANS
- Description: turn on the telluric pre-cleaning ccf debug plot
- Type: bool

PLOT_THERMAL_BACKGROUND
- Description: turn on thermal background (in extract) debug plot
- Type: bool

PLOT_WAVENIGHT_HISTPLOT
- Description: turn on the wave per night hist debug plot
- Type: bool

PLOT_WAVENIGHT_ITERPLOT
- Description: turn on the wave per night iteration debug plot
- Type: bool

PLOT_WAVEREF_EXPECTED
- Description: turn on the wave lines hc/fp expected vs measured debug plot(will plot once for hc once for fp)
- Type: bool

PLOT_WAVE_FIBER_COMPARISON
- Description: turn on the wave line fiber comparison plot
- Type: bool

PLOT_WAVE_FP_FINAL_ORDER
- Description: turn on the wave solution final fp order debug plot
- Type: bool

PLOT_WAVE_FP_IPT_CWID_1MHC
- Description: turn on the wave solution fp interp cavity width 1/m_d hc debug plot
- Type: bool

PLOT_WAVE_FP_IPT_CWID_LLHC
- Description: turn on the wave solution fp interp cavity width ll hc and fp debug plot
- Type: bool

PLOT_WAVE_FP_LL_DIFF
- Description: turn on the wave solution old vs new wavelength difference debug plot
- Type: bool

PLOT_WAVE_FP_LWID_OFFSET
- Description: turn on the wave solution fp local width offset debug plot
- Type: bool

PLOT_WAVE_FP_MULTI_ORDER
- Description: turn on the wave solution fp multi order debug plot
- Type: bool

PLOT_WAVE_FP_M_X_RES
- Description: turn on the wave solution fp fp_m_x residual debug plot
- Type: bool

PLOT_WAVE_FP_SINGLE_ORDER
- Description: turn on the wave solution fp single order debug plot
- Type: bool

PLOT_WAVE_FP_WAVE_RES
- Description: turn on the wave solution fp wave residual debug plot
- Type: bool

PLOT_WAVE_HC_BRIGHTEST_LINES
- Description: turn on the wave solution hc brightest lines debug plot
- Type: bool

PLOT_WAVE_HC_GUESS
- Description: turn on the wave solution hc guess debug plot (in loop)
- Type: bool

PLOT_WAVE_HC_RESMAP
- Description: turn on the wave solution hc resolution map debug plot
- Type: bool

PLOT_WAVE_HC_TFIT_GRID
- Description: turn on the wave solution hc triplet fit grid debug plot

- Type: bool

PLOT_WAVE_LITTROW_CHECK1
- Description: turn on the wave solution littrow check debug plot
- Type: bool

PLOT_WAVE_LITTROW_CHECK2
- Description: turn on the wave solution littrow check debug plot
- Type: bool

PLOT_WAVE_LITTROW_EXTRAP1
- Description: turn on the wave solution littrow extrapolation debug plot
- Type: bool

PLOT_WAVE_LITTROW_EXTRAP2
- Description: turn on the wave solution littrow extrapolation debug plot
- Type: bool

POLAR_CONT_TELLMASK_LOWER
- Description: Define the telluric mask for calculation of continnum lower limits (string list)
- Type: float

POLAR_CONT_TELLMASK_UPPER
- Description: Define the telluric mask for calculation of continnum upper limits (string list)
- Type: float

POLAR_LSD_ANALYSIS
- Description: Perform LSD analysis
- Type: str

POLAR_LSD_FILE_KEY
- Description: Define the file regular expression key to lsd mask files
- Type: str

POLAR_LSD_MIN_LINEDEPTH
- Description: Define minimum line depth to be used in the LSD analyis
- Type: float

POLAR_LSD_NBIN1
- Description: Define the normalise by continuum lsd binsize used in the normalization with PO-LAR_LSD_NORM = True
- Type: int
- Minimum: 1

POLAR_LSD_NBIN2
- Description: Define the normalise by continuum lsd binsize used in the profile calculation
- Type: int
- Minimum: 1

POLAR_LSD_NLFIT1
- Description: Define whether to use a linear fit in the normalise by continuum lsd calc used in the normalization with POLAR_LSD_NORM = True
- Type: bool

POLAR_LSD_NLFIT2
- Description: Define whether to use a linear fit in the normalise by continuum lsd calc used in the profile calculation
- Type: bool

POLAR_LSD_NORM
- Description: Define whether to normalise by stokei by the continuum in lsd process
- Type: bool

POLAR_LSD_NOVERLAP1
- Description: Define the normalise by continuum lsd overlap with adjacent bins used in the normalization with POLAR_LSD_NORM = True
- Type: int
- Minimum: 0

POLAR_LSD_NOVERLAP2
- Description: Define the normalise by continuum lsd overlap with adjacent bins used in the profile calculation
- Type: int
- Minimum: 0

POLAR_LSD_NPOINTS
- Description: Define number of points for output LSD profile
- Type: int

POLAR_LSD_NSIGCLIP1
- Description: Define the normalise by continuum lsd sigma clip value used in the profile calculation
- Type: float
- Minimum: 0

POLAR_LSD_NSIGCLIP2
- Description: Define the normalise by continuum lsd sigma clip value used in the profile calculation
- Type: float
- Minimum: 0

POLAR_LSD_NWINDOW1
- Type: str

POLAR_LSD_NWINDOW2
- Type: str

POLAR_LSD_ORDER_MASK
- Description: Define the order wavelength mask filename
- Type: str

POLAR_LSD_PATH
- Description: Define the spectral lsd mask directory for lsd polar calculations
- Type: str

POLAR_LSD_VFINAL
- Description: Define final velocity (km/s) for output LSD profile
- Type: float

POLAR_LSD_VINIT
- Description: Define initial velocity (km/s) for output LSD profile
- Type: float

POLAR_LSD_WL_LOWER
- Description: Define mask for selecting lines to be used in the LSD analysis lower bounds (string list)
- Type: str

POLAR_LSD_WL_UPPER
- Description: Define mask for selecting lines to be used in the LSD analysis upper bounds (string list)
- Type: str

POLAR_METHOD
- Description: Define the polarimetry calculation method
- Type: str

POLAR_VALID_FIBERS
- Description: Define all possible fibers used for polarimetry (define as a string list)
- Type: str

POLAR_VALID_STOKES
- Description: Define all possible stokes parameters used for polarimetry (define as a string list)
- Type: str

POST_CLEAR_REDUCED
- Description: Define whether (by deafult) to clear reduced directory
- Type: bool

POST_OVERWRITE
- Description: Define whether (by default) to overwrite post processed files
- Type: bool

PPM_MASK_NSIG
- Description: Define allowed preprocess master mask number of sigma
- Type: float

PP_BAD_EXPTIME_FRACTION
- Description: Define the fraction of the required exposure time that is required for a valid observation
- Type: float
- Minimum: 0

PP_CORRUPT_HOT_THRES
- Description: Defines the threshold in sigma that selects hot pixels
- Type: int

- Minimum: 0

PP_CORRUPT_MED_SIZE
- Description: Defines the size around badpixels that is considered part of the bad pixel
- Type: int
- Minimum: 1

PP_CORRUPT_RMS_THRES
- Description: Defines the RMS threshold to also catch corrupt files
- Type: float
- Minimum: 0.0

PP_CORRUPT_SNR_HOTPIX
- Description: Defines the snr hotpix threshold to define a corrupt file
- Type: float
- Minimum: 0.0

PP_DARK_MED_BINNUM
- Description: Define the number of bins used in the dark median process - [cal_pp]
- Type: int
- Minimum: 0

PP_HOTPIX_BOXSIZE
- Description: Defines the box size surrounding hot pixels to use
- Type: int
- Minimum: 1

PP_HOTPIX_FILE
- Description: Defines the pp hot pixel file (located in the data folder)
- Type: str

PP_LOWEST_RMS_PERCENTILE
- Description: Define the lowest rms value of the rms percentile allowed if the value of the pp_rms_percentile-th is lower than this this value is used
- Type: float
- Minimum: 0.0

PP_MEDAMP_BINSIZE
- Description: Define the bin to use to correct low level frequences. This value cannot be smaller than the order footprint on the array as it would lead to a set of NaNs in the downsized image
- Type: int

PP_NUM_DARK_AMP
- Description: Define the number of dark amplifiers
- Type: int
- Minimum: 0

PP_NUM_REF_BOTTOM
- Description: Define the number of un-illuminated reference pixels at bottom of image
- Type: int

PP_NUM_REF_TOP
- Description: Define the number of un-illuminated reference pixels at top of image
- Type: int

PP_OBJ_DPRTYPES
- Description: Define object dpr types
- Type: str

PP_RMS_PERCENTILE
- Description: Define the percentile value for the rms normalisation (0-100)
- Type: int
- Minimum: 0
- Maximum: 100

PP_TOTAL_AMP_NUM
- Description: Define the total number of amplifiers
- Type: int
- Minimum: 0

QC_DARK_TIME
- Description: Min dark exposure time
- Type: float

- Minimum: 0.0

QC_EXT_FLUX_MAX
- Description: Saturation level reached warning
- Type: float

QC_FF_MAX_RMS
- Description: Maximum allowed RMS of flat field
- Type: float

QC_LOC_MAXFIT_REMOVED_CTR
- Description: Maximum points removed in location fit
- Type: int
- Minimum: 0

QC_LOC_MAXFIT_REMOVED_WID
- Description: Maximum points removed in width fit
- Type: int
- Minimum: 0

QC_LOC_RMSMAX_CTR
- Description: Maximum rms allowed in fitting location
- Type: float
- Minimum: 0.0

QC_LOC_RMSMAX_WID
- Description: Maximum rms allowed in fitting width
- Type: float
- Minimum: 0.0

QC_MAX_DARK
- Description: Max fraction of dark pixels (percent)
- Type: float

QC_MAX_DARKLEVEL
- Description: Max dark median level [ADU/s]
- Type: float

QC_MAX_DEAD
- Description: Max fraction of dead pixels
- Type: float

RAW_TO_PP_ROTATION
- Description: Define the rotation of the pp files in relation to the raw files, nrot = 0 -> same as input, nrot = 1 -> 90deg counter-clock-wise, nrot = 2 -> 180deg, nrot = 3 -> 90deg clock-wise, nrot = 4 -> flip top-bottom, nrot = 5 -> flip top-bottom and rotate 90 deg counter-clock-wisenrot = 6 -> flip top-bottom and rotate 180 deg, nrot = 7 -> flip top-bottom and rotate 90 deg clock-wise, nrot >=8 -> performs a modulo 8 anyway
- Type: int

REMAKE_DATABASE_DEFAULT
- Description: define the default database to remake
- Type: str

REPROCESS_ABSFILECOL
- Description: Define the absolute file column name for raw file table
- Type: str

REPROCESS_MODIFIEDCOL
- Description: Define the modified file column name for raw file table
- Type: str

REPROCESS_NIGHTCOL
- Description: Define the night name column name for raw file table
- Type: str

REPROCESS_PINAMECOL
- Description: Define the pi name column name for raw file table
- Type: str

REPROCESS_RAWINDEXFILE
- Description: Define the raw index filename
- Type: str

REPROCESS_RUN_KEY

- Description: Key for use in run files
- Type: str

REPROCESS_SEQCOL
- Description: define the sequence (1 of 5, 2 of 5 etc) col for raw file table
- Type: str

REPROCESS_SORTCOL_HDRKEY
- Description: Define the sort column (from header keywords) for raw file table
- Type: str

REPROCESS_TIMECOL
- Description: define the time col for raw file table
- Type: str

ROOT_DRS_LOC
- Description: root for localisation header keys
- Type: str

SHAPEL_PLOT_ZOOM1
- Description: Define first zoom plot for shape local zoom debug plot should be a string list (xmin, xmax, ymin, ymax)
- Type: str

SHAPEL_PLOT_ZOOM2
- Description: Define second zoom plot for shape local zoom debug plot should be a string list (xmin, xmax, ymin, ymax)
- Type: str

SHAPEOFFSET_ABSDEV_THRESHOLD
- Description: very low thresholding values tend to clip valid points
- Type: float

SHAPEOFFSET_BOTTOM_PERCENTILE
- Description: defines the bottom percentile for fp peak
- Type: float

SHAPEOFFSET_DEVIANT_PMAX
- Description:
- Type: float
- Minimum: 0
- Maximum: 100

SHAPEOFFSET_DEVIANT_PMIN
- Description: Define the most deviant peaks - percentile from [min to max]
- Type: float
- Minimum: 0
- Maximum: 100

SHAPEOFFSET_DRIFT_MARGIN
- Description: Define the maximum allowed offset (in nm) that we allow for the detector)
- Type: float

SHAPEOFFSET_FIT_HC_SIGMA
- Description: The number of sigmas that the HC spectrum is allowed to be away from the predicted (from FP) position
- Type: float

SHAPEOFFSET_FPINDEX_MAX
- Description: Maximum number of FP (larger than expected number (~10000 to ~25000)
- Type: int
- Minimum: 10000
- Maximum: 25000

SHAPEOFFSET_FPMAX_NUM_ERROR
- Description: Define the maximum error in FP order assignment we assume that the error in FP order assignment could range from -50 to +50 in practice, it is -1, 0 or +1 for the cases weve tested to date
- Type: int

SHAPEOFFSET_MASK_BORDER
- Description: Define the border in pixels at the edge of the detector
- Type: int

SHAPEOFFSET_MASK_EXTWIDTH

- Description: Define the width of the FP to extract (+/- the center)
- Type: int

SHAPEOFFSET_MASK_PIXWIDTH
- Description: Define the width of the FP mask (+/- the center)
- Type: int

SHAPEOFFSET_MAXDEV_THRESHOLD
- Description: Define the maximum allowed maximum absolute deviation away from the error fit
- Type: float

SHAPEOFFSET_MED_FILTER_WIDTH
- Description: define the median filter to apply to the hc (high pass filter)]
- Type: int

SHAPEOFFSET_MIN_MAXPEAK_FRAC
- Description: Define the minimum maxpeak value as a fraction of the maximum maxpeak
- Type: float

SHAPEOFFSET_TOP_FLOOR_FRAC
- Description: defines the floor below which top values should be set to this fraction away from the max top value
- Type: float

SHAPEOFFSET_TOP_PERCENTILE
- Description: defines the top percentile for fp peak
- Type: float

SHAPEOFFSET_VALID_FP_LENGTH
- Description: Define the valid length of a FP peak
- Type: int

SHAPEOFFSET_WAVEFP_INV_IT
- Description: Define the number of iterations to do for the wave_fp inversion trick
- Type: int

SHAPEOFFSET_XOFFSET
- Description: defines the shape offset xoffset (before and after) fp peaks
- Type: int

SHAPE_DEBUG_OUTPUTS
- Description: Define whether to output debug (sanity check) files
- Type: bool

SHAPE_FP_MASTER_MIN_IN_GROUP
- Description: Define the minimum number of FP files in a group to mean group is valid
- Type: int
- Minimum: 1

SHAPE_LARGE_ANGLE_MAX
- Description: the range of angles (in degrees) for the first iteration (large) and subsequent iterations (small)
- Type: float

SHAPE_LARGE_ANGLE_MIN
- Description: the range of angles (in degrees) for the first iteration (large) and subsequent iterations (small)
- Type: float

SHAPE_MASTER_FIBER
- Description: Define the shape master dx rmsquality control criteria (per order)
- Type: float

SHAPE_MASTER_FP_INI_BOXSIZE
- Description: Define the initial search box size (in pixels) around the fp peaks
- Type: int
- Minimum: 1

SHAPE_MASTER_FP_SMALL_BOXSIZE
- Description: Define the small search box size (in pixels) around the fp peaks
- Type: int
- Minimum: 1

SHAPE_MASTER_LINTRANS_NITER
- Description: Define the number of iterations used to get the linear transform params

- Type: int
- Minimum: 1

SHAPE_MASTER_VALIDFP_PERCENTILE
- Description: Define the percentile which defines a true FP peak [0-100]
- Type: float
- Minimum: 0
- Maximum: 100

SHAPE_MASTER_VALIDFP_THRESHOLD
- Description: Define the fractional flux an FP much have compared to its neighbours
- Type: float
- Minimum: 0

SHAPE_MEDIAN_FILTER_SIZE
- Description: the size of the median filter to apply along the order (in pixels)
- Type: int
- Minimum: 0

SHAPE_MIN_GOOD_CORRELATION
- Description: The minimum value for the cross-correlation to be deemed good
- Type: float
- Minimum: 0.0

SHAPE_NSECTIONS
- Description: number of sections per order to split the order into
- Type: int
- Minimum: 1

SHAPE_NUM_ITERATIONS
- Description: The number of iterations to run the shape finding out to
- Type: int
- Minimum: 1

SHAPE_ORDER_WIDTH
- Description: width of the ABC fibers (in pixels)
- Type: int
- Minimum: 1

SHAPE_PLOT_SELECTED_ORDER
- Description: The order to use on the shape plot
- Type: int
- Minimum: 0

SHAPE_QC_DXMAP_STD
- Description: Defines the largest allowed standard deviation for a given per-order and per-x-pixel shift of the FP peaks
- Type: int

SHAPE_QC_LTRANS_RES_THRES
- Description: Define the largest standard deviation allowed for the shift in x or y when doing the shape master fp linear transform
- Type: float

SHAPE_SHORT_DX_MEDFILT_WID
- Type: int

SHAPE_SIGMACLIP_MAX
- Description: max sigma clip (in sigma) on points within a section
- Type: float
- Minimum: 0.0

SHAPE_SMALL_ANGLE_MAX
- Description: the range of angles (in degrees) for the first iteration (large) and subsequent iterations (small)
- Type: float

SHAPE_SMALL_ANGLE_MIN
- Description: the range of angles (in degrees) for the first iteration (large) and subsequent iterations (small)
- Type: float

SHAPE_UNIQUE_FIBERS

- Description: define the names of the unique fibers (i.e. not AB) for use in getting the localisation coefficients for dymap
- Type: str

SKIP_DONE_PP
- Description: Define whether to skip preprocessed files that have already be processed
- Type: bool

SUMMARY_LATEX_PDF
- Description: Define whether we try to create a latex summary pdf (turn this off if you have any problems with latex/pdflatex)
- Type: bool

TAPAS_FILE
- Description: Define the name of the tapas file to use
- Type: str

TAPAS_FILE_FMT
- Description: Define the format (astropy format) of the tapas file "TAPAS_FILE"
- Type: str

TELLUP_ABSO_EXPO_KEXP
- Description: define the gaussian exponent of the kernel used in abso_expo a value of 2 is gaussian, a value >2 is boxy
- Type: float
- Minimum: 0.0

TELLUP_ABSO_EXPO_KTHRES
- Description: define the kernel threshold in abso_expo
- Type: float
- Minimum: 0.0

TELLUP_ABSO_EXPO_KWID
- Description: define the gaussian width of the kernel used in abso_expo
- Type: float
- Minimum: 0.0

TELLUP_CCF_SCAN_RANGE
- Description: width in km/s for the ccf scan to determine the abso in pre-cleaning
- Type: float
- Minimum: 0.0

TELLUP_CLEAN_OH_LINES
- Description: define whether to clean OH lines
- Type: bool

TELLUP_DEXPO_CONV_THRES
- Description: define dexpo convergence threshold
- Type: float
- Minimum: 0.0

TELLUP_DEXPO_MAX_ITR
- Description: define the maximum number of iterations to try to get dexpo convergence
- Type: int
- Minimum: 1

TELLUP_DO_PRECLEANING
- Description: define whether we do pre-cleaning
- Type: bool

TELLUP_D_WATER_ABSO
- Description: set the typical water abso exponent. Compare to values in header for high-snr targets later
- Type: float
- Minimum: 0.0

TELLUP_FORCE_AIRMASS
- Description: define whether to force airmass fit to header airmass value
- Type: bool

TELLUP_H2O_CCF_FILE
- Description: define the telluric trans water abso CCF file
- Type: str

TELLUP_OHLINE_PCA_FILE

- Description: define the OH line pca file
- Type: str

TELLUP_OTHERS_CCF_FILE

- Description: define the telluric trans other abso CCF file
- Type: str

TELLUP_OTHER_BOUNDS

- Description: set the lower and upper bounds (String list) for the exponent of the other species of absorbers
- Type: str

TELLUP_REMOVE_ORDS

- Description: define the orders not to use in pre-cleaning fit (due to theraml background)
- Type: str

TELLUP_SNR_MIN_THRES

- Description: define the minimum snr to accept orders for pre-cleaning fit
- Type: float
- Minimum: 0.0

TELLUP_TRANS_SIGLIM

- Description: define the threshold for discrepant transmission (in sigma)
- Type: float
- Minimum: 0.0

TELLUP_TRANS_THRES

- Description: define the transmission threshold (in exponential form) for keeping valid transmission
- Type: float

TELLUP_WATER_BOUNDS

- Description: set the lower and upper bounds (string list) for the exponent of water absorber
- Type: str

TELLURIC_FIBER_TYPE

- Description: the fiber required for input template files
- Type: str

TELLURIC_FILETYPE

- Description: the OUTPUT type (KW_OUTPUT header key) and DrsFitsFile name required for input template files
- Type: str

TELLU_ABSORBERS

- Description: Define list of absorbers in the tapas fits table
- Type: str

TELLU_ALLOWED_DPRTYPES

- Description: The allowed input DPRTYPES for input telluric files
- Type: str

TELLU_BLACKLIST_NAME

- Description: Define telluric black list name
- Type: str

TELLU_CUT_BLAZE_NORM

- Description: Define level above which the blaze is high enough to accurately measure telluric
- Type: float

TELLU_DB_MATCH

- Description: Define the match type for telluDB files match = older when more than one file for each key will select the newest file that is OLDER than time in fitsfilename match = closest when more than on efile for each key will select the file that is closest to time in fitsfilename if two files match with keys and time the key lower in the calibDB file will be used
- Type: str

TELLU_LIST_DIRECTORY

- Description: Define telluric black/white list directory
- Type: str

TELLU_WHITELIST_NAME

- Description: Define telluric white list name
- Type: str

THERMAL_ALWAYS_EXTRACT

- Description: define whether to always extract thermals (i.e. overwrite existing files)
- Type: bool

THERMAL_BLUE_LIMIT
- Description: define thermal blue limit (in nm)
- Type: float

THERMAL_CORRECT
- Description: whether to apply the thermal correction to extractions
- Type: bool

THERMAL_CORRETION_TYPE1
- Description: define DPRTYPEs we need to correct thermal background using telluric absorption (TAPAS)
- Type: str

THERMAL_CORRETION_TYPE2
- Description: define DPRTYPEs we need to correct thermal background using method 2
- Type: str

THERMAL_ENVELOPE_PERCENTILE
- Description: define the percentile to measure the background for correction type 2
- Type: float
- Minimum: 0
- Maximum: 100

THERMAL_EXTRACT_TYPE
- Description: define the type of file to use for wave solution (currently allowed are "E2DS" or "E2DSFF")
- Type: str

THERMAL_FILTER_WID
- Description: width of the median filter used for the background
- Type: int

THERMAL_ORDER
- Description: define the order to perform the thermal background scaling on
- Type: int

THERMAL_PLOT_START_ORDER
- Description: define the order to plot on the thermal debug plot
- Type: int

THERMAL_RED_LIMIT
- Description: define thermal red limit (in nm)
- Type: float

THERMAL_THRES_TAPAS
- Description: maximum tapas transmission to be considered completely opaque for the purpose of background determination in last order.
- Type: float

USE_SKYDARK_CORRECTION
- Description: Define whether to use SKYDARK for dark corrections
- Type: bool

USE_SKYDARK_ONLY
- Description: If use_skydark_correction is True define whether we use the SKYDARK only or use SKYDARK/DARK (whichever is closest)
- Type: bool

WAVENIGHT_PLT_BINL
- Description: wave night plot hc bin lower bound in multiples of rms
- Type: float
- Minimum: 0

WAVENIGHT_PLT_BINU
- Description: wave night plot hc bin upper bound in multiples of rms
- Type: float
- Minimum: 0

WAVENIGHT_PLT_NBINS
- Description: wave night plot hist number of bins
- Type: int
- Minimum: 0

5.2. Glossary

WAVEREF_EDGE_WMAX
- Description: minimum distance to the edge of the array to consider a line
- Type: int
- Minimum: 0

WAVEREF_FITDEG
- Description: get the degree to fix master wavelength to in hc mode
- Type: int
- Minimum: 1

WAVEREF_FP_NHIGH
- Description: define the highest N for fp peaks
- Type: int
- Minimum: 1

WAVEREF_FP_NLOW
- Description: define the lowest N for fp peaks
- Type: int
- Minimum: 0

WAVEREF_FP_POLYINV
- Description: define the number of iterations required to do the Fp polynomial inversion
- Type: int
- Minimum: 1

WAVEREF_HC_BOXSIZE
- Description: value in pixel (+/-) for the box size around each HC line to perform fit
- Type: int
- Minimum: 0

WAVEREF_HC_FIBTYPES
- Type: str

WAVEREF_NSIG_MIN
- Description: min SNR to consider the line
- Type: int
- Minimum: 0

WAVE_ALWAYS_EXTRACT
- Description: define whether to always extract HC/FP files in the wave code (even if they
- Type: bool

WAVE_CCF_DETNOISE
- Description: The detector noise to use for the FP CCF
- Type: float
- Minimum: 0.0

WAVE_CCF_MASK
- Description: The filename of the CCF Mask to use for the FP CCF
- Type: str

WAVE_CCF_MASK_FMT
- Description: Define the CCF mask format (must be an astropy.table format)
- Type: str

WAVE_CCF_MASK_MIN_WEIGHT
- Description: Define the weight of the CCF mask (if 1 force all weights equal)
- Type: float

WAVE_CCF_MASK_NORMALIZATION
- Description: Define the default CCF MASK normalisation mode for FP CCF options are: None for no normalization all for normalization across all ordersorder for normalization for each order
- Type: str

WAVE_CCF_MASK_PATH
- Description: Define the ccf mask path the FP CCF
- Type: str

WAVE_CCF_MASK_UNITS
- Description: Define the wavelength units for the mask for the FP CCF
- Type: str

WAVE_CCF_MASK_WIDTH
- Description: Define the width of the template line (if 0 use natural)

- Type: float

WAVE_CCF_NOISE_BOXSIZE
- Description: The size around a saturated pixel to flag as unusable for wave dv rms calculation
- Type: int
- Minimum: 0.0

WAVE_CCF_NOISE_SIGDET
- Description: The value of the noise for wave dv rms calculation snr = flux/sqrt(flux + noise^2)
- Type: float
- Minimum: 0.0

WAVE_CCF_NOISE_THRES
- Description: The maximum flux for a good (unsaturated) pixel for wave dv rms calculation
- Type: float
- Minimum: 0.0

WAVE_CCF_N_ORD_MAX
- Description: Define the number of orders (from zero to ccf_num_orders_max) to use to calculate the FP CCF
- Type: int
- Minimum: 1

WAVE_CCF_RV_THRES_QC
- Description: define the quality control threshold from RV of CCF FP between master fiber and other fibers, above this limit fails QC [m/s]
- Type: float
- Minimum: 0

WAVE_CCF_SMART_MASK_MAXLAM
- Description: define the maximum wavelength for the smart mask [nm]
- Type: float
- Minimum: 0

WAVE_CCF_SMART_MASK_MINLAM
- Description: define the minimum wavelength for the smart mask [nm]
- Type: float
- Minimum: 0

WAVE_CCF_SMART_MASK_TRIAL_NMAX
- Description: define the converges parameter for dwave in smart mask generation
- Type: float
- Minimum: 0

WAVE_CCF_SMART_MASK_TRIAL_NMIN
- Description: define a trial minimum FP N value (should be lower than true minimum FP N value)
- Type: int
- Minimum: 0

WAVE_CCF_SMART_MASK_WIDTH
- Description: define the width of the lines in the smart mask [km/s]
- Type: float
- Minimum: 0

WAVE_CCF_STEP
- Description: The CCF step size to use for the FP CCF
- Type: float
- Minimum: 0.0

WAVE_CCF_TARGET_RV
- Description: The target RV (CCF center) to use for the FP CCF
- Type: float
- Minimum: 0.0

WAVE_CCF_UPDATE_MASK
- Description: Define whether to regenerate the fp mask (WAVE_CCF_MASK) when we update the cavity width in the master wave solution recipe
- Type: bool

WAVE_CCF_WIDTH
- Description: The CCF width size to use for the FP CCF
- Type: float

- Minimum: 0.0

WAVE_EXTRACT_TYPE
- Description: define the type of file to use for wave solution (currently allowed are "E2DS" or "E2DSFF"
- Type: str

WAVE_FIBER_COMP_PLOT_ORD
- Description: define the wave fiber comparison plot order number
- Type: int
- Minimum: 0

WAVE_FIT_DEGREE
- Description: define the fit degree for the wavelength solution
- Type: int

WAVE_FP_BLAZE_THRES
- Description: Minimum blaze threshold to keep FP peaks
- Type: float
- Minimum: 0.0

WAVE_FP_CAVFIT_DEG
- Description: Define the polynomial fit degree between FP line numbers and the measured cavity width for each line
- Type: int
- Minimum: 0

WAVE_FP_CAVFIT_MODE
- Description: Select the FP cavity fitting (WAVE_MODE_FP = 1 only) Should be one of the following: 0 - derive using the 1/m vs d fit from HC lines 1 - derive using the ll vs d fit from HC lines
- Type: int

WAVE_FP_DOPD0
- Description: Define the initial value of FP effective cavity width 2xd in nm
- Type: float
- Minimum: 0.0

WAVE_FP_DPRLIST
- Description: define the dprtype for generating FPLINES (string list)
- Type: str

WAVE_FP_DV_MAX
- Description: Maximum DV to keep HC lines in combined (WAVE_NEW) solution
- Type: float
- Minimum: 0.0

WAVE_FP_ERRX_MIN
- Description: Define the minimum instrumental error
- Type: float
- Minimum: 0.0

WAVE_FP_LARGE_JUMP
- Description: Define the FP jump size that is too large
- Type: float
- Minimum: 0

WAVE_FP_LLDIF_MAX
- Description: Maximum FP peaks wavelength separation fraction diff. from median
- Type: float
- Minimum: 0.0

WAVE_FP_LLDIF_MIN
- Description: Minimum FP peaks wavelength separation fraction diff. from median
- Type: float
- Minimum: 0.0

WAVE_FP_LLFIT_MODE
- Description: Select the FP wavelength fitting (WAVE_MODE_FP = 1 only) Should be one of the following: 0 - use fit_1d_solution function 1 - fit with sigma-clipping and mod 1 pixel correction
- Type: int

WAVE_FP_LL_DEGR_FIT
- Description: Define the wavelength fit polynomial order
- Type: int

- Minimum: 0

WAVE_FP_LL_OFFSET
- Description: Maximum fract. wavelength offset between cross-matched FP peaks
- Type: float
- Minimum: 0.0

WAVE_FP_MAX_LLFIT_RMS
- Description: Define the max rms for the wavelength sigma-clip fit
- Type: float
- Minimum: 0

WAVE_FP_NORM_PERCENTILE
- Description: define the percentile to normalize the spectrum to (per order) used to determine FP peaks (peaks must be above a normalised limit defined in WAVE_FP_PEAK_LIM
- Type: float
- Minimum: 0.0

WAVE_FP_P2P_WIDTH_CUT
- Description: Define peak to peak width that is too large (removed from FP peaks)
- Type: float
- Minimum: 0.0

WAVE_FP_PEAK_LIM
- Description: define the normalised limit below which FP peaks are not used
- Type: float
- Minimum: 0.0

WAVE_FP_PLOT_MULTI_INIT
- Description: First order for multi-order wave fp plot
- Type: int
- Minimum: 0

WAVE_FP_PLOT_MULTI_NBO
- Description: Number of orders in multi-order wave fp plot
- Type: int
- Minimum: 1

WAVE_FP_SIGCLIP
- Description: Sigma-clip value for sigclip_polyfit
- Type: float
- Minimum: 0.0

WAVE_FP_UPDATE_CAVITY
- Description: Decide whether to refit the cavity width (will update if files do not exist)
- Type: bool

WAVE_FP_WEIGHT_THRES
- Description: Define the weight threshold (small number) below which we do not keep fp lines
- Type: float
- Minimum: 0.0

WAVE_FP_XDIF_MAX
- Description: Maximum FP peaks pixel separation fraction diff. from median
- Type: float
- Minimum: 0.0

WAVE_FP_XDIF_MIN
- Description: Minimum FP peaks pixel separation fraction diff. from median
- Type: float
- Minimum: 0.0

WAVE_HC_FITBOX_EWMAX
- Description:
- Type: float
- Minimum: 0.0

WAVE_HC_FITBOX_EWMIN
- Description: the e-width of the line expressed in pixels.
- Type: float
- Minimum: 0.0

WAVE_HC_FITBOX_GFIT_DEG

- Description: the fit degree for the wave hc gaussian peaks fit
- Type: int

WAVE_HC_FITBOX_RMS_DEVMAX
- Description:
- Type: float
- Minimum: 0.0

WAVE_HC_FITBOX_RMS_DEVMIN
- Description: the RMS of line-fitted line must be between DEVMIN and DEVMAX of the peak value must be SNR>5 (or 1/SNR<0.2)
- Type: float
- Minimum: 0.0

WAVE_HC_FITBOX_SIGMA
- Description: number of sigma above local RMS for a line to be flagged as such
- Type: float

WAVE_HC_FITBOX_SIZE
- Description: width of the box for fitting HC lines. Lines will be fitted from -W to +W, so a 2*W+1 window
- Type: int

WAVE_HC_MAX_DV_CAT_GUESS
- Description: Maximum distance between catalog line and init guess line to accept line in m/s
- Type: int
- Minimum: 0.0

WAVE_HC_NITER_FIT_TRIPLET
- Description: Number of times to run the fit triplet algorithm
- Type: int
- Minimum: 1

WAVE_HC_NMAX_BRIGHT
- Description: number of bright lines kept per order avoid >25 as it takes super long avoid <12 as some orders are ill-defined and we need >10 valid lines anyway 20 is a good number, and we see no reason to change it
- Type: int
- Minimum: 10
- Maximum: 30

WAVE_HC_QC_SIGMA_MAX
- Description: quality control criteria if sigma greater than this many sigma fails
- Type: float
- Minimum: 0.0

WAVE_HC_RESMAP_DV_SPAN
- Description: Defines the dv span for PLOT_WAVE_HC_RESMAP debug plot, should be a string list containing a min and max dv value
- Type: str

WAVE_HC_RESMAP_SIZE
- Description: Define the resolution and line profile map size (y-axis by x-axis)
- Type: str

WAVE_HC_RESMAP_XLIM
- Description: Defines the x limits for PLOT_WAVE_HC_RESMAP debug plot, should be a string list containing a min and max x value
- Type: str

WAVE_HC_RESMAP_YLIM
- Description: Defines the y limits for PLOT_WAVE_HC_RESMAP debug plot, should be a string list containing a min and max y value
- Type: str

WAVE_HC_RES_MAXDEV_THRES
- Description: Define the maximum allowed deviation in the RMS line spread function
- Type: float

WAVE_HC_TFIT_CUT_THRES
- Description: Cut threshold for the triplet line fit [in km/s]
- Type: float

• Minimum: 0.0

WAVE_HC_TFIT_DEG
  • Description: The fit degree between triplets
  • Type: int
  • Minimum: 0

WAVE_HC_TFIT_DVCUT_ALL
  • Description:
  • Type: float
  • Minimum: 0.0

WAVE_HC_TFIT_DVCUT_ORDER
  • Description: Define the distance in m/s away from the center of dv hist points outside will be rejected [m/s]
  • Type: float
  • Minimum: 0.0

WAVE_HC_TFIT_MINNUM_LINES
  • Description: Minimum number of lines required per order
  • Type: int
  • Minimum: 0

WAVE_HC_TFIT_MINTOT_LINES
  • Description: Minimum total number of lines required
  • Type: int
  • Minimum: 0

WAVE_HC_TFIT_ORDER_FIT_CONT
  • Description: this sets the order of the polynomial used to ensure continuity in the xpix vs wave solutions by setting the first term = 12, we force that the zeroth element of the xpix of the wavelegnth grid is fitted with a 12th order polynomial as a function of order number (format = string list separated by commas
  • Type: str

WAVE_HC_TFIT_SIGCLIP_NUM
  • Description: Number of times to loop through the sigma clip for triplet fit
  • Type: int
  • Minimum: 1

WAVE_HC_TFIT_SIGCLIP_THRES
  • Description: Sigma clip threshold for triplet fit
  • Type: float
  • Minimum: 0.0

WAVE_LINELIST_AMPCOL
  • Description:
  • Type: str

WAVE_LINELIST_COLS
  • Description: Define the line list file column names (must be separated by commas and must be equal to the number of columns in file)
  • Type: str

WAVE_LINELIST_FILE
  • Description: Define the line list file (located in the DRS_WAVE_DATA directory)
  • Type: str

WAVE_LINELIST_FMT
  • Type: str

WAVE_LINELIST_START
  • Description: Define the line list file row the data starts
  • Type: int

WAVE_LINELIST_WAVECOL
  • Description: Define the line list file wavelength column and amplitude column Must be in WAVE_LINELIST_COLS
  • Type: str

WAVE_LITTROW_CUT_STEP_1
  • Description: Define the littrow cut steps for the HC wave solution
  • Type: int

WAVE_LITTROW_CUT_STEP_2
- Description: Define the littrow cut steps for the FP wave solution
- Type: int

WAVE_LITTROW_EXT_ORDER_FIT_DEG
- Description: Define the order fit for the Littrow solution (fit along the orders) TODO needs to be the same as ic_ll_degr_fit
- Type: int

WAVE_LITTROW_FIG_DEG_1
- Description: Define the fit polynomial order for the Littrow fit (fit across the orders) for the HC wave solution
- Type: int

WAVE_LITTROW_FIG_DEG_2
- Description: Define the fit polynomial order for the Littrow fit (fit across the orders) for the FP wave solution
- Type: int

WAVE_LITTROW_ORDER_FINAL_1
- Description: Define the order to end the Littrow fit at for the HC wave solution
- Type: int

WAVE_LITTROW_ORDER_FINAL_2
- Description: Define the order to end the Littrow fit at for the FP wave solution
- Type: int

WAVE_LITTROW_ORDER_INIT_1
- Description: Define the order to start the Littrow fit from for the HC wave solution
- Type: int

WAVE_LITTROW_ORDER_INIT_2
- Description: Define the order to start the Littrow fit from for the FP wave solution
- Type: int

WAVE_LITTROW_QC_DEV_MAX
- Description: Maximum littrow Deviation from wave solution (at x cut points)
- Type: float

WAVE_LITTROW_QC_RMS_MAX
- Description: Maximum littrow RMS value
- Type: float

WAVE_LITTROW_REMOVE_ORDERS
- Description: Define orders to ignore in Littrow fit (should be a string list separated by commas
- Type: str

WAVE_MASTER_FIBER
- Description: Define wave master fiber (controller fiber)
- Type: str

WAVE_MODE_FP
- Description: Define the mode to calculate the fp wave solution
- Type: int

WAVE_MODE_HC
- Description: Define the mode to calculate the hc wave solution
- Type: int

WAVE_NIGHT_DCAVITY
- Description: starting point for the cavity corrections
- Type: float
- Minimum: 0.0

WAVE_NIGHT_HC_SIGCLIP
- Description: define the sigma clip value to remove bad hc lines
- Type: float
- Minimum: 0.0

WAVE_NIGHT_MED_ABS_DEV
- Description: median absolute deviation cut off
- Type: float
- Minimum: 0.0

WAVE_NIGHT_NITERATIONS1

- Description: number of iterations for hc convergence
- Type: int
- Minimum: 1

WAVE_NIGHT_NITERATIONS2
- Description: number of iterations for fp convergence
- Type: int
- Minimum: 1

WAVE_NIGHT_NSIG_FIT_CUT
- Description: sigma clipping for the fit
- Type: float
- Minimum: 1

WAVE_N_ORD_FINAL
- Description: Defines order to which the solution is calculated
- Type: int

WAVE_N_ORD_START
- Description: Defines order from which the solution is calculated
- Type: int

WAVE_PIXEL_SHIFT_INTER
- Description: Define intercept and slope for a pixel shift
- Type: float

WAVE_PIXEL_SHIFT_SLOPE
- Description:
- Type: float

WAVE_T_ORDER_START
- Description: Defines echelle of first extracted order
- Type: int

5.2.5 Keywords (Autogen)

KW_ACQTIME
- Description: define the HEADER key for acquisition time Note must set the date format in KW_ACQTIME_FMT

KW_AIRMASS
- Description: define the airmass HEADER key
- Type: float

KW_BBAD
- Description: fraction of bad pixels with all criteria
- Type: float

KW_BBFLAT
- Description: fraction of bad pixels from flat
- Type: float

KW_BERV
- Description: the BERV calculated with KW_BERVSOURCE
- Type: float

KW_BERVALT
- Description: the observatory altitude used to calculate the BERV
- Type: float

KW_BERVDEC
- Description: the Declination used to calculate the BERV
- Type: float

KW_BERVEPOCH
- Description: the epoch (jd) used to calculate the BERV
- Type: float

KW_BERVGAIA_ID
- Description: the Gaia ID used to identify KW_BERV_POS_SOURCE for BERV calculation
- Type: str

KW_BERVLAT

- Description: the observatory latitude used to calculate the BERV
- Type: float

KW_BERVLONG
- Description: the observatory longitude used to calculate the BERV
- Type: float

KW_BERVMAX
- Description: the maximum BERV found across 1 year (with KW_BERVSOURCE)
- Type: float

KW_BERVMAX_EST
- Description: the maximum BERV found across 1 year (calculated with estimate)
- Type: float

KW_BERVOBJNAME
- Description: the OBJNAME used to identify KW_BERV_POS_SOURCE for BERV calculation
- Type: str

KW_BERVPLX
- Description: the parallax [mas] used to calculate the BERV
- Type: float

KW_BERVPMDE
- Description: the pmde [mas/yr] used to calculate the BERV
- Type: float

KW_BERVPMRA
- Description: the pmra [mas/yr] used to calculate the BERV
- Type: float

KW_BERVRA
- Description: the Right Ascension used to calculate the BERV
- Type: float

KW_BERVRV
- Description: the rv [km/s] used to calculate the BERV
- Type: float

KW_BERVSOURCE
- Description: the source of the calculated BERV parameters
- Type: str

KW_BERV_EST
- Description: the BERV calculated with the estimate
- Type: float

KW_BERV_GAIA_BPMAG
- Description: the Gaia BP mag (if present) for the gaia query
- Type: float

KW_BERV_GAIA_GMAG
- Description: the Gaia G mag (if present) for the gaia query
- Type: float

KW_BERV_GAIA_MAGLIM
- Description: the Gaia G mag limit used for the gaia query
- Type: float

KW_BERV_GAIA_PLXLIM
- Description: the Gaia parallax limit used the gaia query
- Type: float

KW_BERV_GAIA_RPMAG
- Description: the Gaia RP mag (if present) for the gaia query
- Type: float

KW_BERV_OBSTIME
- Description: the actual jd time used to calculate the BERV
- Type: float

KW_BERV_OBSTIME_METHOD
- Description: the method used to obtain the berv obs time
- Type: str

KW_BERV_POS_SOURCE
- Description: the source of the BERV star parameters (header or gaia)

- Type: str

KW_BHOT
- Description: fraction of hot pixels
- Type: float

KW_BJD
- Description: the Barycenter Julian date calculate with KW_BERVSOURCE
- Type: float

KW_BJD_EST
- Description: the Barycenter Julian date calculated with the estimate
- Type: float

KW_BLAZE_BPRCNTL
- Description: The blaze sinc bad percentile value used
- Type: float

KW_BLAZE_CUT
- Description: the blaze cut used
- Type: float

KW_BLAZE_DEG
- Description: the blaze degree used (to fit)
- Type: int

KW_BLAZE_NITER
- Description: The number of iterations used in the blaze sinc fit
- Type: int

KW_BLAZE_SCUT
- Description: The blaze sinc cut threshold used
- Type: float

KW_BLAZE_SIGFIG
- Description: The blaze sinc sigma clip (rejection threshold) used
- Type: float

KW_BLAZE_WID
- Description: the blaze with used
- Type: float

KW_BNDARK
- Description: fraction of non-finite pixels in dark
- Type: float

KW_BNFLAT
- Description: fraction of non-finite pixels in flat
- Type: float

KW_BNILUM
- Description: fraction of un-illuminated pixels (from engineering flat)
- Type: float

KW_BTOT
- Description: fraction of total bad pixels
- Type: float

KW_CALIBWH
- Description: define the calibration wheel position
- Type: str

KW_CASS_TEMP
- Description: define the cassegrain temperature HEADER key
- Type: float

KW_CCAS
- Description: define the science fiber type HEADER key
- Type: str

KW_CCF_BOXSIZE
- Description: the size in pixels around saturated pixels to regard as bad pixels used in the ccf photon noise calculation
- Type: int

KW_CCF_DVRMS_CC
- Description: the dev rms calculated during the CCF [m/s]

- Type: float

KW_CCF_DVRMS_SP
- Description: the dv rms calculated for spectrum [m/s]
- Type: float

KW_CCF_MASK
- Description: the ccf mask file used
- Type: str

KW_CCF_MASK_MIN
- Description: the minimum weight of a line in the CCF MASK used
- Type: float

KW_CCF_MASK_UNITS
- Description: the wavelength units used in the CCF Mask for line centers
- Type: str

KW_CCF_MASK_WID
- Description: the mask width of lines in the CCF Mask used
- Type: float

KW_CCF_MAXFLUX
- Description: the upper limit for good pixels (above this are bad) used in the ccf photon noise calculation
- Type: float

KW_CCF_MEAN_CONSTRAST
- Description: the mean constrast (depth of fit ccf) from the mean ccf
- Type: float

KW_CCF_MEAN_FWHM
- Description: the mean fwhm from the mean ccf
- Type: float

KW_CCF_MEAN_RV
- Description: The mean rv calculated from the mean ccf
- Type: float

KW_CCF_NMAX
- Description: The last order used in the mean CCF (from 0 to nmax are used)
- Type: int

KW_CCF_RV_CORR
- Description: the corrected radial velocity of the object (taking into account the FP RVs)
- Type: float

KW_CCF_RV_DRIFT
- Description: The radial velocity drift between wave sol FP and simultaneous FP (if present) if simulataneous FP not present this is just the wave solution FP CCF value
- Type: float

KW_CCF_RV_OBJ
- Description: The radial velocity measured from the object CCF against the CCF MASK
- Type: float

KW_CCF_RV_SIMU_FP
- Description: The radial velocity measured from a simultaneous FP CCF (FP in reference channel)
- Type: float

KW_CCF_RV_TIMEDIFF
- Description: the time diff (in days) between wave file and file (fiber specific)
- Type: str

KW_CCF_RV_WAVEFILE
- Description: the wave file used for the rv (fiber specific)
- Type: str

KW_CCF_RV_WAVESRCE
- Description: the wave file source used for the rv reference fiber
- Type: str

KW_CCF_RV_WAVETIME
- Description: the wave file time used for the rv [mjd] (fiber specific)
- Type: str

KW_CCF_RV_WAVE_FP
- Description: The radial velocity measured from the wave solution FP CCF

- Type: float

KW_CCF_SIGDET

- Description: the read noise used in the photon noise uncertainty calculation in the ccf
- Type: float

KW_CCF_STEP

- Description: the ccf step used (in km/s)
- Type: float

KW_CCF_TARGET_RV

- Description: the central rv used (in km/s) rv elements run from rv +/- width in the ccf
- Type: float

KW_CCF_TOT_LINES

- Description: the total number of mask lines used in all ccfs
- Type: int

KW_CCF_WIDTH

- Description: the width of the ccf used (in km/s)
- Type: float

KW_CDBBACK

- Description: background calibration file used
- Type: str

KW_CDBBAD

- Description: bad pixel calibration file used
- Type: str

KW_CDBBLAZE

- Description: blaze calibration file used
- Type: str

KW_CDBDARK

- Description: dark calibration file used
- Type: str

KW_CDBFLAT

- Description: flat calibration file used
- Type: str

KW_CDBLOCO

- Description: localisation calibration file used
- Type: str

KW_CDBORDP

- Description: order profile calibration file used
- Type: str

KW_CDBSHAPEDX

- Description: shape dx calibration file used
- Type: str

KW_CDBSHAPEDY

- Description: shape dy calibration file used
- Type: str

KW_CDBSHAPEL

- Description: shape local calibration file used
- Type: str

KW_CDBTHERMAL

- Description: thermal calibration file used
- Type: str

KW_CDBWAVE

- Description: wave solution calibration file used
- Type: str

KW_CDEN

- Description: define the density HEADER key
- Type: str

KW_CMMTSEQ

- Description: define polarisation HEADER key
- Type: str

KW_CMPLTEXP
- Description: define the exposure number within sequence HEADER key
- Type: int

KW_COSMIC
- Description: whether cosmics where rejected
- Type: int

KW_COSMIC_CUT
- Description: the cosmic cut criteria
- Type: float

KW_COSMIC_THRES
- Description: the cosmic threshold used
- Type: float

KW_CREF
- Description: define the reference fiber type HEADER key
- Type: str

KW_C_CVRTE
- Description: whether the calibratoins have been converted to electrons
- Type: str

KW_C_FLIP
- Description: whether the calibrations have been flipped
- Type: str

KW_C_FTYPE
- Description: whether the calibrations have an ftype
- Type: str

KW_C_RESIZE
- Description: whether the calibrations have been resized
- Type: str

KW_DARK_B_DEAD
- Description: The fraction of dead pixels in the blue part of the dark (in %)
- Type: float

KW_DARK_B_MED
- Description: The median dark level in the blue part of the dark in ADU/s
- Type: float

KW_DARK_CUT
- Description: The threshold of the dark level to retain in ADU
- Type: float

KW_DARK_DEAD
- Description: The fraction of dead pixels in the dark (in %)
- Type: float

KW_DARK_MED
- Description: The median dark level in ADU/s
- Type: float

KW_DARK_R_DEAD
- Description: The fraction of dead pixels in the red part of the dark (in %)
- Type: float

KW_DARK_R_MED
- Description: The median dark level in the red part of the dark in ADU/s
- Type: float

KW_DATE_OBS
- Description: define the observation date HEADER key
- Type: float

KW_DBERV
- Description: the derivative of the BERV (BERV at time + 1s - BERV)
- Type: float

KW_DBERV_EST
- Description: the derivative of the BERV (BERV at time + 1s - BERV) calculated with estimate
- Type: float

KW_DPRTYPE

- Description: Define the key to get the data fits file type
- Type: str

KW_DRS_BPMAG
- Description: the Gaia BP magnitude to be used by the drs (after preprocessing)
- Type: float

KW_DRS_BPMAG_S
- Description: the source of the bpmag used by the drs (after preprocessing)
- Type: str

KW_DRS_DATE
- Description: DRS version date keyword
- Type: str

KW_DRS_DATE_NOW
- Description: Processed date keyword
- Type: str

KW_DRS_DEC
- Description: the declination to be used by the drs (after preprocessing)
- Type: float

KW_DRS_DEC_S
- Description: the source of the dec to be used by the drs (after preprocessing)
- Type: str

KW_DRS_EPOCH
- Description: the epoch to be used by the drs (after preprocessing)
- Type: float

KW_DRS_EPOCH_S
- Description: the source of the epoch used by the drs (after preprocessing)
- Type: str

KW_DRS_GAIAID
- Description: the gaia id to be used by the drs (after preprocessing)
- Type: str

KW_DRS_GAIAID_S
- Description: the source of the gaia id to be used by the drs (after preprocessing)
- Type: str

KW_DRS_GMAG
- Description: the Gaia G magnitude to be used by the drs (after preprocessing)
- Type: float

KW_DRS_GMAG_S
- Description: the source of the gmag used by the drs (after preprocessing)
- Type: str

KW_DRS_OBJNAME
- Description: the object name to be used by the drs (after preprocessing)
- Type: str

KW_DRS_OBJNAME_S
- Description: the source of the object name used by the drs
- Type: str

KW_DRS_PLX
- Description: the parallax to be used by the drs (after preprocessing)
- Type: float

KW_DRS_PLX_S
- Description: the source of the parallax used by the drs (after preprocessing)
- Type: str

KW_DRS_PMDE
- Description: the proper motion in dec to be used by the drs (after preprocessing)
- Type: float

KW_DRS_PMDE_S
- Description: the source of the pmde used by the drs (after preprocessing)
- Type: str

KW_DRS_PMRA
- Description: the proper motion in ra to be used by the drs (after preprocessing)

- Type: float

KW_DRS_PMRA_S
- Description: the source of the pmra used by the drs (afer prepreocessing)
- Type: str

KW_DRS_QC
- Description: the drs qc
- Type: str

KW_DRS_QC_LOGIC
- Description: the logic of the quality control parameter
- Type: str

KW_DRS_QC_NAME
- Description: the name of the quality control parameter
- Type: str

KW_DRS_QC_PASS
- Description: whether this quality control parameter passed
- Type: str

KW_DRS_QC_VAL
- Description: the value of the qc
- Type: str

KW_DRS_RA
- Description: the right ascension to be used by the drs (after preprocessing)
- Type: float

KW_DRS_RA_S
- Description: the source of the ra to be used by the drs (after preprocessing)
- Type: str

KW_DRS_RPMAG
- Description: the Gaia RP magnitude to be used by the drs (after preprocessing)
- Type: float

KW_DRS_RPMAG_S
- Description: the source of the rpmag used by the drs (after preprocessing)
- Type: str

KW_DRS_RV
- Description: the radial velocity to be used by the drs (after preprocessing)
- Type: float

KW_DRS_RV_S
- Description: the source of the radial velocity used by the drs (after preprocessing)
- Type: str

KW_DRS_TEFF
- Description: the effective temperature to be used by the drs (after preprocessing)
- Type: float

KW_DRS_TEFF_S
- Description: the source of teff used by the drs (after preprocessing)
- Type: str

KW_EXPREQ
- Description: define the required exposure time HEADER key (used to get value only)
- Type: float

KW_EXPTIME
- Description: define the exposure time HEADER key (used to get value only)
- Type: float

KW_EXT_END
- Description: the end order for extraction
- Type: int

KW_EXT_RANGE1
- Description: the upper bound for extraction of order
- Type: int

KW_EXT_RANGE2
- Description: the lower bound for extraction of order
- Type: int

KW_EXT_SNR
- Description: SNR calculated in extraction process (per order)
- Type: float

KW_EXT_START
- Description: the start order for extraction
- Type: int

KW_EXT_TYPE
- Description: The extraction type (only added for E2DS files in extraction)
- Type: str

KW_FIBER
- Description: the fiber name
- Type: str

KW_FRMTIME
- Description: define the frame time HEADER key
- Type: float

KW_FTELLU_ABSO_PREFIX
- Description: The prefix for molecular
- Type: float

KW_FTELLU_ABSO_SRC
- Description: The source of the loaded absorption (npy file or trans_file from database)
- Type: str

KW_FTELLU_ADD_DPC
- Description: whether we added first derivative to principal components
- Type: bool

KW_FTELLU_AMP_PC
- Description: Telluric principle component amplitudes (for use with 1D list)
- Type: float

KW_FTELLU_DVTELL1
- Description: Telluric principle component first derivative
- Type: float

KW_FTELLU_DVTELL2
- Description: Telluric principle component second derivative
- Type: float

KW_FTELLU_FIT_DPC
- Description: whether we fitted the derivatives of the principal components
- Type: bool

KW_FTELLU_FIT_ITERS
- Description: the number of iterations used to fit
- Type: int

KW_FTELLU_FIT_KEEP_NUM
- Description: Number of good pixels requirement used
- Type: int

KW_FTELLU_FIT_MIN_TRANS
- Description: The minimum transmission used
- Type: float

KW_FTELLU_IM_PX_SIZE
- Description: The image pixel size used
- Type: float

KW_FTELLU_KERN_VSINI
- Description: The smoothing kernel size [km/s] used
- Type: float

KW_FTELLU_LAMBDA_MAX
- Description: The maximum wavelength used
- Type: float

KW_FTELLU_LAMBDA_MIN
- Description: The minimum wavelength used
- Type: float

KW_FTELLU_NPC

- Description: The number of principle components used
- Type: int

KW_FTELLU_NTRANS
- Description: The number of trans files used in pc fit (closest in expo h20/others)
- Type: int

KW_FTELLU_RECON_LIM
- Description: the log limit in minimum absorption used
- Type: float

KW_FTELLU_TAU_H2O
- Description: Tau Water depth calculated in fit tellu
- Type: float

KW_FTELLU_TAU_REST
- Description: Tau Rest depth calculated in fit tellu
- Type: float

KW_FTELLU_TEMPHASH
- Description: the hash for the template generation (unique)
- Type: str

KW_FTELLU_TEMPLATE
- Description: the template that was used (or None if not used)
- Type: str

KW_FTELLU_TEMPNUM
- Description: the number of template files used
- Type: int

KW_FTELLU_TEMPTIME
- Description: the hash for the template generation (unique)
- Type: str

KW_GAIA_ID
- Description: define the gaia id
- Type: str

KW_GAIN
- Description: define the gain HEADER key (used to get value only)
- Type: float

KW_HUMIDITY
- Description: define the humidity HEADER key
- Type: float

KW_IDENTIFIER
- Description: Define the header key that uniquely identifies the file (i.e. an odometer code)

KW_INFILE1
- Description: input files
- Type: str

KW_INFILE2
- Description: input files
- Type: str

KW_INFILE3
- Description: input files
- Type: str

KW_INIT_WAVE
- Description: the initial wave file used for wave solution
- Type: str

KW_INPUTRV
- Description: define the rv HEADER key
- Type: float

KW_LEAK_BADR_U
- Description: Define the bad ratio offset limit used for correcting leakage
- Type: float

KW_LEAK_BP_U
- Description: Define the background percentile used for correcting leakage
- Type: float

KW_LEAK_CORR
- Description: Define whether leak correction has been done
- Type: int

KW_LEAK_KERSIZE
- Description: Define the kernel size used for correcting leakage master
- Type: float

KW_LEAK_LP_U
- Description: Define the lower bound percentile used for correcting leakage
- Type: float

KW_LEAK_NP_U
- Description: Define the normalisation percentile used for correcting leakage
- Type: float

KW_LEAK_UP_U
- Description: Define the upper bound percentile used for correcting leakage
- Type: float

KW_LEAK_WSMOOTH
- Description: Define the e-width smoothing used for correcting leakage master
- Type: float

KW_LOC_BCKGRD
- Description: Mean background (as percentage)
- Type: float

KW_LOC_CTR_COEFF
- Description: Coeff center order
- Type: int

KW_LOC_DEG_C
- Description: fit degree for order centers
- Type: int

KW_LOC_DEG_W
- Description: fit degree for order widths
- Type: int

KW_LOC_MAXFLX
- Description: Maximum flux in order
- Type: float

KW_LOC_NBO
- Description: Number of orders located
- Type: int

KW_LOC_RMS_CTR
- Description: Maximum rms allowed for location fit
- Type: float

KW_LOC_RMS_WID
- Description: Maximum rms allowed for width fit (formally KW_LOC_rms_fwhm)
- Type: float

KW_LOC_SMAXPTS_CTR
- Description: Maximum number of removed points allowed for location fit
- Type: int

KW_LOC_SMAXPTS_WID
- Description: Maximum number of removed points allowed for width fit
- Type: int

KW_LOC_WID_COEFF
- Description: Coeff width order
- Type: int

KW_MID_OBSTIME_METHOD
- Description: Define the method by which the MJD was calculated
- Type: str

KW_MID_OBS_TIME
- Description: Define the mid exposure time

KW_MJDEND
- Description: define the MJ end date HEADER key

KW_MKTELL_AIRMASS
- Description: The recovered airmass value calculated in mktellu calculation
- Type: float

KW_MKTELL_BLAZE_CUT
- Description: The blaze normalization cut used for mktellu calculation
- Type: float

KW_MKTELL_BLAZE_PRCT
- Description: The blaze percentile used for mktellu calculation
- Type: float

KW_MKTELL_DEF_CONV_WID
- Description: The default convolution width in pix used for mktellu calculation
- Type: int

KW_MKTELL_TEMPHASH
- Description: the hash for the template generation (unique)
- Type: str

KW_MKTELL_TEMPNUM
- Description: the number of template files used
- Type: str

KW_MKTELL_TEMPTIME
- Description: the time the template was generated
- Type: str

KW_MKTELL_TEMP_FILE
- Description: The template file used for mktellu calculation
- Type: str

KW_MKTELL_TEMP_MEDFILT
- Description: The median filter width used for mktellu calculation
- Type: float

KW_MKTELL_THRES_TFIT
- Description: The min transmission requirement used for mktellu/ftellu
- Type: float

KW_MKTELL_TRANS_FIT_UPPER_BAD
- Description: The upper limit for trans fit used in mktellu/ftellu
- Type: float

KW_MKTELL_WATER
- Description: The recovered water optical depth calculated in mktellu calculation
- Type: float

KW_MKTEMP_BERV_COV
- Description: the berv coverage calculated for this template calculation
- Type: float

KW_MKTEMP_BERV_COV_MIN
- Description: the minimum berv coverage allowed for this template calculation
- Type: float

KW_MKTEMP_BERV_COV_RES
- Description: the resolution used for this template calculation
- Type: float

KW_MKTEMP_BERV_COV_SNR
- Description: the core snr used for this template calculation
- Type: float

KW_MKTEMP_HASH
- Description: store a unique hash for this template (based on file name etc)
- Type: str

KW_MKTEMP_NFILES
- Description: store the number of files used to create template
- Type: int

KW_MKTEMP_SNR_ORDER
- Description: the snr order used for quality control cut in make template calculation
- Type: int

KW_MKTEMP_SNR_THRES

- Description: the snr threshold used for quality control cut in make template calculation
- Type: float

KW_MKTEMP_TIME
- Description: store time template was created
- Type: float

KW_NEXP
- Description: define the total number of exposures HEADER key
- Type: int

KW_OBJDEC
- Description: define the observation dec HEADER key
- Type: float

KW_OBJDECPM
- Description: define the observation proper motion in dec HEADER key
- Type: float

KW_OBJECTNAME
- Description: define the raw observation name
- Type: str

KW_OBJEQUIN
- Description: define the observation equinox HEADER key
- Type: float

KW_OBJNAME
- Description: define the observation name
- Type: str

KW_OBJRA
- Description: define the observation ra HEADER key
- Type: float

KW_OBJRAPM
- Description: define the observation proper motion in ra HEADER key
- Type: float

KW_OBJ_TEMP
- Description: define the object temperature HEADER key
- Type: float

KW_OBSTYPE
- Description: define the observation type HEADER key
- Type: str

KW_OUTPUT
- Description: the output key for drs outputs
- Type: str

KW_PID
- Description: DRS process ID
- Type: str

KW_PI_NAME
- Description: define the pi name HEADER key
- Type: str

KW_PLX
- Description: define the parallax HEADER key
- Type: float

KW_POLAR_LSD_FIT_RESOL
- Description: define the Resolving power from gaussian fit from polar lsd
- Type: float

KW_POLAR_LSD_FIT_RV
- Description: define the Radial velocity (km/s) from gaussian fit from polar lsd
- Type: float

KW_POLAR_LSD_MASK
- Description: define the LSD mask filename
- Type: str

KW_POLAR_LSD_MEANNULL
- Description: define the Mean of null LSD profile

- Type: float

KW_POLAR_LSD_MEANPOL
- Description: define the Mean polarization of data in LSD
- Type: float

KW_POLAR_LSD_MEANSVQU
- Description: define the mean of pol LSD profile
- Type: float

KW_POLAR_LSD_MEDABSDEV
- Description: define the Med abs dev polarization of data in LSD
- Type: float

KW_POLAR_LSD_MEDPOL
- Description: define the Median polarization of data in LSD
- Type: float

KW_POLAR_LSD_MLDEPTH
- Description: define the minimum line depth value used in LSD analysis
- Type: float

KW_POLAR_LSD_NBIN1
- Description: define the bin size used for norm continuum
- Type: int

KW_POLAR_LSD_NBIN2
- Description: define the bin sized used in profile calc
- Type: int

KW_POLAR_LSD_NLAP1
- Description: define the overlap used for norm continuum
- Type: int

KW_POLAR_LSD_NLAP2
- Description: define the overlap used in profile calc
- Type: int

KW_POLAR_LSD_NLFIT1
- Description: define whether a linear fit was used for norm continuum
- Type: bool

KW_POLAR_LSD_NLFIT2
- Description: define whether a linear fit was used in profile calc
- Type: bool

KW_POLAR_LSD_NMODE1
- Description: define the mode used for norm continuum
- Type: str

KW_POLAR_LSD_NMODE2
- Description: define the mode used in profile calc
- Type: str

KW_POLAR_LSD_NORM
- Description: Define whether stokesI was normalised by continuum
- Type: bool

KW_POLAR_LSD_NPOINTS
- Description: define the Number of points for LSD profile
- Type: int

KW_POLAR_LSD_NSIG1
- Description: define the sig clip used for norm continuum
- Type: float

KW_POLAR_LSD_NSIG2
- Description: define the sigma clip used in profile calc
- Type: float

KW_POLAR_LSD_NWIN1
- Description: define the window size used for norm continuum
- Type: int

KW_POLAR_LSD_NWIN2
- Description: define the window size used in profile calc
- Type: int

KW_POLAR_LSD_STDNULL
- Description: define the Std dev of null LSD profile
- Type: float

KW_POLAR_LSD_STDPOL
- Description: define the Std dev polarization of data in LSD
- Type: float

KW_POLAR_LSD_STDSVQU
- Description: define the Std dev of pol LSD profile
- Type: float

KW_POLAR_LSD_VFINAL
- Description: Define final velocity value used in LSD analysis
- Type: float

KW_POLAR_LSD_VINIT
- Description: Define initial velocity value used in LSD analysis
- Type: float

KW_POL_BERVCEN
- Description: define the BERV at center of observation
- Type: float

KW_POL_BERVS
- Description: define the bervs for exposure list
- Type: float

KW_POL_BJDCEN
- Description: define the BJD at center of observation
- Type: float

KW_POL_BJDS
- Description: define the bjds for exposure list
- Type: float

KW_POL_ELAPTIME
- Description: define the Elapsed time of observation (sec)
- Type: float

KW_POL_EXPS
- Description: define the exposure times of exposure list
- Type: float

KW_POL_EXPTIME
- Description: define the Total exposure time (sec)
- Type: float

KW_POL_FILES
- Description: define the base file name exposure list
- Type: str

KW_POL_LSD_COL1
- Description: define the lsd column: Velocities (km/s)
- Type: str

KW_POL_LSD_COL2
- Description: define the lsd column: Stokes I LSD profile
- Type: str

KW_POL_LSD_COL3
- Description: define the lsd column: Gaussian fit to Stokes I LSD profile
- Type: str

KW_POL_LSD_COL4
- Description: define the lsd column: Stokes V, U, or Q LSD profile
- Type: str

KW_POL_LSD_COL5
- Description: define the lsd column: Null polarization LSD profile
- Type: str

KW_POL_MEANBJD
- Description: define the Mean BJD for polar sequence
- Type: float

KW_POL_METHOD

- Description: defines the Polarimetry method
- Type: str

KW_POL_MJDCEN
- Description: define the MJD at center of observation
- Type: float

KW_POL_MJDENDS
- Description: define the mjdends at end for exposure list
- Type: float

KW_POL_MJDS
- Description: define the mjds at start for exposure list
- Type: float

KW_POL_NEXP
- Description: define Number of exposures for polarimetry
- Type: int

KW_POL_STOKES
- Description: define the Stokes paremeter: Q, U, V, or I
- Type: str

KW_PPMSTR_FILE
- Description: Define the key to store the name of the pp master file used in pp (if used)
- Type: str

KW_PPMSTR_NSIG
- Description: The number of sigma used to construct pp master mask
- Type: float

KW_PPSHIFTX
- Description: The shift in pixels so that image is at same location as engineering flat
- Type: float

KW_PPSHIFTY
- Description: The shift in pixels so that image is at same location as engineering flat
- Type: float

KW_PPVERSION
- Description: DRS preprocessing version
- Type: str

KW_RDNOISE
- Description: define the read noise HEADER key a.k.a sigdet (used to get value only)
- Type: float

KW_S1D_BLAZET
- Description: the blaze threshold used for the s1d
- Type: float

KW_S1D_BVELO
- Description: the bin size for wave grid kind=velocity
- Type: float

KW_S1D_BWAVE
- Description: the bin size for wave grid kind=wave
- Type: float

KW_S1D_KIND
- Description: the wave grid kind used for s1d (wave or velocity)
- Type: str

KW_S1D_SMOOTH
- Description: the smooth size for the s1d
- Type: float

KW_S1D_WAVEEND
- Description: the wave end point used for s1d
- Type: float

KW_S1D_WAVESTART
- Description: the wave starting point used for s1d
- Type: float

KW_SATURATE
- Description: define the saturation limit HEADER key

- Type: float

KW_SAT_LEVEL
- Description: the max saturation level
- Type: int

KW_SAT_QC
- Description: the saturation QC limit
- Type: int

KW_SHAPE_A
- Description: Shape transform A parameter
- Type: float

KW_SHAPE_B
- Description: Shape transform B parameter
- Type: float

KW_SHAPE_C
- Description: Shape transform C parameter
- Type: float

KW_SHAPE_D
- Description: Shape transform D parameter
- Type: float

KW_SHAPE_DX
- Description: Shape transform dx parameter
- Type: float

KW_SHAPE_DY
- Description: Shape transform dy parameter
- Type: float

KW_TARGET_TYPE
- Description: define the target type (object/sky)
- Type: str

KW_TELLUP_ABSOEXPO_KEXP
- Description: Define the gauss shape of the kernel used in abso_expo for tellu pre-cleaning
- Type: float

KW_TELLUP_ABSOEXPO_KTHRES
- Description: Define the kernel threshold in abso_expo used in tellu pre-cleaning
- Type: int

KW_TELLUP_ABSOEXPO_KWID
- Description: Define the gauss width of the kernel used in abso_expo for tellu pre-cleaning
- Type: float

KW_TELLUP_CCFP_OTHERS
- Description: Define the ccf power of the others
- Type: float

KW_TELLUP_CCFP_WATER
- Description: Define the ccf power of the water
- Type: float

KW_TELLUP_CCF_SRANGE
- Type: float

KW_TELLUP_DEXPO_CONV_THRES
- Description: Define dexpo convergence threshold used
- Type: float

KW_TELLUP_DEXPO_MAX_ITR
- Description: Define the maximum number of operations used to get dexpo convergence
- Type: int

KW_TELLUP_DFLT_WATER
- Description: Define default water absorption used (tellu pre-cleaning)
- Type: float

KW_TELLUP_DO_PRECLEAN
- Description: Define whether precleaning was done (tellu pre-cleaning)
- Type: bool

KW_TELLUP_DVGRID

- Description: Define the dv wave grid (same as s1d) in km/s used
- Type: float

KW_TELLUP_DV_OTHERS
- Description: Define the velocity of other species absorbers calculated in telluric preclean process
- Type: float

KW_TELLUP_DV_WATER
- Description: Define the velocity of water absorbers calculated in telluric preclean process
- Type: float

KW_TELLUP_EXPO_OTHERS
- Description: Define the exponent of other species from telluric preclean process
- Type: float

KW_TELLUP_EXPO_WATER
- Description: Define the exponent of water key from telluric preclean process
- Type: float

KW_TELLUP_FORCE_AIRMASS
- Description: Define the whether to force fit to header airmass used for tellu pre-cleaning
- Type: bool

KW_TELLUP_OTHER_BOUNDS
- Description: Define the bounds of the exponent of other species used for tellu pre-cleaning
- Type: str

KW_TELLUP_REMOVE_ORDS
- Description: Define which orders were removed from tellu pre-cleaning
- Type: str

KW_TELLUP_SNR_MIN_THRES
- Description: Define which min snr threshold was used for tellu pre-cleaning
- Type: float

KW_TELLUP_TRANS_SIGL
- Description: Define the threshold for discrepant tramission used for tellu pre-cleaning
- Type: float

KW_TELLUP_TRANS_THRES
- Description: Define the exponent of the transmission threshold used for tellu pre-cleaning
- Type: float

KW_TELLUP_WATER_BOUNDS
- Description: Define the bounds of the exponent of water used for tellu pre-cleaning
- Type: str

KW_TELLUP_WAVE_END
- Description: Define the wave end (same as s1d) in nm used
- Type: float

KW_TELLUP_WAVE_START
- Description: Define the wave start (same as s1d) in nm used
- Type: float

KW_USED_CONT_BINSIZE
- Description: define the continuum bin size used
- Type: int

KW_USED_CONT_OVERLAP
- Description: define the continuum overlap used
- Type: int

KW_USED_MIN_FILES
- Description: define the minimum number of files used
- Type: int

KW_USED_VALID_FIBERS
- Description: define all possible fibers for polarimetry used
- Type: str

KW_USED_VALID_STOKES
- Description: define all possible stokes parameters used
- Type: str

KW_UTC_OBS
- Description: define the observation time HEADER key

- Type: float

KW_VERSION
- Description: DRS version
- Type: str

KW_WAVECOEFFS
- Description: the wave coefficients
- Type: float

KW_WAVEFILE
- Description: the wave file used
- Type: str

KW_WAVESOURCE
- Description: the wave source of the wave file used
- Type: str

KW_WAVETIME
- Description: the wave file mid exptime [mjd]
- Type: float

KW_WAVE_DEG
- Description: fit degree for wave solution
- Type: int

KW_WAVE_ECHELLE_START
- Description: the echelle number of the first order used
- Type: int

KW_WAVE_FITDEG
- Description: the fit degree for wave solution used
- Type: int

KW_WAVE_HCG_EWMAX
- Description: the min e-width of the line for gaussian peak fitting used
- Type: float

KW_WAVE_HCG_EWMIN
- Description: the min e-width of the line for gaussian peak fitting used
- Type: float

KW_WAVE_HCG_FB_RMSMAX
- Description: the max rms for gaussian peak fitting used
- Type: float

KW_WAVE_HCG_FB_RMSMIN
- Description: the min rms for gaussian peak fitting used
- Type: float

KW_WAVE_HCG_GFITMODE
- Description: the fit degree for the gaussian peak fitting used
- Type: int

KW_WAVE_HCG_SIGPEAK
- Description: the sigma above local rms for fitting hc lines used
- Type: float

KW_WAVE_HCG_WSIZE
- Description: the width of the box for fitting hc lines used
- Type: int

KW_WAVE_HCLL_FILE
- Description: the filename for the HC line list generated
- Type: str

KW_WAVE_LITT_EXT_FITDEG_1
- Description: the littrow extrapolation fit degree value used for HC
- Type: int

KW_WAVE_LITT_EXT_ORD_START_1
- Description: the littrow extrapolation start order value used for HC
- Type: int

KW_WAVE_LITT_FITDEG_1
- Description: the littrow fit degree value used for HC
- Type: int

KW_WAVE_LITT_XCUTSTEP_1
- Description: the littrow x cut step value used for HC
- Type: int

KW_WAVE_LIT_END_1
- Description: the littrow end order used for HC
- Type: float

KW_WAVE_LIT_ORDER_END_1
- Description: the littrow order end value used for HC
- Type: int

KW_WAVE_LIT_ORDER_INIT_1
- Description: the littrow order initial value used for HC
- Type: int

KW_WAVE_LIT_ORDER_START_1
- Description: the littrow order start value used for HC
- Type: int

KW_WAVE_LIT_RORDERS
- Description: the orders removed from the littrow test
- Type: float

KW_WAVE_LIT_START_1
- Description: the littrow start order used for HC
- Type: int

KW_WAVE_MODE_FP
- Description: the mode used to calculate the fp wave solution
- Type: str

KW_WAVE_MODE_HC
- Description: the mode used to calculate the hc wave solution
- Type: str

KW_WAVE_NBO
- Description: Number of orders in wave image
- Type: int

KW_WAVE_RES_MAPSIZE
- Description: the wave resolution map dimensions
- Type: int

KW_WAVE_RES_MAXDEVTHRES
- Description: the max deviation in rms allowed in wave resolution map
- Type: float

KW_WAVE_RES_WSIZE
- Description: the width of the box for wave resolution map
- Type: float

KW_WAVE_TRP_CATGDIST
- Description: the max distance between catalog line and initial guess line in triplet fit
- Type: float

KW_WAVE_TRP_DVCUTALL
- Description: the distance away in dv to reject all triplet in triplet fit
- Type: float

KW_WAVE_TRP_DVCUTORD
- Description: the distance away in dv to reject order triplet in triplet fit
- Type: float

KW_WAVE_TRP_FITDEG
- Description: the fit degree for triplet fit
- Type: int

KW_WAVE_TRP_MIN_NLINES
- Description: the minimum number of lines required per order in triplet fit
- Type: int

KW_WAVE_TRP_NBRIGHT
- Description: the number of bright lines to used in triplet fit
- Type: int

KW_WAVE_TRP_NITER

- Description: the number of iterations done in triplet fit
- Type: float

KW_WAVE_TRP_ORDER_FITCONT
- Description: the degree(s) of fit to ensure continuity in triplet fit
- Type: float

KW_WAVE_TRP_SCLIPNUM
- Description: the iteration number for sigma clip in triplet fit
- Type: float

KW_WAVE_TRP_SCLIPTHRES
- Description: the sigma clip threshold in triplet fit
- Type: float

KW_WAVE_TRP_TOT_NLINES
- Description: the total number of lines required in triplet fit
- Type: int

KW_WEATHER_TOWER_TEMP
- Description: define the weather tower temperature HEADER key
- Type: float

KW_WFP_BLZ_THRES
- Description: the blaze threshold used for FP wave sol improvement
- Type: float

KW_WFP_BOXSIZE
- Description: The boxsize used for FP file CCF
- Type: int

KW_WFP_CAVFIT_DEG
- Description: the polynomial degree fit order used for fitting the fp cavity
- Type: int

KW_WFP_CM_INDX
- Description: the index to start crossmatching fps at
- Type: float

KW_WFP_CONTRAST
- Description: Contrast of the wave FP file CCF
- Type: float

KW_WFP_CUTWIDTH
- Description: the normalised cut width for large peaks used
- Type: float

KW_WFP_DETNOISE
- Description: The det noise used for the FP file CCF
- Type: float

KW_WFP_DOPD0
- Description: the initial value of the FP effective cavity width used
- Type: float

KW_WFP_DRIFT
- Description: drift of the FP file used for the wavelength solution
- Type: float

KW_WFP_DVMAX
- Description: the max dv to keep hc lines used
- Type: float

KW_WFP_ERRX_MIN
- Description: the minimum instrumental error used
- Type: float

KW_WFP_FILE
- Description: Wavelength solution for fiber C that is source of the WFP keys
- Type: str

KW_WFP_FPCAV_MODE
- Description: the mode used to fit the FP cavity
- Type: int

KW_WFP_FWHM
- Description: FWHM of the wave FP file CCF

- Type: float

KW_WFP_LARGE_JUMP
- Description: the largest jump in fp that was allowed
- Type: float

KW_WFP_LIMIT
- Description: the normalised limited used to detect FP peaks
- Type: float

KW_WFP_LINES
- Description: Number of lines for the wave FP file CCF
- Type: float

KW_WFP_LLFITDEG
- Description: the used polynomial fit degree (to fit wave solution)
- Type: int

KW_WFP_LLFIT_MODE
- Description: the mode used to fit the wavelength
- Type: int

KW_WFP_LL_OFFSET
- Description: the maximum fraction wavelength offset btwn xmatch fp peaks used
- Type: float

KW_WFP_MASK
- Description: Mask for the wave FP file CCF
- Type: float

KW_WFP_MASKMIN
- Description: The weight of the CCF mask (if 1 force all weights equal) used for FP CCF
- Type: float

KW_WFP_MASKUNITS
- Description: The units of the input CCF mask (converted to nm in code)
- Type: str

KW_WFP_MASKWID
- Description: The width of the CCF mask template line (if 0 use natural) used for FP CCF
- Type: float

KW_WFP_MAXFLUX
- Description: The max flux used for the FP file CCF
- Type: float

KW_WFP_MAXLL_FIT_RMS
- Description: the max rms for the wave sol sig clip
- Type: float

KW_WFP_NMAX
- Description: the highest order used for the FP file CCF
- Type: int

KW_WFP_NPERCENT
- Description: the percentile to normalise the FP flux per order used
- Type: float

KW_WFP_ORD_FINAL
- Description: the last order used for FP wave sol improvement
- Type: int

KW_WFP_ORD_START
- Description: the first order used for FP wave sol improvement
- Type: int

KW_WFP_SIGDET
- Description: The sigdet used for FP file CCF
- Type: float

KW_WFP_STEP
- Description: Step for the wave FP file CCF
- Type: float

KW_WFP_TARG_RV
- Description: Target RV for the wave FP file CCF
- Type: float

KW_WFP_T_ORD_START
- Description: the echelle number used for the first order
- Type: int

KW_WFP_UPDATECAV
- Description: whether the cavity file was updated
- Type: int

KW_WFP_WEI_THRES
- Description: the weight below which fp lines are rejected
- Type: float

KW_WFP_WIDTH
- Description: Width for the wave FP file CCF
- Type: float

KW_WFP_WIDUSED
- Description: the FP widths used for each order (1D list)
- Type: float

KW_WFP_XDIFF_MAX
- Description: the maximum fp peak pixel sep used for FP wave sol improvement
- Type: float

KW_WFP_XDIFF_MIN
- Description: the minimum fp peak pixel sep used for FP wave sol improvement
- Type: float

KW_WNT_DCAVITY
- Description: starting point for the cavity corrections used in wave night
- Type: int

KW_WNT_DCAVSRCE
- Description: source fiber for the cavity correction
- Type: str

KW_WNT_HCSIGCLIP
- Description: define the sigma clip value to remove bad hc lines used
- Type: float

KW_WNT_MADLIMIT
- Description: median absolute deviation cut off used
- Type: float

KW_WNT_NITER1
- Description: number of iterations for convergence used in wave night (hc)
- Type: int

KW_WNT_NITER2
- Description: number of iterations for convergence used in wave night (fp)
- Type: int

KW_WNT_NSIG_FIT
- Description: sigma clipping for the fit used in wave night
- Type: int

5.3 Update notes

5.3.1 Changelog

5.3.1.1 0.8.001 (2023-01-30)

- [APERO] update README.md (move developer and main to v0.7.275) [Neil Cook]
- [APERO] fix typo *apero.science.telluric.gen_tellu.py* - image.shape[0] –> range(image.shape[0]) [njcuk9999]
- [APERO] update date / version / documentation. [Neil Cook]

5.3.1.2 0.7.275 (2023-01-27)

- [APERO] allow masking of bad wavelength regions in telluric correct + mask out bad tranmission. [Neil Cook]
- [APERO] *apero.science.telluric.template_tellu.py* - calculate the s1d template error and *n_valid*. [Neil Cook]
- [APERO] *apero.science.telluric.template_tellu.py* - calculate the s1d template error and *n_valid*. [Neil Cook]
- Merge branch 'v0.7.273-live' into v0.7.267-live. [Neil Cook]
- [APERO] recalculate template RMS + linearize template bcols between e2ds and s1d [NIRPS] change *MK-TEMPLATE_SNR_ORDER* 33–>59. [Neil Cook]

5.3.1.3 0.7.274 (2023-01-25)

- [APERO] fix not having a –since option. [njcuk9999]
- [APERO] *apero_go.py* - add –setup option. [njcuk9999]
- [APERO] check that –since argument is a valid date+ [njcuk9999]
- [APERO] add a –since argument to *drs_get.py*. [njcuk9999]
- [APERO] low-pass hot star template + deconv=median for hot stars (update *MKTEM-PLATE_HOTSTAR_KER_VEL* dtype) [njcuk9999]
- [APERO] low-pass hot star template + deconv=median for hot stars (update imports) [njcuk9999]
- [APERO] low-pass hot star template + deconv=median for hot stars. [njcuk9999]
- [NIRPS] *apero.science.telluric.gen_tellu.py* - *finite_res_correction* now requires params (For threshold) [njcuk9999]
- [NIRPS] fix sky corr being applied twice for nirps and fix convergence. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.273-live' into v0.7.273-live. [njcuk9999]
- [APERO] update *install.py module_translation*. [Neil Cook]
- [NIRPS] *gen_tellu.py* - filter over bad finite res corrections. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.273-live' into v0.7.273-live. [Neil Cook]
- [NIRPS] update skymodels (error in calculation) [njcuk9999]
- [APERO] *apero.science.calib.wave.py* - update key in table to key in table.colnames. [Neil Cook]
- [APERO] update requirements. [Neil Cook]
- [APERO] update readme. [Neil Cook]
- Merge branch 'v0.7.273-live' into developer. [Neil Cook]
  # Conflicts: # .gitignore # README.md # *apero/core/core/drs_database.py* # *apero/core/core/drs_startup.py* # *apero/core/instruments/default/default_config.py* # *apero/core/instruments/default/default_constants.py* # *apero/core/instruments/spirou/default_constants.py* # *apero/core/instruments/spirou/file_definitions.py* # *apero/core/instruments/spirou/recipe_definitions.py* # apero/core/math/general.py # *apero/data/spirou/reset/runs/calib_run.ini* # *apero/data/spirou/reset/runs/complete_run.ini* # *apero/data/spirou/reset/runs/mini_run.ini* # *apero/data/spirou/reset/runs/other_run.ini* # *apero/data/spirou/reset/runs/science_run.ini* # *apero/data/spirou/reset/runs/trigger_night_calib_run.ini* # apero/lang/backup/language.xls # apero/lang/databases/language.xls # *apero/recipes/spirou/apero_ccf_spirou.py* # *apero/recipes/spirou/cal_thermal_spirou.py* # apero/science/calib/localisation.py # apero/science/calib/shape.py # apero/science/calib/wave.py # apero/science/extract/berv.py # apero/science/polar/general.py # *apero/science/telluric/gen_tellu.py* # *apero/science/velocity/gen_vel.py* # *apero/tools/module/setup/drs_processing.py* # *apero/tools/recipes/bin/apero_processing.py* # *apero/tools/recipes/spirou/apero_drift_spirou.py* # *apero/tools/recipes/spirou/apero_expmeter_spirou.py* # changelog.md # documentation/working/conf.py # documentation/working/index.rst # documentation/working/main/misc/changelog.rst # version.txt
- [APERO] update date/version/docs. [Neil Cook]
- Update *peak_number* rounding issue. [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into developer. [Neil Cook]
- Merge branch 'master' into developer. [Neil Cook]
- *Science.extract.berv.py* - *get_berv* should warn when barycorrpy fails. [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into developer. [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into developer. [njcuk9999]
- *Apero.science.calib.shape.py* - Problem with shape when maximum correlation between FPs split between pixels (Issue #668) [njcuk9999]
- *Apero.core.instruments.spirou.file_definitions.py* - *RAW_LFC_FP* did not have outfunc - add out-

func=out.blank. [Neil Cook]

- *Apero.core.instruments.spirou.recipe_definitions.py - leak_master* should be after thermal master. [Neil Cook]
- *Apero.data.spirou.reset.runs.other_run.ini* - add LFCFP and FPLFC to other run.ini file. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py + recipe_definitions.py* - add LFCFP and FPLFC to sequences. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py + recipe_definitions.py* - add LFCFP and FPLFC to sequences. [Neil Cook]
- *Apero.tools.module.setup.drs_processing.py - _split_string_list* - if *allow_whitespace* must return a list not string. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py - _split_string_list* should not split by white space unless directly told to (allows spaces in filenames) [njcuk9999]
- *Apero.recipes.spirou.cal_ccf_spirou.py* - make sure A and B can be used as science fibers. [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - update *DRIFT_DPRTYPES* - (add *FP_DARK)* [Neil Cook]
- *Apero.recipes.spirou.cal_thermal_spirou.py - thermal_files* are not indexed - correct this. [Neil Cook]
- *Apero.science.calib.localisation.py + wave.py* - add *KW_PID* to writing functions. [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into developer. [njcuk9999]
- Update README.md. [Neil Cook]
  correct typo
- *Apero.science.telluric.gen_tellu.py* - deal with Etienne using 0 as flag - bad bad bad. [njcuk9999]
- *Tools.recipe.spirou.cal_drift_spirou.py* - update output filename. [Neil Cook]
- *Tools.recipe.spirou.cal_drift_spirou.py* - allow *OBJ_FP* and *DARK_FP* files (and deal with fibers not containing FP) [Neil Cook]
- *Apero.science.calib.localisation.py* - fix qc logic for *MAX_RMPTS_POS* and *MAX_RMPTS_WID.* [Neil Cook]
- *Apero.core.core.drs_startup.py* - pep8 change. [Neil Cook]
- *Cal_expmeter_spirou.py* - update output filename based on input fibers. [Neil Cook]
- *Apero.core.core.drs_startup.py* - try to fix integer scalar bug. [Neil Cook]
- *Apero.tools.recipes.spirou.cal_expmeter_spirou.py* - add –fibers option. [Neil Cook]
- Update date/version/changelog/readme/documentation. [Neil Cook]

5.3.1.4 0.7.273 (2023-01-23)

- [NIRPS] update telluric list. [njcuk9999]
- [APERO] *apero.science.telluric.gen_tellu.py* - correct typo for failing precleaned files. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.267-live' into v0.7.267-live. [njcuk9999]
- [APERO] correct params['INPUTS'] for FINITERES. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.267-live' into v0.7.267-live. [njcuk9999]
- [APERO] update date/version/docs. [Neil Cook]
- [NIRPS] update *sky_model* (ha and he) [njcuk9999]
- [APERO] *apero.science.telluric.gen_tellu.py* - fix spline in finite res. [njcuk9999]

5.3.1.5 0.7.272 (2023-01-19)

- [APERO] allow switching on and off of finite res corr (via params and user input) + add header key that finite res was/wasn't done. [Neil Cook]
- [APERO] *ref_calib_run.ini* should not have *RUN_OBS_DIR* set to *DEFAULT_REF_OBSDIR* (we need *FP_FP* from all nights) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.267-live' into v0.7.267-live. [njcuk9999]
- [APERO] *apero.science.telluric.gen_tellu.py* - deal with edge effects in *wave_to_wave.* [Neil Cook]
- [APERO] *apero.science.calib.gen_calib.py* - fix typo in *check_fp.* [njcuk9999]
- [APERO] *apero.science.preprocessing.detector.py* - flag pixels that have inconsistent intercept in LED. [Neil Cook]
- [APERO] *apero.science.preprocessing.detector.py* - flag pixels that have inconsistent intercept in LED. [Neil Cook]
- [APERO] do not do science capacitive coupling correction for HC files. [Neil Cook]

- [NIRPS] apero.science.preprocessing.detector - do not sigma clip columns when we are creating a mask. [Neil Cook]
- [APERO] *apero.science.preprocessing.detector.py* - account for NaNs in butterfly maps. [Neil Cook]
- [APERO] *apero.science.telluric.gen_tellu.py* - correct (bad) changes for finite res. [Neil Cook]
- [APERO] *apero.science.telluric.gen_tellu.py* - correct (bad) changes for finite res. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.267-live' into v0.7.267-live. [Neil Cook]
- [NIRPS] correct *nirps_correction.* [Neil Cook]
- [NIRPS] *science.preprocessing.detector.py* - correct typos. [Neil Cook]
- [NIRPS] *science.preprocessing.detector.py* - correct of the first read of the amplifiers. [Neil Cook]
- [NIRPS] *science.preprocessing.detector.py* - correct of the first read of the amplifiers. [Neil Cook]
- [APERO] *apero.science.telluric.template_tellu.create_deconvolved_template* do not copy over flux (call flux0 as input) [Neil Cook]

5.3.1.6 0.7.271 (2023-01-17)

- [APERO] *apero.core.math.gen_math.py* - add typing in *square_medbin.* [Neil Cook]
- [APERO] *science.telluric.gen_tellu.py* - fix that *qc_exit_tellu_preclean* fails without *image_e2ds_ini (PRE_SKYCORR_IMAGE)* [Neil Cook]
- [NIRPS] *science.preprocessing.detector.py* - fix nirps pp mask. [Neil Cook]
- [APERO] correct A and B telluric properly (sky + finite resolution) [Neil Cook]
- [APERO] correct A and B telluric properly (sky + finite resolution) [Neil Cook]
- [NIRPS] *apero.core.utils.drs_utils.py* - fix that times are a numpy array. [njcuk9999]
- [APERO] correct *post_t_file* (OHLINE, SKYCORR etc) [Neil Cook]
- [APERO] finish adjustments to finite resolution model. [Neil Cook]
- [APERO] add finite resolution effects code. [Neil Cook]
- [APERO] print progress on capacitive coupling. [Neil Cook]
- [NIRPS] add in the capacitive coupling from sci flux (for NIRPS) [Neil Cook]
- [APERO] add in the capacitive coupling from sci flux. [Neil Cook]

5.3.1.7 0.7.270 (2023-01-13)

- [APERO] correct typo (bug) cavity[0] must have the pedestal added before updating by *mean_hc_vel* - all wave sols are wrong without this fix. [njcuk9999]
- [APERO] typo *correct_capacitive_coupling_pattern -> correct_capacitive_coupling.* [Neil Cook]
- [NIRPS] minor bug fixes for variable resolution. [njcuk9999]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [APERO] correct the capacitive coupling pattern using the amplifier bias model. [Neil Cook]
- [NIRPS] correct + speed variable resolution convolution, add *sky_model* for NIRPS HA. [njcuk9999]
- [APERO] add in variable resolution for the tellu convolution. [njcuk9999]
- [APERO] correct s1d res maps (needed blaze) [njcuk9999]
- [APERO] add s1d res amp/fwhm/expo files. [njcuk9999]
- Merge branch 'v0.7.261-live' into v0.7.267-live. [njcuk9999]
- [APERO] *apero.core.math.gen_math.py* - deal with nans for robust chebyshev. [njcuk9999]

5.3.1.8 0.7.269 (2023-01-10)

- [APERO] create s1d res map [unfinished] [Neil Cook]
- [NIRPS] sky corr changes. [njcuk9999]
- [NIRPS] remove ravel from possible Nones. [Neil Cook]
- [NIRPS] remove ravel from possible Nones. [Neil Cook]
- [NIRPS] correct typo np.nqnwum –> np.nansum. [Neil Cook]
- Merge branch 'v0.7.261-live' into v0.7.267-live. [Neil Cook]
- [NIRPS] deal with not having the *KW_CAV_PEDESTAL* key. [Neil Cook]
- [NIRPS] add sky correction. [Neil Cook]
- [NIRPS] add sky correction. [Neil Cook]
- Merge branch 'v0.7.261-live' into v0.7.259-nirps-test. [Neil Cook]
- [NIRPS] add sky correction. [Neil Cook]
- [NIRPS] plan for res convolve change. [Neil Cook]
- [NIRPS] add *apero_skycorr_nirps_he.py* [UNFINISHED] [Neil Cook]
- [NIRPS] add sky model correction to telluric *mk_tellu* and *fit_tellu* codes. [Neil Cook]

5.3.1.9 0.7.268 (2022-12-23)

- [APERO] update *apero_database.py* database names. [njcuk9999]
- [APERO] update date/version/docs/changelog. [njcuk9999]

5.3.1.10 0.7.267 (2022-12-22)

- [APERO] change continuity for wave to chebyshev. [Neil Cook]
- [APERO] add sigma cut criteria on the CCF FWHM for the mean CCF profile. [Neil Cook]
- [APERO] add sigma cut criteria on the CCF FWHM for the mean CCF profile. [Neil Cook]
- [APERO] do not do nsig CCF cut for FP. [Neil Cook]
- [APERO] set a minimum value for allowed CCF fit (peak CCF < 5sigma) [Neil Cook]

5.3.1.11 0.7.266 (2022-12-21)

- [APERO] fix key error with *CAVITY_PEDESTAL*. [Neil Cook]
- [APERO] add res e2ds to wave sol. [njcuk9999]
- [APERO] add a resolution e2ds map for amp/fwhm/expo. [Neil Cook]
- [APERO] improve wave solution with more cavity fit using chebyshev. [njcuk9999]
- [APERO] try making wave solution converge across machines. [Neil Cook]
- [APERO] *apero.core.math.gen_math.py* - update *robust_polyfit* and *robust_chebyfit* to be fuzzy at edges. [Neil Cook]
- [APERO] *apero.core.math.gen_math.py* - update *robust_polyfit* and *robust_chebyfit* to be fuzzy at edges. [Neil Cook]
- [APERO] *apero.core.math.gen_math.py* - update *robust_polyfit* and *robust_chebyfit* to be fuzzy at edges. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.261-live' into v0.7.261-live. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.261-live' into v0.7.261-live. [Neil Cook]
- [APERO] correct typo. [Neil Cook]
- [APERO] *apero.core.math.gen_math.py* - update *robust_polyfit* and *robust_chebyfit* to be fuzzy at edges. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.259-nirps-test' into v0.7.259-nirps-test. [njcuk9999]
  # Conflicts: # *apero/data/spirou/telluric/sky_PCs.fits*
- [APERO] update *sky_PCs.fits*. [Neil Cook]
- [SPIROU] update *sky_PCs.fits* (needed to be flipped in shape) [njcuk9999]

5.3.1.12 0.7.265 (2022-12-13)

- [APERO] storage for optimizing code. [Neil Cook]
- [APERO] storage for optimizing code. [Neil Cook]
- Merge branch 'v0.7.261-live' into v0.7.259-nirps-test. [Neil Cook]
- [APERO] implement a locking for orderps file so we don't try to write it and read it at the same time (should prevent an error we are getting in extraction) [Neil Cook]
- [APERO] fix ycents for AB,A,B spirou (change added for NIRPS) in order table. [Neil Cook]
- [APERO] fix ycents for AB,A,B spirou (change added for NIRPS) in order table. [Neil Cook]
- [APERO] fix ycents for AB,A,B spirou (change added for NIRPS) in order table. [Neil Cook]
- Merge branch 'v0.7.259-nirps-test' into v0.7.261-live. [Neil Cook]
- [APERO] update date/version/docs. [Neil Cook]
- [NIRPS] switch sequences for EFF,SKY,SKY and DARK,SKY. [njcuk9999]
- [NIRPS] add *calculate_dxmap_nirps* to both modes (rename from *calculate_dxmap_nirpshe)* [njcuk9999]
- [NIRPS] add *calculate_dxmap_nirps* to both modes (rename from *calculate_dxmap_nirpshe)* [njcuk9999]
- [APERO] *apero.science.extract.gen_ext.py* - better handle trying shapel file (when multiple files try to write it at once) [Neil Cook]
- [NIRPS] *apero.recipes.nirps_ha.apero_preprocess_nirps_ha.py* - fix loading of led lat. [Neil Cook]
- [APERO] add –plot=4 (select plots) and fix –fpref. [njcuk9999]
- [NIRPS] fix LED flat creation + update run.ini files. [Neil Cook]
- [NIRPS] fix LED flat creation + combine (for hash code) + save to calibDB. [Neil Cook]

5.3.1.13 0.7.264 (2022-12-08)

- [NIRPS] update LED flat creation. [Neil Cook]
- [NIRPS] update preprocessing codes to use *LED_FLAT* from calibrations. [Neil Cook]
- [APERO] update *apero_get* + documentation. [Neil Cook]
- [APERO] update *apero_get.py.* [njcuk9999]
- [APERO] *apero_get.py* allow wildcard for –objnames. [Neil Cook]
- [NIRPS] Add LED flat creation to *PP_REF*. [Neil Cook]
- [APERO] update sky model. [njcuk9999]
- [APERO] require wavelength solution to be within 7 days if a night calibration. [njcuk9999]
- [APERO] try to fix problem with *shapel_orderps* FileNotFoundError. [Neil Cook]
- [APERO] add order table (for extracted files) + *WAVE_POLY_TYPE* + *LOC_POLY_TYPE*. [Neil Cook]
- [APERO] add order table (for extracted files) + *WAVE_POLY_TYPE* + *LOC_POLY_TYPE*. [Neil Cook]
- [APERO] add order table (for extracted files) + *WAVE_POLY_TYPE* + *LOC_POLY_TYPE*. [Neil Cook]
- [APERO] add poly type to loco keys loaded from locofile. [njcuk9999]
- [NIRPS] remove extraction bad pixel flagging for HA-A, HA-B, HE-B fibers [APERO] add loc and wave poly coeff type (Chebyshev) [njcuk9999]

5.3.1.14 0.7.263 (2022-11-30)

- [NIRPS] change s1d max wavelength. [njcuk9999]
- [APERO] add *led_flat* code + allow forcing only telluric preclean. [njcuk9999]
- [APERO] add *led_flat.* [njcuk9999]
- [APERO] allow a constant to determine the min exptime for darks in the *dark_ref.* [njcuk9999]
- [APERO] must add to e2dsoutputs for leak correction to work. [njcuk9999]
- [NIRPS] update the list of telluric stars. [njcuk9999]
- [NIRPS] *apero.tools.module.processing.drs_processing.py* - fix skip list with *INCLUDE_OBS_DIRS* and *EXCLUDE_OBS_DIRS* (param–> param.listp) [njcuk9999]
- [NIRPS] *apero.science.gen_ext.py* - allow override of fibers for fplines calculation (for *FP_FP* tests) [njcuk9999]
- [NIRPS] *apero.science.calib.localisation.py* - change max to a percentile in the order loc label (avoids picking up pixels outside order for width measurement) [njcuk9999]
- [NIRPS] update *nirps_he recipe_definitions* (add *PP_EVERY* and *EXT_EVERY)* [Neil Cook]

5.3.1.15   0.7.262 (2022-11-15)

- [APERO] Add *PP_EVERY* to *pp_seq_opt* and *EXTRACT_EVERY* to *eng_seq* (used in *other_run.ini)* to preprocess and extract everything (no calibs) [Neil Cook]
- [NIRPS] update HE and HA default wave solution. [Neil Cook]
- [NIRPS] updates for nirps HE wave solution. [Neil Cook]
- [APERO] update reset.calib.csv and *deafult_constants* for wave constants. [Neil Cook]
- [APERO] update nirps ref wave solutions. [Neil Cook]
- [APERO] nirps updates for wave sol. [Neil Cook]

5.3.1.16   0.7.261 (2022-11-10)

- [APERO]doc string / typing /pcheck / pep8 update. [Neil Cook]
- Merge branch 'v0.7.259-working' into v0.7.259-nirps-test. [Neil Cook]
- Merge branch 'v0.7.259-nirps-test' into v0.7.259-working. [Neil Cook]
- [APERO] fix exposure meter. [Neil Cook]
- [APERO] doc string/ typing / pcheck / pep8 updates. [Neil Cook]
- [APERO] *localisation.py* - remove cross term between coefficients in the loco fit. [Neil Cook]
- [NIRPS] update orders and order position. [Neil Cook]

5.3.1.17   0.7.260 (2022-11-07)

- [NIRPS] use chebyshev in the continuity fit. [Neil Cook]
- [NIRPS] use chebyshev in the continuity fit. [Neil Cook]
- [NIRPS] use chebyshev in the continuity fit. [Neil Cook]
- [NIRPS] use chebyshev in the continuity fit. [Neil Cook]
- [NIRPS] update number of orders (75–> 74) and *LOC_YDET_MIN.* [Neil Cook]
- [NIRPS] update number of orders (74–> 75) [Neil Cook]
- [NIRPS] update *LOC_YDET_MAX, LOC_YDET_MAX.* [Neil Cook]
- [NIRPS] back to 74 orders but move *LOC_YDET_MAX.* [Neil Cook]
- [NIRPS] back to 73 orders but move *LOC_YDET_MAX.* [Neil Cook]
- [NIRPS] update number of orders 73 –> 74. [Neil Cook]
- [NIRPS] update number of orders 73 –> 74. [Neil Cook]
- [APERO] *install.py* - fix git python version. [Neil Cook]
- [APERO] fix problem with *leak_ref* not being a hash code file (was just using first file) [Neil Cook]
- [APERO] *apero.plotting.plot_functions.py* - fix broken plot (type reference–>ref) [Neil Cook]
- [APERO] add paper to main page. [Neil Cook]
- [APERO] fix for badpix (bstatsb) [Neil Cook]
- [APERO] update version/date/changelog/docs. [Neil Cook]

5.3.1.18   0.7.259 (2022-11-04)

- [APERO] add git branch + git hash + python modules + python version to *PARAM_TABLE.* [Neil Cook]
- [APERO] pep8 and warning fixes. [Neil Cook]
- Merge branch 'v0.7.254-working' into v0.7.254-cheby. [Neil Cook]
  # Conflicts: # *apero/core/math/gen_math.py* # *apero/plotting/plot_functions.py* # apero/science/calib/shape.py # apero/science/calib/wave.py # apero/tools/module/utils/inverse.py
- [APERO] push chevyshev + clean hot pix lin mini fix into working branch. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.254-cheby' into v0.7.254-cheby. [Neil Cook]
- [APERO] *apero.tools.recipes.spirou.apero_expmeter_spirou.py.* [Neil Cook]
- [APERO] remove linear minimization from *clean_hotpix* function. [Neil Cook]
- [APERO] fixes for chebyshev. [Neil Cook]
- [APERO] force jit functions to not use fastmath mode. [Neil Cook]
- [APERO] fixes to EA chebyshev code. [Neil Cook]

5.3.1.19 0.7.258 (2022-10-31)

- Adding cheby stuff all over the place. [eartigau]
- [APERO] make sure assets directory is reset (but copy all "new" files to a backup assets dir) [Neil Cook]
- [APERO] re-run template after best telluric correction. [Neil Cook]
- [APERO] add zsh profiles to setup dir. [Neil Cook]
- [APERO] update import order (pycharm Ctrl+Alt+O to sort) [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.20 0.7.257 (2022-10-25)

- [APERO] correct columns in *apero_stats.py*. [Neil Cook]
- [APERO] add file index mode to *apero_stats.py* + write *apero_stats_static.txt* and *apero_stats_varying.txt* to msg/report directory. [Neil Cook]
- [APERO] remove cook@localhost.mysql.backup file from calib reset (it shouldn't be here) [Neil Cook]
- [APERO] start adding "all" mode to *apero_stats.py*. [Neil Cook]
- [APERO] fix *FORCE_REFWAVE* flag in *get_wavelength* function calls. [Neil Cook]
- [APERO] add conda and git documentation to other documentation. [Neil Cook]
- [APERO] add TODO re: hard coded value. [Neil Cook]
- [APERO] add a limit to *apero_stats* memory mode. [Neil Cook]
- [APERO] update *apero_stats* memory plot. [Neil Cook]
- [APERO] add to *apero_get* documentation. [Neil Cook]
- [APERO] test of wave [EXT] memory issue. [Neil Cook]
- [APERO] test of wave [EXT] memory issue. [Neil Cook]
- [APERO] fix problem with using *setup/install.py* –update mode. [Neil Cook]
- [APERO] update *apero_stats* plot. [Neil Cook]

5.3.1.21 0.7.256 (2022-10-13)

- [APERO] pep8 fixes. [Neil Cook]
- [APERO] fixes for adding log start/log end + ccf *run_file*. [Neil Cook]
- [APERO] add *LOG_START* and *LOG_END* to log database (and fix *END_TIME)* - will require new log database. [Neil Cook]
- [APERO] improve memory stats plot. [Neil Cook]
- [APERO] add an exact requirements module to test all packages being the same. [Neil Cook]
- [APERO] fix custom arguments [INPUTS] coming from run.ini file and –mask argument not looking in the *assets/ccf_masks* directory. [Neil Cook]
- [APERO] add a printout to *wave_ref_spirou* + update *apero_overall_flow* graph. [Neil Cook]
- [APERO] update date/version/changelog/docs. [Neil Cook]

5.3.1.22 0.7.254 (2022-09-22)

- [APERO] test fix for pickling PseudoConstants. [Neil Cook]
- [APERO] Apply fixes for pickling Run Class. [Neil Cook]
- [APERO] *apero.science.extract.extraction.py* - fix bug is cosmic check res = sx - fx/amp –> res = sx - *fx*amp*. [Neil Cook]
- [APERO] *apero.core.utils.drs_startup.py* - use np.genfromtxt instead of np.loadtxt as there is a bug in numpy 1.23. [Neil Cook]

5.3.1.23 0.7.255 (2022-09-30)

- [APERO] doc + pep8 *[gen_ calib.py]* [Neil Cook]
- [APERO] doc + pep8 *[flat_ blaze.py]* [Neil Cook]
- [APERO] doc + pep8 [background.py, badpix.py, dark.py] [Neil Cook]
- [APERO] update docs. [Neil Cook]
- [APERO] update date/version/changelog/docs. [Neil Cook]

5.3.1.24 0.7.253 (2022-09-29)

- [APERO] add *apero_ stats* memory table to report directory. [Neil Cook]
- [APERO] correct documentation schematics not appearing. [Neil Cook]
- [APERO] correct documentation schematics not appearing. [Neil Cook]
- [APERO] update versionn/date/docs/changelog. [Neil Cook]

5.3.1.25 0.7.252 (2022-09-27)

- [APERO] continue update doc string + pep8. [Neil Cook]
- [APERO] continue update doc string + pep8. [Neil Cook]
- [APERO] continue update doc string + pep8. [Neil Cook]
- [APERO] continue update doc string + pep8. [Neil Cook]
- [APERO] *apero.core.instruments.*.file_ definitions.py* - fix typo _ *WAVESOL_REF* –> _ *wavesol_ ref.* [Neil Cook]
- [APERO] update program descriptions and some doc strings + pep8. [Neil Cook]
- [APERO] *documentation.unused.v07_ docstring_ update.txt* - add more recipes to check. [Neil Cook]
- [APERO] *documentation.unused.v07_ docstring_ update.txt* - add more recipes to check. [Neil Cook]
- [APERO] *apero.science.calib.gen_ calib.py* - if not required do not cause error. [Neil Cook]
- [APERO] correct flat codes - combine method should be "flat" [Neil Cook]
- [APERO] *apero.io.drs_ path.py* - reset the listdir function. [njcuk9999]

5.3.1.26 0.7.251 (2022-09-19)

- [APERO] update doc strings + pep8 (see *v07_ docstring_ update.txt)* [Neil Cook]
- [APERO] documentation - add to useful mysql commands. [Neil Cook]
- [APERO] update doc strings + pep8 (see progress in *v07_ docstring_ update.txt)* [Neil Cook]
- [APERO] *apero.tools.module.testing.drs_ stats.py* - for sqlite need the LIKE parameter for recipe. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_ installation.py* - fix arg return of *get_ sqlite_ settings.* [Neil Cook]
- [APERO] update doc-string + deal with pep8. [Neil Cook]
- [APERO] update doc-string + deal with pep8. [Neil Cook]

5.3.1.27 0.7.250 (2022-09-13)

- [APERO] update language database. [Neil Cook]
- [SPIROU] documentation: add schematics back to *recipe_ definitions.py.* [Neil Cook]
- [APERO] update some todo messages. [Neil Cook]
- [APERO] update language database to replace some text (in TODO) [Neil Cook]
- [APERO] *apero.science.extract.gen_ ext.py* - try to stop errors when order profile exists but cannot be read (parallelisation issue) [Neil Cook]
- Update *UPDATE_ NOTES.txt.* [Neil Cook]
- Update *UPDATE_ NOTES.txt.* [Neil Cook]
- [APERO] *apero.recipes.*.apero_ fit_ tellu*.py* - recon must be multiplied by blaze before creating s1d (for proper weighting) [Neil Cook]
- [APERO] *apero.science.polar.gen_ pol.py* - fix factor 2 in exponent (from Eder) [Neil Cook]

5.3.1.28 0.7.249 (2022-09-07)

- [APERO] *setup.install.py* - make sure config path is still the full path. [Neil Cook]
- [APERO] *apero.base.base.py* - fix references to allparams. [Neil Cook]
- [NIRPS] correct typo *apero_PP_REF_nirps –> apero_pp_ref_nirps*. [Neil Cook]
- [NIRPS] correct typo *apero_PP_REF_nirps –> apero_pp_ref_nirps*. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_installation.py* - save install params to *DRS_UCONFIG* (for re-use / debug) in install.sh. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_installation.py* - *all_params['MYSQL']* parameters should be upper-case (to match sqlite) [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_installation.py* - *all_params['MYSQL']* parameters should be upper-case (to match sqlite) [Neil Cook]
- [APERO] *apero.core.instruments.default.grouping.py* - fix problem where 1 entry leads to a crash. [Neil Cook]
- [APERO] fix sqlite installation error (Issue #682) [Neil Cook]
- [APERO] apero.base.base.py: typo FILEINDEX –> FINDEX. [Neil Cook]
- [APERO] test recipe documentation. [Neil Cook]
- [APERO] correct *drs_db* change. [Neil Cook]
- [APERO] update version/date/changelog/documentation. [Neil Cook]

5.3.1.29 0.7.248 (2022-08-31)

- [APERO] manage locking better (when no PID), manage databases better (from one place *pconst.GET_DB_COLS()* + base) [Neil Cook]

5.3.1.30 0.7.247 (2022-08-29)

- [APERO] Change object database to astrometric database. [Neil Cook]
- [APERO] Change object database to astrometric database. [Neil Cook]
- Merge branch 'v0.7.242-working' into v0.7.243-working. [Neil Cook]
  # Conflicts: # *apero/core/core/drs_file.py* # *apero/tools/module/listing/file_explorer.py*
  Conflicts fixed
- [APERO] update references to INDEX (and make all database lower case for SQL) [Neil Cook]
- [APERO] documentation - update files. [Neil Cook]
- [APERO] documentation - add sequence graphml/jpg/pdf files. [Neil Cook]
- *Apero.tools.module.database.database_gui.py* - save the hash col before removing it and add it back when saving. [Neil Cook]
- Put the readme files back in /bin/ and /tools/ [Neil Cook]
- [APERO] *apero.science.telluric.template_tellu.py* - fix s1d template (in similar way to s1d template) [Neil Cook]

5.3.1.31 0.7.246 (2022-08-17)

- [APERO] add to sequence schematics + descriptions. [Neil Cook]
- [APERO] update file descriptions + update documentation with file descriptions. [Neil Cook]
- [APERO] update file descriptions. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_reset.py* - correct temporary message. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_reset.py* - correct file list. [Neil Cook]
- [APERO] *apero.tools.module.setup.drs_reset.py* - speed up reset (or at least display a message) [Neil Cook]
- [APERO] documentation - update overview schematics (yed) [Neil Cook]
- [APERO] *apero.tools.recipes.bin/apero_stats.py* - need recipe to be passed (for plotting) [Neil Cook]
- [APERO] *apero.tools.recipes.bin/apero_stats.py* - need recipe to be passed (for plotting) [Neil Cook]
- [APERO] *apero.science.telluric.gen_tellu.py* - change pre-cleaning SNR criteria to be median SNR (not max) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.243-working' into v0.7.243-working. [Neil Cook]
- [APERO] *apero.science.telluric.template_tellu.py* - [BAD BUG] fix for templates - binning was incorrect if N>50 files was using only the first sqrt(N) files, if N<50 was using only using the first. [Neil Cook]

- [APERO] paper - update *apero_overall_flow* diagram. [Neil Cook]

5.3.1.32 0.7.245 (2022-08-10)

- Merge branch 'v0.7.242-working' into v0.7.243-working. [Neil Cook]
- [APERO] *apero.tools.recipes.bin.apero_stats.py* - add memory stats to *apero_stats.py*. [Neil Cook]
- Update filenames master–>ref. [Neil Cook]
- Update filenames master–>ref. [Neil Cook]
- Re-add run.ini files after master–>ref. [Neil Cook]
- Re-add run.ini files after master–>ref. [Neil Cook]
- Replace "master/MASTER" with "ref/reference" (do not use "master" as a word) [UNTESTED] [Neil Cook]

5.3.1.33 0.7.244 (2022-08-02)

- [APERO] *core.instruments.*.recipe_defintions.py* - missing *WAVEREF_EXPECTED* from plots. [Neil Cook]
- Update *mysql_database_commands.rst*. [Neil Cook]
  Add some extra useful MySQL commands
- Add files via upload. [Neil Cook]
  add overview for paper

5.3.1.34 0.7.243 (2022-06-30)

- [APERO] *apero.base.drs_db.py* - up the wait time for database connection failure (5s–> 30s) [Neil Cook]
- Up the wait time for database connection failure. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.242-working' into v0.7.242-working. [Neil Cook]
- [APERO] deal with nan slices in transmission. [njcuk9999]
- Update paper schematics. [Neil Cook]

5.3.1.35 0.7.242 (2022-06-23)

- [NIRPS] modify tapas to mask unusable regions. [njcuk9999]
- [APERO] *tools.module.processing.drs_processing.py* - make *KW_OBSTYPE* condition depend on instrument. [njcuk9999]
- [NIRPS] adjust some tellu parameters for nirps. [njcuk9999]
- [APERO] remove shortcut to *apero_flat_spirou.py* in bin dir. [Neil Cook]
- Update version/date/changelog/docs. [Neil Cook]

5.3.1.36 0.7.241 (2022-06-21)

- [APERO] *apero.core.core.drs_file.py* - deal with nans better. [njcuk9999]
- [APERO] *apero.core.core.drs_file.py* - deal with nans better. [njcuk9999]
- [NIRPS] add a *test_fp_dark* file definition. [njcuk9999]

5.3.1.37 0.7.240 (2022-06-17)

- [APERO] small changes for update to reject database. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- [APERO] change slightly how REJECTLIST works (to allow difference between spirou and nirps) [Neil Cook]
- [NIRPS] *default_constants.py* - update *GL_OBJ_COL_NAME*. [njcuk9999]

5.3.1.38 0.7.239 (2022-06-14)

- [APERO] *drs_astrometrics.py* - ask user for Teff source. [Neil Cook]
- [NIRPS] add *TEST_DARK_DARK_SKY* from EFF,SKY,SKY files and add to engineering seqeuence. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- [NIRPS] update hot star list. [Neil Cook]
- [NIRPS] fix typo *LW_DRS_QC -> KW_DRS_QC*. [njcuk9999]
- [NIRPS] undo shape change for ha (from he) [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [Neil Cook]
- [NIRPS] B fiber should be *fit_cavity + fit_achromatic* = False. [njcuk9999]
- [APERO] save preprocessing files that fail qc to disk but check in all recipes that qc has passed (unless user forces *no_in_qc* check) [njcuk9999]
- [APERO] *apero.science.calib.background.py* - slightly change how background subtraction is done. [njcuk9999]
- [NIRPS] add raw test dark. [Neil Cook]

5.3.1.39 0.7.238 (2022-06-09)

- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [Neil Cook]
- [NIRPS] add *pp_test_eff_sky* file definition. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- [APERO] *tools.module.processing.drs_trigger.py* - put the *trigger_table.fits* in a standard location (not dependent on recipe run location) [Neil Cook]
- [NIRPS] fix for getting object name. [njcuk9999]
- [NIRPS] *science.extract.extraction.py* - remove an extra factor of gain (didn't matter for SPIRou as gain=1) [njcuk9999]
- [NIRPS] update *file_definitions.py* for *RAW_FLUXSTD_SKY*. [njcuk9999]
- [NIRPS] add *TELLU_SKY* file definition. [Neil Cook]
- [APERO] update date/version/doc/changelog. [Neil Cook]

5.3.1.40 0.7.237 (2022-06-08)

- Add FLUX,STD,SKY file definition. [njcuk9999]
- [APERO] fixes for trigger + [NIRPS] gain header key change. [njcuk9999]
- [APERO] fix drsfile.nosave in *copy_header/copy_hdict*. [Neil Cook]
- [APERO] do not check non calib recipes for calib run. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- Deal with *store_true* action better (when called as an argument) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- [APERO] add a nosave option for debug/plotting/information purposes (no writing of files) - bug fix. [Neil Cook]
- [APERO] add a nosave option for debug/plotting/information purposes (no writing of files) [Neil Cook]
- [APERO] add to trigger code (tested) [Neil Cook]
- [APERO] add new wave sol for *NIRPS_HA*. [njcuk9999]

5.3.1.41 0.7.236 (2022-06-04)

- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- [APERO] first commit of very basic trigger. [Neil Cook]
- [APERO] *apero.io.drs_fits.py* - fix *read_multi* extension being None (deepcopy instead of array) [njcuk9999]
- [APERO] fix memory leak with bottleneck + over copying of fits reader. [njcuk9999]
- [NIRPS] update *nirps_he* default wave sol. [njcuk9999]
- [APERO] *apero.core.instruments.default.deafult_constants.py* - *BADPIX_ERODE_SIZE* and *BAD-PIX_DILATE_SIZE* must be integers. [njcuk9999]
- [APERO] flat - better deal with bad flat pixels. [njcuk9999]
- [APERO] badpix - add erosion + dilution factors for large bad pixels. [njcuk9999]
- [APERO] *apero.science.extract.extraction.py* - fix flat (do not correct too small or too large values) [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [Neil Cook]
  # Conflicts: # bin/apero_flat_spirou.py
- [NIRPS] add nirps to the documentation. [Neil Cook]
- [APERO] todo deal with small number division in the flat. [njcuk9999]
- [APERO] better patch edges of large bad pixel regions [NIRPS] update wave sols + catalogue. [njcuk9999]

5.3.1.42 0.7.235 (2022-05-31)

- [NIRPS] add in telluric recipes. [njcuk9999]
- [NIRPS] *apero.tools.module.processing.drs_run_ini.py* - add to run.ini files the nirps helios sequence. [njcuk9999]
- Add changes to allow helios to be reduced. [njcuk9999]
- Pep8 changes. [njcuk9999]
- Update default nirps he wave solution + fix typo in *WAVE_FIBER_OFFSET_MOD* and *WAVE_FIBER_SCALE_MOD.* [njcuk9999]
- Update default nirps he wave solution. [njcuk9999]
- *WAVEREF_EXPECTED* to take diffvelo + allow offset/sclae of wave solution by N pixels. [njcuk9999]
- Update header keys for *nirps_he.* [Neil Cook]

5.3.1.43 0.7.234 (2022-05-20)

- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [njcuk9999]
- Add *mk_tellu* and *mk_model* to *nirps_ha* and *nirps_he* to sequences. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.232-working' into v0.7.232-working. [Neil Cook]
- Add *mk_tellu* and *mk_model* to *nirps_ha* and *nirps_he.* [Neil Cook]
- Long and lat flipped for nirps (whoops) [njcuk9999]
- Update tellu white list and default master wave sol for *nirps_ha.* [njcuk9999]

5.3.1.44 0.7.233 (2022-05-18)

- Deal with no pmra/pmde in headers. [njcuk9999]
- Update *nirps_ha* wave sol. [Neil Cook]
- Update *PP_OBJ_DPRTYPES* (add *OBJ_SKY)* [Neil Cook]
- For nirps we need to test whether OBJECT not in obstype (for SKY test) [Neil Cook]
- Object type different for nirps - add *REPROCESS_OBJECT_TYPES.* [Neil Cook]
- Add *fit_tellu* and *mk_template* for *nirps_he/nirps_ha.* [Neil Cook]
- Update gain header key for nirps. [Neil Cook]
- Update exptime for nirps. [Neil Cook]
- Some speed up tests. [Neil Cook]
- Update date/version/docs/changelog. [Neil Cook]

5.3.1.45 0.7.232 (2022-05-06)

- Merge remote-tracking branch 'origin/v0.7.228-working' into v0.7.228-working. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.228-working' into v0.7.228-working. [njcuk9999]
- Replace PandasLikeDatabase with PandasLikeDatabaseDuckDB - speeds up post processing by factor of 5. [njcuk9999]
- Update date/version/docs/changelog. [Neil Cook]

5.3.1.46 0.7.231 (2022-05-06)

- *Apero.science.polar.gen_ pol.py* - shift correctly all parameters stored in headers of the wave solution. [Neil Cook]
- Create a *pol_ calib* to store shifted blaze and wave + add *WAVE_ AB* ad *BLAZE_ AB* to p.fits from *pol_ calib*. [Neil Cook]
- Add a binary flag for when wave master is forced. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ database.py* - add a reset database option. [Neil Cook]
- *Apero.io.drs_ path.py* - sort directories and *valid_files*. [Neil Cook]

5.3.1.47 0.7.230 (2022-05-04)

- *Apero.science.polar.gen_ pol.py* - deal with polar failing on orders with all NaN. [njcuk9999]
- *Mk_ template* now bins to avoid loading many images + correct berv coverage. [Neil Cook]

5.3.1.48 0.7.229 (2022-04-29)

- Apero.data.spirou.databases.reset.calib.csv - uhash must be unique - generate hash for default values. [Neil Cook]
- *Apero.tools.module.database.manage_ database.py* - update database creation with additional unique columns in calib/tellu database. [Neil Cook]
- Update reset calibration database (need UHASH column) [Neil Cook]
- *Apero.tools.recipes.bin.apero_ explorer.py* - correct getting hash arg. [Neil Cook]
- *Apero.core.core.drs_ misc.py* - do not use nan for doubles in stats. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - do not use nan for doubles. [Neil Cook]
- Update date/version/docs/changelog. [Neil Cook]

5.3.1.49 0.7.228 (2022-04-28)

- Add in PID, PDATE to calibration/telluric database add in RAM/SWAP/CPU column to log database. [Neil Cook]
- *Apero.recipes.spirou.apero_ thermal_ spirou.py* - for *DARK_ DARK_ INT* force wave solution to master. [Neil Cook]
- *Apero.recipes.*.apero_ extract_ *.py* - add way to force wave master in extraction + update *recipe_ definitions.py*. [Neil Cook]

5.3.1.50 0.7.227 (2022-04-26)

- *Documentation.working.resources.default.descriptions.apero_astrometric* s.rst - update the notes on *apero_astrometrics*. [Neil Cook]
- *Apero_astrometrics.py* - allow aliases to be added and deal with Teff objname better. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - link conditions to run.ini file supplied (for checking *obs_dir* etc) [Neil Cook]
- *Apero.tools.module.drs_processing.py* - add *UPDATE_IDATABASE_NAME* run.ini parameter (to allow turning off update certain databases) [Neil Cook]
- Update the default run.ini files. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.225-working' into v0.7.225-working. [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - fix problem with MJDMID having a NaN (float) value. [njcuk9999]
- *Apero_extract_spirou.py* - add *EXP_FPLINE* flag. [Neil Cook]
- *Apero.recipes.spirou.apero_pol_spirou.py* - do not allow files that failed qc to be used in polar recipe (by default) flag and return failure. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - remove index database crossmatch for qc mode (not required?) [Neil Cook]

5.3.1.51 0.7.226 (2022-04-21)

- *Apero.tools.resources.run_in.** - update templates for run.ini files to have *UPDATE_INDEX_DATABASE* flag. [Neil Cook]
- *Apero.tools.recipes.bin.apero_processing.py* - add *UPDATE_INDEX_DATABASE* flag so user can not update the index database (needs big warning about doing this) [Neil Cook]
- *Apero.science.calib.leak.py* - add in a second log for fiber loop [untested] [Neil Cook]
- *Apero.recipes.spirou.apero_leak_master_spirou.py* - leak master has no qc - update recipe.log. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - *no_qc* must update children as well. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add *UPDATE_INDEX_DATABASE* to allow not updating index database in *apero_processing* [UNTESTED] [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - update *WAVE_FP_DPRLIST* (missed *POLAR_FP)* [Neil Cook]
- Update some typos in *default_keywords.py*. [Neil Cook]
- Correct typo and change *NO_DB* = False. [Neil Cook]
- *Apero.base.base.py* - update *LOG_FLAGS* to include QCPASSED. [Neil Cook]
- *Apero.base.base.py* - update *LOG_FLAGS* to include OBJ. [Neil Cook]
- Update date/version/changelog/docs. [Neil Cook]

5.3.1.52 0.7.225 (2022-04-13)

- *Apero.science.extract.other.py* - flag when extraction file has been found (require RecipeLog as input to *extract_*_files* functions) [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - add *INT_EXT* and *EXT_FOUND* flags to recipes that use *apero_extract* internally. [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* - *WAVEM_CAV* should only be the main science fiber. [Neil Cook]
- *Apero.base.base.py* - add log flag descriptions - can only add flags if the are here. [Neil Cook]

5.3.1.53 0.7.224 (2022-04-11)

- *Apero.tools.processing.drs_processing.py* - update *skip_clean_arguments* to allow additional arguments. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - *apero_water_master* should be a master recipe always. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - correct typo *"apero_loc.set_flags"* –> *"apero_extract.set_flags"* [Neil Cook]

5.3.1.54 0.7.223 (2022-04-09)

- Merge branch 'v0.7.219-stable-test' into v0.7.221-working. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.219-stable-test' into v0.7.219-stable-test. [Neil Cook]
- Fix tellurics and thermal problems. [njcuk9999]

5.3.1.55 0.7.222 (2022-04-03)

- Update documentation. [Neil Cook]
- Update documentation. [Neil Cook]
- Update date/version/docs. [Neil Cook]

5.3.1.56 0.7.221 (2022-04-02)

- Fixes for outclass (telluric centric fixes) [Neil Cook]
- Fix problems with outclass + move *running/in_parallel/ended* to binary flag + add a flag mode in *apero_explorer.py.* [Neil Cook]

5.3.1.57 0.7.220 (2022-03-31)

- Replace outfunc with outclass (a output file class) [Neil Cook]
- Update error for database not found (was ambiguous) [Neil Cook]
- Update date/version/docs/changelog. [Neil Cook]

5.3.1.58 0.7.219 (2022-03-27)

- Bug fixes after nirps merge. [Neil Cook]
- Merge branch 'v0.7.213-nirps-he' into v0.7.213-working. [Neil Cook]
- *Apero.tools.moduile.processing.drs_grouping_functions.py* - *get_non_file_args()*: add an additional check on group being none before assigning *obs_dir* to group. [Neil Cook]
- Add back in *pp_master* for *nirps_he*. [Neil Cook]
- Re-run run.ini for nirps he. [Neil Cook]
- Merge branch 'v0.7.213-working' into v0.7.213-nirps-he. [Neil Cook]
  # Conflicts: # *apero/core/core/drs_file.py*
- *Apero_shape_master_nirps_he.py* - update shape for nirps he + start preprocess changes. [Neil Cook]
- Add flags to log database and test with preprocessing and loc. [Neil Cook]

5.3.1.59 0.7.218 (2022-03-24)

- *Apero.core.core.drs_base_classes.py* - add binary dictionary (to store flags) - eventually use for log. [Neil Cook]
- *Apero.core.core.drs_file.py* - switch axis in combined table - header keys are columns. [Neil Cook]
- *Apero.science.telluric.template_tellu.py* - template header is now a combined header. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.60 0.7.215 (2022-03-21)

- *Apero.core.*.recipe_definitions.py* - master night non master recipes should not have master=True, night cals should not have thermal master=True. [Neil Cook]
- *Drs_stats.py* - correct typo *LOG_FILE –>* LOGFILE. [Neil Cook]
- *Drs_stats.py* - add logfile and runstring to output timing stats. [Neil Cook]
- *Drs_stats.py* - add pid to log output. [Neil Cook]

5.3.1.61 0.7.214 (2022-03-15)

- Update run.ini files and all negative number of cores (to mean N-abs(cores)) [Neil Cook]
- *Apero_flat_*.py* - remove e2ds saving. [Neil Cook]
- *Apero.core.constants.param_functions.py + apero.core.core.drs_file.py* - add iloc (index database entries) to *PARAM_TABLE*. [Neil Cook]
- *Apero.recipes.spirou.apero_flat_*.py* - write e2ds and e2dsll for flat files (as debug) [Neil Cook]
- *Apero.science.extract.gen_ext.py* - make sure orderps files are added to index database (and have *PARAM_TABLE)* [ID by DRS-TEST] [Neil Cook]
- *Apero.science.calib.dark.py* - fix bad naming of *dark_master* extensions [ID by DRS-TESTS] [Neil Cook]

5.3.1.62 0.7.216 (2022-03-11)

- *Install.py* - fix *database_ask* criteria for reject database. [Neil Cook]
- *Install.py* - do not validate if –help in args. [Neil Cook]
- Update installer with reject database installation. [Neil Cook]
- *Apero_preprocessing.py* - correct *reject_infile()* [Neil Cook]
- Update *apero_go.py.* [Neil Cook]
- Update run.ini files and add reject database to *apero_database.py.* [Neil Cook]
- Update date, version, documentation, changelog. [Neil Cook]

5.3.1.63 0.7.213 (2022-03-09)

- Merge branch 'v0.7.209-neil-test' into v0.7.208-working. [Neil Cook]
- *Apero.science.calib.shape.py* - try again to close file. [Neil Cook]
- *Apero.science.calib.shape.py* - must close file here. [Neil Cook]
- Merge branch 'v0.7.208-stable-test' into v0.7.208-working. [Neil Cook]
- *Apero.tools.recipes.bin.apero_astrometrics.py* - add an option to seach proper motion catalogues for the name even if it isn't found in SIMBAD. [Neil Cook]
- *Apero.science.preprocessing.gen_pp.py* - get the file reject list from the reject database. [Neil Cook]
- Merge branch 'v0.7.208-stable-test' into v0.7.208-working. [Neil Cook]
- *Apero_astrometrics* - correct bug with multiple teff values. [njcuk9999]

5.3.1.64 0.7.212 (2022-03-05)

- Update language database. [Neil Cook]
- Merge branch 'v0.7.208-stable-test' into v0.7.208-working. [Neil Cook]
  # Conflicts: # apero/science/extract/extraction.py
- *Apero.science.extract.extraction.py* - correct typo in extraction. [Neil Cook]
- *Apero.science.extract.extraction.py* - correct typo in extraction. [Neil Cook]
- Merge branch 'v0.7.208-stable-test' into v0.7.208-working. [Neil Cook]
- *Apero.tools.module.database.drs_astrometrics.py* - make teff selection more logical. [Neil Cook]
- *Apero.tools.module.database.drs_astrometrics.py* - make teff selection more logical. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.208-stable-test' into v0.7.208-stable-test. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.208-stable-test' into v0.7.208-stable-test. [njcuk9999]
- *Apero_astrometrics* - correct bug with multiple teff values. [njcuk9999]
- Update a todo. [Neil Cook]
- Continue adding reject database. [Neil Cook]
- Merge branch 'v0.7.208-stable-test' into v0.7.208-working. [Neil Cook]
- *Apeor.plotting.plot_functions.py* - remove forced plot option. [Neil Cook]
- *Apero.tools.module.database.drs_astrometrics.py* - deal better with masked rv value (no "–") [Neil Cook]
- Add reject database. [Neil Cook]
- Add reject database. [Neil Cook]

5.3.1.65 0.7.211 (2022-03-03)

- *Apero.science.extraction.py* - rearrange equations for speed up. [Neil Cook]
- Replace np.nanfunc with mp.nanfunc (speed up) [Neil Cook]
- *Apero_precheck* - get time from sci data if no calibrations. [njcuk9999]
- Merge branch 'v0.7.208-working' into v0.7.208-stable-test. [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - update recipe definitions to add *calib_required* for those calibs that must be checked. [Neil Cook]
- *Apero.core.core.drs_database.py* - only use "USED=1" objects from object database. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - remove the todo line setting all objs to be refound. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - do not get the index database if in timing mode (we don't need it) [Neil Cook]
- Merge branch 'v0.7.208-working' into v0.7.208-stable-test. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - do not crossmatch with index for timing mode. [Neil Cook]
- Merge branch 'v0.7.208-working' into v0.7.208-stable-test. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - add dt vs start time plot. [Neil Cook]
- Merge branch 'v0.7.208-working' into v0.7.208-stable-test. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - use original names for use in astrometrics. [Neil Cook]
- Update requirements for *astro_visu.* [Neil Cook]
- Update requirements for *astro_visu.* [Neil Cook]
- Update visualisation test code. [Neil Cook]
- Update requirements for LAM (downgrade bottleneck) [Neil Cook]

5.3.1.66 0.7.210 (2022-02-23)

- Update visualisation test code. [Neil Cook]
- Update visualisation test code. [Neil Cook]
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- Update visualisation test code. [Neil Cook]
- Update visualisation test code. [Neil Cook]
- Test visualisations. [Neil Cook]

5.3.1.67 0.7.209 (2022-02-17)

- *Apero.plotting.plot_functions.py.plot_stats_timing_plot* - deal with nrows=1 ncols=1. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - deal with None in *END_TIME* better. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - update timing error. [Neil Cook]
- *Apero.plotting.plot_functions.py* - deal with case where nrows = 1. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - fix typo. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - only check obj names for science / hot star observations. [Neil Cook]
- Update date/version/docs. [Neil Cook]

5.3.1.68 0.7.208 (2022-02-11)

- Copyraw and add version to setup codes, point README.md the documentation. [Neil Cook]
- Move the raw sym/copy in *apero_get* into setup (outside apero frame work) as it is probably only going to be used before installation. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - correct typo *filepostfile.out_requiredd –> filepostfile.out_required.* [Neil Cook]
- Merge branch 'v0.7.205-stable-test' into v0.7.205-working. [Neil Cook]
- *Apero.science.calib.wave.py* - remove reference to NAXIS2 and NAXIS1. [Neil Cook]
- *Apero.tools.recipes.bin.apero_visu.py* - for later use. [Neil Cook]
- *Apero.recipes.*.apero_wave_master_*.py.* [Neil Cook]

5.3.1.69 0.7.207 (2022-02-07)

- *Apero.tools.recipes.bin.apero_ get.py* - create *user_ outdir* path if it doesn't exist. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ get.py* - add in a raw copy/symlink option. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ get.py* - move functionality to module + finish changes to filter by qc failures. [njcuk9999]
- *Apero.tools.recipes.bin.apero_ get.py* - only copy those with qc passed. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.205-stable-test' into v0.7.205-stable-test. [Neil Cook]
- Update how null columns are handled. [njcuk9999]
- *Apero.science.calib.thermal.py* - fix ratio1 and ratio2 in Null case (should be ratio) [Neil Cook]
- *Apero.tools.module.database.drs_ astrometrics.py* - add way to not check pm (for dev only) [Neil Cook]
- *Apero.tools.module.database.drs_ astrometrics.py* - add way to attempt to update all missing teffs. [Neil Cook]
- *Apero.tools.module.database.drs_ astrometrics.py* - add way to attempt to update all missing teffs. [Neil Cook]
- *Apero.tools.module.database.dsr_ astrometrics.py* - work on updating teffs. [njcuk9999]
- *Apero.tools.module.database.manage_ database.py* - separate update and get object database functions. [Neil Cook]
- *Apero_ astrometrics.py* - add teff from disk if possible. [Neil Cook]
- Update run.ini files. [Neil Cook]
- *Apero.core.core.drs_ database.py* - return only *OBS_ NAMES[objname]* [njcuk9999]

5.3.1.70 0.7.206 (2022-02-03)

- Update some documentation. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.71 0.7.205 (2022-02-01)

- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - deal with SKY and CALIB object names. [njcuk9999]
- *Apero.core.core.drs_ database.py* - deal with special (calib/sky/test) better when trying to find aliases (don't check) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- *Apero.core.core.drs_ fil.py* - update DrsInputFile children to have instrument input. [njcuk9999]
- Update *PP_ OBJ_ DPRTYPES*. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
  # Conflicts: # *apero/tools/recipes/bin/apero_ get.py*
- Obj fix. [Neil Cook]
- *Find_ objname* requires rawobjname not objname. [njcuk9999]
- *Apero.core.core.drs_ database.py* - save a list of obs names so we don't do this multiple times per object. [Neil Cook]
- *Apero.tools.module.processing.drs_ run_ini.py* - correct *pp_ seq_ opt* (set all *RUN_ PP_ XXX* to False except those we want as True by default) [Neil Cook]
- Continue dealing with aliases to object names. [Neil Cook]
- Update documentation. [Neil Cook]
- Update documentation. [Neil Cook]
- Update documentation. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- Update object database / index database / header fix to check object name aliases for raw data and in preprocessing (everything after this point uses preprocessing names) [Neil Cook]

5.3.1.72 0.7.204 (2022-01-29)

- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- Updates to *apero_astrometrics.py* to query pm catalogues for new coords/motions. [Neil Cook]
- *Apero_leak_master_nirps_he.py* - fix extract name (ha–>he) [Neil Cook]
- *Apero.plotting.plot_functions.py* - flip figure rows/cols + stokes parameter. [Neil Cook]
- *Apero.plotting.plot_functions.py* - LSD param typos. [Neil Cook]
- *Apero.plotting.plot_functions.py* - pprops and lprops –> props. [Neil Cook]
- *Apero.science.polar.lsd.py* - linevelo[jpos] –> linevelo[pix] [Neil Cook]
- *Apero.plotting.plot_functions.py* - typo tab:b -> tab:blue. [Neil Cook]
- Add labels to *plot_polar_fit_cont* graph. [Neil Cook]

5.3.1.73 0.7.203 (2022-01-28)

- *Apero.plotting.plot_functions.py* - more plot fixes. [Neil Cook]
- *Apero.plotting.plot_functions.py* - more plot fixes. [Neil Cook]
- *Apero.plotting.plot_functions.py* - more plot fixes. [Neil Cook]
- *Apero.plotting.plot_functions.py* - correct more typos. [Neil Cook]
- *Apero.plotting.plot_functions.py* - correct typo NEXPOSURES –> *N_EXPOSURES*. [Neil Cook]
- *Apero.plotting.plot_functions.py* - deal with contx being None. [Neil Cook]
- *Apero.plotting.plot_functions.py* - *CONT_XBIN*, *CONT_YBIN* -> *CONT_POL_XBIN*, *CONT_POL_YBIN*. [Neil Cook]
- *Apero.plotting.plot_functions.py* - *FLAT_X* –> *FLAT_WLDATA*. [Neil Cook]
- *Apero.plotting.plot_functions.py* - *plot_polar_fit_cont* correct plot. [Neil Cook]
- *Apero.plotting.plot_functions.py* - *plot_polar_fit_cont* correct typo s–>ms. [Neil Cook]
- *Apero.science.polar.gen_pol.py* - typo *PLOT_POLAR_FIT_CONT* –> *POLAR_FIT_CONT*. [Neil Cook]
- *Apero.science.polar.gen_pol.py* - typo *POLAR_FIT_CONT* –> *PLOT_POLAR_FIT_CONT*. [Neil Cook]
- *Apero.insturments.spirou.recipe_definitions.py* - polar code –exposures should not be required. [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - remove *KW_THERM_RATIO_2*. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [njcuk9999]
- *Apero.core.core.drs_file.py* - deal better with exclude keys in post processing. [njcuk9999]
- *Apero.core.instruemnts.*.default_constants.py* - add LSD MAX LINEDEPTH. [Neil Cook]
- Add excess emissivity csv file (default file for the drs) [Neil Cook]
- Add excess emissivity changes. [Neil Cook]
- Add new lsd masks. [Neil Cook]
- Add polar changes (Eder update for 0.7) [Neil Cook]

5.3.1.74 0.7.202 (2022-01-26)

- Move leak and thermal to own calib py files and start excess emissivity work. [Neil Cook]
- *[NIRPS_HE] apero.science.preprocessing.detector.py* - account for too much flux between pixels. [Neil Cook]
- Correct mini runs for *nirps_he* and *nirps_ha*. [Neil Cook]
- Update documentation (put examples for *apero_get* in correct place) [Neil Cook]

5.3.1.75 0.7.201 (2022-01-25)

- Updates to get nirps-he working (currently on preprocessing) [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.science.extract.gen_ext.py* - correct typo *THERMALFF_RATIO* to *THERMALFF_RATIO_USED*. [Neil Cook]
- Update lang messages that are warnings/errors to display error code. [Neil Cook]
- *Apero.core.core.drs_file.py* - must copy exclude keys. [Neil Cook]
- *Apero.core.core.drs_file.py* - need to deal with *DrsOutFile.exclude_keys* = None. [Neil Cook]
- *Apero.tools.recipes.spirou.apero_postprocess_spirou.py* - allow polar code to skip certain files (i.e. if DRSMODE=SPECTROSCOPY or UNKNOWN there will not be any p files to product) [Neil Cook]

- *Apero.tools.recipes.bin.apero_ astrometrics.py* - need to add old name to aliases. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ astrometrics.py* - need to update *astro_ obj.objname.* [Neil Cook]
- Update *apero_ astrometrics.py* and *apero_ precheck.py* with new options. [Neil Cook]
- Update docs for dev tools + some optimization. [Neil Cook]

5.3.1.76 0.7.200 (2022-01-25)

- Update docs for dev tools + some optimization. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [Neil Cook]
- Remove _ = *display_ func* and use of Constants = constants.load() where possible. [Neil Cook]
- Add a mode to thermal correction (tapas vs percentile) + add the thermal ratios to header. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [njcuk9999]
- *Recipe_ definitions* for astrometric code wrong. [Neil Cook]
- *Recipe_ definitions* for astrometric code wrong. [Neil Cook]
- Update requirements pillow + ipython. [Neil Cook]
- Apero.science.extract + telluric - fix magic grid (no divide by 1000) [njcuk9999]

5.3.1.77 0.7.199 (2022-01-21)

- Update some recipe definitions for dev tools. [Neil Cook]
- *Apero.science.polar.gen_ pol.py* - deal with full order having no good (all NaNs) pixels. [njcuk9999]

5.3.1.78 0.7.198 (2022-01-20)

- Update documentation descriptions for user tools. [Neil Cook]
- Update documentation descriptions for user tools. [Neil Cook]
- Update documentation descriptions for user tools. [Neil Cook]
- Update documentation descriptions for user tools. [Neil Cook]
- *Apero.tools.module.testing.drs_ stats.py* - deal with no unhandled errors found. [Neil Cook]
- *Apero.tools.module.testing.drs_ stats.py* - check for PPLOG = None. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ stats.py* - error mode requires plog. [Neil Cook]
- *Apero.tools.module.testing.drs_ stats.py* - append after errors caught (otherwise x,y and m could be different lengths) [Neil Cook]
- *Apero.tools.module.drs_ documentation.py* - fix capitalization (just first word) [Neil Cook]
- Only clean auto files if we are redoing all automatically created files. [Neil Cook]
- Rearrange doc structure + fix warnings + add tools and dev tools + clean auto files before restarting. [Neil Cook]
- Rearrange doc structure. [Neil Cook]
- Update documentation code + recipe definitions + file definitions + update docs. [Neil Cook]

5.3.1.79 0.7.197 (2022-01-13)

- Merge remote-tracking branch 'origin/v0.7.194-working' into v0.7.194-working. [njcuk9999]
- *Apero.science.calib.flat_ blaze.py* - add warning message that we are trying sinc fit again + update language database. [Neil Cook]
- *Apero.science.calib.flat_ blaze.py* - sometimes does not fit (but not reproducible) try again 5 times and then report error. [Neil Cook]
- *Apero.recipes.spirou.apero_ postprocess_ spirou.py* - correct error reporting. [njcuk9999]
- *Apero.core.instruments.spirou.file_ definitions.py* - cannot take tellu from telluric database (shouldn't be the closest - should match odometer *(KW_ IDENTIFIER)* [Neil Cook]
- *Apero.core.instruments.spirou.file_ definitions.py* - TELLU A and B files not in telluric database (should they be?) [Neil Cook]
- *Apero.core.instruments.spirou.file_ definitions.py* - tellurics from telluric database? [Neil Cook]

- *Apero.core.instruments.spirou.file_definitions.py* - t.fits hlink for telluric files should be from database (shouldn't save if qc wasn't passed) [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - fix typo *OBJ_HC2 –> OBJ_HCTWO.* [Neil Cook]

5.3.1.80 0.7.196 (2022-01-12)

- Update the language database. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - update pass message for calib delta time + language database. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - update pass message for calib delta time + language database. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - improve error for calib delta time. [Neil Cook]
- Problem with error code 09-002 and 09-003. [Neil Cook]
- Correction of magic grid function (from lbl changes) [Neil Cook]

5.3.1.81 0.7.195 (2021-12-27)

- *Apero.tools.module.setup.drs_isntallation.py* - *user_instrument* must be a string. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - self.index is dataframe. [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - *PID–>KW_PID.* [Neil Cook]
- *Apero.tools.module.testing.drs_stats.py* - obtain the index database once and pass dataframe to classes. [Neil Cook]
- Update date/version/changelog/docs. [Neil Cook]

5.3.1.82 0.7.194 (2021-12-22)

- Merge remote-tracking branch 'origin/v0.7.193-working' into v0.7.193-working. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - deal with masked columns and force str/float for all ftable row values (into tabledict) [njcuk9999]
- Deal with postprocess wave/blaze from calibration (may not be present in index database) [Neil Cook]
- Update language database for template skipped recipes. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py + file_definitions.py* - for mini data pol + ccf should only include *science_targets.* [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - move around errors. [njcuk9999]
- *Apero.core.core.drs_database.py* - correct column order in *update_header_fix()* [Neil Cook]
- *Apero.core.core.drs_database.py* - correct typos *OBS_KIND–>OBS_DIR.* [Neil Cook]
- Astropy (np>1.18) and numba (<1.12) conflict on numpy –> np=1.20.3. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.83 0.7.193 (2021-12-20)

- *Apero.recipes.spirou.apero_postprocess_spirou.py* - move text to language database. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - combien textentry better. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - better handle error reporting. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - report error numbers. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py* - report error numbers. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.recipes.spirou.apero_postprocess_spirou.py + apero.core.core.drs_file.py* - add changes to report errors better in post processing. [Neil Cook]
- *Apero.science.calib.flat_blaze.py* - correct strlist for sinc fit (error reporting caused exception which hides actual error) [Neil Cook]

5.3.1.84 0.7.192 (2021-12-17)

- Update language database. [Neil Cook]
- *Apero.science.extract.berv.py* - check whether both barycorrpy and pyasl are nan + deal better in pyasl with no distance (and give error when ra/dec are nan because of bad *apply_ space_ motion)* [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.182-working' into v0.7.182-working. [njcuk9999]
- Update DrsDatabaseErrors. [Neil Cook]
- Update the install module to work with command line args (see *install_ script.sh)* [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.182-working' into v0.7.182-working. [njcuk9999]
- *Apero.core.instruemnts.spirou.pseudo_ const.py* - get output type for header/hdict (otherwise drsfile is updated) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.182-working' into v0.7.182-working. [njcuk9999]
- Update *FILEDEF_ HEADER_ KEYS* (for spirou to include polar keys) [Neil Cook]
- Fixes for errors with full run 211018. [njcuk9999]

5.3.1.85 0.7.191 (2021-12-15)

- *Apero.tools.module.testing.drs_ stats.py* - update error mode. [Neil Cook]
- *Apero.tools.module.testing.drs_ stats.py* - update error mode. [Neil Cook]
- *Apero.tools.module.testing.drs_ stats.py* - update error mode. [Neil Cook]
- Add an error mode to the *apero_stats.py* module. [Neil Cook]
- *Apero.tools.moduile.recipes.bin.apero_ astrometerics.py* - finalise design (move functionality to *drs_ astrometrics.py.* [Neil Cook]
- *Apeor.science.velocity.gen_ vel.py* - Fix CamelCase column names. [Neil Cook]
- *Apero.core.instruments.spirou.file_ definitions.py* - make S1D files have tag UniformWavelength/UniformVelocity. [Neil Cook]
- Remove auth keys for google sheet. [Neil Cook]
- *Tools.recipes.bin.apero_ astrometrics.py* - add code to get/write to googlesheet. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ astrometrics.py* - add astrometrics code [unfinished] [Neil Cook]

5.3.1.86 0.7.190 (2021-12-08)

- *Apero.tools.module.testing.drs_ stats.py* - fix qc stat plot. [Neil Cook]
- Debug printout tables= [Neil Cook]
- Debug printout tables= [Neil Cook]
- Debug printout tables= [Neil Cook]
- *Apero.base.drs_ db.py* - infer table name when getting columns. [Neil Cook]
- *Apero_ stats.py* - add qc mode (unfinished) [Neil Cook]
- *Apero_ stats.py* - add qc print outs [still need qc plots] [Neil Cook]
- *Apero_ stats.py* - add qc mode (unfinished) [Neil Cook]
- *Setup.install.py* - add fix for Issue #676 - weird module version must be set in *module_ translation.* [Neil Cook]

5.3.1.87 0.7.189 (2021-12-06)

- Add timing to *apero_ stats* (formly *apero_log_ stats)* - still need QC and error checks. [Neil Cook]
- Remove ABSPATH (not indexed) in favour of *BLOCK_ KIND* + *OBS_ DIR* + FILENAME. [Neil Cook]
- Allow thermal correction for telescope dark to use internal dark if telescope dark is mising. [Neil Cook]
- Re-make run.ini files with changes to thermal code. [Neil Cook]
- Re-make run.ini files with changes to thermal code. [Neil Cook]
- *Apero.tools.module.processing.drs_ precheck.py* - update precheck to handle exclusive/inclusive drs file lists. [Neil Cook]
- Add quality control in preprocessing to catch *DARK_ DARKs* that contain science data - these will not be preprocessed. [Neil Cook]
- Update run.ini files + typo in msg. [Neil Cook]
- Finish *apero_ run_ ini.py* code. [Neil Cook]

5.3.1.88 0.7.188 (2021-12-01)

- Continue work on run.ini auto make. [Neil Cook]
- Continue work on *apero_run_ini.py.* [Neil Cook]
- Continue work on *apero_run_ini.py.* [Neil Cook]

5.3.1.89 0.7.187 (2021-11-24)

- *Apero.tools.module.processing.drs_precheck.py* - must mask out other bad nights before comparing the 7 day rule. [Neil Cook]
- *Apero.tools.module.processing.drs_precheck.py* - add a way to filter which nights are actually bad and which nights aren't. [Neil Cook]
- *Apero.base.drs_db.py* - must set number of tries after super call. [Neil Cook]
- Deal with language database trying to connect multiple times. [Neil Cook]
- *Apero.core.core.drs_argument.py* - don't load database until required. [Neil Cook]
- *Apero_get.py* - problem with AND when no object condition. [Neil Cook]
- *Apero.base.drs_db.py* - fix create index on multiple columns. [Neil Cook]
- *Apero.tools.module.drs_reset.py* - pep8 fixes. [Neil Cook]
- *Apero.tools.module.drs_reset.py* - add faster remove approach (when we have none or a few skip files) [Neil Cook]
- *Apero.tools.module.database.manage_database.py* + *apero.core.core.drs_database.py* - fix *idb_cols.get_index_groups.* [Neil Cook]
- Remove circular imports to PandasLikeDatabase (move to *drs_base_classes.py)* [Neil Cook]
- Remove requirement for database.tname when tname set in database. [Neil Cook]

5.3.1.90 0.7.186 (2021-11-23)

- *Apero.core.core.drs_file.py* - pep8 move comment. [Neil Cook]
- *Apero.core.core.drs_argument.py* - remove pandas database store. [Neil Cook]
- *Apero.core.core.drs_database.py* + *drs_file.py* - load the whole database entry for that night. [Neil Cook]
- *Apero.tools.recipes.bin.apero_get.py* - allow no objname. [Neil Cook]

5.3.1.91 0.7.185 (2021-11-19)

- Deal with loading. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.182-working' into v0.7.182-working. [Neil Cook]
- Option to turn off using database in arguments calls. [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* - *_wavesol_master_* -> *_wavesol_master* (removes double *__)* [Neil Cook]

5.3.1.92 0.7.184 (2021-11-17)

- *Apero.tools.recipes.dev.apero_run_ini.py* - first commit and code for auto generating run.ini files [unfinished] [Neil Cook]
- Update *UPDATE_NOTES.txt.* [Neil Cook]
- *Apero.core.core.drs_log.py* - change recipe type when extract used inside another recipe. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - change recipe type when extract used inside another recipe. [Neil Cook]
- Update log dir for recipes calling extract recipe. [Neil Cook]
- Update log dir for recipes calling extract recipe. [Neil Cook]
- Update *UPDATE_NOTES.txt.* [Neil Cook]
- *Apero.core.utils.drs_startup.py* + *apero.core.core.drs_file* + *drs_log.py* - get the *obs_dir* (without path) for logging - log messages to subdir. [Neil Cook]

5.3.1.93 0.7.183 (2021-11-12)

- *Apero.recipe.spirou.apero_ extract_ spirou.py* - add combine method argument. [Neil Cook]
- Update date/version/changelog/update notes/documentation. [Neil Cook]

5.3.1.94 0.7.182 (2021-11-10)

- *Apero.core.core.drs_ database.py* - do not log error in *read_header* - pass exception back to handler. [njcuk9999]
- *Apero.core.core.drs_ database.py* - when updating index if we can't get header skip it - bad files should not crash the process here - but we should warn the user. [Neil Cook]
- *Apero.core.instruments.default.pseudo_ const.py* - update cleaning of object name now "+" goes to P and "-" goes to M by default. [Neil Cook]

5.3.1.95 0.7.181 (2021-11-09)

- Update run.ini files for default skip parameters. [Neil Cook]
- *Apero.recipes.spirou.apero_ ccf_ spirou.py* - corrections for teff mask change. [Neil Cook]
- *Apero.core.instruments.default.recipe_ definitions.py* - update precheck descriptions. [Neil Cook]
- *Apero.tools.module.processing.drs_ precheck.py* - update name of precheck module. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ precheck.py + apero.tools.module.processing.drs_ precheck.py* - add precheck code (check before running *apero_ processing)* for checking raw calibration files, raw telluric files, raw science files and object names (from database vs header) [Neil Cook]
- *Apero.io.drs_fits.py* - correct typo fits.getdata –> fits.getheader. [Neil Cook]

5.3.1.96 0.7.180 (2021-11-06)

- Make fure all FTELLU1 and FTELLU2 are FTFIT1 and FTFIT2. [Neil Cook]
- *Apero.io.drs_ fits.py* - correct typo fits.getheader –> fits.getdata. [Neil Cook]
- Update date/version/changelog/docs/update notes. [Neil Cook]

5.3.1.97 0.7.179 (2021-11-04)

- Merge branch 'v0.7.173-stable-test' into v0.7.173-obj-res-test. [Neil Cook]
- *Apero.science.calib.shape.py* - deal with shape master having more nights than the max number of shape files (means each group will only have one entry and all were skipped) change to single file groups being kept (just not combined) [njcuk9999]
- *Apero.io.drs_ fits.py* - need to deal with getdata for bad files (maybe corrupted but don't always need all extensions) [Neil Cook]
- *Science.preprocessing.gen_ pp.py* need to deal with converting astrometrics from header to required units (assume database is good) [Neil Cook]
- Update language database. [Neil Cook]
- Add readme to each *ccf_ mask* directory. [Neil Cook]
- Default ccf mask now uses Teff (via *teff_ mask.csv)* to assign masks - can still use old method with filename if desired. [Neil Cook]
- *Apero.science.extract.berv.py* - typo *set_ sources–>set_ source.* [Neil Cook]

5.3.1.98 0.7.178 (2021-11-03)

- Force bad values of plx/rv. [Neil Cook]
- Preprocessing + berv correction - simplify to use gsheet(s) and do not match. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - only print about engineering nights once + remove "Removing filters" printout. [Neil Cook]

5.3.1.99 0.7.177 (2021-11-02)

- Make sure FTFIT1 and FTFIT2 are in the run.ini files. [Neil Cook]
- *Apero.core.core.drs_database.py* - clear TLOG + typo in comment. [Neil Cook]
- Try to improve getting file list from disk (avoid glob due to max open file holders) [Neil Cook]
- Remove env files. [Neil Cook]

5.3.1.100 0.7.176 (2021-10-29)

- *Apero.science.calib.wave.py* - deal with no cavity degree polynomial (i.e. from the default master wave sol) [Neil Cook]
- *Apero.science.calib.wave.py* - correct getting cavity polynomial from header. [Neil Cook]

5.3.1.101 0.7.175 (2021-10-22)

- *Apero.core.math.fast.py* - fix weird typo np.array(guess) –> float(guess) [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.173-working' into v0.7.173-working. [Neil Cook]
- *Apero.core.math.fast.py* - update *odd_ratio_mean* function. [Neil Cook]

5.3.1.102 0.7.174 (2021-10-19)

- Update schematics for paper. [Neil Cook]
- Update schematics for paper. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.103 0.7.173 (2021-10-18)

- Update language database. [Neil Cook]
- *Apero.core.core.drs_log.py* - update log. [Neil Cook]
- Update warning messages to have sublevel. [Neil Cook]

5.3.1.104 0.7.172 (2021-10-13)

- *Science.telluric.gen_tellu.py* - fix the width of the preclean ccf (now a low pass filter) [Neil Cook]
- *Apero.core.utils.drs_utils.py+ apero.science.calib.dark.py* + shape.py - fix the down selection of master files (selected by time) [Neil Cook]
- Update the run.ini files + add the *fit_tellu res_plot* in the plotter functions. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.105 0.7.171 (2021-10-08)

- *Apero.science.calib.dark.py + apero.science.calib.shape.py* - add limits for the dark master and shape master max number of files. [Neil Cook]
- *Apero.science.extract.gen_ext.py* - fix output for thermal files. [Neil Cook]
- Telluric update (EA-210923) - add *apero_mk_model_spirou.py* + add changes to *fit_tellu* + pre-cleaning. [Neil Cook]
- *Apero.recipes.*.apero_wave_*.py* - deal with and comment *fit_cavity* and *fit_achromatic* better. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.io.drs_fits.py* - read with multifits return better. [Neil Cook]
- Update run.ini files that use telluric recipes. [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - update telluric *recipe_definitions.py.* [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* - add *TELLU_MODEL* to *file_definitions.py.* [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - update *tellup_ccf_scan_range + thermal_extract_type* (e2dsff–>e2ds) [Neil Cook]
- Continue work on transmission model update [EA 210923] [Neil Cook]
- Continue work on transmission model update [EA 210923] [Neil Cook]

5.3.1.106 0.7.170 (2021-10-04)

- Start work on telluric update (EA-210923) [Neil Cook]
- Unbreak logging system (conflict with *OBS_DIR)* [Neil Cook]
- Conflict between *obs_dir* from params and *run_file.* [Neil Cook]
- Wave extraction needs to use master wave sol. [Neil Cook]
- Wave extraction needs to use master wave sol. [Neil Cook]
- Wave extraction needs to use master wave sol. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - deal with locking params better. [Neil Cook]
- Update date/version/docs/changelog. [Neil Cook]

5.3.1.107 0.7.169 (2021-10-01)

- *Apero.science.extract.gen_ext.py* - leak correction must use reference fiber (not science fiber) to scale *dark_fp* correction. [Neil Cook]
- *Apero.science.wave.py* - add *cavity/cavity_deg/mean_hc_vel/err_hc_vel* to wprops (for storing in header) [Neil Cook]
- *Apero.recipes.*.apero_extract_*.py* - reference fiber must be extracted first - other fibers use reference fiber for leak correction. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - add *CDBLEAKR/CDTLEAKR/WCAV/W-CAV_DEG/WAVEMHC/WAVEEMHC* keywords. [Neil Cook]
- Add leakm (file and time) to the extracted header, do not filter master calibrations by dtime for calib vs obs (now use a CalibFile class to store info) [Neil Cook]
- Allow run file as an argument to recipes - (–crunfile) this allows passing a constant in the run.ini file when running *apero_processing.py.* [Neil Cook]

5.3.1.108 0.7.168 (2021-09-29)

- *Apero.core.core.drs_database.py* - deal with unix time better (may be np.nan oir none time –> in these cases set to None) [njcuk9999]
- *Apero.recipes.*.apero_extract_nirps*.py* - correct position in foout 3–>2 2–>1 1–>0. [njcuk9999]
- *Apero.science.extract.gen_ext.py* - *LEAK_CORRECTED* is in eprops not params. [njcuk9999]

5.3.1.109 0.7.167 (2021-09-28)

- Merge branch 'v0.7.156-working' into v0.7.166-working. [njcuk9999]
- *Apero.core.instruments.default.grouping.py* - deal with no table (rawtab = None) [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.156-working' into v0.7.156-working. [njcuk9999]
- Merge remote-tracking branch 'origin/v0.7.156-working' into v0.7.156-working. [njcuk9999]
- Merge branch 'v0.7.156-working' of github.com:njcuk9999/apero-drs into v0.7.156-working. [njcuk9999]
- Merge branch 'v0.7.156-working' of github.com:njcuk9999/apero-drs into v0.7.156-working. [njcuk9999]
- *Apero.core.core.drs_database.py* - deal with removed files from the database. [njcuk9999]
- Update language database. [Neil Cook]
- Fix error in post products not adding wave files. [Neil Cook]
- Update language database. [Neil Cook]
- Update update notes. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *DO_CALIB_DTIME_CHECK* and *MAX_CALIB_DTIME*. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - add in a way to check delta time on observation vs calibration. [Neil Cook]
- Remove log.txt. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.110 0.7.166 (2021-09-27)

- Update language database. [Neil Cook]
- *Apero.science.calib.wave.py* - replace mean rv fit diff with mean of difference of rvs in orders. [Neil Cook]
- *Apero.core.instruemnts.default.default_keywords.py* - the default key=" should be key='NULL' (otherwise get comments list) [Neil Cook]
- *Apero.science.telluric.template_tellu.py* - correct *b_cols*. [Neil Cook]

5.3.1.111 0.7.165 (2021-09-25)

- *Apero.science.calib.wave.py* - fix typo WLOG(params, msg) –> WLOG(params, '', msg) [Neil Cook]
- *Apero.science.calib.gen_calib.py* - deal with returning None (cannot case filename to string) [Neil Cook]
- *Apero.recipes.spirou.apero_extract_spirou.py* - correct indices on fbprops. [Neil Cook]
- *Apero.science.calib.gen_calib.py + apero.science.extract.gen_ext.py* - fix calib file being None in wave sol + orderp does n ot have CDTORDP (use MJDMID) [Neil Cook]
- *Apero.science.calib.shape.py + apero.science.extract.gen_ext.py* - use sprops. [Neil Cook]
- *Apero.recipes.*.apero_extract/flat*.py* - push sprops into *order_profiles*. [Neil Cook]
- *Apero.recipes.*.apero_shape_*.py* - poush sprops into write. [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* - change *orderp_straight* to DrsFitsFile. [Neil Cook]
- *Apero.core.core.drs_file.py* - allow coping of hdict / header without drsfile instance. [Neil Cook]
- *Apero.core.core.drs_database.py* - do not fix headers for non fits files. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - fix *load_calib_file* (add *return_time=True)* [Neil Cook]
- *Apero.core.core.drs_database.py* - fix ctable output. [Neil Cook]
- Add calibration MJDMID to all files that use CDBXXXX (as CBTXXXX) [Neil Cook]

5.3.1.112 0.7.164 (2021-09-23)

- Apero.science.calib - *wave.py* - print out CCFRV as well as DV tests. [Neil Cook]
- *Apero.core.core.drs_database.py* - change message 40-001-00031 from general to debug print out ("Skipping search") [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - change cosmic intcut from 10-50 to 50-100. [Neil Cook]
- *Apero.data.spirou.calib.catalogue_UNe.csv* - add red most lines [EA] from large catalogue. [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - add back in order 48 to wave solution. [Neil Cook]

5.3.1.113 0.7.163 (2021-09-22)

- Update requirements (untested) [Neil Cook]
- *Apero.core.instruments.** - make all instruments consistent (groups + other) [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - deal with non raw filter keys on raw files (ignore) [Neil Cook]
- Update catalogues from Etienne. [Neil Cook]
- Flat + wave - combine with sum not median. [Neil Cook]

5.3.1.114 0.7.162 (2021-09-22)

- Need to deal with raw keys only. [Neil Cook]
- *Apero.recipes.spirou.apero_ flat_ spirou.py* - [REVERT] flats should be summed not medianed [EA] [Neil Cook]
- *Apero.recipes.spirou.apero_ flat_ spirou.py* - flats should be summed not medianed [EA] [Neil Cook]
- Update version/date/changelog/documentation. [Neil Cook]

5.3.1.115 0.7.161 (2021-09-15)

- *Apero.base.base.py + apero.core.core.drs_ loy.py* - make sure use of DPARAMS and IPARAMS give correct exception. [Neil Cook]
- *Apero.core.core.data.*.databases.reset** - *WAVEM_ D –> WAVESOL_ DEFAULT.* [Neil Cook]
- Update *UPDATE_ NOTES.txt.* [Neil Cook]
- *Apero.core.core.drs_ database.py* - need to deal with forbidden keys better (comment, history and '' included) [Neil Cook]
- *Apero.data.*.reset.runs/master_ calib_ run.ini* - typo *calib_ seq –> master_ seq.* [Neil Cook]
- *Requirements_ developer.txt* - ttkthemes required. [Neil Cook]
- *Apero.tools.module.database.database_ update.py* - fix rlog values (now attributes are upper case) [Neil Cook]
- *Apero.science.extract.gen_ ext.py* - add debug saving of e2ds uncorrected. [Neil Cook]
- *Apero.recipes.*.apero_ extract_ *.py* - add recipe to *manage_leak_ correction* arguments. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - add '' and 'HISTORY' to forbidden keys. [Neil Cook]
- Remove *apero_ leak* as recipe. [Neil Cook]
- *Apero.core.core.drs_ file.py* - skip forbidden header keys. [Neil Cook]

5.3.1.116 0.7.160 (2021-09-14)

- *Apero.recipe.spirou.apero_ extract_ spirou.py* - get leakcorr from *data_ dict* (i.e. via *science.extract.other.py extract_ files())* [Neil Cook]
- *Apero.science.calib.flat_ blaze* and apero.science.extract.extraction + *gen_ ext* + other - fix blaze keys. [Neil Cook]
- Language database update. [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - fix logging of DrsCodedException. [Neil Cook]
- *Apero.core.instruments.*.recipe_ definitions.py* - add argument –leakcorr to *apero_ extract.* [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - remove *ALLOWED_ LEAK_ TYPES* add *COR-RECT_ LEAKAGE* and *LEAKAGE_ REF_ TYPES.* [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - must not update database in test run for Pool and Process. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - deal with runs not in ini files (now skips by default) [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - for nirps *KW_ OBJNAME* not Calibration use *RAW_ DPRCATG* as CALIB. [Neil Cook]
- *Apero.data.*.reset.runs.calib_ run.ini* - add *PP_ FF* to *RUN_* and *SKIP_* menus. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - add files to set. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - need to filter by files (why was this removed?) [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - do not update database in test run mode. [Neil Cook]

- *Apero.core.instruments.*.recipe_definitions.py* - *pp_seq_opt* typo *add(apero_extract -> add(apero_preprocess.* [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* - make sure types have outfunc set. [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - *leak_master* should use E2DS not E2DSFF (change in where we do leak correction in extraction process) [Neil Cook]
- *Apero.core.instruments.nirps_ha.file_definitions.py* - remove *out_wave_hc* and *out_wave_fp* references. [Neil Cook]

5.3.1.117 0.7.159 (2021-09-10)

- Add leak to extraction recipe (break up flat blaze corr) [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - add *DRS_DATE_NOW* (DRSPDATE) to index database. [Neil Cook]
- Revert UNe catalogue list. [Neil Cook]
- Wave - fix default and master wave solution names. [Neil Cook]

5.3.1.118 0.7.158 (2021-09-03)

- Update indexing (index *KW_MID_OBS_TIME, KW_OBJNAME, KW_DPRTYPE, KW_OUTPUT, KW_PID, KW_IDENTIFIER)* [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* + *apero_postprocess_spirou.py* - change overwrite to skip - default is now to overwrite. [Neil Cook]
- *Apero.data.*.reset.runs.complete_run.ini* - *full_seq* should use EXTALL and LEAKALL. [Neil Cook]
- *Apero.data.spirou.reset.runs.*.ini* - update master nights. [Neil Cook]

5.3.1.119 0.7.157 (2021-08-30)

- *Apero.recipes.spirou.apero_postprocess_spirou.py* - *set_infile* must take params (dealing with multiple possible DrsFitsFiles for single extension) [Neil Cook]
- *Apero.science.calib.wave.py* - remove references to *WAVE_FP* and *WAVE_HC* (use *WAVE_NIGHT)* and *WAVEM_FP* and *WAVEM_HC* (use master wave sol) [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* + *recipe_definitions.py* - remove old definitions and make sure recipes use the new ones. [Neil Cook]
- *Apero.core.core.drs_file.py* - need to allow multiple drsfiles for some outfile extensions. [Neil Cook]
- Update version/date/changelog/documentation. [Neil Cook]

5.3.1.120 0.7.156 (2021-08-26)

- *Apero.base.drs_db.py* - fix backup db directory. [Neil Cook]
- *Apero.science.telluric.fit_tellu.py* - correct scaling on tcorr A and B (needed blazeAB for reconAB not blazeA or blazeB) [Neil Cook]
- *Apero.science.calib.wave.py* - fix master wave. [Neil Cook]
- Update date/version/changelog/documents. [Neil Cook]

5.3.1.121 0.7.155 (2021-08-25)

- *Apero.core.core.drs_database.py* - update reset + add key error for PandasDBStorage.get. [Neil Cook]
- *Apero.tools.recipes.bin.apero_processing.py* - move update index db stuff to function (for use elsewhere as well) + add indexdbm to args of *process_run_list.* [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add an *update_index_db* function to deal with updates to block kinds (add it to multiprocesses so that after recipe finished all block kinds are updated) [Neil Cook]
- *Apero.database.database_update.py* - correct inputs for *index_update.* [Neil Cook]
- *A[erp/cpre/cpre/drs_database.py* - add subkey option to reset. [Neil Cook]

- *Apero.core.core.drs_database.py* - add classes PandasDBStorage (for storage) and PandasLikeDatabase (proxy pandas dataframe as database) to allow re-use of same databases / arrays instead of re-querying sql databases. [Neil Cook]
- *Apero.base.drs_db.py* - add to doc string. [Neil Cook]
- *Apero.core.core.drs_argument.py* - only read database once if in parallel mode and store in global way for other iterations. [Neil Cook]
- Update requirements - now require pandasql for efficiency. [Neil Cook]
- *Apero.science.calib.wave.py* - wave solution should use *WAVE_FP* and *WAVE_HC* not *WAVEM_FP* and *WAVEM_HC*. [Neil Cook]
- *Apero.science.calib.localisation.py* - *all_labels −> all_labels2*. [Neil Cook]

5.3.1.122 0.7.154 (2021-08-23)

- *Apero.core.instruments.default.grouping.py* - better handle masked table: table.mask[colname] not table[colname].mask. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Workflows.diagram.yml - avoid making new commit on push. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- *Apero.base.drs_db.py* - update path for sql to be in ~/.apero/ (for backups only) [Neil Cook]
- *Apero.plotting.plot_functions.py* - plots using fiber should have fiber in the suffix. [Neil Cook]
- README.md - update code diagram description. [Neil Cook]

5.3.1.123 0.7.153 (2021-08-20)

- Repo visualizer: updated diagram. [repo-visualizer]
- Update readme and diagram.yml. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update readme and diagram.yml. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update readme and diagram.yml. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update readme and diagram.yml. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update diagram yaml. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update diagram yaml. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- Repo visualizer: updated diagram. [repo-visualizer]
- Update diagram yaml. [Neil Cook]
- Add diagram. [Neil Cook]
  add diagram
- Update diagram yaml. [Neil Cook]
- Try adding codebase diagram. [Neil Cook]
- *Apero.tools.recipes.bin.apero_get.py* - fix problems with blank fields. [Neil Cook]
- *Apero.tools.recipes.bin.apero_get.py* - deal with *filter_items* equal to None. [Neil Cook]
- Param func listp and listd need 'required' keyword argument. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.151-working' into v0.7.151-working. [Neil Cook]
- *Apero.core.instruments.defualt.recipe_definitions.py* - name of *apero_get* typo anme −> name. [Neil Cook]

5.3.1.124 0.7.152 (2021-08-05)

- Update loc regions text. [Neil Cook]
- *Apero.core.instruments.default.grouping.py* - pol group must remove masked rows. [Neil Cook]
- *Apero.core.core.drs_file.py* - deal with math = "None" (for polar combine –> return first header value) [Neil Cook]
- Update date/version/changelog/docs. [Neil Cook]
- Update date/version/changelog/docs. [Neil Cook]
- *Apero.science.calib.wave.py* - *wfp_target_rv* None –> 0.0 (so not Null in header) [Neil Cook]

5.3.1.125 0.7.151 (2021-07-29)

- *Apero.science.calib.wave.py* - *wfp_target_rv* None –> 0.0 (so not Null in header) [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - *remove_std_hkeys* True by default + add Recon/Recon-Err to s.fits file + add tag for UniformWavelength and UniformVelocity. [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - update *FORBIDDEN_KEYS* definitions. [Neil Cook]
- *Apero.core.instruments.default.grouping.py* - polar sequences must be for same object + correct *_is_numeric* function. [Neil Cook]
- *Apero.core.core.drs_file.py* - combine filename column names should not end in .fits + remove std hkeys by default. [Neil Cook]

5.3.1.126 0.7.150 (2021-07-24)

- *Apero.science.preprocessing.detector.py* - fix issue with cosmic correction being slow - need to correct intercept + errslope. [Neil Cook]
- Remove databases and update gitignore. [Neil Cook]
- *Apero.science.calib.wave.py* - update wave qc (limit to 2 m/s between fibers) and add back in the ccf rv qc (again qc at 2 m/s) [Neil Cook]
- *Apero.core.math.gen_math.py* - add todo to fix this function (can take a long time) [Neil Cook]
- Add *start_time* and *end_time* to log database. [Neil Cook]
- *Apero.base.drs_db.py* - fix commit problem with sqlite3. [Neil Cook]
- *Apero.recipes.*.apero_preprocess_*.py* - move cosmic ray correction before shift. [Neil Cook]
- *Apero-drs-full.setup.install.py* + *setup_lang.py* - add way to get lang code without using apero (so we can check modules) otherwise if modules don't exist we can't import apero.base. [Neil Cook]

5.3.1.127 0.7.149 (2021-07-21)

- *Apero.base.drs_db.py* - add changes to make sqlite work again. [Neil Cook]
- Sqlite3 no longer works - test it. [Neil Cook]
- *Apero.core.instruments.default.grouping.py* - need to deal with NUMEXP and CMPLTEXP being blank - remove them (adds 3 ms to polar grouping) [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.128 0.7.148 (2021-07-16)

- Update .gitignore. [Neil Cook]
- Update language database. [Neil Cook]
- Update language database + add install text to language database (using langdb proxy) [Neil Cook]
- Add text to language database. [Neil Cook]
- *Apero.science.localisation.py* - add loc im regions plot. [Neil Cook]
- *Setup.install.py* - scikit-image –> skimage in *module_translation*. [Neil Cook]
- Update language database. [Neil Cook]
- Add *pp_ff* and *ext_ff* to runs. [Neil Cook]
- *Apero.core.core.drs_database* + *apero.core.utils.drs_utils.py* + *apero.tools.module.processing.drs_processing.py* - fix problem with include/exclude list of *obs_dirs*. [Neil Cook]

- Update documentation, date, version, changelog. [Neil Cook]

5.3.1.129 0.7.147 (2021-07-14)

- Update language database. [Neil Cook]
- *Apero.science.calib.wave.py* - update echelle orders calculation + up limits on *WAVE_CCF_RV_THRES_QC*. [Neil Cook]
- Force recipes that are master to give error on qc failure. [Neil Cook]

5.3.1.130 0.7.146 (2021-07-13)

- *Apero.core.instruments.nirps_ha.default_constants.py* - up the nirps qc limit to 20 m/s. [Neil Cook]
- *Apero.science.calib.wave.py - match_fplines* to get dv from wave meas. [Neil Cook]

5.3.1.131 0.7.145 (2021-07-13)

- *Apero.science.calib.wave.py* - need to sort both to the same length (assumes 1. they are sorted by peakn 2. there are no duplicates) [Neil Cook]
- *Apero.science.calib.flat_blaze.py* - deal with blaze failing even simple fix (remove cubic term) [Neil Cook]
- Update wave sol to fix problem with dv measurement between A,B and C rel to AB. [Neil Cook]

5.3.1.132 0.7.144 (2021-07-09)

- Try to fix wave master solution. [Neil Cook]
- Try to fix wave master solution. [Neil Cook]
- Try to fix wave master solution. [Neil Cook]
- Update documentation + add recipe sequence auto doc. [Neil Cook]
- Update documentation + add recipe sequence auto doc. [Neil Cook]
- Update documentation. [Neil Cook]
- *Apero.science.calib.flat_blaze.py - load_calib_file* must use fiber argument!! [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - *WAVE_CAVITY_FIT_DEGREE* too high, change from 11 –> 7. [Neil Cook]

5.3.1.133 0.7.143 (2021-07-06)

- *Apero.science.extract.berv.py* - make sure berv warning is on by default. [Neil Cook]
- Update date / version / documentation. [Neil Cook]

5.3.1.134 0.7.142 (2021-07-05)

- Update documentation. [Neil Cook]
- Change grouping to only allow a maximum number of files in a group. [Neil Cook]
- Update documentation. [Neil Cook]
- Add *nirps_he* mode. [Neil Cook]
- Update wave solution. [Neil Cook]

5.3.1.135 0.7.141 (2021-07-02)

- Add auto-doc recipe definitions. [Neil Cook]
- *Apero.core.instruments.nirps_ha.pseudo_const.py* - correct typo remove filename from *get_drs_mode*. [Neil Cook]

5.3.1.136 0.7.140 (2021-06-30)

- Apero.tools.module.documentation - add css + table formatting. [Neil Cook]
- Apero.tools.module.documentation - add to file definitions documentation nirps + spirou. [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - expand *psuedo_consts* loading certain variables only once. [Neil Cook]
- *Apero.science.calib.shape.py* - correctiong for infiles for outfile3+ (nirps hcfiles None) [Neil Cook]

5.3.1.137 0.7.139 (2021-06-29)

- Update documentation based on *file_definitions* page. [Neil Cook]
- Add way to compile list of file definitions. [Neil Cook]
- *Apero.core.instruments.nirps_ha.default_constants.py* - change the localisation ydet max value limit from 4060–>4050. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add DrsCodedException as known error type (expected) [Neil Cook]
- *Apero.core.instruments.nirps_ha.file_definitions.py* - add *OBJ_SKY*, *OBJ_TUN*, *TEST_HCONE_HCONE*, *TEST_FP_HCONE*, *TEST_HCONE_FP*, *TEST_DARK_FP*. [Neil Cook]
- *Apero.core.core.drs_file.py* - get id file error keys from psuedo const. [Neil Cook]
- *Apero.core.instruments.nirps_ha.file_definitions.py* - add FLAT,LED to known raw file types. [Neil Cook]
- Update reset.object.csv file based on current googlesheet (so we don't have to recheck we supply this as default) [Neil Cook]

5.3.1.138 0.7.138 (2021-06-29)

- Database fixes - FLOAT–>DOUBLE, order file names for skipping, fix grouping for polar files (pol not running) [Neil Cook]
- Remove PPM from nirps run.ini files. [Neil Cook]
- Update requirements (no longer a test) [Neil Cook]
- Update master night for nirps. [Neil Cook]
- Update pseudo const for nirps. [Neil Cook]
- Update date/version/changelog/docs. [Neil Cook]

5.3.1.139 0.7.137 (2021-06-25)

- Finish delete table app for *apero_database.py* (–delete) [Neil Cook]
- *Apero.tools.module.database.manage_db_gui.py* - work on app to delete / manage tables. [Neil Cook]
- Few fixes for database indexing. [Neil Cook]

5.3.1.140 0.7.136 (2021-06-23)

- *Apero.core.utils.drs_utils.py* - forgot *param_kind* in log key loop. [Neil Cook]
- Continue database indexing overhaul. [Neil Cook]
- *Apero.base.drs_db.py* - add index column. [Neil Cook]
- Optimize database using index columns and define all sql data types properly (to aid speed up + indexing) [Neil Cook]
- *Apero.io.drs_path.py* - add listdirs, nofiles and listfiles functions (for quick directory/file listings) [Neil Cook]
- *Apero.core.math.gen_math.py* - rename 'slice' to 'imslace' (avoid using standard name) [Neil Cook]
- *Apero_wave_night_nirps_ha.py* - do not update *smart_fp_mask* here (only in master) [Neil Cook]
- *Apero_wave_night_spirou.py* - do not update *smart_fp_mask* here (only in master) [Neil Cook]
- Turn off cosmic correction for NIRPS - broken (Etienne will fix later) [Neil Cook]

5.3.1.141 0.7.135 (2021-06-21)

- *Apero.core.core.drs_database* - add todo on how we deal with unique columns. [Neil Cook]
- Try to speed up processing pre-indexing. [Neil Cook]
- Try to speed up processing pre-indexing. [Neil Cook]
- Try to speed up processing pre-indexing. [Neil Cook]
- *Apero.core.core.drs_file.py* - self.abspath should be a string here. [Neil Cook]

5.3.1.142 0.7.134 (2021-06-18)

- *Apero.core.core.drs_database.py* - last modified date a problem with many files. [Neil Cook]
- Update nirps preprocessing. [Neil Cook]
- *Apero_preprocess_nirps_ha.py* - need to add etiennes code for fixing first pixel in amp. [Neil Cook]
- Update version/date/changelog/update notes. [Neil Cook]
- Fix *apero_postprocess_spirou.py* - fix db infiles. [Neil Cook]

5.3.1.143 0.7.133 (2021-06-17)

- Keep adding drs output files with infiles (for the database) - brute force approach –> find blanks in database (we missed some) [Neil Cook]
- Keep adding drs output files with infiles (for the database) - brute force approach –> find blanks in database (we missed some) [Neil Cook]
- Add *KW_INSTRUMENT* + add infiles column to the index database. [Neil Cook]

5.3.1.144 0.7.132 (2021-06-15)

- Update *requirements_test.txt.* [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - fix *drs_mode.* [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - add instrument to the keywords. [Neil Cook]
- *Apero.core.instruments.spirou.pseudo_const.py* - update DRSMODE - spectroscopy only for P16,P16 everything else with P2 or P4 or P14 or P16 is POLAR (if valid in both channels) [Neil Cook]

5.3.1.145 0.7.131 (2021-06-14)

- *Apero.core.instruments.*.file_definitions + default_keywords.py* - make sure raw files check instrument header key. [Neil Cook]
- *Apero.core.instruments.spirou.pseudo_const.py* - add polar rhomb positions that are valid for spectroscopy (P2,P4,P14,P16) unless specific polar combination. [Neil Cook]
- Add out directory to the reset code. [Neil Cook]

5.3.1.146 0.7.130 (2021-06-12)

- Work on *apero_get.py*. [Neil Cook]
- Updates to echelle order numbers to wave solution - add to header. [Neil Cook]
- Add echelle order numbers to wave solution. [Neil Cook]

5.3.1.147 0.7.129 (2021-06-11)

- Updates to localisation - now tested on mini data 1+2 spirou, + nirps 20210218. [Neil Cook]
- Code space for echelle orders + change *wave_night __NAME__* to *wave_night* (was *wave_master)* [Neil Cook]
- *Apero_get.py* - new tool to get any file from the drs - currently code not copied see *apero-utils/general/apero_get/apero_get.py* for the draft code. [Neil Cook]

5.3.1.148 0.7.128 (2021-06-09)

- Updates to localisation. [Neil Cook]
- *Apero.tools.recipes.bin.apero_database.py* - add a mode to update reset.object.csv using either a dfits text file or a read of all current raw files. [Neil Cook]
- Continue changes to update localisation for SPIRou and NIRPS. [Neil Cook]
- Upgrade the localisation using new recipe from EA (use blob finding) [Neil Cook]
- Fix installation bug (Issue #669) [Neil Cook]

5.3.1.149 0.7.127 (2021-06-02)

- *Apero.core.utils.drs_startup.py* - must update recipe.inpudir and *recipe.in_block_str* when *in_block_str* is a block kind (and forced) [Neil Cook]
- *Apero.core.utils.drs_startup.py* - deal with *in_block_str* being a path as well as the current working directory containing block kind as a directory (would break here before) [Neil Cook]
- *Apero.science.calib.wave.py* - need a return to *res_fit_super_gauss* function. [Neil Cook]
- Merge branch 'master' into v0.7.126-working. [Neil Cook]
  # Conflicts: # README.md
- Update README.md. [Neil Cook]
  correct typo
- Update version/date/changelog/update notes/documentation. [Neil Cook]

5.3.1.150 0.7.126 (2021-06-01)

- *Apero.science.calib.wave.py* - fix res map to work for NIRPS (gaussian fit vs super-gaussian fit for spirou) [Neil Cook]

5.3.1.151 0.7.125 (2021-05-31)

- *Apero.science.preprocessing.gen_pp.py* - handle request.get() exception or going to the wrong link (table inconsistent) [Neil Cook]
- Update wave codes for NIRPS and SPIRou - now can remove orders from any part of the detector. [Neil Cook]
- Update some doc strings + unused arguments in wave codes. [Neil Cook]
- Update nirps default wave grid (for cut 71) [Neil Cook]

5.3.1.152 0.7.124 (2021-05-27)

- Update nirps default wave grid (for cut 71) [Neil Cook]
- Wave sol changes for *NIRPS_HA* full detector. [Neil Cook]

5.3.1.153 0.7.123 (2021-05-26)

- *Apero.recipes.nirps_ha.apero_wave_master_nirps_ha.py* - add back in the FP file check. [Neil Cook]
- *Apero.recipes.science.calib.wave.py* - modify wave code for nirps. [Neil Cook]
- *Setup.newprofile.py* - (re)create yamls after updating them. [Neil Cook]
- *Apero.science.extract.extraction.py* - clean up *calculate_blaze_flat_sinc* args. [Neil Cook]
- *Apero.science.calib.flat_blaze.py* - make med filter size a constant (for each instrument) [Neil Cook]
- *Apero.recipes.*.apero_extract_*.py* - quicklook remove wavesol. [Neil Cook]
- *Apero.plotting.plot_funcitons.py* - type *frame1.set_ylim* –> *frame2.set_ylim.* [Neil Cook]
- *Apero.core.utils.drs_recipe.py* + others - deal with *DRS_OBJ_NAME + DRS_OBJ_NAMES.* [Neil Cook]
- *Apero.instruments.nirps_ha.recipe_definitions.py* - *apero_pp_master* needed *group_func + group_column.* [Neil Cook]
- *Apero.core.instruments.default.grouping.py* - need to deal with rawtab=None. [Neil Cook]
- *Apero.instruments.*.pseudo_const.py* - sort out objname + null text. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *FF_BLAZE_SINC_MED_SIZE.* [Neil Cook]
- *Apero.base.base.py* - *write_yaml* Path–>str + pep8. [Neil Cook]
- *Apero.core.instruments.spirou.default_keywords.py* - use OBJECT not OBJNAME (reversal of last weeks change) [Neil Cook]
- Update date / version / changelog / documentation. [Neil Cook]

5.3.1.154 0.7.122 (2021-05-25)

- *Apero.recipes.nirps_ha.apero_wave_master_nirps_ha.py* - pep8 updates. [Neil Cook]
- *Apero.core.instruments.spirou.pseudo_const.py* - if OBJNAME is None use OBJECT header key. [njcuk9999]
- *Apero.core.core.drs_Database.py* + *apero.core.instruments.spirou.pseudo_const.py* - address Null vs None values in database. [njcuk9999]
- *Apero.core.instruments.spirou.pseudo_const.py* - need to add objectname and objectname2 for index database. [njcuk9999]

5.3.1.155 0.7.121 (2021-05-21)

- *Apero.plotting.html.py latex.py plot_functions.py* - add typing doc strings and pep8. [Neil Cook]
- *Apero.plotting.html.py latex.py plot_functions.py* - add typing doc strings and pep8. [Neil Cook]
- *Apero.recipes.nirps_ha.apero_wave_master_nirps_ha.py + spirou/apero_wave_master_spirou.py* - remove debug hc + fp lines. [Neil Cook]
- *Apero.recipes.nirps_ha.apero_wave_master_nirps_ha.py + spirou/apero_wave_master_spirou.py + apero.science.calib.wave.py* - move offset code and apply to spirou and nirps. [Neil Cook]
- Update berv keys + remove HIERARCH keys + remove pp keys from post products (to be in-line with CADC) [Neil Cook]
- *Apero.core.core.drs_file.py* - make sure we copy all post file properties (explains why *header_add* were disappearing) [Neil Cook]
- *Apero.core.instruments.nirps_ha.default_constants.py* - *WAVEREF_HC_BOXSIZE* from 5–>13. [Neil Cook]
- *Apero.base.base.py* - remove future warning –> error. [Neil Cook]
- *Apero.plotting.core.py* - update typing/doc strings. [Neil Cook]
- *Apero.plotting.core.py* - update typing/doc strings. [Neil Cook]

5.3.1.156 0.7.120 (2021-05-19)

- *Apero.science.preprocessing.gen_pp.py* - update *resolve_target* (python typing) [Neil Cook]
- *Apero.science.calib.gen_calib.py* - fix from logging issues in *check_fp* + add doc strings + typing. [Neil Cook]
- *Apero.core.core.drs_database.py* - *load_db* does not log by default. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add database settings to the display print out. [Neil Cook]

5.3.1.157 0.7.119 (2021-05-19)

- Test requirements + fix some warnings + add way to filter warnings (db mysql connection need func to ignore internal warnings as they are weird) [Neil Cook]
- Database - backup databases before deleting (in case I'm being stupid and delete them without realising) [Neil Cook]
- *Apero.setup.newprofile.py* - update error message for invalid path / apero profile name + change cprint sys.exit message to red. [Neil Cook]
- *Apero.setup.*.py* - update installation doc strings + pep8 + bring *newprofile.py* inline with changes to install.py. [Neil Cook]

5.3.1.158 0.7.118 (2021-05-17)

- *Apero.setup.install.py + apero.tools.module.setup.drs_installation.py* - fix problem with database tables going to "MAIN" and problem with upper case vs lower case apero profile names (force lower) [Neil Cook]
- Apero.data.spirou.reset.calibdb - remove *master_calib_SPIROU.txt* (not longer used) [Neil Cook]
- *Apero.data.nirps_ha.databases.reset.calib.csv* - test 41 orders first for wave solution. [Neil Cook]
- *Apero.science.extract.berv.py* - add todo to check epoch for spirou. [Neil Cook]
- *Apero.science.calib.shape.py* - Problem with shape when maximum correlation between FPs split between pixels (Issue #668) [Neil Cook]
- Must deal with having no epoch - assume it is the observation time in this case. [Neil Cook]
- Update version to 0.7.117, update docs, date, changelog. [Neil Cook]

5.3.1.159 0.7.117 (2021-05-15)

- *Apero.science.calib.gen_ calib.py* - objname can be Null or None - deal with this. [Neil Cook]
- Make sure SKY is checked in OBJECT and OBJNAME even when *TRG_ TYPE* is set. [Neil Cook]

5.3.1.160 0.7.116 (2021-05-13)

- *Apero.science.calib.wave.py* - make sure qc failure prints to screen. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - some rlog columns were still wrong –> correct humantime, groupname, level-crit, *qc_ values*, errormsgs. [Neil Cook]
- *Apero.recipes.spirou.apero_wave_master_ spirou.py* - for master solution need an offset test after first HC lines calculation (this is because default wave solution can be off from master night if master night is far from when the default wave solution was made) [Neil Cook]
- Update *mini_ run* files to have *SCIENCE_ TARGETS* = All by default. [Neil Cook]
- Continue work on recreating databases from files on disk. [Neil Cook]

5.3.1.161 0.7.115 (2021-05-10)

- Update language database. [Neil Cook]
- Add functionality to update databases from files on disk (index, log, calib, tellu) [Neil Cook]
- *Apero.data.spirou.reset.runs.*.ini* - correct run.ini with THI and THT. [Neil Cook]
- *Apero.core.core.drs_ file.py + apero.io.drs_ fits.py* - make sure headers are copied to extensions - was isinstance(header[it], Header) now isinstance(header[it], (Header, fits.Header)) [Neil Cook]

5.3.1.162 0.7.114 (2021-05-06)

- CADC output fixes. [Neil Cook]
- More fixes for nirps into 0.7 (works up to *apero_ flat)* [Neil Cook]
- Fixes for quicklook sequence. [Neil Cook]

5.3.1.163 0.7.113 (2021-05-04)

- Update runs for NIRPS (LOC(M)AB –> LOC(M)A, LOC(M)C –> LOC(M)B) [Neil Cook]
- Update to code to bring NIRPS to 0.7. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_ definitions.py* - *leak_ master* must be after thermal masters. [Neil Cook]
- *Apero.science.calib.wave.py* - add printouts for *calc_ wave_ lines.* [Neil Cook]
- *Apero.science.calib.flat_ blaze.py* - correct problem with blaze in new mini data set (local minima) [Neil Cook]
- Update language database. [Neil Cook]
- Equalise nirps with spirou. [Neil Cook]
- Add program + parallel to log database + add switches for DEBUG files. [Neil Cook]
- Update *UPDATE_ NOTES.txt.* [Neil Cook]

5.3.1.164 0.7.112 (2021-04-30)

- Make sure keys are added before argparse. [Neil Cook]
- Only update *drs_ processing.py* Run runstring once. [Neil Cook]
- Correct typo '–parallel' –> ' –parallel' [Neil Cook]
- Deal with using –parallel argument (stops index database updating in a recipe run) [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.core.drs_ argument.py* - add parallel argument. [Neil Cook]
- Update language database. [Neil Cook]

5.3.1.165 0.7.111 (2021-04-28)

- *Apero.science.preprocessing.gen_pp.py* - add bad list checker. [Neil Cook]
- Update language database. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.tools.recipe.bin.apero_processing.py* - index certain block kinds to avoid indexing during recipe runs. [Neil Cook]
- *Apero.science.polar.gen_pol.py* - correct typo *STOKESI_CONTINUUM_DETECTION_ALGORITHM –> STOKESI_CONTINUUM_DET_ALG.* [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.tools.recipe.bin.apero_processing.py* - try to stop re-indexing of the database occuring. [Neil Cook]
- *Get_wavesol* requires either 'infile' OR ('header' and 'nbpix') not both - correct. [Neil Cook]

5.3.1.166 0.7.110 (2021-04-27)

- *Apero.core.utils.drs_utils.py* - add running to param table (rlog.running) [Neil Cook]
- *Apero.science.wave.py* - correct typo **margs –>* args=margs. [Neil Cook]
- Move text to language database + update language database. [Neil Cook]
- Move text to language database and constants to instrument/default definitions. [Neil Cook]
- Fix mk tellu *add_wave_keys.* [Neil Cook]

5.3.1.167 0.7.109 (2021-04-23)

- Move *wave.py –> wave_old.py* and move *wave2.py –> wave.py* (and move last required functions from *wave_old.py –>* wave.py) + move *wave_master_old + wave_night_old* to apero/tools/recipes/spirou/ [Neil Cook]
- Change recipe names *cal_obj_ –> apero_* [Neil Cook]
- Update changelog + update notes. [Neil Cook]
- Update version/date/changelog/update notes. [Neil Cook]

5.3.1.168 0.7.108 (2021-04-22)

- Fix grouping + fix emailing + fix run.ini files. [Neil Cook]
- Update run.ini files with LOCAB LOCC (previously LOC) and LOCMAB LOCMC (previously LOCM) [Neil Cook]
- *Apero.core.core.drs_database.py* - fix drsfile being NpyFile. [Neil Cook]
- *Apero.science.calib.wave2.py* - must read hc and fp e2ds files in *process_fibers.* [Neil Cook]
- Fix *plot_waveref_expected* with large outliers. [Neil Cook]
- Update wave sol with ea fixes. [Neil Cook]

5.3.1.169 0.7.107 (2021-04-20)

- *Apero.tools.module.processing.py + apero.tools.recipes.bin.apero_processing.py* - remove reset from processing. [Neil Cook]
- Add NIRPS 0.6 changes. [Neil Cook]
- *Apero.core.core.drs_file.py* - make sure *obs_dir* is cleaned of *block_path* (via *block_kind)* [Neil Cook]
- Remove reset options from processing (do via *apero_reset.py* if required) [Neil Cook]
- Update nirps definitions with changes to 0.7 (note nirps still on 0.6 and needs adding - this just changes 0.7 changes to code left over before 0.6 divergence) [Neil Cook]
- *Apero.science.calib.wave.py* - correct type (this is for wave2) - eventually move wave -> *wave_old.* [Neil Cook]
- Allow for recipe kind from input args + update recipe defintions with new recipe kinds for all sequences. [Neil Cook]
- Apero.recipes.spirou - move old wave sols to *_old* and new from *_ea* to main (no extra suffix) [Neil Cook]

5.3.1.170 0.7.106 (2021-04-20)

- Fix grouping + shortnames + set running on construction *(__init__)* [Neil Cook]
- Catch warnings on astroquery import. [Neil Cook]
- *Apero.recipes.spirou.cal_wave_*_ea_spirou.py* - fix cavity file. [Neil Cook]
- *Apero.core.core.drs_database.py* - change rtype –> *recipe_type* + add *recipe_kind*. [Neil Cook]
- *Apero.core.core.drs_argument.py* - add recipe kind global argument. [Neil Cook]
- Fix grouping for polar code + change sequences arguments for polar code. [Neil Cook]
- *Apero.core.instruments.grouping.py* - work on the grouping for polar files. [Neil Cook]
- Fixes to *cal_wave_master_ea* and *cal_wave_night_ea*. [Neil Cook]

5.3.1.171 0.7.105 (2021-04-15)

- Move ea wave functions from wave to wave2. [Neil Cook]
- *Apero.science.calib.wave2.py* - continue work on ea wave sol. [Neil Cook]
- *Apero.recipes.spirou.cal_wave_*_ea_spirou.py* - continue update to wave master + night ea. [Neil Cook]
- *Apero.plotting.plot_functions.py* - add *legend_no_alpha* + *plot_wave_hc_resmap* + *plot_wave_hc_resmap_old*. [Neil Cook]
- *Apero.core.math.py* - add *centered_super_gauss* function (for wave res map) [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add plot to *cal_wave_master_ea_spirou.py*. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - add WAVERES file (copy of WAVERESHC) [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - add wave res keywords. [Neil Cook]
- *Apero.recipe.spirou.cal_wave_master_ea_spirou.py* - add WAVESOURCE to wprops. [Neil Cook]

5.3.1.172 0.7.104 (2021-04-13)

- *Apero.core.instruments.spirou.recipe_definitions.py* - add *SUIM_CCF_RV_FIT* to summary plots. [Neil Cook]
- *Apero.recipe.spirou.cal_wave_master_ea_spirou.py* - continue work with EA on new wave sol. [Neil Cook]
- *Apero.science.gen_pol.py* - add more info to question. [Neil Cook]
- Make sure user can turn off saving to the database. [Neil Cook]
- Continue with polar update. [Neil Cook]
- Update sequence overview flow charts. [Neil Cook]
- *Apero.core.core.drs_file.py + apero.science.polar.gen_pol.py* - corrects to polar code. [Neil Cook]

5.3.1.173 0.7.103 (2021-04-10)

- Fix ccf typo + *drs_file.DrsPath* distinguish between abspath and *obs_dir* and *block_kind*. [Neil Cook]
- *Apero.core.core.drs_file.py* - make block paths real paths (try to fix Issue #660) [Neil Cook]
- Remove references to *DRS_DS9_PATH* and *DRS_LATEX_PATH* - either get from shutil.which or don't use. [Neil Cook]
- Remove references to *DRS_DS9_PATH* and *DRS_LATEX_PATH* - either get from shutil.which or don't use. [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - add lsd keywords + lsd file. [Neil Cook]
- *Apero.science.calib.gen_calib.py* - correct typo *block_ind –> block_kind*. [Neil Cook]
- *Apero.core.core.drs_file.py* - sort out length of data, header, names, datatype, dtype. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add polar to sequences and run.ini files [still requires grouping] [Neil Cook]
- Polar update - add writing polar files [unfinished - needs lsd files] [Neil Cook]
- Polar update - add writing polar files [unfinished - needs lsd files] [Neil Cook]
- Change return of *drs_file.combine*. [Neil Cook]

5.3.1.174 0.7.102 (2021-04-08)

- Continue work on polar lsd code integration. [Neil Cook]
- Continue work on polar lsd code integration. [Neil Cook]
- Continue work on polar lsd code integration. [Neil Cook]
- Continue work on polar lsd code integration. [Neil Cook]
- Continue work on polar lsd code integration. [Neil Cook]

5.3.1.175 0.7.101 (2021-04-06)

- Continue work on polar code integration. [Neil Cook]
- Continue work on polar code integration. [Neil Cook]
- Continue work on polar lsd integration. [Neil Cook]
- Continue work on polar code integration. [Neil Cook]
- Continue work on polar code integration. [Neil Cook]
- Merge pull request #666 from njcuk9999/v0.7-zsh. [Neil Cook]
  Add zsh support
- Add zsh to setup files. [Thomas Vandal]
- Add first version of zsh files. [Thomas Vandal]

5.3.1.176 0.7.100 (2021-04-02)

- *Apero.recipes.spirou.obj_pol_spirou.py* + *science.polar.gen_pol.py* - continue work on polar code. [Neil Cook]
- *Apero.core.core.drs_file.py* - add to Block class (fileset) + move *get_file_definition* here + add *get_infile_infilename* function. [Neil Cook]
- Move *get_file_definition* to *drs_file.py*. [Neil Cook]
- Start work on polar code. [Neil Cook]
- *Apero.base.drs_db.py* - hide connection debug printout - use later to profile. [Neil Cook]

5.3.1.177 0.7.099 (2021-03-31)

- *Apero.base.drs_db.py* - up the wait time to reconnect to 5+-1s * 20 (max 120s) - brute force hack to try to make connections wait longer. [Neil Cook]
- *Apero.base.drs_db.py* - up the wait time to reconnect to 10+-2s (from 0.1+-0.1) - brute force hack to try to make connections wait longer. [Neil Cook]
- *Apero.base.drs_db.py* - up the wait time to reconnect to 2+-1s (from 0.1+-0.1) - brute force hack to try to make connections wait longer. [Neil Cook]
- *Apero.base.drs_db.py* - save error from exception. [Neil Cook]
- *Apero.base.drs_db.py* - and connection timing. [Neil Cook]
- *Apero.base.drs_db.py* - try again after connection failure. [Neil Cook]
- *Apero.core.core.drs_file.py* + *science.telluric.fit_tellu.py* - clear a possible back log of npy writing + do not populate output dictionary for npy files (not required - they shouldn't be in the index database) [Neil Cook]

5.3.1.178 0.7.098 (2021-03-29)

- *Apero.base.drs_db.py* - add extra info to connection() error message. [Neil Cook]
- *Apero.recipes.spirou.obj_pol_spirou.py* - start integrating polar code. [Neil Cook]
- *Apero.base.drs_db.py* - allow dbname to be unset (dbname='NULL') [Neil Cook]
- *Apero.tools.module.setup.drs_reset.py* - try to remove files but give warning and continue if failed. [Neil Cook]
- *Apero.base.drs_db.py* - add table name to error. [Neil Cook]
- *Apero.base.drs_db.py* - make errors more explicit (database name) + close cursor and connections. [Neil Cook]

5.3.1.179 0.7.097 (2021-03-27)

- *Apero.base.drs_db.py* - correct database exception error. [Neil Cook]
- *Apero.science.extract.berv.py* - ***bprops* should be props=bprops. [Neil Cook]
- *Apero.base.drs_db.py* - problem with shallow copy on values + need to deal with masked column in gtable (re: *input_gaiaid)* [Neil Cook]
- *Apero.base.drs_db.py* - continue integration of changes to the database connection + add "out" files to index database + fix *apero_explorer pandas.to_sql* erasing UNIQUE column. [Neil Cook]

5.3.1.180 0.7.096 (2021-03-25)

- *Apero.base.drs_db.py* - continue work on _conn_ replacement. [Neil Cook]
- *Apero.base.drs_db.py* - we cannot connect until we are going to do something –> move all _conn_ inside places where we actually use the database - only connect (then importantly disconnect) each time we do something - do not keep connection open. [Neil Cook]
- *Apero.io.drs_fits.py* - deal with not being able to remove a file because it doesn't exist (try to test existence again) [Neil Cook]
- *Apero.recipes.*.cal_badpix_*.py* - combine *DARK_DARK same_type=False* (want to combine *DARK_DARK_TEL* and *DARK_DARK_INT)* [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.181 0.7.095 (2021-03-24)

- Merge branch 'v0.7.090-test-stable' into v0.7.090-work. [Neil Cook]
- Merge pull request #662 from njcuk9999/v0.7.090-sql-reconnect. [Neil Cook]
  Update *drs_db* to reconnect upon cursor creation failure
- Add *KW_OUTPUT* for pp files + *KW_PID* for combined files + recipe in index database. [Neil Cook]
- Merge branch 'v0.7.090-test-stable' into v0.7.090-work. [Neil Cook]
- *Apero.base.drs_db.py* - add doc string for connect class and move all connections here. [Neil Cook]

5.3.1.182 0.7.094 (2021-03-19)

- Undo unnecessary changes. [cusher]
- Update *drs_db* to reconnect upon cursor creation failure. [cusher]
- *Apero.base.drs_db.py* - add doc string for connect class and move all connections here. [Neil Cook]
- *Apero.base.drs_db.py* - add connection timeout for mwsql connection. [Neil Cook]
- *Apero.base.drs_db.py* - add connection timeout for mwsql connection. [Neil Cook]

5.3.1.183 0.7.093 (2021-03-17)

- *Apero.core.core.drs_file.py* - *get_hkey_2d* dim1/dim2 should be integers. [Neil Cook]
- *Apero.data.spirou.reset.runs.other_run.ini* - add LFCFP and FPLFC to other run.ini file. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* + *recipe_definitions.py* - add LFCFP and FPLFC to sequences. [Neil Cook]

5.3.1.184 0.7.092 (2021-03-13)

- *Apero.tools.module.processing.drs_processing.py* - fix duplicate entries (pp + raw) and make badpix *dark_dark* inclusive (int + tel) [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - change using defaults from warning to normal message. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_defintiions.py* + *blank_run.ini* - add a blank sequence (for apero testing and maybe loading raw files to index database) [Neil Cook]
- *Apero.tools.module.setup.drs_processing.py* - *_split_string_list* should not split by white space unless directly told to (allows spaces in filenames) [Neil Cook]

5.3.1.185 0.7.091 (2021-03-11)

- Update *spirou_map_sections.graphml*. [Neil Cook]
- Fix *display_func* + processing *obs_dir*. [Neil Cook]
- Add spirou map sections (for documenation and paper) [Neil Cook]
- *Params.snapshot_table* –> add recipe to args. [Neil Cook]
- Recipes - remove params from log functions. [Neil Cook]
- *Apero.io.drs_fits.py* - add *find_named_extensions* + *update_extension*. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - rtype <–> *block_kind*. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - change rtype and *block_kind* for recipe.log. [Neil Cook]
- *Apero.core.core.drs_misc.py* - raise value error for non-string name in *display_func*. [Neil Cook]
- Remove RecipeLog from *drs_log.py*. [Neil Cook]
- *Apero.core.core.drs_file.py* - add *update_param_table* function. [Neil Cook]
- *Apero.core.core.drs_database.py* - add update param table to calib/tellu file update. [Neil Cook]
- *Apero.core.constants.param_functions.py* - update *snapshot_table* to have recipe.log parameters. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.186 0.7.090 (2021-03-09)

- *Apero.core.core.drs_file.py* - catch *numpy_load* failure. [Neil Cook]

5.3.1.187 0.7.089 (2021-03-06)

- Need gaiadr for AstroObject. [Neil Cook]
- *Apero.science.calib.wave.py* - correct typo. [Neil Cook]
- *Apero.core.instruments.*.deafult_keywords.py* - add *KW_GAIA_DR* (for future determining against dr2/dr3. [Neil Cook]
- Recipes: *.inputtype–>.in_block_str .outputtype–>.out_block_str*. [Neil Cook]
- *Apero.recipes.*.obj/out_postprocess_*.py* - *DIRNAME–>OBS_DIR*, *kind–>block_kind*. [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - add *POLAR_DARK* and *POLAR_FP* to DPRTYPES. [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - *DIRNAME–>OBS_DIR*, *KIND–>BLOCK_KIND*. [Neil Cook]
- *Apero.core.core.drs_file.py* - *kind–>block_kind*. [Neil Cook]

5.3.1.188 0.7.088 (2021-03-04)

- *Apero.core.core.drs_ database.py* - deal with null values in index database hkeys. [Neil Cook]
- *General.py −> gen_ xxx.py*, processing fixes. [Neil Cook]

5.3.1.189 0.7.087 (2021-03-03)

- Rework directory/nightname (str −> DrsPath, *night−>obs_ dir)*, remove whitelist (−>include list) and black-list (−>exclude list) [Neil Cook]
- Rework directory (str −> DrsPath) - [unfinished] [Neil Cook]

5.3.1.190 0.7.086 (2021-02-27)

- *Apero.science.calb.wave.py* - need to worry about updating e2ds files with multiple extensions. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - need to add *POLAR_ FP* and *POLAR_ DARK* to obj types. [Neil Cook]
- *Apero.io.drs_ fits.py* - warnings for Table.read (with multiple tables) [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - add *REPROCESS_ OBJ_ DPRTYPES.* [Neil Cook]
- *Apero.core.core.drs_ file.py* - correct _ _ log_ _ [Neil Cook]
- *Apero.tools.module.database.manage_ databases.py + apero.recipes.bin.apero_ database.py* - add kill switch for database stuck with processes *(apero_ database.py* –kill) [Neil Cook]

5.3.1.191 0.7.085 (2021-02-26)

- Need to be able to kill database connections. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - do not add nightname if already a master sequence. [Neil Cook]
- *Apero.science.calb.shape.py* - *lin_ transform_ vect* should be list. [Neil Cook]
- Correct typos with *snapshot_ table* input. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - deal with directory separately from file/files (due to needing path between filename and raw/tmp/red path. [Neil Cook]
- *Apero.core.core.drs_ file.py* - fix headers + dout/hout. [Neil Cook]
- *Apero.core.core.drs_ database.py* - condition now comes from uhash for index and object dbs. [Neil Cook]
- *Apero.base.drs_ db.py* - get condition from uhash if *unique_ cols* is populated + deal with unique exception text better (force lower case) [Neil Cook]
- *Apero.recipes.spirou.cal_ ccf_ spirou.py* - make sure A and B can be used as science fibers. [Neil Cook]

5.3.1.192 0.7.084 (2021-02-24)

- *Apero.core.core.drs_ database.py* - deal with unique keys in database. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.core.drs_ database.py* - allow for unique columns (by using a hash column) in INDEX and HASH databases. [Neil Cook]
- *Apero.core.core.drs_ database.py* - allow for unique columns (by using a hash column) in INDEX and HASH databases. [Neil Cook]
- Remove breakpoint/breakfunc (use debugger) + add hdict to snapshot table + replace most *write_file* with *write_ multi* + snapshot tables. [Neil Cook]
- Change *display_func* (remove breakpoints/breakfuncs) + start adding parameter table to outputs *(write_ multi* first) [Neil Cook]

5.3.1.193 0.7.083 (2021-02-20)

- *Apero.core.constants.param_ functions.py* - add used functionality to keep track of uses of parameters in a recipe (for output table) [Neil Cook]
- Continue work on new wave solution by EA [UNFINISHED - solution diverges on mean2error while loop) [Neil Cook]
- Continue work on new wave solution by EA [UNFINISHED - solution diverges on mean2error while loop) [Neil Cook]
- Continue work on new wave solution by EA [UNFINISHED - requires new *calc_ wave_ lines* func for HC and FP lines) [Neil Cook]

5.3.1.194 0.7.082 (2021-02-18)

- Update *UPDATE_ NOTES.txt*. [Neil Cook]
- Apero.science.wave2 - add EA code for new wave solution. [Neil Cook]
- *Apero.core.core.drs_ file.py* - drsfile can be 'table' therefore have to check if drsfile is DrsInputFile or else deepcopy. [Neil Cook]
- *Apero.core.constants.param_ functions.py* - must check for INSTRUMENT (as this is used in installation when yaml may not exist) [Neil Cook]

5.3.1.195 0.7.081 (2021-02-12)

- *Apero.science.calib.wave.py* - typing for *generate_ res_ files*. [Neil Cook]
- *Apero.science.calib.wave.py* - correct *generate_ res_ file* (should return names for extensions) [Neil Cook]
- *Apero.base.base.py* - add profile to all database tables - so you can change each table in settings. [Neil Cook]
- *Apero.tools.module.setup.drs_ installation.py* - change install message (to be more clear) [Neil Cook]
- *Apero.core.instruments.spirou.file_ definitions.py* + *apero.core.core.drs_ file.py* - add a tag to *out_ post* files + add NEXT to primary. [Neil Cook]

5.3.1.196 0.7.080 (2021-02-11)

- Update *UPDATE_ NODATE.txt*. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.insturments.spirou.pseudo_ const.py* - *get_ drs_ mode()* - only set *DRS_ MODE* for OB-STYPE="OBJECT" [Neil Cook]
- Add extension names to all extensions. [Neil Cook]
- *Apero.core.insturments.spirou.recipe_ definitions.py* - add *quick_ seq* (for trigger use) [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - setup() must load psuedo constants with an instrument (as FILEMOD-/RECIPEMOD for recipes / files with no instrument come from here) [Neil Cook]
- *Apero.core.core.drs_ log.py* - need to allow logger to have params as an input. [Neil Cook]
- *Apero.core.constants.param_ functions.py* - *load_ config* need a default option (instrument=None) [Neil Cook]
- Update constants.load, constants.pload (do not define instrument) + attempt a better way to read (get first ext automatrically) / write fits (do not write in primary) [Neil Cook]
- Get instrument from base.IPARAMS not from definition. [Neil Cook]

5.3.1.197 0.7.079 (2021-02-10)

- Update extraction cosmic ray rejection [UNTESTED] [Neil Cook]
- *Apero.recipes.spirou.cal_thermal_spirou.py* - *thermal_files* are not indexed - correct this. [Neil Cook]
- Update *UPDATE_NOTES.txt.* [Neil Cook]
- *Apero.tools.module.error.find_error.py + apero.tools.recipes.dev.apero_langdb.py* - add –find option to *langdb.py* that launches *find_error* gui. [Neil Cook]
- *Apero.core.instruments.spirou.pseudo_const.py* - pep8 clean up. [Neil Cook]
- *Apero.base.drs_db.py* - surround all connections to cursor with the "with" statement to make sure connections are closed in all circumstances (i.e. Ctrl+C) [Neil Cook]

5.3.1.198 0.7.078 (2021-02-09)

- Apero.core.instruments.spirou - add *POLAR_FP* and *POLAR_DARK* (similar to *OBJ_FP* and *OBJ_DARK)* for polar files with *SBRHB1_P* and *SBR2_P* keys used to distinguish between spectroscopy and polarimetry. [Neil Cook]
- *Apero.setup.newprofile.py* - fix code to copy profile files in 0.7 format. [Neil Cook]
- Add switch between pool and process *(REPROCESS_MP_TYPE)* [Neil Cook]

5.3.1.199 0.7.077 (2021-02-08)

- *Setup.install.py* - add mysql-connector to *module_translation.* [Neil Cook]
- Update requirements. [Neil Cook]
- *Apero-drs-spirou.recipe_definitions.py* - change grouping for *obj_pp_recipe.* [Neil Cook]
- *Apero.recipe.spirou.obj_postprocess_spirou.py* - remove unused imports. [Neil Cook]
- *Apero.core.core.drs_file.py* - add clear file to postprocess. [Neil Cook]

5.3.1.200 0.7.076 (2021-02-04)

- *Apero.core.core.drs_file.py* - allow *set_infile* to take a filename. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_defintions.py* - add *obj_pp_recipe.* [Neil Cook]
- *Apero.recipes.spirou.obj_postprocess_spirou.py* - convert *out_postprocess* to a per file (for *apero_processing.py* and multiple cores) [Neil Cook]
- Apero.tools.recipes.spirou - move *tellu_db* files here. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - change *FWHM_PIXEL_PSF -> FWHM_PIXEL_LSF.* [Neil Cook]
- *Apero.ploting.plot_functions.py* - add *tellup_clean_oh* to definitions. [Neil Cook]
- *Apero.data.spirou.reset.runs.complete_run.ini* - remove commit() to database outside for loops (commit each entry) [Neil Cook]
- *Apero.core.instruments.spirou.recipe_defintions.py* - remove *obj_mk_tellu_db* and *obj_fit_tellu_db* from full sequence. [Neil Cook]
- Remvoe commit() to database outside for loops (commit each entry) [Neil Cook]
- *Apero.core.core.drs_database.py* - only check last modified for raw files. [Neil Cook]

5.3.1.201 0.7.075 (2021-02-03)

- Add thermal flow diagram. [Neil Cook]
- Make sure PyQt5 is installed. [Neil Cook]
- *Apero.science.preprocessing.detector.py* - fix mask1+mask2 -> *xpand_mask* now data is fixed. [Neil Cook]
- *Apero.plotting.core.py* - remove Qt4Agg (not supported in matplotlib 3.3+) [Neil Cook]
- *Apero.core.core.drs_file.py* - allow *read_data* to return data (and not set self.data) [Neil Cook]

5.3.1.202 0.7.074 (2021-02-02)

- *Apero.tools.module.setup.drs_ installation.py* - clean profile names. [Neil Cook]
- *Apero.science.preprocessing.detector.py* - do not do *expand_ mask*. [Neil Cook]
- *Apero.core.instruments.default.default_ constants.py* - *PP_ COSMIC_ BOXSIZE* should be an integer. [Neil Cook]
- *Apero.core.core.drs_ database.py* - make sure checking *last_ mod* done correctly *(exclude_ files + last_ mod* should be arrays not pandas table columns) [Neil Cook]
- Update language database. [Neil Cook]
- Update requirements + apero-pip env. [Neil Cook]
- *Apero.tools.module.setup.drs_ reset.py* - deal with not having index/log database in reduced/tmp resets. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - replace all non alphanumeric characters (except *"_"*) with _ (then remove double *_ _*) [Neil Cook]
- *Apero.base.drs_ db.py* - add *tname_ in_ db* function to check tables in database for database.tname. [Neil Cook]
- *Apero.core.core.drs_ database.py* - add a *last_ modified* check for raw files (to update them if they've changed) [Neil Cook]
- Update date/version/changelog/update notes/documentation. [Neil Cook]

5.3.1.203 0.7.073 (2021-01-29)

- Update *UPDATE_ NOTES.txt*. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - deal with "switch" arguments (should be user defined only) [Neil Cook]
- *Apero.core.core.drs_file.py* - deal with not selecting DEBUG-uncorr files (assume they don't have runargs) [Neil Cook]
- *Apero.science.preprocessing.detector.py* - finish *correct_ cosmics* function + add typing. [Neil Cook]
- *Apero.recipes.*.cal_ preprocess_ *.py* - add changes to add *correct_ cosmics* functionality. [Neil Cook]
- *Apero.core.math.general.py* - add *xpand_ mask* function (for pp cosmic) [Neil Cook]
- *Apero.core.instruments.*.default_ keywords.py* - add *PP_ COSMIC* keywords. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - add *PP_ COSMIC* constants. [Neil Cook]

5.3.1.204 0.7.072 (2021-01-27)

- *Apero.recipe.spirou.cal_ preprocess_ spirou.py* - start adding cosmic ray reject code. [Neil Cook]
- *Apero.core.core.drs_file.py* - add loading all extensions to *drs_file.get_ data*. [Neil Cook]
- *Apero.science.calib.localisation.py + wave.py* - add *KW_ PID* to writing functions. [Neil Cook]
- *Apero.core.instruments.default.default_ constants.py* - add *PLOT_ TELLUP_ CLEAN_ OH* to *_ _ all_ _* [Neil Cook]
- Update language database. [Neil Cook]

5.3.1.205 0.7.071 (2021-01-26)

- *Apero.science.telluric.gen_ tellu.py* - add EA's changes to sky model. [Neil Cook]
- *Apero.science.calib.wave.py* - add *KW_ PID* to wave writing functions. [Neil Cook]
- *Apero.plotting.plot_ functions.py* - add *plot_ tellup_ clean_ oh* function. [Neil Cook]
- Apero.data.spirou.telluric - update *sky_ PCs.fits*. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_ definitions.py* - add *TELLUP_ CLEAN_ OH* to plots. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - add *TELLUP_ OHLINE_ NBRIGHT*. [Neil Cook]

5.3.1.206 0.7.070 (2021-01-22)

- Documentation - todo.rst - add to known issues. [Neil Cook]
- *Apero.tools.module.setup.drs_ installation.py* - fix hasattr. [Neil Cook]
- Update setup/envs/apero-pip. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - deal with Etienne using 0 as flag - bad bad bad. [Neil Cook]
- *Apero.core.core.drs_ file.py* - do not check metric for *DARK_ DARK* and *HC_ HC*. [Neil Cook]

5.3.1.207 0.7.069 (2021-01-20)

- Update language database. [Neil Cook]
- *Apero.core.core.drs_ file.py* - need to deal with metric removing all files. [Neil Cook]
- Update typo in documentation *WAVE_ {FIBER} –> LEAKM_ {FIBER}* [Neil Cook]
- README.md - update typo - *WAVE_ {FIBER} –> LEAKM_ {FIBER}* [Neil Cook]
- *Apero.core.core.drs_ file.py* - must update kind when *forced_ dir.* [Neil Cook]
- *Apero.core.core.drs_ database.py* - must update kind when *forced_ dir.* [Neil Cook]
- *Apero.core.core.drs_ argument.py* - must update kind when *forced_ dir.* [Neil Cook]

5.3.1.208 0.7.068 (2021-01-19)

- *Apero.tools.module.processing.drs_ processing.py* - need to make sure directory is set to None if not the master recipe. [Neil Cook]
- Update TODO. [Neil Cook]
- *Apero.recipes.spirou.** - make sure recipes with two levels end log1 as well as log2. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - edit how we *write_ logfile* when set present (only log set) else log self. [Neil Cook]
- *Apero.recipes.spirou.cal_ thermal_ spirou.py* - must update some header keys to match *cal_ thermal* (not *cal_ extract* that was used internally) [Neil Cook]
- Update todo. [Neil Cook]
- *Apero.plotting.core.py* - matplotlib.use does not have warn argument in 3.3.3. [Neil Cook]

5.3.1.209 0.7.067 (2021-01-15)

- *Apero.core.instruemnts.spirou.file_ definitions.py* - add *remove_ drs_ hkeys* and *remove_ std_ hkeys.* [Neil Cook]
- *Apero.recipes.*.out_ postprocess_ {instrument}.py* - add processing header updates. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - add *NON_ CHECK_ DUPLICATE_ KEYS*, *FORBIDDEN_ OUT_ KEYS* methods. [Neil Cook]
- *Apero.core.instruments.*.default_ keywords.py* - add *post_ exclude* argument where required. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - add *POST_ HDREXT_ COMMENT_ KEY*. [Neil Cook]
- *Apero.core.core.drs_ file.py* - add header modifications to DrsOutFile (and DrsOutFileExtension) [Neil Cook]
- *Apero.core.constants.constant_ functions.py* - add *post_ exclude* to Keyword class. [Neil Cook]

5.3.1.210 0.7.066 (2021-01-14)

- *Apero.core.instruemtns.spirou.file_ definitions.py* - add TODOs re: meeting with Chris. [Neil Cook]
- Update documentation. [Neil Cook]
- *Apero.tools.recipe.dve.apero_ constants.py* - add way to generate glossary from constants/keywords. [Neil Cook]
- *Apero.base.base.py* - add bool to the STRTYPES. [Neil Cook]
- *Apero.instruments.default.default_ keywords.py* - add descriptions for Keywords. [Neil Cook]
- Update todo/update notes. [Neil Cook]
- *Apero.tools.recipes.dev.apero_ constants.py* - add check that dev wants to clean constants (and return success/fail) [Neil Cook]
- Update descriptions of Const. [Neil Cook]

- *Apero.tools.module.utils.constants_tools.py* - simplify description tool - manually edit after. [Neil Cook]

5.3.1.211 0.7.065 (2021-01-13)

- *Apero.tools.module.utils.constants_tools.py* - add todo to change adding descriptions to constants. [Neil Cook]
- Update todo and update notes. [Neil Cook]
- *Apero.tools.recipes.dev.apero_constants.py* - add a tool for dealing with constants. [Neil Cook]
- *Apero.tools.module.testing.drs_dev.py* - fix mod from ImportModule. [Neil Cook]
- *Apero.tools.module.setup.drs_installation.py* - add settings for *apero_constants.py*. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - fix mod from dev recipes. [Neil Cook]
- Correct typos in *default_consts*. [Neil Cook]
- *Apero.core.core.drs_file.py* - remove dprtype filter on combine metric 1 (accept all files) [Neil Cook]

5.3.1.212 0.7.064 (2021-01-11)

- Update TODO list. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.core.drs_file.py* - metric 1 only valid for specific types - deal with this. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *COMBINE_METRIC_THRESHOLD1* and *COMBINE_METRIC1_TYPES*. [Neil Cook]
- *Apero.core.core.drs_file.py* - add metric for rejecting combine files. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *COMBINE_THRESHOLD*. [Neil Cook]

5.3.1.213 0.7.063 (2021-01-08)

- Update language database. [Neil Cook]
- Update *update_notes* + readme + todo.rst. [Neil Cook]
- *Apero.recipes.nirps_ha.out_postprocess_nirps_ha.py* - copy over work from SPIRou to NIRPS (placeholder until we have a post process file for NIRPS) [Neil Cook]
- *Apero.core.instruments.** - update *recipe_definitions.py* and *file_definitions.py* (and copy to NIRPS) [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add *add_non_file_args* function (to deal with setting –night, –wnightlist, –bnightlist from processing) [Neil Cook]
- *Apero.recipe.*.out_{instrument} –> apero.recipe.*.out_postprocess_{instrument}* [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - make all out file types not required. [Neil Cook]
- Update run.ini files with *out_postprocess*. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *POST_CLEAR_REDUCED* and *POST_OVERWRITE* to constants. [Neil Cook]
- *Apero.core.core.drs_file.py* - update *process_links* and return success/failure. [Neil Cook]

5.3.1.214 0.7.062 (2021-01-07)

- *Apero.recipes.spirou.out_spirou.py* - continue work on *out_spirou.py*. [Neil Cook]
- *Apero.core.instruments.spirou.output_filenames.py* - continue work on *post_file* (outfunc) [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - update out files (continued work) [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - reformat *index_keys*. [Neil Cook]
- *Apero.core.core.drs_file.py* - move *output_dictionary* to DrsInputFile, and continue work on DrsOutFile. [Neil Cook]
- *Core.core.drs_database.py* - fix hkeys loop in *IndexDatabase.get_entries()* and add *_hkey_condition*. [Neil Cook]
- *Tools.recipe.bin.apero_listing.py* + *apero.core.core.drs_database.py* - update *apero_listing.py* to handle wrong number of columns. [Neil Cook]

5.3.1.215 0.7.061 (2021-01-06)

- *Apero.recipes.out_ spirou.py* - continue adding code to process *post_process* files. [Neil Cook]
- *Apero.core.instruments.spirou.** - add *post_file* options. [Neil Cook]
- *Apero.core.instruments.*.default_config.py* - add *DRS_DATA_OUT* directory (for post processed files) [Neil Cook]
- *Setup.install.py + apero.tools.module.setup.drs_installation.py* - add database options from command line. [Neil Cook]

5.3.1.216 0.7.060 (2021-01-05)

- Update language database and todo list. [Neil Cook]
- *Tools.module.database.database_gui.py* - fix saving of database (table should be database.tname not self.kind) [Neil Cook]
- *Apero.** - add first work for post processing *(out_ {instrument}.py)* [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - add *KW_IDENTIFIER*. [Neil Cook]
- *Core.core.drs_file.py* - add DrsOutFileExtension and DrsOutFile for post processing of files. [Neil Cook]
- Update *default_constants.py default_keywords.py pseudo_const.py*. [Neil Cook]
- Update language database + update notes. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - get template from user definition (if present) [Neil Cook]
- Documentation - add *cal_shape_spirou_schematic*. [Neil Cook]
- Update documentation. [Neil Cook]
- Update *file_definitions.py* and *recipe_definitions.py*. [Neil Cook]
- *Apero.core.core.drs_file.py* - make checksum upper case. [Neil Cook]

5.3.1.217 0.7.059 (2020-12-24)

- Update object database. [Neil Cook]
- *Apero.tools.module.database.manage_databases.py* - update *make_object_reset* (OBJNAME–>OBJECT) [Neil Cook]
- Update notes and todo. [Neil Cook]
- *Apero.tools.module.setup.drs_reset.py* - for reseting tmp/red dirs also reset databases. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add shortname to processing for all recipes. [Neil Cook]
- *Apero.science.calib.wave.py* - add wave coeffs table. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - add sname (shortname) and rtype (raw/tmp/red) [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add rtype tp recipe log (raw/tmp/red) [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - add short name. [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - change columns. [Neil Cook]
- *Apero.core.core.drs_file.py* - checksum for filename (untested) [Neil Cook]
- *Apero.core.core.drs_database.py* - add delete row functions (for reset) [Neil Cook]
- *Core.core.drs_argument.py* - add special shortname argument (to carry short name forward to recipe) [Neil Cook]

5.3.1.218 0.7.058 (2020-12-22)

- Update todo + *UPDATE_NOTES.txt*. [Neil Cook]
- *Apero.science.preprocessing.gen_pp.py* - deal with being offline (warning + skip step) [Neil Cook]
- *Apero.core.instruments.*.pseudo_const.py* - deal with multiple _ _ in a row (replace with _) [Neil Cook]
- *Tools.recipes.spirou.cal_drift_spirou.py* - added support for *OBJ_FP* and *DARK_FP* for *cal_drift*. [Neil Cook]
- *Apero.science.calib.shape.py* - *max_dxmap_info* must have three terms. [Neil Cook]

5.3.1.219 0.7.057 (2020-12-22)

- Update todo (more tasks) [Neil Cook]
- *Apero.tools.module.database.manage_ databases.py* - add the new *astro_ obj.update_ objects*. [Neil Cook]
- *Apero.science.preprocessing.gen_ pp.py* - add an update target method to *astro_ obj*. [Neil Cook]
- Update todo. [Neil Cook]
- *Apero.science.calib.shape.py* - pep8 too long line. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - set *log_ file* and *plot_ dir* to "Not Set" [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - add back log file and correct typo kwargs –> skwargs. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - correct *PP_ BAD_ EXPTIME_ FRACTION*. [Neil Cook]
- *Apero.science.calib.localisation.py* - fix qc logic for *MAX_ RMPTS_ POS* and *MAX_ RMPTS_ WID*. [Neil Cook]
- *Apero.tools.recipe.spirou.cal_ expmeter_ spirou.py* - add –fibers input to choose fibers to add to mask. [Neil Cook]
- *Apero.core.core.drs_ misc.py* - try to fix integer scalar bug. [Neil Cook]

5.3.1.220 0.7.056 (2020-12-20)

- Re-save shape master schematic. [Neil Cook]
- Add shape master schematic + add tools pages (empty for now) [Neil Cook]
- Add to localisation documentation. [Neil Cook]
- Add update object database to *apero_ processing.py*. [Neil Cook]

5.3.1.221 0.7.055 (2020-12-17)

- Add 10% exptime limit in preprocessing. [Neil Cook]
- Update documentation. [Neil Cook]

5.3.1.222 0.7.054 (2020-12-16)

- Update todo/update notes and documentation. [Neil Cook]
- Update todo list. [Neil Cook]
- Update todo list. [Neil Cook]
- Add *apero_ database.py* - to import csv file to database and export database to csv file. [Neil Cook]
- Update language database. [Neil Cook]
- Update documentation. [Neil Cook]
- *Apero.base.drs_ base* + *apero.lang.core.drs_ lang.py* - *drs_ base.BETEXT* from langdb.csv and language proxy from same function. [Neil Cook]
- Update version/date/changelog/documentation. [Neil Cook]

5.3.1.223 0.7.053 (2020-12-15)

- *Apero-drs.setup.install.py* - update requirements path and weird import modules (not equal to module name) [Neil Cook]
- Correct requirements. [Neil Cook]
- Update todo list. [Neil Cook]
- *Apero.tools.recipe.bin.apero_ reset.py* - must work out files to exclude before warn statement. [Neil Cook]
- *Apero.tools.module.setup.drs_ instllation.py* - add database installation steps. [Neil Cook]
- *Apero.lang.core.drs_ lang.py* - need to check whether language database has a table yet (and don't try getting it if it doesn't exist yet) [Neil Cook]
- *Apero.base.base.py* - try getting all parameters from allparams (if we are updating an installation these all will be filled, if installing for first time some will be filled) [Neil Cook]

5.3.1.224 0.7.052 (2020-12-14)

- Update documentation. [Neil Cook]
- Only resolve objects for *OBJ_FP* and *OBJ_DARK* + do not add multiple rows for *KW_OBJNAME*. [Neil Cook]

5.3.1.225 0.7.051 (2020-12-12)

- Continue updating documentation. [Neil Cook]
- *Core.instrument.spirou.default_constants.py* - change central column to 2044 (was 2500 - why?) [Neil Cook]
- Update documentation. [Neil Cook]

5.3.1.226 0.7.050 (2020-12-10)

- Update todo list. [Neil Cook]
- *Apero_reset.py* + *apero_processing.py* - do not warn if reset log file is present (and skip it) [Neil Cook]
- Update language database. [Neil Cook]
- Apero.documentation.working.user.general.todo.rst - update todo list. [Neil Cook]
- *Apero.plotting.core.py* - deal with plt = None. [Neil Cook]
- *Apero.tools.moduile.processing.drs_processing.py* - deal with no plt import. [Neil Cook]

5.3.1.227 0.7.048 (2020-12-10)

- *Apero.core.instruments.default.grouping.py* + *apero.tools.module.processing.drs_processing.py* - add master value to set directory name. [Neil Cook]
- Apero.lang - force the encoding (remove bad characters) [Neil Cook]
- Apero.lang - update reset files. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - revert to Process (Pool is not working) [Neil Cook]
- *Apero.lang.core.drs_lang.py* - make sure reset csv files are utf-8 encoded. [Neil Cook]

5.3.1.228 0.7.047 (2020-12-07)

- *Apero-drs.apero.base.drs_db.py* - user and host must come from arguments. [Neil Cook]
- *Apero-drs.apero.base.drs_db.py* - must reset path after call to super. [Neil Cook]
- *Apero-drs.apero.base.drs_db.py* - path must be set before we check mysql. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - try fixing freezing Pool. [Neil Cook]

5.3.1.229 0.7.046 (2020-12-04)

- *Apero.data.nirps_ha.calibdb.MASTER_WAVE_NIRPS_HA.fits* - update default wave solution. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - import matplotlib to close plots. [Neil Cook]
- *Apero.plotting.core.py* - move import for matplotlib to separate function *(import_matplotlib)* [Neil Cook]
- *Apero.data.nirps_ha.reset.calibdb* - Add Etiennes new *MASTER_WAVE* file for NIRPS. [Neil Cook]
- *Apero.io.drs_fits.py* - deal with HIERARCH keys and keys longer than 8 characters better. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - deal with not using recipe. [Neil Cook]

5.3.1.230 0.7.045 (2020-12-02)

- Update language database. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - move *class_ name* outside *_ _ init_ _* [Neil Cook]
- *Apero.core.instruments.default_ keywords.py* - add *combine_ method* for keywords that require it. [Neil Cook]
- *Apero.core.instrument.*.pseudo_ const.py* - add *class_ name*. [Neil Cook]
- *Apero.core.core.drs_ file.py* - update combine to include updating the headers. [Neil Cook]
- *Apero.core.core.drs_ base_ classes.py* - move *class_ names* outside *_ _ init_ _* [Neil Cook]
- *Apero.core.constants.constant_ functions.py* - add *combine_ method* to Keyword Class. [Neil Cook]
- Update todo list. [Neil Cook]
- *Apero.core.instruments.default.grouping.py* - continue work on grouping. [Neil Cook]
- For key, item in *self._ _ dict_ _* −> for key, item in *self._ _ dict_ _ .items()* [Neil Cook]

5.3.1.231 0.7.044 (2020-12-01)

- *Apero.tools.module.processing.drs_ processing.py* - for skip add nightname to whitelist. [Neil Cook]
- *Apero.science.telluric.template_ tellu.py* - typo *get_ key* −> *get_ hkey*. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - add a *group_ func* storage in recipe instance. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_ definitions.py* - add group funcs for all functions to be used in *apero_ processing*. [Neil Cook]
- *Apero.tools.module.processing.drs_ grouping_ functions.py* + *apero.core.instruments.default.grouping.py* - add grouping functions - so *apero_ processing* can use custom functions to group files/args for processing. [Neil Cook]

5.3.1.232 0.7.043 (2020-11-30)

- Update todo/update/docs. [Neil Cook]
- Apero.science.telluric - add berv coverage to template construction. [Neil Cook]
- Add *plot_ mktemp_ berv_ cov* to *plot_ functions.py*. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py default_ keywords.py* - add berv correction keywords/constants. [Neil Cook]

5.3.1.233 0.7.042 (2020-11-27)

- *Apero.base.drs_ db.py* - correct typo values−> values=values. [Neil Cook]
- *Core.instruments.*.pseudo_ const.py* - add *FIBER_ LOC*. [Neil Cook]
- *Apero.science.calib.localisation.py* - update cent/wid coefficient tables. [Neil Cook]
- *Apero.base.drs_ db.py* - force table to be set. [Neil Cook]

5.3.1.234 0.7.041 (2020-11-26)

- *Apero.base.drs_ base.py* - do not call exception - raise exception. [Neil Cook]
- *Apero.base.drs_ db.py* - correct self.database.get to include table. [Neil Cook]
- Update todo list + documentation. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.tools.module.database.manage_ database.py* - must do a super call in Database Exception + set self.tname after super (MySqlDatabasE) [Neil Cook]
- *Apero.base.drs_ db.py* - remove reference to 'MAIN' (replace with database.tname) - so mysql can write to different tables - make sql tname be *{kind}_ {profile}* from database.yaml. [Neil Cook]
- *Apero.apero.instruments.spirou.recipe_ defintions.py* - add masknormmode option. [Neil Cook]
- *Apero.science.velocity.general.py* - add in ccf mask norm options. [Neil Cook]
- Update documentation. [Neil Cook]
- Update update notes + todo. [Neil Cook]
- *Apero.core.core.drs_ database.py* - if all rows have rawfix=1 don't do loop. [Neil Cook]

- *Apero.core.core.drs_database.py* - do not fix header if rawfix == 1. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add some print statements about progress + update language database. [Neil Cook]
- *Apero.tools.recipes.dev.apero_langdb.py* - add reload option (to reload the database from reset files but not regenerate reset files) [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - format global condition better. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - only show overwriting value if original value was not null (None) + move all conditional filters that are not recipe specific outside the recipe loop. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - filter objects in *SCIENCE_TARGETS* and *TELLURIC_TARGETS* by tstars+ostars (i.e. all on disk) [Neil Cook]

5.3.1.235 0.7.040 (2020-11-25)

- Update documentation. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - correct typo value –> objname. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.000-pre' into v0.7.000-pre. [Neil Cook]
- *Apero.tools.processing.drs_processing.py* - correct SQL logic for conditions. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* + *tools.module.processing.drs_processing.py* - add template stars to *process_adds/add_extra/update_args.* [Neil Cook]
- *Apero.base.drs_db.py* - correct arg for error (DatabaseError) [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add *teplate_required* to *tellu_seq* and *science_seq.* [Neil Cook]
- *Apero.science.preprocessing.gen_pp.py* - have to search colnames of table. [Neil Cook]
- *Apero.tools.module.processing.py* - deal with *RECAL_TEMPLATE* = False and rejecting objnames with templates. [Neil Cook]
- *Apero.science.telluric.template_tellu.py* - add *list_current_templates* function. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - add *template_required* flag (to be added in sequences) [Neil Cook]
- *Apero.core.instruments.spirou.py* - add *template_required* to MKTELLU3,4 FTELLU2,3. [Neil Cook]
- *Apero.data.*.reset.runs* - correct typo: *RECAL_TEMPALTES –> RECAL_TEMPLATES.* [Neil Cook]

5.3.1.236 0.7.039 (2020-11-24)

- Update language database. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add code to set *science_targets* and *telluric_targets* from command line args + add rejecting via odometer codes. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *ODOCODE_REJECT_GSHEET_ID* and *ODOCODE_REJECT_GSHEET_NUM* to constants. [Neil Cook]
- *Apero.science.preprocessing.gen_pp.py* - add getting the rejection list from googlesheet. [Neil Cook]
- *Apero.data.*.reset.runs.*run.ini* - add *USE_ODO_REJECTLIST* and *RECAL_TEMPLATES* to run.ini files. [Neil Cook]
- *Apero.core.instruments.default.recipe_definitions.py* - add –*science_targets* and –*telluric_targest* to argumnets of *apero_processing.* [Neil Cook]
- *Apero.core.core.drs_text.py* - add *cull_leading_trailing* function. [Neil Cook]

5.3.1.237 0.7.038 (2020-11-23)

- *Apero.recipes.spirou.obj_mk_template_spirou.py* + *science.telluric.tempalte_tellu.py* - deal with copying hdict/header better. [Neil Cook]
- *Apero.core.core.drs_file.py* - try to populate *output_dict* (for index database) differently. [Neil Cook]
- Apero - telluric - add TEMPLATE TIME to *mk_tellu / fit_tellu* products. [Neil Cook]
- *Apero.science.telluric.template_tellu.py* - add a *generate_template_hash* function. [Neil Cook]
- *Apero.** - telluric - add number of files and template hash for better id of template. [Neil Cook]
- *Apero.recipes.spirou.cal_preprocess_spirou.py* - add object database outside for loop. [Neil Cook]
- Add first test of a setup.py. [Neil Cook]
- Update requirements/environments. [Neil Cook]

- Update environments to use mostly pip - astropy 4.1. [Neil Cook]
- *Apero.science.calib.localisation.py* - add coefficients as tables in the fits files. [Neil Cook]

5.3.1.238 0.7.037 (2020-11-20)

- *Apero.lang.core.drs_lang.py* - only report when tkey is not tvalue (otherwise we get duplication) [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add python modules being used to log. [Neil Cook]
- *Apero.base.base.py* - add *RECOMM_USER* and *RECOMM_DEV*. [Neil Cook]
- Update *requirements_developer.txt* and rint must be a single number (not array) [Neil Cook]

5.3.1.239 0.7.036 (2020-11-18)

- Update installation. [Neil Cook]
- Update installation. [Neil Cook]
- Update installation. [Neil Cook]
- Update installation. [Neil Cook]
- Update installation. [Neil Cook]
- *Apero.lang.core.drs_lang.py* - deal with no language database and return proxy to language database. [Neil Cook]
- *Apero.base.drs_db.py* - add a proxy language database (for when we don't have access to the database) [Neil Cook]
- Update changelog/version/date/documentation/language database. [Neil Cook]

5.3.1.240 0.7.035 (2020-11-18)

- *Apero.tools.module.processing.drs_processing.py* - do not worry about nulls - all raw filters should be present in index database. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - remove files from *add_filters* (should only be raw filters because we use raw files) [Neil Cook]
- *Apero.core.core.drs_file.py* - if column is masked don't filter by it. [Neil Cook]

5.3.1.241 0.7.034 (2020-11-17)

- *Apero.** - correct problems with textentry. [Neil Cook]
- *Apero.base.* apero.core.core.** - add/update import rules. [Neil Cook]
- *Apero.base.** - move none base modules to core.core. [Neil Cook]
- *Apero.base.drs_exceptions.py* - reorganise exceptions. [Neil Cook]
- *Apero.** - replace TextEntry with textentry. [Neil Cook]

5.3.1.242 0.7.033 (2020-11-14)

- Update language database. [Neil Cook]
- *Apero.base.drs_base.py drs_db.py drs_text.py + lang.core.drs_lang.py* - use BETEXT *base_error* and *base_printer*. [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - move *LANG_DB_COLUMNS* to *base.py* (same with IN-STRUMENTS definition) [Neil Cook]
- *Apero.tools.recipe.dev.apero_langdb.py* - update for new language database. [Neil Cook]
- *Apero.tools.module.database.manaage_database.py* - deal with change to language db functionality. [Neil Cook]
- Update language database files. [Neil Cook]
- *Apero.core.core.drs_database.py* - move language database stuff to *drs_db.py*. [Neil Cook]
- *Apero.base.** - start moving around base functionality (for base lang/print/error integration) [UNFINISHED] [Neil Cook]
- *Apero.base.drs_base.py* - add place to add base base functions. [Neil Cook]

- *Apero.base.drs_db.py* - add BaseDatabaseManager and LanguageDatabase classes. [Neil Cook]
- *Apero.base.base.py* - add language variables to base and re-organise order of base constants. [Neil Cook]

5.3.1.243 0.7.032 (2020-11-12)

- *Apero.core.core.drs_argument.py* - change sql column names to not be reserved names and change X==Y -> X=Y. [Neil Cook]
- *Apero.base.drs_db.py* - pandas functions have to be abstracted. [Neil Cook]
- *Apero.recipes.*.cal_wave_* + apero.science.calib.wave.py* - add calls to database and missing database keys. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - allow log database from parent. [Neil Cook]
- *Apero.base.drs_db.py* - add doc strings to new functions. [Neil Cook]
- *Apero.base.drs_db.py + apero.core.core.drs_database.py + apero.tools.module.database.database_gui.py + manage_databases.py* - modify MySQL feature (after testing) [Neil Cook]

5.3.1.244 0.7.031 (2020-11-10)

- *Apero.science.preprocessing.gen_pp.py* - do not hard code googlesheet columns - now defined at top and separate from database col names. [Neil Cook]
- *Apero.tools.module.database.database_gui.py + manage_databases.py* - add path back to *database_wrapper.* [Neil Cook]
- *Apero.core.utils.drs_startup.py* - deal with reloading filemod and recipemod when instrument changes. [Neil Cook]
- *Apero.core.core.drs_database.py* - deal with sqlite3 vs mysql (with paths) [Neil Cook]
- *Apero.base.drs_db.py* - make sure all table names end with _TABLE (to avoid SQL commands) [Neil Cook]

5.3.1.245 0.7.030 (2020-11-09)

- *Apero.tools.module.database.manage_database.py* - replace calls to *drs_db.Database* with *drs_db.database_wrapper* and calls to 'MAIN' table with self.kind. [Neil Cook]
- *Apero.tools.module.database.database_gui.py* - replace calls to *drs_db.Database* with *drs_db.database_wrapper* and calls to 'MAIN' table with self.kind. [Neil Cook]
- *Apero.science.preprocessing.gen_pp.py* - replace calls to *drs_db.Database* with *drs_db.database_wrapper* and calls to 'MAIN' table with self.kind. [Neil Cook]
- *Apero.core.core.drs_database.py* - replace calls to *drs_db.Database* with *drs_db.database_wrapper* and calls to 'MAIN' table with self.kind. [Neil Cook]
- *Apero.base.drs_db.py* - start implementing MySQL as an alternative to sqlite [UNFINISHED/UNTESTED] [Neil Cook]
- *Apero.tools.recipes.bin.apero_log_stats.py* - update to use from database. [Neil Cook]

5.3.1.246 0.7.029 (2020-11-04)

- *Apero.tools.resources.images.spirou_logo.png* - tmp icon for apero explorer app. [Neil Cook]
- *Apero.tooks.recipe.bin.** - remove instrument from arguments (now from *DRS_UCONFIG* install yaml) [Neil Cook]
- *Apero.tools.module.setup.drs_installation.py* - deal with reset and validate codes no longer needing instrument. [Neil Cook]
- *Apero.tools.module.database.database_gui.py* - add *is_openable* and *load_file* functions to database handler + add option if file is open to open it (in right click popup menu) [Neil Cook]
- *Apero.core.utils.drs_startup.py* - check that instrument is None or matches install.yaml (in *DRS_UCONFIG)* [Neil Cook]
- *Apero.core.instruments.default.recipe_definitions.py* - remove all instrument arguments (now get from *DRS_UCONFIG* install yaml) [Neil Cook]
- *Apero.base.drs_db.py* - fix backup replace path. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - remove *RESET_LOGFITS.* [Neil Cook]

- *Apero.data.*.reset.runs.** - remove references to *reset_logfits* - now a database. [Neil Cook]
- *Apero.science.calib.wave.py* - wavefile must have params. [Neil Cook]
- *Apero.science.extract.berv.py* - correct typo DPRTPYE–>DPRTYPE. [Neil Cook]

5.3.1.247 0.7.028 (2020-10-30)

- Recipes - update *get_berv* parameters. [Neil Cook]
- *Apero.science.extract.berv** - finish update to berv code (using. [Neil Cook]
- *Apero.recipes.*cal_extract_** - update args for *get_berv.* [Neil Cook]
- *Apero.io.drs_fits.py* - make sure get function pushes NaN back to np.nan. [Neil Cook]

5.3.1.248 0.7.027 (2020-10-29)

- Update update notes + add update header file. [Neil Cook]
- *Apero.science.prepreocessing.py* - make AstroObject pickeable. [Neil Cook]
- *Apero.sciience.extract.berv2.py* - redo berv code now object resolving done in preprocessing [UNFINISHED] [Neil Cook]
- *Apero.recipes.spirou.cal_preprocess_spirou.py* - add the *resolve_target* function to update header. [Neil Cook]
- *Apero.io.drs_fits.py* - add a *set_key* function (for using a keywordstore) [Neil Cook]
- Apero.data.database.reset.object.csv - update colnames. [Neil Cook]
- *Apero.core.instruments.*.deafult_keywords.py* - add *DRS_{RESOLVE}* keywords. [Neil Cook]
- *Apero-drs.apero.core.core.drs_database.py* - cahnge "GAIAID" –> *GAIA_COL_NAME.* [Neil Cook]

5.3.1.249 0.7.026 (2020-10-28)

- Apero.data.spirou.database.reset.object.csv - update object reset file (with new values) [Neil Cook]
- *Apero.tools.module.database.manage_database.py* - must load objdbm. [Neil Cook]
- *Apero.tools.moduile.database.manage_database.py* - update object database and add new way to reset object csv file. [Neil Cook]
- *Apero.science.preprocessing.py* - move *general.py –> gen_pp.py.* [Neil Cook]
- *Apero.recipes.spirou.cal_preprocess* - todo - resolve target. [Neil Cook]
- *Apero.core.instruments.spirou.default_keywords.py* - update objra/objdec to *ra_deg* and *dec_deg.* [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - update columns for object database (sources) [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - update *OBJ_LIST* constants. [Neil Cook]
- *Apero.core.core.drs_database.py* - make sure obj database adds sources + use set (update row) when gaia id exists (do not add a new row) [Neil Cook]

5.3.1.250 0.7.025 (2020-10-26)

- *Apero.tools.module.processing.drs_processing.py* - *run_process* function - *generate_run_table* requires module not recipe (should be the recipe to run not the recipe it is called from) [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - update *get_non_tellu_objs* for use with index database. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_db_spirou.py + obj_mk_tellu_db_spirou.py + obj_spec_spirou.py* - updaet with database interface. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - make sure filters are stripped of leading/trailing white spaces. [Neil Cook]

5.3.1.251 0.7.024 (2020-10-23)

- *Apero.tools.module.processing.drs_processing.py* - modify *run_process* to work with index database. [Neil Cook]
- *Apero.recipes.spirou.obj_mk_tellu_db_spirou.py* - start work to fix this [UNFINISHED] [Neil Cook]
- *Apero.core.utils.drs_utils.py* - allow *update_index_db* to take in a database (so we don't read many times), modify *find_files* to accept lists of filters. [Neil Cook]
- *Apero.core.core.drs_database.py* - add a *get_entries* method to LogDatabase (for skip table) [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - add aliases column from object database. [Neil Cook]
- *Apero.core.core.drs_database.py* - add to object database functions. [Neil Cook]

5.3.1.252 0.7.023 (2020-10-21)

- *Apero.tools.module.database.manage_databases.py* - log database should use *LOG_DB_COLUMNS* from pconst. [Neil Cook]
- *Apero.core.utils.drs_utils.py* - load database on creation. [Neil Cook]
- *Apero.core.utils.drs_startup.py* - change *drs_log.RecipeLog* to *drs_utils.RecipeLog*. [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - group is sql keyword - use groupname. [Neil Cook]
- *Apero.tools.module.database.database_gui.py* - *list_database* now returns classes - fix return and get paths. [Neil Cook]
- *Apero.core.core.drs_file.py* - *remove_insuffix* in args should be None not False (leave to default value unless set) [Neil Cook]

5.3.1.253 0.7.022 (2020-10-20)

- *Apero.core.core.drs_file.py* - catch bad files in *last_modified*. [Neil Cook]
- *Apero.base.drs_db.py* - exectue –> execute. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - remove *obj_mk_tellu_db* and *obj_fit_tellu_db* from *limited_seq*. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_db_spirou.py* - remove *apero.io.drs_text (apero.base.drs_text)* [Neil Cook]
- *Apero.core.core.drs_file.py* - only add *last_modified* time if file exists - and set used = 0 if file doesn't exist (for some reason) [Neil Cook]
- *Apero-base.drs_db.py* - in colnames use *self._execute* (to catch the database lock) [Neil Cook]

5.3.1.254 0.7.021 (2020-10-15)

- *Apero.core.core.drs_database.py* - *add_entries* func add doc string. [Neil Cook]
- *Apero.base.drs_db.py* - try to deal with sqlite database is locked error (try again up to a max wait time) [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - preclean filepath should be from telluric database directory (Issue #651) [Neil Cook]
- *Apero.science.polar.general.py* - update polar recipe with bug from Issue #648. [Neil Cook]

5.3.1.255 0.6.132 (2020-10-15)

- *Apero.science.telluric.gen_tellu.py* - preclean filepath should be from telluric database directory (Issue #651) [Neil Cook]
- Apero.data.spirou.reset.runs - reformat run.ini files (more logical order) [Neil Cook]
- Update polar code - Issue #648. [Neil Cook]
- Update language database. [Neil Cook]
- Add .run to .gitignore. [Neil Cook]
- *Apero_processing.py* - add ptime. [Neil Cook]
- *Apero.core.math.general.py* - correct math for *iuv_spline* nanmask –> ~nanmask. [Neil Cook]
- *Apero.core.math.general.py* - deal with too many NaNs in spline - correct eargs. [Neil Cook]

- *Apero.core.math.general.py* - deal with too many NaNs in spline. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - correct what goes into the headers for TQCCL and TQCCP (was *qc_values −> qc_logic,qc_pass)* [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - EXTOBJ −> EXTTELL. [Neil Cook]
- Merge branch 'developer' into working. [Neil Cook]
- Merge branch 'master' into developer. [Neil Cook]
- Merge branch 'master' into working. [Neil Cook]
- Update README.md. [Neil Cook]
  update processing tables in README.md
- Update README.md. [Neil Cook]
  update readme.md *pp_seq_opt*
- Update processing tables in README.md. [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into developer. [Neil Cook]
- Update *drs_database.py*. [Neil Cook]
  removed chmod to 644
- *Apero.tools.module.processing.drs_processing.py* - *send_email* should be False not 'False' [Neil Cook]

5.3.1.256 0.7.020 (2020-10-14)

- Apero - continue adding log features. [Neil Cook]
- Apero.core.utils - start adding log database. [Neil Cook]
- *Apero.tools.module.setup.drs_installation.py* - fix *create_symlinks*. [Neil Cook]
- *Apero-drs.setup.install.py* - os.environ[CARD] requires a str not a Path. [Neil Cook]
- *Apero-drs.setup.install.py* - must activate *DRS_UCONFIG* in environ. [Neil Cook]
- *Apero.base.base.py* - need to reload iparams and dparams after creating yaml files. [Neil Cook]
- *Apero.base.base.py* - for installation we cannot have DPARAMS and IPARAMS. [Neil Cook]
- *Setup.install.py* - have _ _ *file* _ _ path absolute. [Neil Cook]
- *Setup.install.py* - add print statement (For test) [Neil Cook]
- *Apero.tools.module.setup.drs_installation.py* - *DRS_DATA_RECUC*: 'red'−>'reduced' [Neil Cook]
- Udpate language database. [Neil Cook]

5.3.1.257 0.7.019 (2020-10-14)

- *Apero.tools.module.setup.** - create yamls and update database creation. [Neil Cook]
- Apero-drs/config - remove redundant ini files. [Neil Cook]
- *Apero.tools.module.gui.general.py* - get *DRS_UCONFIG* from base. [Neil Cook]
- Apero.tools.module.database - update paths to use database yaml file. [Neil Cook]
- *Apero.io.drs_lock.py* - need max wait time (used to be database setting) [Neil Cook]
- *Apero.core.instruments.*.default_config.py* - remove database settings (now in yaml) [Neil Cook]
- *Apero.core.core.drs_database.py* - change how set path works. [Neil Cook]
- *Apero.core.constants.param_functions.py* - only cache when *from_file* is True (otherwise don't ever read files) [Neil Cook]
- *Apero.base.py* - add yaml reading functions here. [Neil Cook]
- *Apero-drs/** - work on yaml inputs for install + database. [Neil Cook]
- *Apero.science.extract.other.py* - deal with exceptions/errors from extrecipe better. [Neil Cook]
- *Apero.recipes.spirou.cal_dark_master_spirou.py* - set nightname to 'other' [Neil Cook]
- *Apero.core.utils.drs_startup.py* - test is mod is None (as well as mod instance None) [Neil Cook]
- *Apero.core.instruments.*.recipe_definitions.py* - typo intputtype −> inputtype. [Neil Cook]
- *Apero.core.core.drs_file.py* - typo *DRS_CALIB_DB −> DRS_DATA_ASSETS*. [Neil Cook]
- *Apero.core.core.drs_argument.py* - deal with directory better. [Neil Cook]
- *Apero.data.spirou.reset.runs.*.ini* - reorganise run.ini files. [Neil Cook]

5.3.1.258 0.7.018 (2020-10-11)

- *Apero-drs.apero.science.calib.badpix.py* - chaange recipe.outputdir to recipe.outputtype. [Neil Cook]
- Sort out disambiguity between inputdir outputdir inputtype outputtype (former should be None or Path, later should be 'raw', 'red', 'tmp', 'calib', 'asset' etc) [Neil Cook]

5.3.1.259 0.7.017 (2020-10-10)

- *Apero.core.utils.drs_ startup.py* - parg –> pargs[parg] for settings params. [Neil Cook]
- *Apero.core.core.drs_ file.py* - outfile must update params. [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - need to update input files with params (after we have added to them) [Neil Cook]
- *Apero.core.core.drs_ database.py* - need to not check dirname if check=False (in *DatabaseManager.set_ path)* [Neil Cook]
- *Apero.core.core.drs_ argument.py* - need to deal with empty types in _ *check_file_ logic.* [Neil Cook]

5.3.1.260 0.7.016 (2020-10-10)

- Add default calibdb/objectdb csv files for NIRPS. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - *find_files* correct typing pd.dataframe –> pd.DataFrame. [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - do not check path of index database here - sometimes we may not have it (only on reset?) [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - frecipe must get params (it changed previously) [Neil Cook]
- *Apero.core.instruments.nirps_ ha.deafult_ config.py* - update some settings for database (c.f. spirou) [Neil Cook]
- *Apero.core.instruments.default.pseudo_ const.py* - correct columns for *index_ database* columns. [Neil Cook]
- *Apero.core.core.drs_ file.py* - correct *remove_ insuffix* default value should be None. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - write a new *find_files* function that uses the index database. [Neil Cook]
- Move *find_files* to *drs_ utils.py.* [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - change location of *get_ output_ dir* and *get_ input_ dir.* [Neil Cook]
- *Apero.core.core.drs_ file.py* - move *get_ dir get_ input_ dir* and *get_ output_ dir* here. [Neil Cook]
- *Apero.core.core.drs_ database.py* - add _ *update_ params* so we only update database when new request comes in (unless forced) [Neil Cook]
- *Core.core.drs_ argument.py* - update check directory and check file to use indexdb instead of opening headers. [Neil Cook]
- *Apero.base.drs_ db.py* - count should return an int. [Neil Cook]

5.3.1.261 0.7.015 (2020-10-08)

- *Apero.tools.recipe.bin.apero_ listing.py* - update listing to update index database. [Neil Cook]
- 'reduced' –> 'red', from apero.core.core import *drs_ database.* [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.io.** - sort out imports. [Neil Cook]
- *Apero.core.util.drs_ utils.py* - sort out imports. [Neil Cook]
- *Apero.core.utils.drs_ startup.py* - get IndexDatabase (for *recipe_ setup)* [Neil Cook]
- *Apero.core.instruments.*.recipe_ definitions.py* - change 'reduced' to 'red' [Neil Cook]
- *Apero.core.core.drs_ log.py* - move *setup_ inputs* to *drs_ recipe.py.* [Neil Cook]
- *Apero.core.core.drs_ file.py* - update write functions (add runstring and kind for index database) [Neil Cook]
- *Apero.core.core.drs_ database.py* - deal with no instrument + move *drs_database.py* from *core.utils.drs_ database.py.* [Neil Cook]
- *Apero.core.core.drs_ argument.py* - add IndexDatabase to Argument Checks (unfinished) [Neil Cook]
- *Core.constants.param_ functions.py* - deal with no value in listp and dictp. [Neil Cook]
- *Apero.base.drs_ db.py* - typo :param columns: –> :param column: [Neil Cook]

5.3.1.262 0.7.014 (2020-10-07)

- Update language database. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - continue integrating index database. [Neil Cook]
- *Apero.core.utils.drs_ database.py* - continue work integrating index database. [Neil Cook]
- *Apero.core.instruemnts.*.default_ constants.py* - change REPROCESS columns (for index database) [Neil Cook]
- *Apero.core.core.drs_ file.py* - change kwargs for hkeys in NpyFile. [Neil Cook]
- *Apero.tools.recipe.bin.apero_ processing.py* - continue work integrating index database. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py + apero.tools.module.processing.drs_ processing.py* - move processing/reprocessing functionality to *drs_ processing*. [Neil Cook]
- *Apero.core.utils.drs_ database.py* - continue work on index database. [Neil Cook]
- *Apero.base.drs_ db.py* - add count and unique functions. [Neil Cook]

5.3.1.263 0.7.013 (2020-10-07)

- *Apero.tools.module.processing.drs_ processing.py + apero.recipes.bin.apero_ processing.py* - start update with IndexDatabase (unfinished) [Neil Cook]
- *Apero.science.polar.general.py* - change *KW_ ACQTIME* to *KW_ MJDEND*. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.core.utils.drs_ utils.py* - modify *update_ index_ db*. [Neil Cook]
- *Apero.core.utils.drs_ recipe.py* - deal with filemod better. [Neil Cook]
- *Apero.core.utils.drs_ database.py* - continue working on IndexDatabaseManager. [Neil Cook]
- *Apero.core.instruments.spirou.file_ definitions.py* - update *drs_finput* with hkeys (still need to do this for nirps) [Neil Cook]
- *Apero.core.instruments.deafult_ keywords.py* - *KW_ ACQTIME* –> MJDEND. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - adjust pseudo const for index files. [Neil Cook]
- *Apero.core.core.drs_ file.py* - change kwargs to hkeys. [Neil Cook]
- *Apero.base.drs_ db.py* - add command to database error (on execute) [Neil Cook]
- *Apero.core.math.general.py* - add nan spline to account for *iuv_ spline* going wrong (with NaNs len $<$ k $+$ 1) [Neil Cook]

5.3.1.264 0.7.012 (2020-10-05)

- *Apero.tools.recipes.bin.apero_ processing.py* - start adding IndexDatabase functionality. [Neil Cook]
- *Apero.tools.module.setup.drs_ reset.py* - change *create_ databases–>manage_ database*. [Neil Cook]
- *Apero.tools.module.processing.drs_ processing.py* - start adding IndexDatabase functionality. [Neil Cook]
- *Apero.tools.module.database.manage_ database.py* - renamed from *create_ databases.py*. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.io.drs_ path.py* - allow copytree to log. [Neil Cook]
- *Apero.core.utils.py* - add utils module for functions that must import from all other utils. [Neil Cook]
- *Core.utils.drs_ database.py* - add features to IndexDatabaseManager. [Neil Cook]
- *Apero.core.instruments.*.pseudo_ const.py* - add *INDEX_ HEADER_ KEYS* and modify *IN-DEX_ DB_ COLUMNS*. [Neil Cook]
- *Core.core.drs_ file.py* - tag some functions to be changed to database functions. [Neil Cook]
- *Apero.base.drs_ misc.py* - allow *get_ uncommon_ paths* to accept Path as well as string. [Neil Cook]
- *Apero.base.drs_ db.py* - add column names to set function. [Neil Cook]
- Change *drs_ database2.py –> drs_ database.py*. [Neil Cook]

5.3.1.265 0.7.011 (2020-10-02)

- *Apero.tools.module.setup.drs_reset.py* - create databases after reseting files (otherwise databases are removed) [Neil Cook]
- *Apero.io.drs_image.py* - *unix_char_code* moved from *drs_startup* to *drs_misc.* [Neil Cook]
- *Apero.science.calib.dark.py* - add *out_fmt* for *get_mid_obs_time.* [Neil Cook]
- *Apero.science.calib.shape.py* - add *out_fmt* for *get_mid_obs_time.* [Neil Cook]

5.3.1.266 0.7.010 (2020-10-01)

- *Apero.science.telluric.gen_tellu.py* - *get_non_tellu_objs* add doc string. [Neil Cook]
- *Apero.recipes.spirou.obj_mk_template_spirou.py* - key is just filetype now (fiber separate) *filetype_fiber –> filetype.* [Neil Cook]
- *Apero.core.utils.drs_database2.py* - allow *iarmass/tau_Water/tau_others* to be string (to handle 'None') [Neil Cook]
- *Apero.science.telluric.fit_tellu.py* - number of trans files should be one less than length (but mask <= instaed of <) [Neil Cook]
- *Apero.science.wave.py* - fix file for *out_wave_fp/out_wave_hc.* [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py + obj_mk_template_spirou.py* - add database=telludbm for tellu database functions. [Neil Cook]
- *Apero.recipe.spirou.cal_dark_master_spirou.py* - *drs_fits –> drs_file* import. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - EXTOBJ –> EXTTELL + continue update to new database system for tellurics. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - EXTOBJ –> EXTTELL. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - *TELLU_CONV* should be of *wavem_fp* or *wavem_hc* drs file type. [Neil Cook]
- *Apero.core.core.drs_file.py* - add filename as arg to *construct_filename* (used for certain outfuncs) [Neil Cook]
- *Apero.base.drs_db.py* - only open cursor when require and close it after to avoid locking. [Neil Cook]

5.3.1.267 0.7.009 (2020-09-30)

- *Apero.science.telluric.gen_tellu.py* - move database interface over from old text database to new sql database. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* - add database inpout to *telluric.tellu_preclean.* [Neil Cook]
- *Apero.io.drs_fits.py, io.drs_image.py, io.drs_lock.py, io.drs_path.py, io.drs_table.py* - add import rules (to avoid circular imports) [Neil Cook]
- *Apero.core.utils.drs_database2.py* - update telluric database manager. [Neil Cook]
- *Apero.core.utils.drs_data.py* - add npy file type. [Neil Cook]
- *Apero.core.core.drs_file.py* - reformat *get_hkey.* [Neil Cook]
- *Apero.base.drs_db.py* - add colnames function and *_decode_value* function. [Neil Cook]
- Move DrsFits functions from *apero.io.drs_fits* to *apero.core.core.drs_file* (they should be with the class not IO functions) - functions moved: *get_index_files*, *find_files*, *find_raw_files*, combine, *fix_header*, *id_drs_file*, *get_mid_obs_time*, *_get_files*, *_get_path_and_check*, [Neil Cook]
- Update processing tables in README.md. [Neil Cook]
- Update *UPDATE_NOTES.txt* (probably prematurely) [Neil Cook]
- Update requirements (split into conda/pip for those installating using these lists) [Neil Cook]
- Move apero-drs/misc to apero-utils repo. [Neil Cook]

5.3.1.268 0.7.008 (2020-09-29)

- *Apero.io.drs_fits.py* - need to deal with key == '' [Neil Cook]
- *Apero-drs.misc.tools.profiler.apero_profiler.py* - add recipe profiler. [Neil Cook]

5.3.1.269 0.7.007 (2020-09-25)

- *Apero.io.drs_table.py* - pickling/python typing/docstrings. [Neil Cook]
- *Apero.io.drs_path.py* - continue pickling/python typing/docstrings. [Neil Cook]
- *Apero.base.drs_text.py* - move *test_format* here from *drs_table.py.* [Neil Cook]

5.3.1.270 0.7.006 (2020-09-24)

- *Apero.io.drs_lock.py* - make sure classes are pickle-able, add python typing and docstrings. [Neil Cook]
- *Apero.io.drs_image.py drs_lock.py* - continue pickling/typing/docstring. [Neil Cook]
- Apero.core.instruments - fix pep8. [Neil Cook]

5.3.1.271 0.7.005 (2020-09-22)

- *Drs_fits.find_files* – add filters arg (dict) [Neil Cook]
- *Apero.io.drs_fits.py* - continue pickling/typing/docstring adding. [Neil Cook]
- *Apero.io.drs_fits.py* - start pickling/python typing/doc string. [Neil Cook]
- *Misc.tools.copy_master_db.py* - code to only copy master database. [Neil Cook]

5.3.1.272 0.7.004 (2020-09-19)

- *Setup.install.py* - correct typo barycorrp=y –> barycorrpy. [Neil Cook]
- Build documentation. [Neil Cook]
- *Apero.tools.module.documentation.drs_changelog.py* - change how we produce changelog.rst. [Neil Cook]
- *Apero.science.extract.berv.py* - remove func as input parameter. [Neil Cook]
- *Apeor.core.utils.drs_startup.py* - instrument = 'None' not just None. [Neil Cook]
- *Apero.core.core.drs_file.py* - copy *output_dict* + datatype + dtype from instance2. [Neil Cook]
- Build documentation. [Neil Cook]
- Build documentation. [Neil Cook]
- Build documentation. [Neil Cook]
- Add empty recipe documentation. [Neil Cook]
- *Apero.io.drs_fits.py* - close the hdu and for now keep the image in primary hdu (remove later) [Neil Cook]
- *Apero.core.utils.drs_database.py* - remove chmod 644 for copying to databases. [Neil Cook]
- *Apero.core.core.drs_file.py* - deep copy header/hdict when copying file. [Neil Cook]

5.3.1.273 0.7.003 (2020-09-16)

- Add .run to .gitignore. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - add TODO to see if we can see whats wrong (later) [Neil Cook]
- *Apero.science.** - fix after debug run. [Neil Cook]
- *Apero.plotting.core.py* - deal with no pdfpath set (skip commit) [Neil Cook]
- *Apero.core.recipes.*.** - update after debug run. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.io.drs_fits.py* - fix after debug run. [Neil Cook]
- *Apero.core.math.fast.py* - remove *display_func* from jit function. [Neil Cook]
- *Apero.core.instruments.*.file_definitions.oy* - update *out_orderp_straight.* [Neil Cook]
- *Apero.core.core.*.py* - fix issues after debug run. [Neil Cook]
- *Apero.core.constants.param_funtions.py* - chagne ConfigError–>DrsCodedException. [Neil Cook]

5.3.1.274 0.7.002 (2020-09-15)

- *Apero.core.utils.drs_recipe.py* - correction for typing/structural changes. [Neil Cook]
- *Apero.io.drs_fits.py* - *drs_file* must have params. [Neil Cook]
- *Apero.io.drs_path.py* - update *get_uncommon_path.* [Neil Cook]
- Apero - *apero.core.drs_log –> apero.core.core.drs_log* + instrument = None –> instrument = 'None' [Neil Cook]
- *Apero.core.instruments.*.output_filenames.py* - generalize inputs. [Neil Cook]
- *Apero.core.core.drs_file.py* - make changes to *DrsInputFile.check_params.* [Neil Cook]
- *Apero.core.core.drs_argument.py* - change *recipe.drs_params –>* recipe.params. [Neil Cook]
- *Apero.core.constants.param_functions.py* - instrument variable should be tested for null test None and 'None' [Neil Cook]
- *Apero.base.drs_misc.py* - fix *drs_misc.get_uncommon_path* (first path should be the longest) [Neil Cook]
- *Apero.base.drs_exceptions.py* - Exit has not _ _ init _ _ [Neil Cook]
- *Apero.core.utils.drs_startup.py* - add doc strings/python typing. [Neil Cook]

5.3.1.275 0.7.001 (2020-09-14)

- *Apero.core.utils.drs_recipe.py* - continue typing/pickling/docstrings. [Neil Cook]
- *Apero.tools.module.processing.drs_processing.py* - *send_email* should be False not 'False' [Neil Cook]

5.3.1.276 0.7.000 (2020-09-10)

- *Apero-drs.misc.tools.create_science_targets.py* - add telluric targets (may want to upload these too) [Neil Cook]
- Merge branch 'master' into v0.7.000-pre. [Neil Cook]
  # Conflicts: # *UPDATE_NOTES.txt* # *apero/core/instruments/default/default_config.py* # *apero/core/utils/drs_startup.py* # *apero/io/drs_fits.py* # *apero/recipes/spirou/pol_spirou.py* # *apero/science/telluric/gen_tellu.py* # *apero/tools/module/processing/drs_processing.py*
- Merge pull request #645 from njcuk9999/developer. [Neil Cook]
  Developer –> master v0.6.131
- Update date/version/changelog/docs/update notes/read me. [Neil Cook]
- *Apero.recipes.spirou.pol_spirou.py* - hack from Issue #639 re: linear algebra error. [Neil Cook]
- Identical? [Neil Cook]
- *Apero.core.core.drs_startup.py* - format of splash update. [Neil Cook]
- Update date/version/docs/changelog. [Neil Cook]
- Update object query list. [Neil Cook]
- Issue #644 - deal with table = None in *generate_run_list* + add –test=True to codes which use processing *(obj_mk_tellu_db* an *dobj_fit_tellu_db)* [Neil Cook]
- *Apero.tools.module.setup.drs_processing.py* - deal with table being None (just to test if things work with this option) [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_db_spirou.py* - add break point and *TEST_RUN* = True for test. [Neil Cook]
- *Apero.io.drs_fits.py* - remove breakpoint. [Neil Cook]
- *Apero.io.drs_fits.py* - try to fix copying comments. [Neil Cook]
- *Apero.recipes.nirps_ha.cal_pp_master_nirps_ha.py* - move break point to test error. [Neil Cook]
- *Apero.io.drs_fits.py* - deal with header key not being str. [Neil Cook]
- *Apero.io.drs_fits.py* - deal with header key not being str. [Neil Cook]
- *Apero.recipes.nirps_ha.cal_wave_master_nirps_ha.py* – move breakpoint. [Neil Cook]
- *Apeor.data.nirps_ha.calib* - add *catalogue_UNe.csv* file. [Neil Cook]
- *Apero.science.extract.general.py* - remove breakpoint *apero.core.instruments.default.default_constants.py* - make *LEAKM_WSMOOTH* an int. [Neil Cook]
- *Apero.science.extract.general.py* - move breakpoint. [Neil Cook]
- *Apero.io.drs_image.py* - deal with only one image in *large_image_median* (return image without medianing) [Neil Cook]
- *Apero.recipes.nirps_ha.cal_shape_nirps_ha.py* – move break point. [Neil Cook]
- *Apero.recipes.nirps_ha.cal_shape_nirps_ha.py* – move break point. [Neil Cook]

- *Apero.recipes.nirps_ha.cal_shape_nirps_ha.py* – add break point. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* + *science/telluric/fit_tellu.py* + *gen_tellu.py* + *mk_tellu.py* - fix problem with qc for tellu pre clean. [njcuk9999]
- Update *requirements_current.txt.* [Neil Cook]
  security dependency requires update
- Merge pull request #642 from njcuk9999/developer. [Neil Cook]
  Developer - Master
- Apero - moved *drs_file* from apero.core.utils –> apero.core.core (used in *drs_argument.py)* - continue pickling/docstring/python-typing of *apero.core.utils.drs_recipe.* [Neil Cook]
- Apero - start changes to DrsRecipe (linearizing, pickling, doc strings, python typing) [Neil Cook]
- Apero - fix usage of Dict[value-type] –> Dict[key-type, value-type] [Neil Cook]
- Apero - change *get_key* & *read_header_key–>get_hkey*, *read_header_key_2d_list–>get_hkey_2d*, *read_header_key_1d_list–>get_hkey_1d.* [Neil Cook]
- *Apero.core.utils.drs_file.py* - finish upgrade of *drs_file* (pickling/docstrings/python typing) [Neil Cook]
- Apero - manage getting data and header via *DrsFitsFile.get_data()* and *DrsFitsFile.get_header()* – used to be .data and .header. [Neil Cook]
- *Apero-drs.misc.problems.visu_calibs.py* - add plotting option. [Neil Cook]
- *Apero-drs.misc.problems.visu_calibs.py* - visualizer for which calibration was chosen for which star. [Neil Cook]
- Issue #644 - deal with table = None in *generate_run_list* + add –test=True to codes which use processing *(obj_mk_tellu_db* an *dobj_fit_tellu_db)* [Neil Cook]
- *Apero.core.utils.drs_file.py* - continue work on docstring/python typing/pickling. [Neil Cook]
- *Apero.core.utils.drs_file.py* - continue work on docstring/python typing/pickling. [Neil Cook]
- Apero.core.utils - continue with doc string / python typing / pickling. [Neil Cook]
- *Apero.io.drs_fits.py* - try to fix copying comments. [Neil Cook]
- *Apero.io.drs_fits.py* - deal with header key not being str. [Neil Cook]
- *Apero.core.constants.param_functions.py* - pep8 cleanup. [Neil Cook]
- *Apero.io.drs_image.py* - continued correction to *large_median_image* (for when there is 1 file) [Neil Cook]
- *Apeor.data.nirps_ha.calib* - add *catalogue_UNe.csv* file. [Neil Cook]
- *Apero.core.instruments.default.default_constants.py* - make *LEAKM_WSMOOTH* an int. [Neil Cook]
- *Apero.io.drs_image.py* - deal with only one image in *large_image_median* (return image without medianing) [Neil Cook]
- *Apero.utils.drs_data.py* - continue adding doc strings. [Neil Cook]
- Apero.core.math - update pickling/docstrings/python typing + move DrsMathException to *drs_exceptions.py.* [Neil Cook]
- *Apero.io.drs_fits.py* - change call to *pconst.HEADER_FIXES.* [Neil Cook]
- *Apero.core.utils.drs_startup.py* - chagne wlog to logger in RecipeLog construction. [Neil Cook]
- *Apero.core.instruments.default.pseudo_const.py* - change typing of *REPORT_KEYS()* [Neil Cook]
- *Core.core.drs_log.py* - finish pickling/typing/docstrings. [Neil Cook]
- *Apero.core.constants.param_functions.py* - move base classes out of here and move *capitalise_keys* to *drs_text.py* + pep8 changes. [Neil Cook]
- *Apero.core.constants.param_functions.py* - move base classes out of here and move *capitalise_keys* to *drs_text.py.* [Neil Cook]
- *Apero.core.constants.constant_functions.py* - move CKCaseINSDict here (requires Const and Keyword classes) [Neil Cook]
- Apero.core.instruments - update docstrings/typing/pickling. [Neil Cook]
- *Apero.base.drs_text.py* - move *capitalise_key* to here (from *param_functions.py)* [Neil Cook]
- *Apero.base.drs_base_classes.py* - add base classes here. [Neil Cook]
- Apero - remove usage of apero.core in favour of *apero.core.core.drs_log* and *apero.core.utils.drs_startup.* [Neil Cook]
- Apero - move *pcheck/find_params* to *param_functions* and make class (to add WLOG) - change all calls to *pcheck/find_params.* [Neil Cook]
- *Apero.core.core.drs_log.py* - add typing/pickling/docstrings [UNFINISHED] [Neil Cook]
- *Apero.core.param_functions.py* - correct pep8. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* + *science/telluric/fit_tellu.py* + *gen_tellu.py* + *mk_tellu.py* - fix problem with qc for tellu pre clean. [Neil Cook]
- *Misc.tool.screate_science_targets.py* - update arg list. [Neil Cook]
- Update language database. [Neil Cook]

- *Apero.core.utils.drs_recipe.py* - keywordargument kind = 'kwarg' not 'kwargs' [Neil Cook]
- *Apero.core.core.instruments.*.recipe_definitions.py* - remove all references to nargs (not used- set by dtype) [Neil Cook]
- *Apero.core.core.drs_argument.py* - must define kind otherwise crash in self.exception. [Neil Cook]
- *Core.core.constants.param_functions.py* - CKKCaseINSDict should not force to lists (copy/paste error) [Neil Cook]
- *Apero.core.utils.drs_recipe.py* - update *set_arg* and *set_kwarg* remove ***kwargs* and explicitly type arguments. [Neil Cook]
- *Apero.core.instruments.*.recipe_definitons.py* - change path= –> parent= [Neil Cook]
- *Apero.core.core.drs_argument.py* - pos can be int str or None. [Neil Cook]
- *Misc.tools.create_science_targets.py* - update target list. [Neil Cook]
- *Apero.base.drs_misc.py* - move *get_uncommon_path* to *drs_misc.py.* [Neil Cook]
- *Core.core.drs_argument.py* - add pickling and python type checking to all classes and functions. [Neil Cook]
- Merge branch 'developer' into v0.7.000-pre. [Neil Cook]
  # Conflicts: # README.md # *apero/core/instruments/default/default_config.py*
- *Apero.core.utils.drs_recipe.py* + *drs_startup.py* + *tools.module.processing.drs_processing.py* + *tools.module.testing.drs_dev.py* - change call to constants.getmodnames: path –> *return_paths.* [Neil Cook]
- *Apero.core.core.drs_argument.py* + *drs_log.py* - move textwrap to *apero.base.drs_text.py.* [Neil Cook]
- *Apero.base.** + *apero.core.constants.** - add python type checking, pickle-able classes and doc strings. [Neil Cook]
- *Apero.base.** - make all classes pickle-able. [Neil Cook]
- *Apero.core.core.drs_log.py* + *apero.core.utils.drs_startup.py* - change how Colors class works. [Neil Cook]
- *Apero.base.** - update pep8 and python type checking for base module. [Neil Cook]
- *Apero.science.calib.general.py* + *localisation.py* + *shape.py* - make sure calib file return is string. [Neil Cook]
- *Apero.io.drs_fits.py* - import pathlib. [Neil Cook]
- *Apero.science.calib.wave.py* - remove break ppoint. [Neil Cook]
- *Apero.io.drs_fits.py* - add some python type checking. [Neil Cook]
- *Apero.core.utils.drs_database2.py* - add some python type checking. [Neil Cook]
- Apero.data.spirou.database.reset.calib.csv - update default keys *WAVE_D* –> *WAVEM_D.* [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.** - move fiber in *get_dbkey()* to argument in *load_calib_file.* [Neil Cook]
- *Apero.recipes.*.** - remove params from *add_calib_file* and *add_tellu_file.* [Neil Cook]
- *Apero.** - continue adding *drs_database2* functionality. [Neil Cook]
- *Core.utils.drs_database2.py* - *add_calib_file* + *add_tellu_file* add a *copy_files* option. [Neil Cook]
- Save language.xls. [Neil Cook]
- *Apero-drs.misc.tools.create_science_targets.py* - update target list. [Neil Cook]
- *Apero.io.drs_path.py* - move *drs_break.* [Neil Cook]
- *Apero.core.utils.drs_database** - continue work on database update. [Neil Cook]
- *Apero.core.utils.drs_recipe.py* + *drs_startup.py* - move calls to *drs_break.* [Neil Cook]
- Apero.lang.core - move calls to *drs_break.* [Neil Cook]
- Apero.recipes + apero.science + apero.tools - move around calib db stuff. [Neil Cook]
- *Apero.core.instruments.*.** - add/modify calib db constants. [Neil Cook]
- *Apero.core.core.drs_log.py* - move *dispaly_func* call. [Neil Cook]
- *Apero.core.constants.param_functions.py* - move *break_point* + *display_func* + *get_relative_folder* + *_copy_pdb_rc* + *_remove_pdb_rc* + *_get_prev_count.* [Neil Cook]
- *Apero.base.drs_misc.py* - move *display_func* here and *_get_prev_count.* [Neil Cook]
- *Apero.base.drs_exceptions.py* - add *base_printer.* [Neil Cook]
- *Apero.base.drs_break.py* - move break function here. [Neil Cook]
- *Apero.base.base.py* - add *PDB_RC_FILENAME.* [Neil Cook]
- Merge remote-tracking branch 'origin/v0.7.000-pre' into v0.7.000-pre. [Neil Cook]
- Update README.md. [Neil Cook]
  update *pp_seq_opt*
- Move base functionality to apero.base and update all codes with changes - correct bugs. [Neil Cook]
- Move base functionality to apero.base and update all codes with changes. [Neil Cook]
- *Apero.tool.smodule.database.database_gui.py* - fix crash in pandastable + add way to save/update sql database. [Neil Cook]
- *Apero.data.spirou.reset.runs.calib_run.ini* - add *calib_run.ini* example. [Neil Cook]

- *Apero.core.core.drs_ database2.py* - add typing and doc strings to database function. [Neil Cook]
- *Apero.core.math.fast.py + general.py* - add typing to most functions. [Neil Cook]
- Merge branch 'v0.6.130-pre' into v0.7.000-pre. [Neil Cook]
  # Conflicts: # UPDATE_ NOTES.txt
- *Core.instruments.*.pseudo_ const.py* - make all obj names upper. [Neil Cook]
- *Core.core.drs_ database2.py* - add empty database for when we don't have a dataframe. [Neil Cook]
- Merge branch 'v0.6.130-pre' into v0.7.000-pre. [Neil Cook]
- *Apero.science.telluric.fit_ tellu.py* - must mask *expo_ water/expo_ others* for trans files. [Neil Cook]
- Merge branch 'v0.6.130-pre' into v0.7.000-pre. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - nanmin –> nanmax. [Neil Cook]
- *Apero.recipes.spirou.obj_ mk_ tellu_ spirou.py* - pep8 white space before operator. [Neil Cook]
- *Core.core.drs_ database2.py + tools.module.database.*** - continue to add and test database functionality. [Neil Cook]
- *Core.core.drs_ database2.py + tools.module.database.*** - continue to add and test database functionality. [Neil Cook]
- *Core.core.drs_ database2.py + tools.module.database.*** - continue to add and test database functionality. [Neil Cook]
- Merge branch 'v0.6.130-pre' into v0.7.000-pre. [Neil Cook]
- *Apero.core.instruments.*.default_ config.py* - add database filenames. [Neil Cook]
- *Apero.core.drs_ database2.py* - first commit - start work on buliding database class. [Neil Cook]
- Merge branch 'v0.6.130-pre' into v0.7.000-pre. [Neil Cook]
  # Conflicts: # apero/data/spirou/telluric/tapas_ all_ sp.fits.gz # apero/tools/module/processing/_ _ init_ _ .py # apero/tools/recipes/bin/apero_ database.py
- *Apero.tools.module.gui.database_ gui.py + apero.tools.recipes.bin.apero_ database.py* - add first commit of database gui. [Neil Cook]
- Move *drs_ processing.py* and *drs_ trigger.py* to processing tools.module.processing (from setup) [Neil Cook]
- Move *drs_ processing.py* and *drs_ trigger.py* to processing tools.module.processing (from setup) [Neil Cook]
- *Apero.science.calib.wave.py* - *add_ hkey* values–>value. [Neil Cook]
- *Apero.science.calib.wave.py* - correct TREGIONS. [Neil Cook]
- *Apero.io.drs_ data.py* - fix *fit_ 1m fit_ ll* filename input to *load_ text_ file*. [Neil Cook]
- Update *UPDATE_ NOTES.txt*. [Neil Cook]
- *Apero.io.drs_ path.py* - pep8 changes. [Neil Cook]
- *Apero.tools.reicpes.*.cal_ pphotpix_ spirou.py* - *DRS_ DATA_ ASSET –> DRS_ DATA_ ASSETS*. [Neil Cook]
- *Apero.tools.module.setup.drs_ reset.py* - copy tree when reseting + construct path for assets path. [Neil Cook]
- *Apero.tools.module.setup.drs_ processing.poy* - deal with no skip table. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - *DRS_ DATA_ ASSET –> DRS_ DATA_ ASSETS* + change output to *get_ whitelist/get_ blacklist*. [Neil Cook]
- *Science.calib.wave.py* - *DRS_ DATA_ ASSET –> DRS_ DATA_ ASSETS*. [Neil Cook]
- *Apero.recipes.spirou.obj_ *_ tellu_ *** - change return to *get_ blacklist/get_ whitelist*. [Neil Cook]
- *Apero.io.drs_ data.py* - *DRS_ DATA_ ASSET —> DRS_ DATA_ ASSETS*. [Neil Cook]
- *Apero-drs.setup.install.py* - add –assetdir definition. [Neil Cook]
- *Apero.tools.reicpes.bin.apero_ reset.py* - add a reset for assets directory. [Neil Cook]
- *Apero.tools.recipes.bin.apero_ mkdb.py* - make calib + telluric database from assets dir. [Neil Cook]
- *Apero.tools.module.setup.drs_ reset.py* - deal with reseting assets dir + relative dirs from there. [Neil Cook]
- *Apero.tools.module.setup.drs_ installation.py* - add assets dir to installed directory list. [Neil Cook]
- *Apero.tools.recipes.*.cal_ pphotpix_ *.py* - make hotpix file + debug file spawn from assets dir. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - make *get_ whiltelist/get_ blacklist* files spawn from assets dir. [Neil Cook]
- *Apero.science.calib.wave.py* - make *update_ smart_ fp_ mask* file spawn from assets dir. [Neil Cook]
- *Apero.io.drs_ data.py* - make all relfolders relative to assets directory. [Neil Cook]
- *Apero.core.instruments.*.default_ constants.py* - make ./data paths relative to assets dir. [Neil Cook]
- Apero.data - move around assets (eventually move out and online) [Neil Cook]
- *Apero.core.instruments.*.default_ config.py* - update paths to assets. [Neil Cook]
- *Apero.core.constants.constant_ functions.py* - force dtype in *Constant._ _ init_ _* to Union[None, str, type] [Neil Cook]
- Move old INTROOT code to apero-utils. [Neil Cook]
- *Apero-drs.misc.database_ test* - update test database files. [Neil Cook]
- *Apero-drs.misc.tools.create_ science_ targets.py* - update target lists and version. [Neil Cook]

5.3.1.277 0.6.131 (2020-08-27)

- Update version in readme for master/developer/working. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.278 0.6.130 (2020-08-21)

- Update README.md. [Neil Cook]
  update *pp_seq_opt*
- Update *UPDATE_NOTES.txt*. [Neil Cook]
- *Core.instruments.*.pseudo_const.py* - make all obj names upper. [Neil Cook]
- *Apero.science.telluric.fit_tellu.py* - must mask *expo_water/expo_others* for trans files. [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - set *FTELLU_NUM_TRANS* to 20. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tell_spirou.py* - add tpreprops to inputs of *gen_abso_pca_calc*. [Neil Cook]
- *Science.telluric.fit_tellu.py* - add a trans file mask based on *expo_h2o* and *expo_others* (and use closest N trans files to science object) [Neil Cook]
- *Apero.core.instruments.*.file_definitions.py* + *recipe_definitions.py* - add *ABSO1_NPY* (for trans *expo_h2o+exp_others* vector) [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* + *default_keywords.py* - add *KW_FTELLU_NTRANS* and *FTELLU_NUM_TRANS*. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - nanmin −> nanmax. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - when saving pre-clean only mask to exp(-2) not exp(-1) [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - make sure we don't spline outside magic grid. [Neil Cook]
- Update *UPDATE_NOTES.txt*. [Neil Cook]
- Merge remote-tracking branch 'origin/v0.6.130-pre' into v0.6.130-pre. [Neil Cook]
- Update wave.py. [Neil Cook]
  apero.science.calib.wave.py - *add_hkey* values−>value
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* - add break point for EA. [Neil Cook]
- Apero-drs.misc.INTROOT - move old INTROOT code to apero-utils. [Neil Cook]
- *Apero.science.calib.wave.py* - correct TREGIONS. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - make sure q2dsff file links to correct file. [Neil Cook]
- Update language database. [Neil Cook]
- *Apero.science.extract.general.py* - add *write_extraction_files_ql* function (to write quick look files) [Neil Cook]
- *Apero.recipes.spirou.cal_extract_spirou.py* - add quick look switches. [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add Q2DS and Q2DSFF files for quicklook. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - add quick look e2ds/e2dsff files. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add *EXT_QUICK_LOOK* constant value. [Neil Cook]
- *Apero.tools.recipes.spirou.cal_drift_spirou.py* - clean up. [Neil Cook]
- *Apero.core.core.drs_startup.py* - remove type function (doesn't work as :type:) [Neil Cook]
- Update the update notes (work in progress) [Neil Cook]
- *Apero.tools.recipe.spirou.cal_drift_spirou.py* - add first version of *cal_drift_spirou*. [Neil Cook]
- *Apero.recipes.*.cal_shape_master_*.py* - correct *ALLOWED_FP_TYPES* (didn't break but would on change of input) [Neil Cook]
- Merge remote-tracking branch 'origin/developer' into v0.6.130-pre. [Neil Cook]
  # Conflicts: # *UPDATE_NOTES.txt*
- Merge remote-tracking branch 'origin/developer' into developer. [njcuk9999]
- *Apero.science.calib.shape.py* - filenames must be filtered as well (append to *valid_files)* [njcuk9999]
- *Apero.science.extract.general.py* - correct typo from release. [njcuk9999]
- Update object query list. [njcuk9999]
- Update mtl sync codes. [njcuk9999]
- *Apero.tools.recipes.spirou.cal_drift_spirou.py* - first commit plan for *cal_drift_spirou.py*. [Neil Cook]
- *Apero-drs.apero.science.calib.wave.py* - add header keys NBO/NREGIONS and update gaussian params with names in hdr. [Neil Cook]
- *Apero-drs.tools.recipes.*.** - update instrumental tool recipe names to follow conventions. [Neil Cook]

- *Apero.science.telluric.template_tellu.py* - copy data and delete infile when done (hopefully stops having so many fits file open at once) [Neil Cook]
- *Apero.io.drs_fits.py* - readfits - add options to copy data implicity (slower) [Neil Cook]
- *Apero.core.core.drs_file.py* - *read_file/read_data/read_header* - add option to copy data implicitly. [Neil Cook]
- *Apero-drs.update_notes.txt* - update update notes. [njcuk9999]
- *Apero.data.spirou.reset.runs.** - update runs and add complete + other run.ini. [njcuk9999]
- Apero-drs.README.md - update read me with latest version. [njcuk9999]
- *Apero.core.instruments.*.recipe_definitions.py* - update args for thermal. [njcuk9999]
- *Apero.data.spirou.reset.runs.*run.ini* - update THIM and THTM –> *THI_M* and *THT_M*. [njcuk9999]
- Update changelog/date/version/update notes/documentation. [njcuk9999]

5.3.1.279 0.6.129 (2020-07-29)

- *Apero.science.calib.general.py* - add *check_fp* and *check_fp_files* functionality. [njcuk9999]
- *Apero.recipes.spirou.cal_shape_master_spirou.py + cal_shape_spirou.py + cal_wave_master_spirou.py + cal_wave_night_spirou.py* - check 2d fp files are good to use before using them! [njcuk9999]
- *Apero.io.drs_image.py* - correct typo in comment. [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - add in check fp constants. [njcuk9999]
- *Apero.core.instruments.*.file_definitions.py* - add *LFC_FP* to file types (Issue #641) [njcuk9999]
- *Apero.plotting.plot_functions.py + apero.science.extract.general.py* - remove reference to wave (change to wavemap) [njcuk9999]
- *Apero.plotting.plot_functions.py* - remove reference to wave (change to wavemap) [njcuk9999]
- *Apero.science.calib.flat_blaze.py* - try *curve_fitting* two ways (when first method fails) [njcuk9999]
- *Misc.problems.spikes.** - add test codes for EA. [njcuk9999]

5.3.1.280 0.6.128 (2020-07-28)

- *Apero.science.extract.general.py* - address spikes in s1d data (EA changes) [njcuk9999]
- *Apero.io.drs_fits.py + apero.lang.core.drs_exceptions.py* - get the filename from abspath and don't print in DrsHeaderError. [njcuk9999]
- *Apero.core.core.drs_file.py + apero.core.instruments.*.pseudo_const.py + apero.io.drs_fits.py + apero.lang.core.drs_exceptions.py* - add checks for header key and deal with exception of not finding them properly + update language database. [njcuk9999]
- *Apero.core.core.drs_file.py* - rvalue and value do not exist. [njcuk9999]
- *Apero.core.core.drs_file.py* - add breakpoint to test error. [njcuk9999]
- *Apero.core.core.drs_file.py* - must check that id header keys exist and report error it not + update language db. [njcuk9999]
- Update version/date/changelog/documentation/update notes. [njcuk9999]

5.3.1.281 0.6.127 (2020-07-24)

- *Apero.tools.modeul.setup.drs_processing.py* - filter objects by dprtype and obstype. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - have to make sure string is not in null text before making a string list. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - add break point to test *mk_template* with All. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - only keep log entries that finished (we will only skip finished recipes) [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - remove breakpoint + only keep unique entries in *skip_storage*. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - need to remove all arguments until we find one to keep (as –args might have spaces after them) [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - change skip runstring comparison from adding all arguments to just keeping required arguments. [njcuk9999]

- *Apero.tools.module.setup.drs_ processing.py* - add –master to skip remove args (added after this step) [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - move breakpoint. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - move breakpoint. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - update breakpoint to test thermal/wave/extract. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - add *add_ set_ kwargs* to add optional args to runstring (for skip check comparison) [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - move break point. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - move break point. [njcuk9999]
- *Apero.lang.core.drs_ execptions.py + core.core.drs_ log.py* - remove @profile. [njcuk9999]
- *Apero.lang.core.drs_ execptions.py* - add @profile. [njcuk9999]
- *Apero.core.core.drs_ log.py* - add more @profile. [njcuk9999]
- *Apero.core.core.drs_ log.py* - add @profile to test speed. [njcuk9999]

5.3.1.282 0.6.126 (2020-07-23)

- *Apero.tools.module.setup.drs_ processing.py* - add break point and test timings. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - add break point and test timings. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - only strip recipe.name not column. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - strip *.py* from name. [njcuk9999]
- *Apero.tools.module.setup.drs_ processing.py* - add break point to test skipping. [njcuk9999]
- *Apero.io.drs_ fits.py* - make sure wnightnames and bnightnames are defined. [njcuk9999]
- *Apero.io.drs_ fits.py* - deal with filtering files by whitelist/blacklist nightnames (accept 'All') [njcuk9999]
- *Apero.core.core.drs_ log.py* - correct missing *lang.drs_ text*. [njcuk9999]
- *Apero.tools.modules.setup.drs_ processing.py + apero_ processing.py* - re-work skipping file feature and change *SCIENCE_ TARGETS/TELLUIRC_ TARGETS* to "All" [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.io.drs_ text.py* - add *null_ text* and *true_ text* functions for determining with text is unset/true. [njcuk9999]
- *Apero.data.*.reset.runs.** - update all ini files. [njcuk9999]
- *Core.core.drs_ recipe.py* - when *SCIENCE_ TARGETS* is None use "other stars" list (non-tellurics) + allow *TELLUIC_ TARGETS* and *SCIENCE_ TARGETS* = ALL or None. [njcuk9999]
- Change from apero.lange import *drs_ text* –> from apero import lang. [njcuk9999]

5.3.1.283 0.6.125 (2020-07-22)

- *Apero.science.telluric.gen_ tellu.py* - some pep8 correction. [njcuk9999]
- *Apero.science.telluric.gen_ tellu.py* - correct argument of 40-019-00043. [njcuk9999]
- *Apero.core.core.drs_ log.py* - *add_ level* does not have WLOG –> self.wlog. [njcuk9999]
- *Apero.core.core.drs_ log.py + drs_ startup.py* - RecipeLog cannot use WLOG (get it from construction) [njcuk9999]
- Update README.md. [njcuk9999]
- Merge branch 'neil' into working. [njcuk9999]
- Merge branch *'neil_ tellu'* into neil. [njcuk9999]
  # Conflicts: # *apero/recipes/spirou/obj_ fit_ tellu_ spirou.py* # *apero/recipes/spirou/obj_ mk_ tellu_ spirou.py*
- Update language database. [njcuk9999]
- Move text to language database. [njcuk9999]
- Update language database. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]
- Merge branch 'neil' of https://github.com/njcuk9999/apero-drs into neil. [njcuk9999]
- Os.walk should alwawys follow symbolic links. [njcuk9999]
- Update object database (now 65 entries) [njcuk9999]
- Update the windows setup files (to include forcing utf8) - Issue #640. [njcuk9999]
- Merge pull request #632 from njcuk9999/neil. [Neil Cook]
  Neil –> Working (based on mini run test error)

- Merge pull request #631 from njcuk9999/neil. [Neil Cook]
  Neil –> Working (for mini data test)

5.3.1.284 0.6.124 (2020-07-21)

- Update language database. [njcuk9999]
- Apero.science.telluric - remove language database todos. [njcuk9999]
- *Apero.telluric.fit_ tellu.py* - undo import removal. [njcuk9999]
- *Apero.telluric.fit_ tellu.py* - *fit_ tellu_ write_ corrected* must have nprops as input. [njcuk9999]
- *Apero.telluric.fit_ tellu.py* - correct blaze correction. [njcuk9999]
- *Apero.recipe.spirou.obj_ fit_ tellu_ spirou.py + apero.science.telluric.fit_ tellu.py* - do not normalize by the blaze, just apply the recon. [njcuk9999]
- *Apero.recipe.spirou.obj_ fit_ tellu_ spirou.py + apero.science.telluric.fit_ tellu.py* - must get blaze/wave inside function and normalize inside. [njcuk9999]
- *Apero.recipe.spirou.obj_ fit_ tellu_ spirou.py + apero.science.telluric.fit_ tellu.py* - fix arguments for *correct_ other_ science*. [njcuk9999]
- *Apero.recipes.spirou.obj_ fit_ tellu_ spirou.py* - try out the correction of A and B files + add break point to test. [njcuk9999]
- *Apero.data.core.pdbrc_ full* - rename .pdbrc. [njcuk9999]
- *Apero.core.instruments.*.output_ filenames.py* - remove calibration date prefix. [njcuk9999]
- *Core.constants.param_ functions.py* - change name of default .pdbrc file (to avoid deletion if in that directory) [njcuk9999]
- *Apero.recipes.spirou.obj_ fit_ tellu_ spirou.py + science.telluric.fit_ tellu.py* - the spectrum must be divided by the *recon_ abso_ res* not the *recon_ abso*. [njcuk9999]
- *Apero.science.telluric.fit_ tellu.py* - recon is flatten so *abso_ e2ds* needs to be too (49,4088)–>200312. [njcuk9999]
- *Apero.science.telluric.gen_ tellu.py* - need at least k+1 points to spline. [njcuk9999]

5.3.1.285 0.6.123 (2020-07-18)

- *Apero.core.instruments.*.default_ keywords.py* - add parents for *KW_ MKTELL_ THRES_ TFIT* and *KW_ MKTELL_ TRANS_ FIT_ UPPER_ BAD*. [Neil Cook]
- *Apero.science.telluric.fit_ tellu.py* - add back in *KW_ MKTELL_ THRES_ TFIT* and *KW_ MKTELL_ TRANS_ FIT_ UPPER_ BAD*. [Neil Cook]
- *Apero.core.*.default_ constants.py + default_ keywords.py* - add back in *MKTELLU_ THRES_ TRANSFIT* and *MKTELLU_ TRANS_ FIT_ UPPER_ BAD*. [Neil Cook]
- *Aper.science.telluric.gen_ tellu.py* - put back in break points. [Neil Cook]
- *Apero.science.telluric.mk_ tellu.py* - remove tau from plot. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - add tpclfile to index file. [Neil Cook]
- *Apero.recipe.spirou.obj_ *_ tellu_ spirou.py* - end logging properly when file skipped. [Neil Cook]
- *Apero.recipe.spirou.obj_ *_ tellu_ spirou.py* - add printout validating files. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - add that we read pclean from file. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - correct typo. [Neil Cook]
- *Core.instruments.*.default_ keywords.py* - move CCF water/others to header (from images) [Neil Cook]
- *Apero.io.drs_ fits.py* - *_ read_ fitsmulti* - add log option. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - compare file basenamse for tpclfile. [Neil Cook]
- *Apero.recipe.spirou.obj_ mk_ tellu_ spirou.py* - add break point to see loading of preclean file. [Neil Cook]
- *Apero.science.telluric.mk_ tellu.py* - mixed up *recov_ airmass* and *recov_water* (blame EA) [Neil Cook]
- *Apero.science.telluric.** - remove *FINER_ CWIDTH* and *KW_ MKTELL_ FIN_ CONV_ WID*. [Neil Cook]
- *Apero.science.telluric.** - remove *FINER_ CWIDTH* and *KW_ MKTELL_ FIN_ CONV_ WID*. [Neil Cook]
- *Apero.science.telluric._ _ init_ _ .py* - remove unused alias. [Neil Cook]
- *Apero.science.telluric.mk_ tellu.py* - remove lowpassfilter (to math module) + sort out unused header keys/unused constants. [Neil Cook]
- *Apero.science.telluric.gen_ tellu.py* - remove *load_ tapas_ convolved* function + edit iteration msg. [Neil Cook]
- *Aper.recipes.spirou.obj_ mk_ tellu_ spirou.py* - remove tapas conv not needed in *mk_ tellu* any more (done in tellu pre-clean) + rename *calculate_ telluric_ absorption* to *calculate_ tellu_ res_ absorption*. [Neil Cook]

- *Recipes.spirou.obj_fit_tellu_spirou.py* - *fit_tellu* must *load_conv_tapas* for first time (not done in *mk_tellu* any more) [Neil Cook]
- *Core.math.genearl.py* - add lowpassfilter function from EA. [Neil Cook]
- *Core.instruments.*.default_keywords.py* - remove unused keywords. [Neil Cook]
- *Core.instruments.*.default_constants.py* - remove unused constants. [Neil Cook]
- *Apero.science.telluric.mk_tellu.py* - update lowpassfilter. [Neil Cook]
- *Apero.core.instruments.spirou.default_constants.py* - change conv width and orders. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - *trans_mask* must be floats when saved to fits. [Neil Cook]
- *Apero.core.core.drs_file.py* - correct typo mapf slist–>list. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - corrections with EA. [Neil Cook]
- *Apero.plotting.plot_functions.py* - correct *set_title*. [Neil Cook]
- *Apero.plotting.plot_functions.py* - add plot definitions + correct gauss function guess/return. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - add print outs and edit mas files (no title) [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - make sure we can deal with *conv_paths* unset (none found) [Neil Cook]
- *Aper.core.instruments.*.file_definitions.py* - add dbname/dbkey for *TELLU_TAPAS*. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - update ohline filename + ravel ohpcshift + add warning to *sky_model* < 0. [Neil Cook]
- *Apero.core.instruments.*.file_definitons.py* - fix *out_tellu_spl_npy*. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - correct typo *TELLUP_ABSO_EXP_KEXP* –> *TELLUP_ABSO_EXPO_KEXP*. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - deal with no pclean files found. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - do not require clean files (may not exist) [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - add *out_tellu_pclean* to file sets *out_file* and *tellu_file*. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py mk_tellu.py* - fix imports. [Neil Cook]
- *Apero.recipes.spirou.obj_*_tellu_spirou.py* - add break points to test EA changes. [Neil Cook]

5.3.1.286 0.6.122 (2020-07-17)

- *Apero.science.telluric.template_tellu.py* - add possible todo later. [Neil Cook]
- *Misc.hybrid_tellu.hybrid_tellu.py* - add EA changes after questions. [Neil Cook]
- *Apero.recipes.spirou.*tellu*.py + science.telluric.*.py* - continue to add EA pre-cleaning changes. [Neil Cook]
- *Apero.plotting.plot_functions.py* - add *plot_tellup_wave_trans* and *plot_tellup_abso_spec* functions for tellu pre-cleaning. [Neil Cook]
- *Apero.core.instruments.*.recipe_definition.py* - add plots and outputs to *obj_mk_tellu* and *obj_fit_tellu* recipe definitions. [Neil Cook]
- *Apero.core.instruments.spirou.file_definitions.py* - add *out_tellu_pclean* file. [Neil Cook]
- *Apero.core.instruments.*.default_keywords.py* - add *KW_TELLUP* keywords. [Neil Cook]
- *Apero.core.instruments.*.default_constants.py* - add TELLUP constants + PLOT constants. [Neil Cook]
- *Core.core.drs_file.py* - add listtype argument and deal with booleans and list dtype better + add mapf to *add_hkey* method to add string lists. [Neil Cook]

5.3.1.287 0.6.121 (2020-07-16)

- *Misc.hybrid_tellu.hybrid_tellu.py* - add questions for EA about code. [Neil Cook]
- *Apero.science.telluric.gen_tellu.py* - add EA telluric pre-cleaning. [Neil Cook]
- *Apero.science.telluric.** - *general.py* –> *gen_tellu.py* in imports. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* - temp add params here (for constants file) [Neil Cook]
- *Aper.core.math.gauss.py* - add *gauss_function_nodc*. [Neil Cook]
- *Apero.core.instruemnts.spirou.file_definitions.py* - add *out_tellu_abso_npy*. [Neil Cook]
- *Apero-drs.misc.hybrid_tellu.** - add temp space for EA pre-cleaning code. [Neil Cook]
- *Obj_fit_tellu_spirou.py* - prep for EA precleaning changes. [Neil Cook]
- *Apero.science.telluric.** - rearrange telluric functions. [Neil Cook]
- *Data.spirou.telluric.** - add telluric pre-cleaning data. [Neil Cook]
- *Apero.plotting.plot_functions.py* - add label change to cron plot. [Neil Cook]
- *Core.core.drs_database.py* - do not load image/header if not required. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* - add break point for EA changes. [Neil Cook]

- *Apero.science.telluric.general.py* - correct typo. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py + science.telluric.general.py* - add adjustments to test fit tellu. [Neil Cook]

5.3.1.288 0.6.120 (2020-07-14)

- *Apero.** - remove break points. [Neil Cook]
- *Apero.tools.module.setup.drs_processing.py* - remove break point. [Neil Cook]
- *Apero.recipes.spirou.obj_fit_tellu_spirou.py* - add *correct_other_science* to correct fibers A and B for tellurics. [Neil Cook]
- *Apero.science.velocity.general.py* - add todo about filename. [Neil Cook]
- *Core.core.drs_log.py* - deal with directory (nightname) not defined - go into "other" directory. [Neil Cook]
- Apero.science.telluric - change where Templates/BigCubes are saved to (no info about nightname) - fix. [Neil Cook]
- Apero.science.telluric - change where Templates/BigCubes are saved to (no info about nightname) [Neil Cook]
- Apero.science.telluric - change where Templates/BigCubes are saved to (no info about nightname) [Neil Cook]
- *Apero.science.telluric.general.py* - continue etiennes changes. [Neil Cook]

5.3.1.289 0.6.119 (2020-07-13)

- *Apero.science.telluric.general.py* - must set key for header (remove later) [Neil Cook]
- *Apero.recipes.spirou.obj_mk_tellu_spirou.py + science.telluric.general.py* - start adding changes for EA telluric cleaning. [Neil Cook]
- Update README.md. [Neil Cook]
- *Misc.tools.apero_diff.py* - update paths. [Neil Cook]
- *Apero.recipe.spirou.poly_spirou_new.py* - continue updating polar code. [Neil Cook]
- *Apero.recipes.spirou.cal_extract_spirou.py* - undo commentation. [Neil Cook]
- *Apero.io.drs_data.py* - update colnames from *load_sp_mask_lsd*. [Neil Cook]
- Apero.data.spirou.lsd - add masks. [Neil Cook]
- Remove *apero.data.core.runs.** [Neil Cook]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add *obj_fit_tellu* to *full_seq*. [Neil Cook]
- *Apero.core.instruments.*.recipe_defintiions.py* - make *obj_mk_tellu_db* and *obj_fit_tellu_db* non master recipes (do not require master night to run these) [Neil Cook]
- README.md - remove some formatting. [Neil Cook]

5.3.1.290 0.6.118 (2020-07-09)

- *Apero.science.extract.crossmatch.py + science.extract.crossmatch.py* - move breakpoint. [njcuk9999]
- *Apero.science.extract.crossmatch.py* - add break point to investigate obj table. [njcuk9999]
- *Apero.core.constants.param_functions.py* - add normpath (see Issue #635) [njcuk9999]
- *Apero.recipes.spirou.pol_spirou.py* - add back in constants removed for upgrade (Issue #639) [njcuk9999]
- *Apero.science.velocity.general.py* - replace hard coded C with reffiber form pseudo constants *(FIBER_KINDS)* [njcuk9999]

5.3.1.291 0.6.117 (2020-07-07)

- *Misc.tools.create_science_targets.py* - add all priority targets to string. [njcuk9999]
- *Apero.io.drs_fits.py* - deal with INFs and -INFs in floats (for headers) –> pipe to string INF/-INF. [njcuk9999]
- *Aper.core.math.general.py* - create a better exception when len(x) < k+1 in *iuv_spline.* [njcuk9999]
- *Apero.core.core.drs_log.py* - divide up errors better. [njcuk9999]
- *Apero.science.telluric.general.py* - if column is filename make it absolute paths. [njcuk9999]

5.3.1.292 0.6.116 (2020-07-06)

- Update the readme (working version update) [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.293 0.6.115 (2020-07-04)

- Update language database. [njcuk9999]
- *Apero.io.drs_fits.py* - move printouts to language database. [njcuk9999]
- *Apero.io.drs_fits.py* - only print out whitelisted/blacklisted if night dir not seen before. [njcuk9999]
- *Apero.io.drs_fits.py* - modify blacklist/whitelist logic. [njcuk9999]
- *Apero.io.drs_fits.py* - do not scan all directories when whitelist/blacklist used. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - add *PI_NAMES* filter. [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - add *REPROCESS_PINAMECOL* constant. [njcuk9999]
- *Apero.data.spirou.reset.runs.*run.ini* - add *PI_NAME* variable. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - must check filter values for None/'None' and '' and skip filter for values that are unset. [njcuk9999]

5.3.1.294 0.6.114 (2020-07-04)

- *Apero.core.coire.drs_file.py + apero.tools.module.setup.drs_processing.py* - deal with None/'None','' values in filedict (assume true as not set by file) [njcuk9999]
- *Apero.core.core.drs_recipe.py* - move *break_point.* [njcuk9999]
- *Apero.core.core.drs_recipe.py* - correct typo with filters from *file_filters.* [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - modify break point. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - deal with multiple file filters. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - add break point to test filters. [njcuk9999]
- *Drs_file.py* - change debug output in *check_table_keys* and update language database. [njcuk9999]
- *Apero.core.core.drs_startup.py + apero.core.core.drs_startup.py* - add state string return and fix test run returns. [njcuk9999]
- *Aper.tools.recipe.bin.apero_processing.py + apero.core.core.drs_startup.py* - add keys parameter to allow custom copying of variables from _ _ main _ _ namespace. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - pass pid, success, passed properly back to processing from each job. [njcuk9999]
- *Apero.io.drs_fits.py + apero.recipes.*.*.py* - combine need recipe (for indexing) [njcuk9999]
- *Apero.core.core.drs_log.py* - make sure *set_plot_dir* has correct arguments. [njcuk9999]
- *Apero.core.core.drs_log.py* - *set_plot_dir* update children (and write to file) [njcuk9999]

- *Apero.plotting.core.py* - *recipe.log.set_plot_dir* takes params. [njcuk9999]
- *Apero.** - replace *RAW_OUTPUT_KEYS, REDUC_OUTPUT_KEYS* and *RAW_OUTPUT_KEYS* with *OUTPUT_FILE_HEADER_KEYS.* [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - add pid to returns from linear process (for pickup by trigger) [njcuk9999]
- *Apero.plotting.html.py* - html figure should be just the basename (not the absolute path) [njcuk9999]
- *Apero.plotting.core.py* - update plot location in log when updated in plot. [njcuk9999]
- *Apero.core.instruments.default.pseudo_const.py* - add pid and fiber to reduced dir index.fits. [njcuk9999]
- *Core.core.drs_startup.py* - add nightname to index.fits and sort by lat modified. [njcuk9999]
- *Core.core.drs_log.py* - add *set_plot_dir* and *plot_dir* attribute to add plot directory to log.fits. [njcuk9999]

5.3.1.295 0.6.113 (2020-07-02)

- Update language database. [njcuk9999]
- *Apero.science.telluric.general.py* - add print out for number of files/tpyestr for *get_tellu_objs.* [njcuk9999]
- *Apero.science.telluric.general.py* - add function *get_tellu_objs* to get telluric objects from telluric database. [njcuk9999]
- *Apero.recipes.spirou.obj_mk_tempalte_spirou.py* - distinguish between getting files from disk or telluric database (telluric database files are cleaned for QC) [njcuk9999]
- *Misc.tools.apero_diff.py* - fix bug. [njcuk9999]
- *Apero.science.telluric.general.py* - *load_tellu_file* func add *return_entires* and allow user to set mode + *fit_tellu_quality_control* - use snr qc for ftellu only. [njcuk9999]
- *Core.instruments.*.default_constants.py + default_keywords.py* - add back in some missing FTELLU constants + modify QC keywords. [njcuk9999]
- *Core.core.drs_database.py* - add a mode="ALL" to *get_key_from_db.* [njcuk9999]
- *Apero.core.core.drs_recipe.py* - inherit filters from given files (only if not already in filter list) [njcuk9999]
- *Apero.core.instruments.spirou.file_definitions.py* - add outfunc to *raw_lfc_lfc.* [njcuk9999]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add to engineering sequences. [njcuk9999]

5.3.1.296 0.6.112 (2020-06-29)

- *Apero.core.core.drs_recipe.py* - only do *pconst.DRS_OBJ_NAME* if value is a string. [njcuk9999]
- *Apero.io.drs_fits.py* - must sort the kwargs by the sortmask for files. [njcuk9999]
- *Apero.data.spirou.reset.runs/science_run.ini* - correct typo. [njcuk9999]
- *Apero.core.instruments.spirou.recipe_defintions.py* - make sure *tellu_seq* and *science_seq* only extraction *OBJ_FP* and *OBJ_DARK* files. [njcuk9999]
- Update language database. [njcuk9999]
- *Tools.recipes.spirou.update_berv.py* - add prefix removal. [njcuk9999]

5.3.1.297 0.6.111 (2020-06-27)

- *Tools.recipes.spirou.update_berv.py* - update berv code to account for more extracted files and fibers. [njcuk9999]
- *Apero.core.core.drs_file.py* - output dict needs to look in (1) hdixt (1) header. [njcuk9999]
- *Apero.science.extract.general.py* - add break point to explore problem with indexing. [njcuk9999]
- Make sure os.walk returns sorted files. [njcuk9999]
- Make sure all glob.glob and os.listdir and Path.glob are sorted alphabetically. [njcuk9999]
- *Apero.science.extract.berv.py + apero.science.extract.crossmatch.py* - add hdr objname for objects without valid simbad object name. [njcuk9999]
- *Apero.science.extract.crossmatch.py* - correct typo intable –> table. [njcuk9999]
- *Apero.science.extract.berv.py* - add debug print out of final input berv parameters. [njcuk9999]
- *Apero.science.extract.crossmatch.py* - carefully force data type for columns in object look up table (inlookuptable function) [njcuk9999]
- *Apero.science.extract.berv.py* - refractor some variables names (to distinguish from other variables) [njcuk9999]

- *Apero.io.drs_table.py* - add *force_dtype_col* function to deal with making sure columns are required data types. [njcuk9999]
- *Apero.core.core.drs_log.py* - deep copy anything in pcheck (should not be a shallow copy) [njcuk9999]
- *Apero.recipes.spirou.cal_extract_spirou.py* - add breakpoint. [njcuk9999]

5.3.1.298 0.6.110 (2020-06-25)

- *Apero.tools.module.setup.drs_processing.py* - remove break point (error fixed) [njcuk9999]
- *Apero.science.calib.general.py* - make sure *objname_inputs* is upper case (for comparison with file case) [njcuk9999]
- *Recipes.*.cal_extract_*.py* - log1.writelog –> *log1.write_logfile.* [njcuk9999]
- *Misc.tools.create_science_targets.py* - add additional files to archive. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - find *science_targets* and clean them (as well as telluric targets) - to match drs preprocessing objnames. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - add breakpoints to see crash. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - move science target definitions. [njcuk9999]
- Changelog.md - update some old syntax. [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - move where *science_targets* is updated. [njcuk9999]
- Update *science_targets* (after clean up) [njcuk9999]
- *Apero.tools.module.setup.drs_processing.py* - add break point to test problem. [njcuk9999]
- *Misc.tools.create_science_targets.py* - add a list of science targets to the tar.gz file list. [njcuk9999]

5.3.1.299 0.6.109 (2020-06-24)

- *Apero.plotting.plot_functions.py* - catch NaNs and deal with them in the plot. [njcuk9999]
- *Apero.science.velocity.general.py* - wsum2 cannot be negative (attempt 2) [njcuk9999]
- *Apero.science.velocity.general.py* - wsum2 cannot be negative either. [njcuk9999]
- *Misc.tools.update_header_keys.py* - deal with missing headers better + add subdir / no subdir options. [njcuk9999]
- Update language database. [njcuk9999]
- *Science.velocity.general.py* - wsum cannot be less than zero otherwise wnoise is complex - set wnoise to inf if wsum is zero (we divide by wnoise later –> set ccf noise and ccf snr to NaN) [njcuk9999]
- Find all places where OBJNAME is used (not from the header) and pass value through pp header fix code for objname (in a consistent way) [njcuk9999]

5.3.1.300 0.6.108 (2020-06-22)

- *Apero.science.velocity.general.py* - change *spline_weight(omask_centers)to* sweights. [njcuk9999]
- *Apero.science.velocity.general.py* - add a weight to ignore bad (not mask=good) sections of ccf. [njcuk9999]
- *Apero.science.velocity.general.py* - add break point to investigate crash. [njcuk9999]
- *Apero.misc.tools.update_header_keys.py* - make parallel. [njcuk9999]
- *Apero.io.drs_text.py* - remove debug print outs and deal with empty string (set to None) [njcuk9999]

5.3.1.301 0.6.107 (2020-06-20)

- *Apero.science.extract.other.py* - get nightname from filename dir and dirname from the dir of the night name - file can change this. [njcuk9999]
- *Apero.core.core.drs_startup.py* - add debug printouts. [njcuk9999]
- *Apero.core.core.drs_startup.py + drs_recipe.py* - need to make *force_dirs* from recipe. [njcuk9999]
- *Apero.core.core.drs_startup.py* - need to deal with indir/outdir being none before checking abspath. [njcuk9999]
- *Apero.core.core.drs_startup.py* - need to check if force input/output dir argument has been used - if it has need to update recipe.inputdir and/or recipe.outputdir and update INPATH, OUTPATH. [njcuk9999]
- *Apero.core.core.drs_recipe.py* - add option if force is true to read input/output dir from recipe definition (now updated if force is on from raw/tmp/reduced to abspath) [njcuk9999]

- *Apero.science.extract.other.py* - force indir for extraction (combined files are stored in the reduced dir) [njcuk9999]
- *Core.core.drs_startup.py* - add getting of *forec_indir/outdir* and push into *get_input/output_dir* functions (overwrites default raw/tmp/reduced etc dirs) [njcuk9999]
- *Core.core.drs_recipe.py* - modify *get_input_dir* and *get_output_dir* and make force input/outdur special arguments. [njcuk9999]
- *Core.core.drs_argument.py* - add force input and output dirs. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.302 0.6.106 (2020-06-18)

- *Apero.core.core.drs_file.py* - add *is_combined* and combined list to keys, in combine function change the basename (i.e. 123, 124, 125 –> 12F3T5) and save combined to reduced. [njcuk9999]
- *Apero.core.core.drs_startup.py* - make sure inpath, nightname and output are strings. [njcuk9999]
- *Apero.io.drs_fits.py* - write combined file to the reduced folder (with the new file name) [njcuk9999]
- *Apero.io.drs_text.py* - add *common_text* and *combine_uncommon_text* functions to handle list of files –> single filename. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.science.calib.badpix.py* - change writing badpix file to use flat file (only important for processing with output names) [njcuk9999]
- *Core.instruments.spirou.recipe_defintions.py* - change order of arguments *(cal_shape_master)* - just important for processing with output names. [njcuk9999]
- *Core.instruemnts.spirou.file_definitions.py* - change badpix out files to use *flat_flat.* [njcuk9999]
- *Core.instruments.*.file_definitions.py* - change badpix *dark_dark –> flat_flat.* [njcuk9999]

5.3.1.303 0.6.105 (2020-06-17)

- *Misc.tools.valid_raw_directories.py* - add a WORKSPACE for rawsym as well as raw. [njcuk9999]
- *Misc.tools.apero_diff.py* - only work out the fraction of finite pixels. [njcuk9999]
- *Misc.ea_alder32_code.py* - possible solution to file naming issue. [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - correct *_create_link* (Issue #630) [njcuk9999]
- *Science.calib.general.py* - remove breakpoint. [njcuk9999]
- *Apero.science.calib.background.py* - add break point in *cal_loc.* [njcuk9999]
- *Apero.science.calib.background.py* - add break point in *cal_loc.* [njcuk9999]

5.3.1.304 0.6.104 (2020-06-16)

- *Misc.database_test.database.** - first test and commit of database overhaul. [njcuk9999]
- *Apero.science.preprocessing.detector.py* - correct return to *nirps_correction.* [njcuk9999]
- *Apero.science.preprocessing.detector.py* - make sure we read the mask in get pp master and record to header *(nirps_ha)* [njcuk9999]
- *Apero.data.nirps_ha.engineering.hotpix_pp.csv* - add file to default files. [njcuk9999]
- *Apero.core.instruments.nrips_ha.recipe_definitons.py + data.nrips_ha.reset.runs* - update run.inis and sequences for nirps. [njcuk9999]

5.3.1.305 0.6.103 (2020-06-15)

- *Apero.core.instruments.nirps_ha* - update nirps recipes after spirou changes. [njcuk9999]
- *Apero.recipes.nirps_ha* - update nirps recipes after spirou changes. [njcuk9999]
- *Misc.tools.update_header_keys.py* - add hack tool to update certain header keys on mass (no warning - careful of use!) [njcuk9999]
- Apero.data.spirou.reset.calibdb - update master wave solution + *master_calib_SPIROU.txt* (use more recent wave solutions + different for each fiber) [njcuk9999]
- *Apero.science.velocity.general.py* - add additional check for no valid pixels after blaze cut (keep) –> should avoid NaNs when no lines in order (Issue #622) [njcuk9999]
- Update the language database. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- *Apero.science.velocity.general.py* - add break point to investigate Issue #622. [njcuk9999]

5.3.1.306 0.6.102 (2020-06-12)

- Merge pull request #629 from njcuk9999/working. [Neil Cook]
  Working –> Developer (tested with mini-run successfully)
- Update README.md. [Neil Cook]
- Merge pull request #627 from njcuk9999/neil. [Neil Cook]
  Neil –> working
- *Apero.core.instruments.spirou.recipe_defintions.py* - allow –plot to go to -1 (dev mode plot NOTHING) - not recommended for general use. [njcuk9999]
- *Misc.tools.valid_raw_directories.py* - add code to test the validity of an APERO raw directory. [njcuk9999]
- *Misc.tools.apero_mtl_sync_master.py* - update version and local path. [njcuk9999]
- Merge pull request #626 from njcuk9999/working. [Neil Cook]
  Working
- Merge pull request #625 from njcuk9999/neil. [Neil Cook]
  Neil
- Update *install.py* and *requirements_current.txt*. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]
- *Apero.science.telluric.general.py* - remove break point. [njcuk9999]
- *Apero.core.instruments.*.file_defintiions.py* + *apero.core.instruments.default.output_filenames.py* - use basename instead of filename (avoids confusion in file defintions with *set_file)* [njcuk9999]
- *Apero.core.instruments.default.output_filenames.py* - be more careful with filename when setting a file (should not be a path) [njcuk9999]
- *Apero.science.telluric.general.py* - add break point to test tellu bug. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]
- *Misc.tools.apero_diff.py* - add time/version/id key to file - and order columns better for output. [njcuk9999]
- *Apero.core.core.drs_database.py* - need to lock db files while they are being read (to avoid two or more cores opening at once) [njcuk9999]
- *Apero-drs.misc.tools.apero_diff.py* - add code to compare two DRS reductions. [njcuk9999]
- *Apero.core.core.drs_file.py* - correct typo - os.abspath –> os.path.abspath. [njcuk9999]
- Update date/version/changelog. [njcuk9999]
- Merge pull request #621 from njcuk9999/working. [Neil Cook]
  Working –> Developer
- Merge pull request #620 from njcuk9999/neil. [Neil Cook]
  tools.module.setup.drs_installation.py - Path(in_tool_path) –> str(i. . .
- Merge pull request #619 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #618 from njcuk9999/neil. [Neil Cook]
  Neil –> working

5.3.1.307 0.6.101 (2020-06-09)

- *Apero.science.velocity.general.py* - remove breakpoint (problem solved) - Issue #623. [njcuk9999]
- *Apero.core.core.drs_file.py* - make filename absolute path in all cases (Issue #623) [njcuk9999]
- Add break point to test Issue 623. [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - value.exists() –> not value.exits() (Issue #624) [njcuk9999]

5.3.1.308 0.6.100 (2020-06-08)

- *Misc/tools/apero_diff.py* - code to find differences between two reductions. [njcuk9999]
- *Apero.science.calib.dark.py* - add back in the dark removal of the low frequency dark. [njcuk9999]
- *Apero.recipe.spirou.cal_extract_spirou.py* - remove breakpoints. [njcuk9999]
- *Apero.core.instruments.spirou.default_constants.py* - add HCONE and HCTWO to *THERMAL_CORRECTION_TYPE2.* [njcuk9999]
- Move the break point. [njcuk9999]
- Move the break point. [njcuk9999]
- *Apero.science.velocity.general.py* - move breakpoint. [njcuk9999]
- *Apero.science.velocity.general.py* - add break point fto *fit_fp_peaks.* [njcuk9999]
- Update the *apero_mtl_sync* codes. [njcuk9999]
- *Requirements_current.txt* - add pyyaml requirement. [njcuk9999]
- Update env with yaml/pyyaml. [njcuk9999]
- *Tools.module.setup.drs_installation.py - Path(in_tool_path) –> str(in_tool_path)* [njcuk9999]
- *Apero-drs.setup.install.py* - correct typo *Path(drs_path) –> str(drs_path)* [njcuk9999]
- Update date/version/changelog/update notes/documentation. [njcuk9999]

5.3.1.309 0.6.099 (2020-06-04)

- *Misc.tools.ccf_drift_plot.py* - add another ccf header key plot. [njcuk9999]
- Update update-notes for version 0.6.098. [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - correct typo join(–> joinpath([njcuk9999]
- Apero-drs.setup.envs.README.md - add a read me to detail how to use/mask conda env files. [njcuk9999]
- Setup.env.apero-env-2020-06-03.txt - add env pip install copy. [njcuk9999]
- Setup.env.apero-env-2020-06-03.txt - add yml conda env copy. [njcuk9999]
- Setup.env.apero-env-2020-06-03.txt - add explicit environment copy. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.310 0.6.098 (2020-06-01)

- *Apero.plotting.plot_functions.py* - adjust ccf plot. [njcuk9999]
- *Apero.plotting.plot_functions.py* - update scale and add legend to *plot_ccf_photon_uncert.* [njcuk9999]
- *Apero.science.velocity.general.py* - correct *rv_noise* for *compute_ccf_fp.* [njcuk9999]
- *Apero.science.velocity.general.py* - correct *rv_noise.* [njcuk9999]
- *Apero.science.velocity.general.py* - add breakpoint to test bug. [njcuk9999]
- *Apero.science.velocity.general.py* - add EA calculation of DVRMS CC (from CCF) [njcuk9999]
- *Apero.science.velocity.general.py* - remove redundant 1/1/x –> x. [njcuk9999]
- *Apero.plotting.plot_functions.py* - Update *plot_ccf_photon_uncert* for ccf + sp noise. [njcuk9999]
- *Core.instruments.*.default_keywords.py* - remove *KW_CCF_MEAN_RV_NOISE* (now use *KW_CCF_DVRMS_SP* and *KW_CCF_DVRMS_CC)* [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - add str. [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - add int/float/bool. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.311 0.6.097 (2020-05-30)

- *Setup.install.py* and *setup.newprofile.py* - change os.path to pathlib.Path. [njcuk9999]
- *Apero.tools.module.setup.drs_installation.py* - replace os.path with pathlib.Path. [njcuk9999]
- *Apero.io.drs_path.py* - change copy tree to use pathlib.Path. [njcuk9999]
- *Apero.core.constants.param_functions.py* - allow *get_relative_folder* to accept pathlib.Path. [njcuk9999]
- *Apero.core.instruments.*.default_keywords.py* - add *KW_CCF_DVRMS_SP* and *KW_CCF_DVRMS_CC* keyword arguments. [njcuk9999]
- *Apero.science.velocity.general.py* - add a photon noise per order calculation and save to ccf table/header. [njcuk9999]
- Documnetation.working.user.general.todo.rst - update todo list. [njcuk9999]
- *Apero.recipes.spirou.pol_spirou_new.py* and *science.polar.general_new.py* - continue work on new polar code from @eder. [njcuk9999]
- *Apero.data.spirou.reset.runs.mini_run.ini* - add extra science targets (rv standards) [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - remove polar consts (for now) [njcuk9999]

5.3.1.312 0.6.096 (2020-05-27)

- *Setup.newprofile.py* - add TODO as setup file is at the wrong path and needs fixing. [njcuk9999]
- *Apero.core.math.general.py* - add back in continuum function for now (until new polar code ready) [njcuk9999]
- *Td_data/apero-drs/setup/newprofile.py* - add debug and clean options. [njcuk9999]
- *Misc.tools.ccf_plot.py* - separate out science and reference fiber results into frames for plot. [njcuk9999]
- *Apero.recipes.spirou.pol_spirou_new.py* and *science.polar.general_new.py* - continue polar update from @eder. [njcuk9999]

5.3.1.313 0.6.095 (2020-05-25)

- Test for git version adding for EA. [njcuk9999]
- *Apero.science.calib.dark.py* - make *large_image_median –> large_image_combine* and specify the median math mode (same as before but changed input) [njcuk9999]
- *Apero.recipes.spirou.cal_shape_master_spirou.py* + *apero.science.calib.shape.py* + *apero.io.drsimage.py* - make *large_image_median –> large_image_combine* and use a mean to combine fpcube and return fpmaster instead. [njcuk9999]
- *Apero.science.calib.shape.py* - add back break point to investiage fpdata shape error. [njcuk9999]

5.3.1.314 0.6.094 (2020-05-24)

- *Apero.science.calib.shape.py* - need to increase row every iteration row+=1. [njcuk9999]
- *Apero.io.drs_image.py* + *apero.science.calib.shape.py* - move break point. [njcuk9999]
- *Apero.io.drs_image.py* - add breakpoint to figure out problem. [njcuk9999]
- *Apero.io.drs_image.py* - correct typo *b_it –> f_it*. [njcuk9999]
- *Apero.io.drs_image.py* - add more printouts. [njcuk9999]
- *Apero.io.drs_image.py* - make sure bins are scaled by number of pixels in image0. [njcuk9999]
- *Apero.io.drs_image.py* - make sure npy files have leading zeros. [njcuk9999]
- *Apero.io.drs_image.py* - remove dirs until filepath does not exist. [njcuk9999]
- *Apero.io.drs_image.py* + *science.calib.dark.py* and *science.calib.shape.py* - allow reading of fits and npy files in *large_image_median.* [njcuk9999]
- *Apero.io.drs_image.py* - fix npyfilelist. [njcuk9999]
- *Apero.io.drs_image.py* - clean up and fix typo. [njcuk9999]
- *Apero.io.drs_image.py* - correct typo wargs -> **wargs.* [njcuk9999]
- *Apero.science.calib.dark.py* - correct outdir (no directory defined) [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* and *apero.science.calib.wave.py* - add rv difference bettwen fibers QC. [njcuk9999]
- *Apero.core.instruments.*.default_connstants.py* - add *WAVE_CCF_RV_THRES_QC.* [njcuk9999]

- *Apero.recipes.spirou.cal_wave_night_spirou.py* + *cal_wave_master_spirou.py* + *apero.science.calib.wave.py* - remove break points and printouts –> fixed? [njcuk9999]
- *Apero.recipes.spirou.cal_wave_night_spirou.py* + *cal_wave_master_spirou.py* + *apero.science.calib.wave.py* - remove break points and test fix. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_night_spirou.py* + *cal_wave_master_spirou.py* + *apero.science.calib.wave.py* - add printouts to test differences (with breakpoints) [njcuk9999]
- *Apero.recipes.spirou.cal_wave_night_spirou.py* + *apero.science.calib.wave.py* - add more breakpoints. [njcuk9999]
- Updaet date/version/changelog/documentation. [njcuk9999]

5.3.1.315 0.6.093 (2020-05-22)

- *Apero.science.calib.wave.py* - add force fiber to get wavesolution - do not use wprops in *night_wavesolution* (use only wavemap and wavefile) [njcuk9999]
- *Apero.recipes.*.cal_wave_night_*.py* - *night_wavesolution* now does not take wprops as input - only take wavemap and wavefile, and force fiber to be fiber=fiber (not use fiber) [njcuk9999]
- *Apero.science.calib.wave.py* - force two iterations of each wave solution, first time with AB, second time with own solution. [njcuk9999]
- *Apero.science.calib.wave.py* - force two iterations of each wave solution, first time with AB, second time with own solution. [njcuk9999]
- *Apero.recipe.spirou.cal_wave_master_spirou.py* - correct rkeys/wkeys. [njcuk9999]
- *Apero.science.calib.wave.py* - create *process_fibers* function - loop around fibers and run *night_wavesolution* (update dcavity and hclines/fplines when master is run) [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* - change way we calculate A, B and C (after AB, both AB, A, B and C are calculated in same way as night solution) [njcuk9999]
- *Apero.recipe.spirou.cal_wave_night_spirou.py* - change fpfiles –> rawfplines. [njcuk9999]
- *Apero.science.calib.wave.py* - add waveinit and nbpix to nprops. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* and *cal_wave_night_spirou.py* - add *WFP_FILE.* [njcuk9999]
- *Apeor.core.constants.param_functions.py* - make sure source is not None. [njcuk9999]
- *Apeor.core.constants.param_functions.py* - correct typo np.ndarr –> np.ndarray. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* and *cal_wave_night_spirou.py* - move the break point. [njcuk9999]
- *Apero.recipes.spirou.cal_ccf_spirou.py* - add other key sources. [njcuk9999]
- *Core.lang.core.drs_lang_db.py* - add new terms. [njcuk9999]
- *Core.constants.param_functions.py* - add typing to param dict. [njcuk9999]
- *Apero.core.core.drs_file.py* - add nameattr *(get_instanceof* is now more generic) [njcuk9999]
- *Core.constants.constant_functions.py* - change *_DisplayText* –> DisplayText. [njcuk9999]

5.3.1.316 0.6.092 (2020-05-20)

- *Apero.recipes.spirou.pol_spirou_new.py* + *apero.science.polar.general_new.py* - continue adding eders new polar recipe. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_night_spirou.py* - add break point to wave night. [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - add back *THERMAL_CORRECT* (why did it get removed?) [njcuk9999]

5.3.1.317 0.6.091 (2020-05-20)

- *Apero.science.polar.general_new.py* - add PolarObjOut getting of tellu and ccf files. [njcuk9999]
- *Apero.recipes.spirou.pol_spirou_new.py + apero.science.polar.general_new.py* - continue work on loading polar files (finding ccf + tellu files) [njcuk9999]
- *Apero.core.instruments.default.output_filenames.py* - change wlog import. [njcuk9999]
- *Apero.core.core.drs_file.py* - add *reconstruct_filename* to get another filename close to input one (i.e. change of fiber) [njcuk9999]
- *Misc.tools.wave_drift_comp.py* - remove second plt.close() [njcuk9999]
- *Apero.science.calib.wave.py* - move break point to test rvs. [njcuk9999]
- *Apero.science.calib.wave.py* - add print out about saving fp mask. [njcuk9999]
- *Misc.tools.ccf_plot.py* - update how we get values. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.science.calib.wave.py* - change how we construct outfile for *update_smart* mask. [njcuk9999]
- *Misc.tools.wave_drift_compy.py* - separate the frames into individual figures. [njcuk9999]
- *Apero.science.calib.wave.py* - correct typo in *update_smart_mask* u.nm –> uu.nm. [njcuk9999]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add WAVENIGHT plots to wave master. [njcuk9999]
- Update flow diagram for *cal_wave_master.* [njcuk9999]
- *Apero.science.calib.wave.py* - remove inverse of *fit_ll_d* polynomial (not required any more) [njcuk9999]

5.3.1.318 0.6.090 (2020-05-15)

- *Apero.science.calib.shape.py* - update *construct_master_fp* to use large image median (better memory handlings to avoid memory errors) [njcuk9999]
- *Apero.science.calib.dark.py* - update *construct_master_dark* to use large image median (better memory handlings to avoid memory errors) [njcuk9999]
- *Apero.science.calib.wave.py* - add *WFP_FILE* for HC solution (set to None) [njcuk9999]
- *Apero.science.calib.wave.py* - correct typo *read_header_keys –> read_header_key.* [njcuk9999]
- *Apero.science.calib.wave.py* - add *update_smart_fp_mask* function to re- generate smart-fp-mask. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* - after wave solution calculated add a night wave solution for master fiber + add option to update smart FP mask after cavity poly updated. [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - add *WAVE_CCF_SMART_MASK* constants (for re- generating smart mask) [njcuk9999]
- *Misc.problems.test_crossmatch.py* - add pascals most recent query/gaia link. [njcuk9999]

5.3.1.319 0.6.089 (2020-05-14)

- *Misc.tools.wave_drift_comp.py* - update wave drift code plot to add diff plot. [njcuk9999]
- *Documentation.working._static.yed* - update *cal_wave_master* flow diagrams. [njcuk9999]
- *Apero.science.extract.general.py* - in *write_extraction_files exclude_groups=loc* for e2dsfile (get them just from loc file later) [njcuk9999]
- *Apero.science.calib.wave.py* - read *WFP_FILE* from header, add WAVEINIT (WAVE INIT key at this point is same as WAVEFILE) - could differ after this, change value of *WFP_FILE* to wprops['WFPFILE'], when writing wave solutions update WAVEFILE, WAVETIME, WAVESOURCE and *WFP_FILE* to the new file itself, for *copy_original_keys* new to avoid copying wave keys from hcfile. [njcuk9999]
- *Cal_wave_night_spirou.py* - get back nprops from night write wavesol - pass these to update e2ds HC and FP files, return updated hc and fp e2ds files, use these to populate ccf output. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* - move *write_ccf* function and use updated e2ds files to populate it. [njcuk9999]

5.3.1.320 0.6.088 (2020-05-13)

- *Apero.tools.recipes.utils.get_grid_models.py* - get the goettingen and convert to single table. [njcuk9999]
- *Apero.science.velocity.general.py* - modify *get_ccf_mask* and *ccf_calculation* with EA changes. [njcuk9999]
- *Apero.science.calib.dark.py* and *shape.py* - add large image median funtionality (as untested + unused versions) [njcuk9999]
- *Apero.io.drs_image.py* - add *npy_filelist*, *npy_fileclean* and *large_image_median* (untested) [njcuk9999]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add modifications to *pol_spirou_new*. [njcuk9999]
- *Core.core.drs_startup.py* - add *unix_char_code* function (to spawn from PID) [njcuk9999]
- *Misc.updates_to_drs.new_ccf_ea_2020-05-13.py* - another iteration by EA. [njcuk9999]
- *Apero.science.polar.general_new.py* - use as staging ground for eders changes (compared to 0.6+ version in general.py) [njcuk9999]
- *Apero.science.berv.py* - if infile is not defined should use header only to get berv keys. [njcuk9999]
- *Apeor.recipes.spirou.pol_spirou_new.py* - start filling out code (compared to Eders version and 0.6+ version and 0.5 version) [njcuk9999]
- *Apero.core.instruments.spirou.recipe_definitions.py* - add *pol_spirou_new* (for eders updates) [njcuk9999]

5.3.1.321 0.6.087 (2020-05-12)

- *Apero.recipes.nirps_ha.cal_preprocess_nrips_ha.py* - add header as arg to *pp.nirps_correction*. [njcuk9999]
- *Apero.core.instruments.*.** - update *nirps_ha* with changes to spirou. [njcuk9999]
- *Misc.updates_to_drs.mf_ccf_mask_may2020.py* - add EA code for injestion into the drs. [njcuk9999]
- *Apero.science.calib.wave.py* - do not use *FIBER_WAVE_TYPEs* for non master wave solution (i.e. use AB, A, B and C not just AB, C) [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - be more descriptive about littrow HC and FP constants. [njcuk9999]
- *Apero.recipe.nirps_ha.py* - update changes in *nirps_ha* recipes (from spirou) [njcuk9999]

5.3.1.322 0.6.086 (2020-05-11)

- Update language database. [njcuk9999]
- *Setup.install.py* - allow the user (on crash) to enter a path themselves and try again (for Claires issue that I cannot reproduce) [njcuk9999]
- *Apero.core.core.drs_recipe.py* - check against *input_dir* (from recipe definitions) [njcuk9999]
- *Apero.core.core.drs_argument.py* - remove break point - error fixed. [njcuk9999]
- *Apero.core.core.drs_argument.py* - add break point to fix error. [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* and *cal_wave_night_spirou.py* - add *velocity.write_ccf* to these codes (to save CCF for FPs) [njcuk9999]
- *Apero.core.instruments.spirou.recipe_defintions.py* - add *CCF_RV* to *cal_wave_master* and *cal_wave_night*. [njcuk9999]
- *Documentation.working._static.yed.** - update *spirou_map_all* graphs/pdfs. [njcuk9999]

5.3.1.323 0.6.085 (2020-05-09)

- *Misc.problems.shell_vs_call.py* - first commit of shell vs call test code for Andres/LAM. [njcuk9999]
- *Documentation.working._static.yed.apero_cal_wave_master.** - update *cal_wave_master* flow diagram. [njcuk9999]
- *Documentation.working._static.yed.apero_cal_wave_master.** - add *cal_wave_master* flow diagram. [njcuk9999]
- *Apero_rv* - add code, wrapper and utility functions for new ccf code (thanks to EA and his requirements) [njcuk9999]
- *Apero.tools.recipe.spirou.get_ext_fplines.py* - add file/dprtype/object printout. [njcuk9999]

5.3.1.324 0.6.084 (2020-05-06)

- *Apero-drs.setup.install.py* - add detailed debug of root/cwd/pythonpath and sys.path. [njcuk9999]
- *Apero-drs.setup.install.py* - add another debug printout. [njcuk9999]
- Apero.tools.module.setup and *setup.install.py* - add debug mode. [njcuk9999]
- *Apero.tools.module.setup.drs_ installation.py* + *setup.install.py* - add –*clean_ no_ warning* for those who like deleting data without prompts (Issue #579) [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.325 0.6.083 (2020-05-05)

- *Recipes.spirou.cal_ extract_ spirou.py* + *toools.recipes.spirou.get_ ext_ fplines.py* - change *EXT_ FPLIST* –> *EXT_ FPLINES*. [njcuk9999]
- *Apero.tools.recipes.spirou.get_ ext_ fplines.py* - have to set plot location. [njcuk9999]
- *Science.extract.general.py* - add debug print outputs when fiber and dprtype are incorrect. [njcuk9999]
- *Apero.io.drs_ fits.py* - *HEADER_ FIXES* requireds hdict input and output. [njcuk9999]
- *Core.instruments.*.pseudo_ const.py* - require hdict to be populated. [njcuk9999]
- *Misc.tools.apero_ mtl_ sync_ master.py* - add tmp files to uploads. [njcuk9999]
- *Apero.tools.recipes.spirou.get_ ext_ fplines.py* - first commit of extract fplines (separate from extract code) [njcuk9999]
- *Apero.tools.module.testing.drs_ dev.py* - add mod to temp RecipeDefinition. [njcuk9999]
- *Apero.science.extract.general.py* - add *ref_fplines* function. [njcuk9999]
- *Apero.science.calib.wave.py* - add a required condition to *get_ wavelines*. [njcuk9999]
- *Apero.recipes.spirou.cal_ wave_ night_ spirou.py* - add fiber to *get_ wavelines*. [njcuk9999]
- *Apero.recipes.*.cal_ extract_ spirou.py* - add fplines creation. [njcuk9999]
- *Core.instruments.*.recipe_ defintions.py* - add *EXT_ FPLINES*. [njcuk9999]
- *Core.instruments.*.file_ definitions.py* - add *ext_ fplines*. [njcuk9999]
- *Core.instruments.default_ constant.py* - add *WAVE_ FP_ DPRLIST* to constants. [njcuk9999]
- *Core.core.drs_ log.py* - add doc string for *find_ param*. [njcuk9999]
- *Core.instruments.spirou.default_ config.py* - change calibDB mode to closest. [njcuk9999]
- Merge branch 'developer' of https://github.com/njcuk9999/apero-drs into developer. [njcuk9999]
- Update README.md. [Neil Cook]
  update versions
- Merge pull request #617 from njcuk9999/developer. [Neil Cook]
  Developer
- Merge pull request #608 from njcuk9999/developer. [Neil Cook]
  Developer
- Merge pull request #605 from njcuk9999/developer. [Neil Cook]
  Developer –> master
- Merge pull request #585 from njcuk9999/working. [Neil Cook]
  Working –> Master
- *Setup.install.py* - kill infinite loop to find apero. [njcuk9999]
- Merge pull request #616 from njcuk9999/working. [Neil Cook]
  Working
- Merge pull request #615 from njcuk9999/neil. [Neil Cook]
  update update notes/todo/known issues
- Update update notes/todo/known issues. [njcuk9999]
- Merge pull request #614 from njcuk9999/neil. [Neil Cook]
  neil –> working
- Update date/version/changelog/documentation. [njcuk9999]
- Merge pull request #607 from njcuk9999/working. [Neil Cook]
  Working
- Merge pull request #606 from njcuk9999/neil. [Neil Cook]
  update readme
- Merge pull request #604 from njcuk9999/working. [Neil Cook]
  Working –> Developer
- Merge pull request #603 from njcuk9999/neil. [Neil Cook]

Neil
- Merge pull request #591 from njcuk9999/working. [Neil Cook]
  Working –> Developer
- Merge pull request #590 from njcuk9999/neil. [Neil Cook]
  neil –> working
- Merge pull request #589 from njcuk9999/working. [Neil Cook]
  Working –> Developer
- Merge pull request #587 from njcuk9999/neil. [Neil Cook]
  Neil override: neil –> working
- Merge pull request #582 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #581 from njcuk9999/neil. [Neil Cook]
  Merge allowed

5.3.1.326 0.6.082 (2020-05-04)

- *Apero.tools.resources.setup.apero.*.** - update the MKL environment exports. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.io.drs_fits.py* - add the getting of a time variable from the index files and sort by it before returning - all files should be in date order at point of return. [njcuk9999]
- *Apero.tools.recipes.spirou.update_berv.py* - remove from *__future__* import. [njcuk9999]
- *Apero.recipe.spirou.cal_shape_master_spirou.py* + *apero.science.calib.shape.py* - get dxrms and pass to qc (Issue #602) [njcuk9999]
- *Core.instruments.*.default_constants.py* - add *SHAPE_MASTER_DX_RMS_QC* value (Issue #602) [njcuk9999]
- *Core.core.drs_database.py* - remove break point. [njcuk9999]
- *Apero..science.calib.shape.py* - get rms value for dx-min(ddx) (Issue #602) [njcuk9999]
- *Apero.science.extract.crossmatch.py* - add back warnings for issues with crossmatching - were only debug messages (Issue #612) [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - update gaia url for tap query (Issue #612) [njcuk9999]
- *Apero.core.core.drs_file.py* - need to return False if *copy_cards* has a group argument but header key not found in defined keywords. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.327 0.6.081 (2020-05-01)

- *Science.calib.wave.py* - only update *dd_cavity* when indcavity is None (not the opposite) [njcuk9999]
- *Apero-drs.requirements_current.txt* - change PIL–> Pillow. [njcuk9999]
- Update the date/version/changelog/documentation. [njcuk9999]
- *Misc.tools.ccf_plot.py* - update plot. [njcuk9999]
- *Aspero.science.calib.wave.py* - remove *break_point.* [njcuk9999]
- *Aspero.science.calib.wave.py* - do not update the *d_cavity* when a input dcavity (indcavity) is provided. [njcuk9999]
- *Apero.plotting.plot_functions.py* - add a ylabel for wave night hist graph. [njcuk9999]

5.3.1.328 0.6.080 (2020-04-30)

- *Apero.core.core.drs_file.py* - correct header card copy bug (Issue #611) [njcuk9999]
- *Apero.core.instruemnts.*.default_keywords.py* - correct *KW_INFILE2* and *KW_INFILE3.* [njcuk9999]
- *Apero.plotting.plot_functions.py* - remove frame 3. [njcuk9999]
- *Plotting.plot_functions.py* and *science.calib.shape.py* - remove frame 3, function *get_offset_sp* and xpeak2 etc. [njcuk9999]
- *Plotting.plot_functions.py* and *science.calib.shape.py* - remove frame 3, function *get_offset_sp* and xpeak2 etc. [njcuk9999]
- *Apero.science.calib.general.py* - deal with *n_entries* == 1 for filename not equal to None. [njcuk9999]
- *Apero.science.calib.general.py* - *n_entries* must = 1 (only need one fpmaster) [njcuk9999]

- *Apero.science.calib.general.py* - fix value if it is a filename/DrsFitsFile instance. [njcuk9999]
- *Cal_shape_master_spirou.py* - params['INPUTS']['FPMASTER'][0][0] [njcuk9999]
- *Cal_shape_master_spirou.py* - filename for FPMASTER should be [0] [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.science.calib.shape.py* - typo arg –> args. [njcuk9999]
- *Apero.science.calib.shape.py* - if we have no HC lines do not try to find Nth line fppeak using HC (assume that it is correct from fp) [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.science.calib.shape.py* - add *break_point* to test error. [njcuk9999]
- *Apero.core.instruments.spirou.default_constants.py* - go back to new line list. [njcuk9999]
- *Misc.tools.mk_master_hc_cat.py* - change path of *wave_hclines*. [njcuk9999]
- Update wave calib files. [njcuk9999]
- *Apero.core.instruments.spirou.default_constants.py* - change wave catalogue back to original. [njcuk9999]
- *Apero.science.calib.wave.py* - remove sigclip mask. [njcuk9999]
- *Apero.science.calib.shape.py* - pep8 update. [njcuk9999]
- *Apero.science.calib.wave.py* - add break point from EA. [njcuk9999]
- *Apero.core.instruments.default.default_constants.py* - *WAVE_LINELIST_START* should be an integer. [njcuk9999]
- *Apero.io.drs_data.py* - correct typo *data_start* –> datastart. [njcuk9999]
- *Apero.core.instruments.spirou.default_constants.py* - change linelist start to line 1. [njcuk9999]
- *Apero.core.core.drs_file.py* and *science.extract.general.py* - add *copy_header* function (in addition to *copy_hdict)* and for s1d files copy the header from the e2ds file not the hdict (which only has new keys in) - Issue #610) [njcuk9999]
- *Apero.science.extract.general.py* - add break point to investigate no header in s1d. [njcuk9999]
- Update date/version/changelog/documentation. [njcuk9999]

5.3.1.329 0.6.079 (2020-04-28)

- Update language database. [njcuk9999]
- *Misc/tools/mk_master_hc_cat.py + data.spirou.calib.catalogue_UNe.csv* - code to update the hc linelist. [njcuk9999]
- *Apero.core.instruemnts.spirou.defalut_constants.py* - update catalogue file and fmt. [njcuk9999]
- *Apero.core.instruments.spirou.default_constants.py* - pep8 adjustment. [njcuk9999]
- *Apero.plotting.plot_functions.py* - add summary descriptions for two wave night summary plots. [njcuk9999]
- *Apero.science.calib.wave.py* - add *wave_expected* (after) plot for hc and fp. [njcuk9999]
- *Apero.scioence.calib.wave.py* - and catch warning statement around madmask. [njcuk9999]
- Update language database. [njcuk9999]
- *Science.calib.wave.py* - remove breakpoint + and range for second iteration. [njcuk9999]
- *Apero.plotting.plot_functions.py* - correct wave night figures. [njcuk9999]
- *Apero.science.calib.wave.py* - add break point to test EA new code. [njcuk9999]
- *Plotting.plot_functions.py* - correct typo kwargs['waveref'] –> kwargs['waverefs'] [njcuk9999]
- *Core.instruments.*.default_keywords.py* - correct typo groupu–>group. [njcuk9999]
- *Apero.core.instruments.default.default_constants.py* - remove *PLOT_WAVENIGHT_DIFFPLOT* from *__ALL__* [njcuk9999]
- *Apero.science.calib.wave.py* - add EA updates to *night_wavesolution*. [njcuk9999]
- *Recipes.spirou.cal_wave_night_spirou.py* - add fiber to inputs of *night_wavesolution* (for plot saving) [njcuk9999]
- *Plotting.plot_functions.py* - modify wave night plotting *(wavenight_iterplot + wavenight_histplot)* and remove *wavenight_diffplot* after ea changes. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - modify debug/summary plots after EA changes. [njcuk9999]
- Update language database. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - remove *WAVENIGHT_DIFFPLOT* from debug plot list. [njcuk9999]
- *Core.instruments.default_constants.py* and *default_keywords.py* - add/remove/modify wave night constants/keywords with new update from EA. [njcuk9999]
- *Misc.tools.ccf_plot.py* - update graph. [Neil Cook]

5.3.1.330 0.6.078 (2020-04-27)

- *Recipes.nirps_ha.cal_preprocessing_niprs_ha.py* - update pp for nirps (from spirou updates) [njcuk9999]
- *Recipes.spirou.cal_preprocessing_spirou.py* and *science.preprocessing.general.py* - fix qc to print only when log=True + redo QC after iteration loop. [njcuk9999]
- *Misc.tools.wave_drift_comp.py* - test drift in fibers. [njcuk9999]
- *Apero.recipe.spirou.cal_preprocess_spirou.py* - deal with a QC after a shift in pixels. [njcuk9999]
- Update date, version, changelog, documentation. [njcuk9999]

5.3.1.331 0.6.077 (2020-04-24)

- /locale/ –> /lang/ [njcuk9999]
- Apero.locale –> apero.lang. [njcuk9999]
- *Io.drs_fits.py* + *science.preprocessing.identification.py* - fix for preprocessing to use input file (was changed due to copyother change) [njcuk9999]
- *Apero.science.preprocessing.detector.py* - add a border mask to remove hotpix that lie near the edge (we need to scan around them so these are not useful) [njcuk9999]
- *Apero.io.drs_data.py* + *apero.science.preprocessing.detector.py* - format hotpix table correctly. [njcuk9999]
- *Apero.core.instruments.*.default_constants.py* - add back in *PP_CORRUPT_MED_SIZE*. [njcuk9999]
- *Apero.science.calib.wave.py* - add rhcl and rfpl to output (for saving to file) [njcuk9999]
- *Core.instruments.spirou.file_definitions.py* + *recipe_definitions.py* - add *WAVE_HCLIST* and *WAVE_FPLIST*. [njcuk9999]
- *Recipes.spirou.cal_wave_master_spirou.py* + science.velocity.general.py - remove the wave test code. [njcuk9999]
- *Recipe.spirou.cal_wave_master_spirou.py* + science.velocity.general.py - push correct e2ds fiber into ccf code. [njcuk9999]
- *Science.calib.wave.py* - data *llprops['LL_FINAL']* –> wprops['WAVEMAP'] [njcuk9999]
- *Recipes.spirou.cal_wave_master_spirou.py* + science.velocity.general.py - add wavetest to test wavemap values. [njcuk9999]
- *Science.calib.wave.py* - add master wave sol to solutions (after plotting) [njcuk9999]
- *Recipes.spirou.cal_wave_master_spirou.py* science.calib.wave.py *science.velocity.general.py* - move break points. [njcuk9999]

5.3.1.332 0.6.076 (2020-04-22)

- *Apero.science.calib.wave.py* - correct wave fp header keys. [njcuk9999]
- *Apero.core.instruemnts.spirou.default_constants.py* - add smart FP mask as default from EA. [njcuk9999]
- Add updated cavit length equation files. [njcuk9999]
- Add EA smark fp mask from cavity file. [njcuk9999]
- *Science.velocity.general.py* - deal with bounds and change remove wide peaks criteria. [njcuk9999]
- *Science.velocity.general.py* - deal with bounds and change remove wide peaks criteria. [njcuk9999]
- *Science.velocity.general.py* - remove exception breakpoints. [njcuk9999]
- *Science.velocity.general.py* - adjust dc and shape p0 values. [njcuk9999]
- *Apero.science.velocity.general.py* - add breakpoints to fit fp exceptions (For test) [njcuk9999]
- *Science.velocity.general.py* - deal with bounds being out-of-bounds. [njcuk9999]
- *Apero.science.velocity.general.py* - add back in pcov. [njcuk9999]
- *Apero.science.velocity.general.py* - correct bounds. [njcuk9999]
- *Apero.science.velocity.general.py* - add bounds to fp fit. [njcuk9999]
- *Science.velocity.general.py* - add break point to test. [njcuk9999]
- *Apero.science.velocity.general.py* - set *peak_spacing* = 5 (old drs value) [njcuk9999]
- *Apero.science.calib.wave.py* and *apero.science.velocity.general.py* - remove params from *fit_fp_peaks*. [njcuk9999]

5.3.1.333 0.6.075 (2020-04-21)

- *Apero.science.velocity.general.py* - reduce the peak criteria to half the order peak size. [njcuk9999]
- *Apero.science.velocity.general.py* - change outputs for *fit_fp_peaks*. [njcuk9999]
- *Apero.science.velocity.general.py* - dcpenormpercentak –> dcpeak. [njcuk9999]
- *Apero.science.velocity.general.py* - fix typo normpercentile –> normpercent. [njcuk9999]
- *Science.calib.wave.py* - move print outs to language database. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.science.velocity.general.py* - deal with *curve_fit* warnings. [njcuk9999]
- *Apero.science.calib.wave.py* - add warnings back to code. [njcuk9999]
- Update language database. [njcuk9999]
- *Apero.core.instruments.default_keywords.py* - add *KW_WFP_WIDUSED* for storing width per order. [njcuk9999]
- *Apero.science.calib.wave.py* - move constants to wave file and update header. [njcuk9999]
- *Apero.science.velocity.general.py* - move constants to constants files. [njcuk9999]
- *Core.instruments.*.default_constants.py + default_keywords.py* - adjust wave fp constants after fp finding update. [njcuk9999]
- *Science.calib.wave.py* - need new cond2 for FP. [njcuk9999]
- *Science.calib.wave.py* - add breakpoint to test *get_master_lines*. [njcuk9999]
- *Science.velocity.general.py* - change limit 0.3 –> 0.1. [njcuk9999]
- *Science.calib.wave.py* - remove breakpoint. [njcuk9999]
- *Science.calib.wave.py* - update output from line fit. [njcuk9999]
- *Core.instruments.*.default_contants.py* - update cavity file. [njcuk9999]
- *Science.velocity.general.py* - change EWPEAK to PEAK2PEAK and modify *remove_wide_peaks* (width is peak to peak not normalized width) [njcuk9999]
- *Core.instruemnts.spirou.default_constants.py* - change *WAVE_FP_NORM_WIDTH_CUT* from 0.25 to 15. [njcuk9999]
- *Science.velocity.general.py* - add *fit_fp_peaks* function. [njcuk9999]
- *Science.calib.wave.py* - FP should use *ea_airy* function. [njcuk9999]
- *Science.velocity.general.py* - determine fp peak size from the data (median of all peak widths) [njcuk9999]
- *Science.velocity.general.py* - modify the FP peak finding (now use the *ea_airy* function) [njcuk9999]
- *Core.math.general.py* - add *ea_airy_function* (for FP peak finding) [njcuk9999]
- *Core.insturments.spirou.default_constants.py* - change the border and box size for FP peak finding (now using *ea_airy)* [njcuk9999]
- *Science.velocity.general.py* - add breakpoint to test gaussian. [njcuk9999]

5.3.1.334 0.6.074 (2020-04-20)

- *Apero.core.math.__init__.py* - add *gauss_beta_function*. [njcuk9999]
- *Misc.problems.new_ccf_code.py* - add EA changes to give option to play with convolution kernel. [njcuk9999]
- *Misc.nirps_tools.correct_sims.py* - write code to correct the headres of simulations. [njcuk9999]
- *Apero.science.velocity.general.py* - swap gaussian fit fot *gaussian_beta* fit in *function=measure_fp_peaks*. [njcuk9999]
- *Apero.science.calib.wave.py* - change inverse coefficient fit for updating *pixel_ref* (rpixels –> rwaveref) [njcuk9999]
- *Apero.core.math.gauss.py* - add *gauss_beta_function* for ((x-x0)/sigma)^beta. [njcuk9999]

5.3.1.335 0.6.073 (2020-04-18)

- *Apero.science.calib.wave.py* - add iteration for WAVEREF plot. [njcuk9999]
- *Apero.plotting.plot_functions.py* - update the title depending on where used. [njcuk9999]
- *Documentation.working.user.general.known_issues.rst* - update known issues. [njcuk9999]
- *Science.calib.wave.py* - update plot (give before and after) [UNFINISHED] [njcuk9999]

5.3.1.336 0.6.072 (2020-04-17)

- *Apero.plotting.plot_functions.py* and *science.velocity.general.py* - update wave fiber plot size + add fiber name to ccf fp plot. [njcuk9999]
- *Apero.plotting.plot_functions.py* - make markers smaller. [njcuk9999]
- Wave codes - pep8 corrections. [njcuk9999]
- *Science.calib.wave.py* - correct typo *WAVE_OTHERFIBER –> WAVE_FIBER_COMPARISON*. [njcuk9999]
- Update todo list. [njcuk9999]
- *Science.velocity.general.py* - do not limit fp ccf to fiber c (AB,A,B valid too) [njcuk9999]
- *Apero.recipes.spirou.cal_wave_master_spirou.py* - only do main code for *master_fiber* and then add functionality to process other fibers (fit from FPLINES) + CCF and write loops. [njcuk9999]
- *Apero.plotting.plot_functions.py* - add *plot_wave_fiber_comparison*. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - add *wave_fiber_comp* plots. [njcuk9999]
- Update language database. [njcuk9999]
- *Core.instruments.default.default_constants.py* - add wave fiber constants. [njcuk9999]
- *Documentation.working.user.general.known_issues.rst* - update known issues. [njcuk9999]
- *Misc.problems.new_ccf_code.py* - update *CCF_RV_NULL* and add *IN_RV* (copy from apero-utils) [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - add *EXTRACT_S1D_WEIGHT* to debug plots. [njcuk9999]
- *Core.core.drs_log.py* - change typo fmt–>format. [njcuk9999]
- *Science.calib.wave.py* - add wave time to hc and fp solutions. [njcuk9999]
- *Science.velocity.general.py* - make *null_targetrv*. [njcuk9999]
- *Core.instrument.*.default_constant.py* - NULLVAL for RV is now a abs limit. [njcuk9999]

5.3.1.337 0.6.071 (2020-04-16)

- *Apero.recipes.nirps_ha.cal_preprocess_nirps_ha.py* - change instrument SPIROU –> *NIRPS_HA*. [njcuk9999]
- *Apero.io.drs_data.py* - *load_hotpix* fmt is 'csv' not 'None' [njcuk9999]
- *Apero.io.drs_data.py* - *read_table* default table is fits. [njcuk9999]
- *Core.core.drs_log.py* - Table.read log –> fmt='fits' [njcuk9999]
- *Tools.recipe.bin.apero_processing.py* - remove old break point. [njcuk9999]
- *Tools.module.setup.drs_processing.py* - if we have to find the recipe set the file mod after finding it. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - replace *_run* with *_seq* and add engineering sequence (*hc1_hc1* extract, *fp_fp* extract, *dark_fp* extract) [njcuk9999]
- *Data.spirou.reset.runs.** - update sequences *_run –> _seq*. [njcuk9999]
- *Recipes.spirou.cal_wave_night_spirou.py* - remove one of the breakpoints. [njcuk9999]
- *Core.instruments.spirou.file_definitions.py* - add back in thermal e2ds with correct *kw_output*. [njcuk9999]
- *Recipes.spirou.cal_wave_night_spirou.py* - add breakpoint for testing. [njcuk9999]

5.3.1.338 0.6.070 (2020-04-15)

- *Core.instruments.spirou.recipe_ defintions.py* - add *EXTRACT_ S1D_ WEIGHT*. [njcuk9999]
- README.md - update raw file table. [njcuk9999]
- *Apero.tools.recipes.bin.apero_ mkdb.py* - skip master files. [njcuk9999]
- Update language database. [njcuk9999]
- *Tools.recipes.bin.apero_ mkdb.py* - skip master default files. [njcuk9999]
- *Core.core.drs_ file.py + io.drs_ fits.py* - do not report error from read header in id. [njcuk9999]
- *Core.instruments.spirou.file_ definitions.py* - *out_ wave_ night* - *WAVE_ FP –> WAVE_ NIGHT*. [njcuk9999]
- *Science.extract.other.py* - correct *KW_ OUTPUT* for thermal files. [njcuk9999]
- *Core.core.drs_ file.py + io.drs_ fits.py* - deal with copyother and trying to open files with wrong extensions. [njcuk9999]
- *Data.spirou.reset.runs.mini_ run.ini* - set *reset_run* to False by default. [njcuk9999]
- *Core.core.drs_ file.py* in *check_ read* get *load_ data* option from call args. [njcuk9999]
- *Core.core.drs_ file.py* in *check_ read* get *load_ data* option from call args. [njcuk9999]
- *Tools.recipes.bin.apero_ mkdb.py* - do not get data when identifying file. [njcuk9999]
- *Core.core.drs_ file.py* - read file after copying parameters (so datatype is correct) [njcuk9999]
- *Core.core.drs_ file.py* - do not copy over drsfile.datatype from infile (in copyother) [njcuk9999]
- *Instruments.spirou.file_ definitions.py* - update *KW_ OUTPUT* (should be WAVEM) [njcuk9999]
- *Core.core.drs_ database.py* - fix error in writing to database. [njcuk9999]
- *Science.calib.wave.py* - add WAVETIME to nprops (for header) [njcuk9999]
- *Recipe.spirou.cal_ wave_ night_ spirou.py + science.calib.wave.py* - add input dcavity for fibers A,B,C (use cavity width from AB) [njcuk9999]
- *Core.instrument.*.default_ keywords.py* - add dcavity source. [njcuk9999]

5.3.1.339 0.6.069 (2020-04-09)

- *Recipe.spirou.cal_ ccf_ spirou.py* - correct typo *rv_ props1 –> rv_ props2* for WAVESOURCE. [njcuk9999]
- *Core.instruments.spirou.recipe_ defintions.py* - add tmp (commented) polar recipe. [njcuk9999]
- *New_ ccf_ code.py* - add help. [njcuk9999]
- *Core.core.drs_ log.py* and *io.drs_ lock.py* - correct write statement (log–> mode=a) [njcuk9999]

5.3.1.340 0.6.068 (2020-04-08)

- *Science.velocity.general.py* - add rv wave source to ccf header. [njcuk9999]
- Misc.old - move *cal_ wave_ spirou.py* [old code] to misc. [njcuk9999]
- *Science.calib.wave.py* - add wave time to wprops + add it to header when present (i.e. in *add_ wave_ keys)* [njcuk9999]
- *Recipes.spirou.cal_ ccf_ spirou.py* - add wave source for rv fiber to header. [njcuk9999]
- *Core.instruments.spirou.recipe_ definitions.py* - remove old *cal_ wave.* [njcuk9999]
- *Cpre.instruments.*.default_ keywords.py* - modify ccf rv wave keys. [njcuk9999]
- *Cal_ ccf_ spirou.py* - save rv wavefile, rv wave time and rv time diff (file->wave) to header. [njcuk9999]
- *Core.instruments.*.defaults_ keywords.py* - add *KW_ CCF_ RV_ WAVEFILE, KW_ CCF_ RV_ WAVETIME* and *KW_ CCF_ RV_ TIMEDIFF* (for ccf) [njcuk9999]
- *Misc.problems.new_ ccf_ code.py* - update code, make it completely independent of the drs + add writing file + add switch for OBJ and FP + add plots (and plot switch) [njcuk9999]

5.3.1.341 0.6.067 (2020-04-07)

- Split *create_pp_hotpix.py* into two bits - one for each instrument + update for drs integration (via *drs_dev* tmp functions) [njcuk9999]
- *Science.preprocessing.detector.py* - update get hot pixel function to load ypix and xpix from file. [njcuk9999]
- *Apero.io.drs_data.py* - change *load_full_flat_pp* to *load_hotpix*. [njcuk9999]
- *Data.spiroiu.engineering.hotpix_pp.csv* - update hotpix file for spirou. [njcuk9999]
- *Core.instruments.*.default_constants.py* - modify pp constants for new hotpix function/file. [njcuk9999]

5.3.1.342 0.6.066 (2020-04-07)

- Add a hotpix mask for spirou. [njcuk9999]
- Tools.recipes.utils.README.md - add a directory for utilities. [njcuk9999]
- *Tools.recipe.utils.create_pp_hotpix.py* - add EA hotpix generator. [njcuk9999]
- *Tools.recipes.spirou.update_berv.py* - rename from *cal_update_berv.py*. [njcuk9999]
- *Core.math.general.py* - add in the *normal_fraction* math function. [njcuk9999]

5.3.1.343 0.6.065 (2020-04-03)

- Replace open+read/write+close –> with open+read/write. [njcuk9999]
- *Tools.recipes.spirou.expmeter_spirou.py* - change *copy_hdict* –> *copy_original_keys*. [Neil Cook]
- *Tools.recipes.spirou.expmeter_spirou.py* - corerct code after testing. [Neil Cook]
- *Core.core.drs_file.py* - make *add_hkey* accept list or tuple for keywordstore. [Neil Cook]
- *Tools.recipes.spirou.expmeter_spirou* - add saving to file (using *drs_dev* FileDefinitions and Tmp files) [Neil Cook]
- *Tools.module.testing.drs_dev.py* - add TmpInputFile, TmpFitsFile and TmpNpyFile and FileDefinition to allow external file defintions (for tools and testing) [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- *Tools.recipes.spirou.expmeter_spirou.py* - move exposuremeter constants to constants file (use params) [njcuk9999]
- *Core.instruments.*.default_constants.py* - add exposure meter constants. [njcuk9999]
- *Misc/tools/apero_mtl_sync_master.py* - add master sync code. [Neil Cook]

5.3.1.344 0.6.064 (2020-04-02)

- Update language database. [njcuk9999]
- *Io.drs_lock.py* - deal with locking and removing files bug (Impossible error should now be impossible) [njcuk9999]
- *Core.core.drs_database.py* - check calibration is copied after copying (so we don't update database if there was an uncaught error) [njcuk9999]
- Documentation.working.user.general.todo.rst - update todo list. [njcuk9999]
- *Tools.recipes.spirou.expmeter_spirou.py* - continue work on functionality. [njcuk9999]
- *Io.drs_fits.py* - add function *add_header_key* (for when we don't have a drs fits file) [njcuk9999]
- *Core.math.general.py* - add inverse functionality to rot8. [njcuk9999]
- Update readme. [njcuk9999]
- Update date/version/changelog/update notes. [njcuk9999]

5.3.1.345 0.6.063 (2020-04-01)

- *Apero.data.spirou.reset.runs.mini_run.ini* - turn off MKTELLDB and FTELLDB runs (use individuals) [njcuk9999]
- *Apero.recipes.spirou.cal_leak_spirou.py* - qcparams is a dict –> user ref fiber. [njcuk9999]
- *Apero.recipes.spirou.cal_leak_spirou.py* - add qc to log.fits. [njcuk9999]
- *Core.instruments.default.recipe_definitions.py* - master is reserved keyword –master –> –mlog. [njcuk9999]
- *Recipe.spirou.expmeter_spirou.py* - continue work on exposuremeter. [Neil Cook]
- *Science.telluric.general.py* - fix *core.get_file_definition.* [Neil Cook]
- *Tools.recipe.spirou.expmeter_spirou.py* - add params to arguments of *simage_to_drs.* [Neil Cook]
- *Tools.module.utils.inverse.py* - add required keys. [Neil Cook]
- *Science.telluric.general.py* - provide fiber fot *TELLU_CONV.* [Neil Cook]
- *Tools.recipes.spirou.expmeter_spirou.py* - add telluric map (from mask making) - UNFINISHED. [Neil Cook]
- *Tools.module.utils.inverse.py* - move imports to top. [Neil Cook]
- *Science.telluric.general.py* - add second way to get *TELLU_CONV* if not defined in outputs. [Neil Cook]
- *Io.drs_fits.py* - add two conditions to find files with fibers _*fiber_* or _*fiber.* [Neil Cook]
- *Tools.recipes.spirou.expmeter_spirou.py* - add changes to use *inverse.py* code. [njcuk9999]
- *Tools.module.utils.inverse.py* - add *drs_image_shape* function and reference full image size from params and make *calc_central_localisation* take filename or header. [njcuk9999]
- *Core.instruments.*.default_constants.py* - add in *IMAGE_X_FULL* and *IMAGE_Y_FULL* (for reference) [njcuk9999]
- *Core.instruments.default.pseudo_const.py* - add *INDIVIDUAL_FIBERS* function. [njcuk9999]
- *Tools.module.utils.inverse.py* - add changes with order profile. [Neil Cook]
- Update version/date/documentation/changelog. [Neil Cook]

5.3.1.346 0.6.062 (2020-03-31)

- *Tools.module.utils.inverse.py* - test out making straight image and shifting by x and y. [Neil Cook]
- *Core.core.drs_log.py* - correct typo *('DRS_RECIPE_KIND'* is not None) –> (params['DRS_RECIPE_KIND'] is not None) [Neil Cook]
- *Core.core.drs_log.py* - deal with *DRS_DATA_MSG_FULL* set to None. [Neil Cook]
- *Core.isntruments.default.default_config.py* - add to _ _ ALL_ _ [Neil Cook]
- *Core.isntruments.default.default_config.py* - add some constant that are set in *drs_setup* (for when we are not using setup) [Neil Cook]
- *Science.calib.general.py* - check that inputs is in params (may not be) [Neil Cook]
- *Core.core.drs_recipe.py* - add a quick way to make a recipe (using params) [Neil Cook]
- *Tools.recipes.spirou.exposuremeter_spirou.py* and *module.utils.inverse.py* - start work on inversing drs (exspoure meter etc) [njcuk9999]
- *Core.core.drs_recipe.py* - directory must be an absolute path (if we are in the reduced folder it wont be without these changes –> causes an error later) [njcuk9999]
- *Core.core.drs_argument.py* - paths for commonpath must be absolute –> enforce this explicitly. [njcuk9999]
- *Core.core.drs_argument.py* - add breakpoint to test error. [njcuk9999]
- *Core.core.drs_recipe.py* - *break_point* to test error. [njcuk9999]
- *Core.core.drs_recipe.py* - deal with sys.argv having a full path as first argument (don't know why this is happening) [njcuk9999]
- *Core.core.drs_recipe.py* - remove path from recipe name (for argparse) [njcuk9999]
- *Science.velocity.general.py* - add EA changes from *new_ccf_code* test. [njcuk9999]
- *Misc.problems.new_ccf_code.py* - add EA fixes. [njcuk9999]

5.3.1.347 0.6.061 (2020-03-29)

- *Science.telluric.general.py* - correc typo *KW_FTELLU_TEMP –> KW_FTELLU_TEMPLATE*. [Neil Cook]

5.3.1.348 0.6.060 (2020-03-28)

- *Misc.problems.new_ccf_code.py* - add comments. [Neil Cook]
- *Misc.problems.new_ccf_code.py* - add better plot for EA. [Neil Cook]
- *Misc/problems/new_ccf_code.py* - correction to stand alone ccf code. [njcuk9999]
- *Misc/problems/new_ccf_code.py* - stand alone test of ccf code. [njcuk9999]
- *Science.velocity.general.py* - add in the condition that targetrv is equal to the null value (-9999.99 for spirou) [njcuk9999]
- Update language database. [njcuk9999]
- *Core.instruments.*.default_constants.py* - add *CCF_OBJRV_NULL_VAL*. [njcuk9999]
- *Core.instruments.spirou.default_keywords.py* - correct typo *KW_FTELLU_TEMPLATEKW_FTELLU_TEMPLATE –> KW_FTELLU_TEMPLATE*. [njcuk9999]
- *Recipes.spirou.obj_fit_tellu_spirou.py* and science.telluric.general.py - add a keyword for which template was used (or if not set to None) [njcuk9999]
- *Core.instruments.*.default_keywords.py* - add *KW_FTELLU_TEMPLATE*. [njcuk9999]
- *Core.core.drs_file.py* - change *drs_path() –> drs_path.numpy_load()* [njcuk9999]
- *Core.core.drs_database.py + drs_file.py io.drs_path.py science.telluric.general.py* - replace np.load with *drs_path* function (mitigate certain errors?) [njcuk9999]

5.3.1.349 0.6.059 (2020-03-26)

- Update date/version/changelog/documentation. [njcuk9999]
- *Core.core.drs_database.py* - fix typo master in entries –> master in entries.colnames. [Neil Cook]
- *Core.core.drs_database.py* - add break point to test database error. [njcuk9999]
- *Science.extract.general.py* - correct leakage correction (extimage –> *extimage[order_num])* [njcuk9999]
- *Science.velocity.general.py* - add breakpoint to test error. [njcuk9999]
- *Science.velocity.general.py* - null value of targetrv is not NaN - if so deal with it. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - change *default_ref* of ccf to *CCF_NO_RV_VAL*. [njcuk9999]
- *Core.instruments.default.default_constants.py* - add *CCF_NO_RV_VAL* (set to np.nan) [njcuk9999]
- Update language database. [njcuk9999]
- *Io.drs_lock.py* - add exceptions and warnings for os.remove and os.removedirs (should not crash in lock) [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - change ccf –rv default from None to 'None' [njcuk9999]
- *Core.instruments.*.default_config.py* - add *TELLU_DB_MATCH* and *DB_MATCH*. [njcuk9999]
- *Core.core.drs_file.py locale.core.drs_text.py* and *science.telluric.general.py* - allow np.load to have *allow_pickle*. [njcuk9999]
- *Core.core.drs_database.py* - add a different db match for telluric and calibration database. [njcuk9999]

5.3.1.350 0.6.058 (2020-03-24)

- *Tools.module.setup.drs_processing.py* - correct test for *TEST_RUN*. [njcuk9999]
- *Tools.recipes.bin.apero_processing.py* - add breakpoint. [njcuk9999]
- *Tools.recipes.bin.apero_processing.py* - remove breakpoint. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - update leak files in sequences (should be e2dsff fiber AB) [njcuk9999]
- *Tools.module.setup.drs_processing.py* - change message when just a test. [njcuk9999]
- *Recipes.bin.apero_processing.py* - add breakpoint to test leakage error. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - change *cal_leak* inputtype e2ds –> reduced. [njcuk9999]
- *Core.core.drs_database.py* - 'master' should only be used for databases with 'master' column. [njcuk9999]
- Data.spirou.reset.runs - update run.ini files. [njcuk9999]

- *Tools.module.setup.drs_processing.py* - do not check for master if recipe is None. [njcuk9999]
- *Science.velocity.general.py* - add warning to suppress warning about NaNs in greater than mask. [njcuk9999]
- *Science.velocity.general.py* - add threshold for the blaze. [Neil Cook]
- Update language database. [njcuk9999]
- *Science.velocity.general.py* - mask *mask_centers* and *mask_weights* to just fall in the order in question. [njcuk9999]
- *Core.instruments.*.default_keywords.py* - change WNTDWAVEB –> WNTDWAVB. [njcuk9999]
- *Cal_wave_night_spirou.py* - add breakpoint to investigate bug. [njcuk9999]
- *Core.instruemnts.spirou.recipe_defintions.py* - *cal_leak* should not be a master recipe. [njcuk9999]

5.3.1.351 0.6.057 (2020-03-24)

- Apero.tools.module.setup and *setup/*.py* - add newprofile script to add a new profile quickly (copy of currently in use) [njcuk9999]
- *Science.velocity.general.py* - need to set ccf to NaN if mask has no values for this order. [njcuk9999]
- Update language database. [njcuk9999]
- *Science.velocity.general.py* - add breakpoint to test error. [njcuk9999]
- *Science.velocity.general.py* - add a nansum to *ccf_ord*. [njcuk9999]
- *Science.velocity.general.py* - add a nansum to *ccf_ord*. [njcuk9999]
- *Science.velocity.general.py* - add break point. [njcuk9999]
- *Recipes.spirou.cal_badpix_spirou.py* - remove breakpoint in *cal_badpix*. [njcuk9999]
- *Tools.module.setup.drs_processing.py* - correct –master ==True –> True. [njcuk9999]
- *Tools.module.setup.drs_processing.py* - add –master=True. [njcuk9999]
- *Core.core.drs_argument.py* - –master now has to be True or False. [njcuk9999]
- *Core.core.drs_argument.py* - correct wlog type (should be debug) [njcuk9999]
- Update language database. [njcuk9999]
- *Core.core.drs_argument.py* - update _IsMaster function (no arguments) [njcuk9999]
- *Tools.module.setup.drs_processing.py* - change master arg to have no arguments. [njcuk9999]
- *Tools.module.setup.drs_processing.py* - add push to add –master arg for master recipes. [njcuk9999]
- *Recipes.spirou.cal_badpix_spirou.py* - add break point (to test) [njcuk9999]
- Update language database. [njcuk9999]
- *Core.core.drs_startup.py* - add comment for *debug_key*. [njcuk9999]
- *Core.core.drs_recipe.py* - get master from *input_parameters* and update 'IS_MASTER' if True. [njcuk9999]
- *Core.core.drs_database.py* - remove *is_master* from database *get_entry*, now modify mask2 (always keep master calibrations) [njcuk9999]
- *Core.core.drs_argument.py* - add *is_master* argument (make any recipe a master) [njcuk9999]
- Update language database. [njcuk9999]
- *Data.*.reset.calibdb.master_calib_*.txt* - add master column to default master db files. [njcuk9999]
- *Core.instruments.*.default_config.py* - add column to *calib_db_cols* (master) [njcuk9999]
- *Core.core.drs_database.py* - add column to calibration database (master) and if recipe is master except from "older" [njcuk9999]

5.3.1.352 0.6.056 (2020-03-22)

- *Core.instruments.spirou.file_defintions.py* - save badpix from dark not flat. [njcuk9999]
- Update language database. [njcuk9999]
- *Core.core.drs_database.py* - correct error message 00-002-00006. [njcuk9999]
- *Core.instruments.*.pseudo_const.py* - add *MASTER_DB_KEYS* function. [njcuk9999]
- *Core.drs_database.py* - get master keys from pseudo consts. [njcuk9999]
- *Core.core.drs_startup.py* - add a *IS_MASTER* key to params (True when recipe is a master recipe) [njcuk9999]
- *Core.core.drs_database.py* - if database case = 'older' and we have a master but no older use closest. [njcuk9999]

5.3.1.353 0.6.055 (2020-03-22)

- *Io.drs_fits.py* - pep8 change. [njcuk9999]
- *Core.instruemnts.*.pseduo_const.py* - BERV outputs should use BERV key (make it clear) [njcuk9999]
- *Core.instruments.*.default_keywords.py* - update *KW_MID_OBSTIME_METHOD* (more consistent) [njcuk9999]
- *Core.core.drs_recipe.py* - only check required for dtype = file/files. [njcuk9999]
- *Core.core.drs_argument.py* - DrsArgument required is True by default for args and False by default for kwargs. [njcuk9999]
- *Core.instruments.*.pseudo_const.py* - correct typo need first element in list (not the list itself) [njcuk9999]
- *Core.instruments.*.pseudo_const.py* - correct typo *KW_OBNAME -> KW_OBJNAME*. [njcuk9999]
- .gitignore - ignore all python files in tools. [njcuk9999]
- *Tools.module.setup.drs_processing.py* - fix nightname needed for non- trigger run. [njcuk9999]
- Data.spirou.rset.runs - update run.ini files with leakage codes. [njcuk9999]
- *Core.instruments.spirou.recipe_defintions.py* - update the sequences with leakage codes. [njcuk9999]
- *Data.spirou.reset.calibdb.master_calib_SPIROU.txt* - add default leak master files to calibDB (only to use when we don't have any files) [njcuk9999]
- Data.spirou.ccf - add new masks from Andres. [njcuk9999]
- Data.reset.calibdb - add *MASTER_LEAK* files. [njcuk9999]
- *Science.velocity.general.py* - deal with unset targetrv (input target rv for ccf) - if unset try to get key from header - else set it to zero. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - change the default value of –rv (for ccf) to None (i.e. unset) [njcuk9999]
- *Core.instruments.spirou.default_constants.py* - change default mask to *masque_sept18_andres_trans50.mas.* [njcuk9999]
- *Core.instruments.*.default_config.py* - change *CALIB_DB_MATCH* to 'older' - no matter where on a night we are it should always use calibrations before. [njcuk9999]
- *Core.instruments.*.pseduo_const.py* - add fix for object name having spaces (#Issue 598) – now have key DRSOBJN. [njcuk9999]
- *Core.instruments.*.default_keywords.py* - add OBJECTNAME and change OBJNAME to DRSOBJN (new keyword just for drs) [njcuk9999]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.354 0.6.054 (2020-03-10)

- *Sciecne.extract.general.py* - continue adding leak functionality. [Neil Cook]
- *Apero.science.calib.flat_blaze.py* - allow flat to be loaded quietly. [Neil Cook]
- *Recipes.spirou.cal_leak_spirou.py* - continue work on EA implementation - add *save_uncorrected_ext_fp* and *write_leak* functions. [Neil Cook]
- *Recipes.spirou.cal_leak_master_spirou.py* - add cprops (for header keys) and pipe to *write_leak_master.* [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_strings.py* - add module for generic string manipulation [TODO: find other generic functions and move here] [Neil Cook]
- *Io.drs_path.py* - add copyfile function (with logging) [Neil Cook]
- *Core.instruments.*.default_keywords.py* - add LEAK header keywords. [Neil Cook]
- *Core.instruments.*.file_definitions.py* - add *out_leak_master* to *out_file* set and *calib_file* set. [Neil Cook]
- *Core.instruments.*.defalut_constants.py* - add LEAK and *EXT_S1D* parameters. [Neil Cook]
- *Core.core.drs_file.py* - add an include/exclude part to wild cards so we can search header for specific header keys + add *get_qckeys* method. [Neil Cook]

5.3.1.355 0.6.053 (2020-03-09)

- *Recipes.spirou.cal_leak_spirou.py* and *science.extract.general.py* - add function *dark_fp_regen_s1d* [Neil Cook]
- *Recipes.*.cal_extract_*.py* - get s1d infile from params *(EXT_S1D_INTYPE)* formally hardcoded to E2DSFF. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add *EXT_S1D_INTYPE* to constants. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add *EXT_S1D_INTYPE* to constants. [Neil Cook]
- *Recipe.spirou.cal_leak_spirou.py* and *science.extract.general.py* - add outputs to *extgen.correct_dark_fp* function and make changes to function return. [Neil Cook]
- *Documentation.working._static.yed.spirou_all.graphml* - save flow diagram for spirou. [Neil Cook]
- *Tools.module.setup.drs_processing.py* - fix call to *_linear_process* group should be a keyword argument (Issue #599) [Neil Cook]
- *Core.instruments.spirou.default_keywords.py* - update rv keyword OBSRV –> OBJRV. [Neil Cook]

5.3.1.356 0.6.052 (2020-03-05)

- *Cal_leak_master_spirou.py* - deal *num_files = 0*. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add *blaze_norm_percentile (CCF_BLAZE_NORM_PERCENTILE)* [Neil Cook]
- *Science.velocity.general.py* - EA corrections to RV CCF (normalisation) [Neil Cook]

5.3.1.357 0.6.051 (2020-03-04)

- *Science.extract.general.py* - add leak functions. [Neil Cook]
- *Apero.recipes.spirou.cal_leak_spirou.py* - continue with EA adaptation. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.isntruments.spirou.recipe_definitons.py* - update *cal_leak*. [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - comment these out for now. [Neil Cook]
- *Core.instruments.nirps_ha.default_keywords.py* [APERO] - add *KW_LEAK_CORR*. [Neil Cook]
- *Core.instruments.default.default_keywords.py* - add *KW_LEAK_CORR* keyword. [Neil Cook]

5.3.1.358 0.6.050 (2020-03-03)

- *Science.extract.general.py* [APERO] - add *correct_master_dark_fp correct_dark_fp master_dark_fp_cube get_extraction_files* functions [UNFINISHED] [Neil Cook]
- *Documentation.working._static.yed.spirou_map.graphml* [APERO] - add leak to spirou flow diagram. [Neil Cook]
- *Recipe.spirou.obj_mk_tellu_spirou.py* [SPIROU] - correct typo. [Neil Cook]
- *Recipes.spirou.cal_leak_spirou.py* - first commit add start of *cal_leak* code (from EA code) [Neil Cook]
- *Recipes.spirou.cal_leak_master_spirou.py* - continue work on implementing EA's code. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* [APERO] - deal with not having nightname column for tmp/reduced index files. [Neil Cook]
- *Core.instruments.*.recipe_definitions.py* - update *cal_leak_master* and add *cal_leak*. [Neil Cook]
- *Core.instruments.*.file_definitions.py* [APERO] - set intype for *out_leak_master*. [Neil Cook]
- *Core.instruments.*.pseudo_const.py* - add *FIBER_KINDS* (science and reference) [Neil Cook]
- *Core.instruments.*.default_constants.py* [APERO] - add LEAKM and LEAK constants. [Neil Cook]
- *Core.core.drs_file.py* [APERO] - *read_header_key_1d_list* - update input and param dict. [Neil Cook]

5.3.1.359 0.6.049 (2020-03-02)

- *Tools.module.setup.drs_processing.py* [APERO] - move *find_raw_files, _get_path_and_check, _get_files* to *io.drs_fits*. [Neil Cook]
- *Recipes.spirou.cal_leak_master_spirou.py* [APERO] - first commit [UNFINISHED] of the master leakage creation recipe. [Neil Cook]
- *Nrips_ha.cal_pp_master_nirps_ha.py* [NIRPS] - add nirps master pp code to get *flat_flat* mask. [Neil Cook]
- *Recipes.** and *tools.** - correct call to *drs_fits.find_files* (now requires recipe for raw finding) [Neil Cook]
- *Io.drs_fits.py* [APERO] - update *find_files* to correctly find raw files, add *find_raw_files* function, move *fix_header* to here. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.nirps_ha.file_definitions.py* [NIRPS] - replace fiber AB,A,B,C with A,B. [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* [SPIROU] - add *out_leak_master*. [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - add *ALLOWED_LEAKM_TYPES*. [Neil Cook]
- *Core.instruments.*.recipe_definitions.py* [APERO] - move DrsRecipe construction closer to each recipe + add to recipe list + add *cal_leak_master* + add *cal_pp_master*. [Neil Cook]
- *Core.instruments.*.pseudo_const.py* [APERO] - add *VALID_RAW_FILES* to instruments seperately. [Neil Cook]
- *Core.instruments.nirps_ha.file_definitions.py* [NIRPS] - add *out_pp_master* file for the mask master flat pp file + add *out_leak_master* for *leak_master* code + remove polar file definitions. [Neil Cook]
- *Core.instruments.nirps_ha.default_keywords.py* - add a *PPMSTR_NSIG* keyword to keep track when it is used. [Neil Cook]
- *Core.instruments.nirps_ha.default_constants.py* - add *ALLOWED_PPM_TYPES PPM_MASK_NSIG PP_MEDAMP_BINSIZE* and *ALLOWED_LEAKM_TYPES*. [Neil Cook]
- *Default.default_keywords.py* [NIRPS] - add *PPMSTR_NSIG* constants (for nirps pp correction) [Neil Cook]
- *Core.instruments.default.default_constants.py* - add PPM and LEAKM keywords. [Neil Cook]
- *Core.core.drs_startup.py* - deal with case in *find_files* where we do not have full params set up yet (i.e. WLOG will crash) –> raise ConfigError. [Neil Cook]
- *Core.core.drs_recipe.py* - when we have a master recipe set directory from *params['MASTER_NIGHT']* [Neil Cook]
- Update changelog/date/version/documentation. [Neil Cook]
- Update changelog/date/version/documentation. [Neil Cook]

5.3.1.360 0.6.048 (2020-02-28)

- Documentation.working.user.general.todo.rst - update todo list. [Neil Cook]
- *Tools.recipes.spirou.exposuremeter_spirou.py* - first commit of exposure meter code [UNFINISHED] [Neil Cook]
- Tools.recipes.spirou - move *cal_update_berv.py* to tools. [Neil Cook]
- *Io.drs_fits.py* - add "night" to *find_files* (to filter just one night) [Neil Cook]
- Update language database. [Neil Cook]
- *Tools.module.setup.drs_processing.py* - correct *NIGHT_NAME* –> NIGHTNAME and cause exception when TRIGGER=True and NIGHTNAME unset. [Neil Cook]
- Update run.ini files *(NIGHT_NAME* –> NIGHTNAME) [Neil Cook]
- *Tools.module.setup.drs_processing.py* - update how filters are obtained and add error when incorrect. [Neil Cook]
- Update language database. [Neil Cook]
- *Data.spirou.reset.runs.trigger_night_calbi_run.ini* - correct run and skip pp parameters. [Neil Cook]
- Readme.md - update sequences. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add *pp_run_opt* (preprocessing with options – must turn all off to only select one) [Neil Cook]
- *Data.spirou.reset.runs.trigger*.ini* - add pp seqeunce elements. [Neil Cook]
- *Tools.module.setup.drs_processing.py* - add trigger from file. [Neil Cook]
- *Core.instruments.spirou.recipe_defintions.py* - add *pp_run_sci* sequence (preprocess *OBJ_DARK, OBJ_FP* only) [Neil Cook]
- Update run.ini files. [Neil Cook]

- *Core.core.drs_ recipe.py* - deal with having no files in a recipe that requires files. [Neil Cook]
- Update language database. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add section to stop processing recipes when we are in trigger mode. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - *update_ run_ table* needs to take value from rlist if already populated. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - deal with trigger run when removing engineering nights (i.e. deal with when we have no objects in a directory) [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.default.recipe_ defintions.py* - update dtype for –trigger argument. [Neil Cook]
- Update language database. [Neil Cook]
- Documentation.working.user.general.todo.rst - update todo list. [Neil Cook]
- *Core.instruments.default.recipe_ defintions.py* - add –trigger option to *apero_ processing.py.* [Neil Cook]
- *Drs_ installation.py* – check "clean" argument for update. [Neil Cook]
- *Setup.install.py* - pass args to update. [Neil Cook]
- *Setup.install.py* - print that we are locating install path. [Neil Cook]
- *Tools.module.setup.drs_ reset.py* – do not remove head when removing paths in clean install. [Neil Cook]
- *Io.drs_ lock.py* - add checks in *_ _ remove_ empty_ _* for symbolic links. [Neil Cook]
- *Core.constants.param_ functions.py* - add check for stty for posix os. [Neil Cook]
- Update requirements (in .txt and install.py) [Neil Cook]
- Update version/date/changelog/documentation. [Neil Cook]

5.3.1.361 0.6.047 (2020-02-27)

- *Documentation.working.dev.developer_ guide.rst* [APERO] - add another section todo. [Neil Cook]
- *Science.extract.general.py* [APERO] - pep8 change. [Neil Cook]
- Documentation.working.user.genearl.todo.rst - update todo list. [Neil Cook]
- *Tools.recipe.bin.apero_ go.py* [APERO] - a program to aid finding where data directories are (try cd <quote>python *apero_ go.py* INSTRUMENT –data<quote> to change to data dir. [Neil Cook]
- *Recipes.spirou.cal_ wave_ ** - change how we update hc and fp files once wave solution is updated (correct e2ds/e2dsff/e2dsll and remake s1dw/s1dv) [Neil Cook]
- *Io.drs_ lock.py* - make all lock normal print outs debug print outs (hide unless in debug mode) [Neil Cook]
- *Data.spirou.reset.runs.hc_ run.ini* - update run/skip section. [Neil Cook]
- *Data.spirou.reset.runs.*.ini* - update *RUN_ INI_ FILES* (more appropriate names + updated values) [Neil Cook]
- *Core.instruments.*.recipe_ defintions.py* - add wave plot *(extract_ s1d)* [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* [APERO] - add *apero_ go.py* tools recipe. [Neil Cook]
- README.md - add short name to sequence description. [Neil Cook]

5.3.1.362 0.6.046 (2020-02-27)

- *Tools.recipe.bin.apero_ processing.py* - add a save stats call to save to stats file. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* [APERO] - save a stats fits and stats txt to run folder (under stats) [Neil Cook]
- *Tools.module.setup.drs_ installation.py* - fix force resets without warning. [Neil Cook]
- Update language database. [Neil Cook]

5.3.1.363 0.6.045 (2020-02-26)

- *Tools.module.setup.drs_ installation.py* - deal with tool sub-dirs not existing (first time install) [Neil Cook]
- *../setup/install.py* - search up levels for apero. [Neil Cook]
- *Tools.module.setup.drs_ installation.py* - correct *in_ tool_ path* (how we add bin sub-dir) [Neil Cook]
- *Tools.module.setup.drs_ installation.py* - correct *valid_ path* for validation recipe. [Neil Cook]
- *Tools.module.setup.drs_ installation.py* - make tool links generic (based on sub-dirs) + make paths os independent. [Neil Cook]
- *Apero.tools.resources.setup.** - update paths to add multiple sub- paths. [Neil Cook]
- Apero.tools.recipes - move general –> bin and add instrument tool directories. [Neil Cook]

5.3.1.364 0.6.044 (2020-02-24)

- *Science.preprocessing.detector.py* [NIRPS] - add nirps preprocessing functions from EA [UNFINISHED + QUESTIONS] [Neil Cook]
- *Misc.nrips_ tools.nirps_ pp.py* - copy over EA preprocessing code. [Neil Cook]
- *Recipes.nirps_ ha.cal_ preprocess_ nirps_ ha.py* [NIRPS] - copy over SPIROU code and implement EA changes [UNFINISHED] [Neil Cook]
- *Core.math.general.py* [APERO] - add medbin function. [Neil Cook]
- *Core.core.drs_ startup.py* - allow llmain to be dict or None (via Union) [Neil Cook]

5.3.1.365 0.6.043 (2020-02-22)

- Update documentation. [Neil Cook]
- Working.user.genearl.todo.rst - update todo list. [Neil Cook]
- *Misc.tools.apero_ mtl_ sync.py* - finish off code (formally *mtl_ sync.py)* [Neil Cook]

5.3.1.366 0.6.042 (2020-02-20)

- Working.user.general.todo.rst [APERO] - update todo list. [Neil Cook]
- *Core.math.general.py* [APERO] - pep8 change to robust nan std function. [Neil Cook]
- *Data.nirps_ ha.reset.calibdb.MASTER_ WAVE_ NIRPS_ HA.fits* - add a first attempt at wave solution for *NIRPS_ HA* from optical model. [Neil Cook]
- *Science.extract.general.py* [NIRPS] - NIRPS does not have thermal make these keys added to header conditional on presence in eprops. [Neil Cook]
- *Science.calib.flat_ blaze.py* [NIRPS/SPIROU] - change keep, rms and nan some outliers in flat. [Neil Cook]
- *Recipes.nirps_ ha.cal_ shape_ nirps_ ha.py* [NIRPS] - convert *cal_ shape* from spirou code. [Neil Cook]
- *Recipes.nirps_ ha.cal_ shape_ master_ nirps_ ha.py* [NIRPS] - remove hc and dxmap stuff from spirou code. [Neil Cook]
- *Recipes.nirps_ ha.cal_ flat_ nirps.py* [NIRPS] - add flat/blaze code (converted from spirou) [Neil Cook]
- *Recipes.nirps_ ha.cal_ extract_ nirps_ ha.py* [NIRPS] - add extraction code (converted from spirou) [Neil Cook]
- Update database. [Neil Cook]
- *Core.math.general.py* - add *robust_ nanstd* function. [Neil Cook]
- *Core.instruments.spirou.recipe_ defintions.py* - update shape master help example. [Neil Cook]
- *Core.instruments.nirps_ ha.recipe_ defintions.py* - remove hc inputs/outputs from shape master. [Neil Cook]
- *Core.instruments.nirps_ ha.pseudo_ const.py* [NIRPS] - update *FIBER_ LOC_ COEFF_ EXT.* [Neil Cook]
- *Core.instruments.nirps_ ha.default_ constants.py* [NIRPS] - change *SHAPE_ UNIQUE_ FIBERS, QC_ FF_ MAX_ RMS, EXT_ RANGE1, EXT_ RANGE2, EXT_ S1D_ WAVEEND, EXTRACT_ S1D_ PLOT_ ZOOM1, EXTRACT_ S1D_ PLOT_ ZOOM2.* [Neil Cook]
- *Misc.tools.mtl_ sync.py* - remove requirement of using apero. [Neil Cook]

5.3.1.367 0.6.041 (2020-02-20)

- *Misc.tools.mtl_sync.py* - first commit (code for users to get data from montreal) [Neil Cook]
- Remove unused doc files. [Neil Cook]
- Update documentation. [Neil Cook]
- *Tools.module.documentation.drs_documentation.py* - replace *copy_tree* –> copytree (from *drs_path)* [Neil Cook]
- *Io.drs_path.py* [APERO] - add copytree function (copies all files from src to dst) [Neil Cook]
- *Apero.science.calib.shape.py* - remove private functions in shape. [Neil Cook]
- *Recipes.nirps_ha.cal_shape_master_nirps_ha.py* - copy over code from spirou. [Neil Cook]
- *Plotting.plot_functions.py* [APERO] - update loc plot and shape plot. [Neil Cook]
- *Data.*.reset* [APERO] - update master wave solutions (distinguish spirou and *nirps_ha)* [Neil Cook]
- *Core.instruments.*.file_defintions.py* [APERO] - correct *out_dark* files (suffix needs underscore) [Neil Cook]
- *Core.instruments.*.default_constants.py* [NIRPS] - update loc constants + update comment for *LOC_COLUMN_SEP_FITTING.* [Neil Cook]

5.3.1.368 0.6.040 (2020-02-18)

- *Apero.science.calib.badpix.py* and *localisation.py* [APERO] - *RAW_TO_PP_ROTATION* and pep8 changes. [Neil Cook]
- *Recipes.spirou.cal_preprocess_spirou.py* [SPIROU] - update header key *KW_BERV_OBSTIME_METHOD* –> *KW_MID_OBSTIME_METHOD.* [Neil Cook]
- *Recipes.nirps_ha.*.py* [NIRPS] - add *cal_badpix*, *cal_dark_master*, *cal_loc* for *nirps_ha.* [Neil Cook]
- *Io.drs_image.py* [APERO] - link *rotate_image* function to math.genearl.rot8. [Neil Cook]
- *Io.drs_data.py* [APERO] - fix arguments to error 00-012-00001. [Neil Cook]
- Update documentation. [Neil Cook]
- Update documentation. [Neil Cook]
- *Data.nirps_ha* [NIRPS] - rename data folder from nirps –> *nirps_ha.* [Neil Cook]
- *Apero.core.math.general.py* [APERO] - add rot8 function to deal with rotation modes of images. [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - add *RAW_TO_PP_ROTATION* value. [Neil Cook]
- *Core.instruments.nirps_ha.default_constants.py* - tweak NIRPS values from SPIROU values. [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* [APERO] - get instruments from Constants. [Neil Cook]
- *Core.instruments.default.default_constants.py* [APERO] - add *RAW_TO_PP_ROTATION* constant. [Neil Cook]

5.3.1.369 0.6.039 (2020-02-17)

- *Documentaqtion/working/dev/developer_guide.rst* [APERO] - add github interface as section. [Neil Cook]
- *Core.instruments.nirps_ha.recipe_definitions.py* - change spirou references to *nirps_ha.* [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* [SPIROU] - rename internal instance names *obj_pol_spirou* and *obj_spec_spirou* –> *obj_pol* and *obj_spec.* [Neil Cook]
- *Documentation.working._static.yed.spirou_map_2020-01-22_all.graph* [SPIROU] - update yed graph. [Neil Cook]
- *Recipes.nirps_ha.cal_dark_nirps_ha.py* - copy over spirou recipe. [Neil Cook]
- Update the language database [APERO] add nirps files as duplicates of spirou for start. [Neil Cook]
- *Core.instruments.nirps_ha.pseudo_const.py* [NIRPS] - update splash from spirou –> nirps. [Neil Cook]
- *Core.instruments.deafult.default_config.py* [NIRPS] - add *NIRPS_HA* to list of instruments. [Neil Cook]
- *Tools.module.setup.drs_installation.py* [APERO] - force userconfig to have a os.sep as last character. [Neil Cook]
- NIRPS: start config file copy. [Neil Cook]

5.3.1.370 0.6.038 (2020-02-10)

- *Tools.recipes.general.apero_ log_ stats.py* - remove hard coded path. [Neil Cook]
- Printout of the *limited_ run.ini* on *mini_ data* for *apero_ processing.py* 2020-02-10 13:56:00. [Neil Cook]
- Update yed graphs. [Neil Cook]
- Update yed graphs. [Neil Cook]
- Update changelog. [Neil Cook]
- Update python versions, yed graphs and update notes. [Neil Cook]
- Update *readme/known_ issues/todo.* [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.371 0.6.037 (2020-02-07)

- *Core.core.drs_ recipe.py* - add a pre-filter of table (so we are not scanning all files every time) [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - filelogic must be exclusive for *mk_ tellu*, *fit_ tellu* and *pol_ spirou* + update sequences (only e2dsff not e2ds) [Neil Cook]
- Documentation - add yed graphs. [Neil Cook]
- Documentation.working - update python installation, code links. [Neil Cook]
- Documentation.output - update docs. [Neil Cook]
- *Tools.module.drs_ documentation.py* - update ssh host. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.372 0.6.036 (2020-02-05)

- *Plotting.latex.py* - must clean characters [and] - leads to error in pdflatex. [Neil Cook]
- *Science.calib.wave.py + science.calib.wave1.py* - update master wave to look for all master wave types and generate new error if none found. [Neil Cook]
- *Recipe.spirou.obj_ mk_ tellu_ spirou.py + obj_ fit_ tellu_ spirou.py* - update headers to use correct wave solutions for outputs. [Neil Cook]
- *Plotting.core.py* - add numpy import. [Neil Cook]
- Update language database. [Neil Cook]
- *Recipe.spirou.obj_ mk_ template_ spirou.py* and *science.telluric.general.py* - update wave solution of template. [Neil Cook]
- *Recipes.test.demo_ spirou.py* - add param dict section. [Neil Cook]
- *Spirou.recipe_ definitions.py* - add *old_ run* (with no master/night wave) [Neil Cook]

5.3.1.373 0.6.035 (2020-02-04)

- Update the language database. [Neil Cook]
- *Tools.module.testing.drs_ dev.py* - add a demo class to store demo functions (keep out of demo as they would just confuse the point) [Neil Cook]
- *Recipes.test.demo_ spirou.py* - add a recipe that demonstrates the different features of APERO. [Neil Cook]
- *Locale.core.drs_ text.py* - add a language level in cache data so we are name.instrument.language cache. [Neil Cook]
- *Locale.core.drs_ lang_ db.py* - move dictionary to static call (once per import) – loads quicker. [Neil Cook]
- Data.spirou.demo - add demo data. [Neil Cook]
- *Core.core.drs_ log.py* - correct the language must be a string not a list. [Neil Cook]
- *Testing.drs_ dev.py* - add module to allow recipe definition to come from recipe (used to add rmod to core.setup) [Neil Cook]
- *Science.extract.berv.py - use_ pyasl* in quiet mode in barycorrpy (just for calculating bervmax) [Neil Cook]
- *Science.extract.berv.py* - allow berv to be calculated quietly. [Neil Cook]
- *Core.core.drs_ startup.py* - allow recipe definition to come from input (i.e. define in recipe - for initial testing) [Neil Cook]
- Add new blank codes with recipe definition inline. [Neil Cook]
- Remove from *_ _future_ _* import division imports (no longer supporting python 2) [Neil Cook]
- *Misc.tools.cal_ update_ berv.py* - add switch for skipping. [Neil Cook]

- *Apero.science.extract.berv.py* - use pyasl to measure berv maximum. [Neil Cook]
- *Misc.tools.cal_update_berv.py* - update *.write*→*.write_file*. [Neil Cook]
- *Recipes.spirou.cal_wave_master_spirou* + *cal_wave_night_spirou* - add TODOs to update s1d files AFTER new wave solution generated. [Neil Cook]
- *Apero.plotting.plot_functions.py* - deal with all NaNs in flux[mask] - only set ylim if values are finite. [Neil Cook]
- *Apero.plotting.core.py* - add a *set_interactive* method to try to change backend. [Neil Cook]

5.3.1.374 0.6.034 (2020-02-03)

- *Documentation.working.dev.developer_guide.rst* - add more sections to dev section [UNFILLED] [Neil Cook]
- Update language databases. [Neil Cook]
- *Core.core.drs_file.py* - change *get_keyword_instance* –> *get_instanceof* (more generic) [Neil Cook]
- *Core.constants.param_functions.py* - write all doc strings [UNFINISHED] up to end of ParamDict. [Neil Cook]
- *Core.constants.constant_functions.py* - fill out all doc-strings. [Neil Cook]
- *Core.cosntants.__init__.py* - add comment to *catch_sigint.* [Neil Cook]
- README.md - add changes to sequences (now doing *cal_wave_master)* [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.375 0.6.033 (2020-01-31)

- Add flow diagram for locking wait times. [Neil Cook]
- *Plotting.latex.py* - add switch to turn on/off latex pdf making + add fix to latex command to make it non-interactive (Issue #586) [Neil Cook]
- *Plotting.latex.py* - add -interaction=nonstopmode to not allow latex to pause running on error. [Neil Cook]
- *Core.core.drs_recipe.py* - remove breakpoint. [Neil Cook]
- *Tools.module.setup.drs_processing.py* - deal with unset event (non- parallel process) [Neil Cook]
- *Core.core.drs_argument.py* - make sure reicpe is updated before we run *display_func.* [Neil Cook]
- *Core.instruments.default.default_config.py* - update the value of debug mode (only print at debug>=10) [Neil Cook]
- *Core.constants.constants_functions.py* - update types in doc string. [Neil Cook]
- *Core.core.drs_recipe.py* - move *break_point* to exception. [Neil Cook]
- *Core.core.drs_recipe.py* - add breakpoint to address error. [Neil Cook]
- *Core.core.drs_recipe.py* - add breakpoint to address error. [Neil Cook]
- *Constants.constant_functions.py* - add doc strings. [Neil Cook]
- *Core.core.drs_file.py* - add *display_funcs* and pep8 changes. [Neil Cook]

5.3.1.376 0.6.032 (2020-01-30)

- *Dark_fp_run.ini* - add dark fp run script. [Neil Cook]
- *Core.instruments.spirou.recipe_defintions.py* - add *pp_run* and *dark_fp_run* sequences. [Neil Cook]
- *Io.drs_lock.py* - make sure we do not remove lock path *(drs_msg_path/lock/)* [Neil Cook]

5.3.1.377 0.6.031 (2020-01-29)

- *Core.core.drs_file.py* - update *display_func* for *hkeys_exist.* [Neil Cook]
- *Core.core.drs_argument.py* - add comments to special arg make functions + display func to DrsArgument. [Neil Cook]
- *Core.core.drs_argument.py* - add display func + pep8 corrections. [Neil Cook]
- *Core.core.drs_recipe.py* - change DRSArgumentParser –> DrsArgumentParser. [Neil Cook]
- *Core.core.drs_argument.py* - add *display_funcs* and comments for Parser functions. [Neil Cook]
- *Misc.updates_to_drs.mk_night_wave.py* - add dymanic paths to EA code. [Neil Cook]
- *Science.extract.telluric.general.py* - change read –> readfits. [Neil Cook]
- *Science.extract.general.py* - change read –> *read_file.* [Neil Cook]

- *Science.calib.background.py + badpix.py + dark.py* - change read –> readfits. [Neil Cook]
- *Recipe.spirou.cal_wave_night_spirou.py* - pep8 changes. [Neil Cook]
- *Locale.core.drs_exceptions.py* - add _ _ main_ _ section. [Neil Cook]
- *Io.drs_fits.py* - change read –> readfits. [Neil Cook]
- *Drs_data.py* - change read –> readfits. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add force extract options. [Neil Cook]
- *Locale.core.drs_lang_db.py* - move constant/params text to dict (linked to language database) [Neil Cook]
- *Core.core.drs_file.py* - change read –> read file. [Neil Cook]
- *Core.core.drs_database.py* - change read to readfits (and *read_database)* [Neil Cook]
- *Core.constant.param_functions.py* - add *display_func* and comments. [Neil Cook]
- *Core.constants.constant_function.py* - add comments and display func. [Neil Cook]
- Update language database. [Neil Cook]

5.3.1.378 0.6.030 (2020-01-28)

- *Plotting.plot_functions.py* - pep8 clean up. [Neil Cook]
- *Science.calib.wave1.py* - add hclines and fplines arguments to *get_master_lines* (to get lists from file) and for reference file use these arguments to start with the master. [Neil Cook]
- *Plotting.plot_functions.py* - copy x and y in wave night plot function and catch nan in greater than less than with the "with warnings" command. [Neil Cook]
- Add *display_func.* [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.379 0.6.029 (2020-01-27)

- *Data.spirou.reset.runs.limited_run.ini* - update default *limited_run.ini.* [Neil Cook]
- Update spirou flow map. [Neil Cook]
- *Recipes.spirou.cal_wave_night_spirou.py* - remove breakpoint. [Neil Cook]
- *Locale.core.drs_exception.py* - add wlogbasic (basicalogger wrapper with same args as WLOG) [Neil Cook]
- DrsFitsFile.read –> *read_file.* [Neil Cook]
- *Core.core.drs_log.py* - move *display_func* main to *param_functions* - keep here the use of wlog and textentry (too low in *param_functions)* [Neil Cook]
- *Core.core.drs_file.py* - add *display_funcs* and change *read–>read_file.* [Neil Cook]
- *Core.core.drs_database.py* - add display funcs. [Neil Cook]
- *Core.core.drs_argument.py* - update *func_name* comments - no access to inputs cannot breakfunc here. [Neil Cook]
- *Core.constants.constant_functions.py* - add messages to show *func_name* breakfunc can't work here (too low) [Neil Cook]
- *Recipes.spirou.cal_wave_night_spirou.py* - correct typo set –> *set_sources.* [Neil Cook]
- *Recipes.spirou.cal_wave_night_spirou.py* - add rv properties to nprops. [Neil Cook]
- *Science.calib.wave1.py* - add wavefile, wavesource, nbo, deg to nprops. [Neil Cook]
- *Core.core.drs_startup.py* - breakpoint –> *break_point.* [Neil Cook]
- *Core.constants._ _init_ _.py* - breakpoint –> *break_point.* [Neil Cook]
- *Core.constants.param_functions.py* - rename breakpoint –> *break_point.* [Neil Cook]
- *Recipes.spirou.cal_wave_night_spirou.py* - add breakpoint to check errors. [Neil Cook]
- *Recipes.spirou.cal_wave_night_spirou.py* - replace hcfile and fpfile for *hc_e2ds_file* and *fp_e2ds_file.* [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - key *WAVE_NIGHT_WAVE* –> *WAVEMAP_NIGHT.* [Neil Cook]
- *Spirou_map* – update flow chart. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add shape to master sequence. [Neil Cook]
- *Spirou_map* – update flow chart. [Neil Cook]
- *Recipe.spirou.cal_shape_master_spirou.py* - add way to load fpmaster from file/calibDB – FOR DEBUG ONLY. [Neil Cook]

5.3.1.380 0.6.028 (2020-01-24)

- *Science.calib.shape.py* - EA changes to shape (remove *corr_ dx_ from_ fp)* [Neil Cook]
- Add new spirou flow maps. [Neil Cook]
- *Recipe.spirou.cal_ shape_ master_ spirou.py* - add breakpoint for debugging. [Neil Cook]
- *Plotting.plot_ functions.py* - change *corr_ dx_ from_ fp_ arr* to shifts. [Neil Cook]
- Language database. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add changes for wave master/night. [Neil Cook]
- *Misc.tools.compare_ e2ds.py* - add code to compare used calibrations between two e2ds files. [Neil Cook]
- Update spirou flow graph maps. [Neil Cook]

5.3.1.381 0.6.027 (2020-01-23)

- *Science.calib.wave1.py* - corrections after EA changes. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add rv plots to *cal_ Wave_ night* definition. [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - adjust *WAVE_ LITTROW_ QC* values. [Neil Cook]

5.3.1.382 0.6.026 (2020-01-22)

- *Science.calib.wave1.py* - disable the littrow QC (still breaking) [Neil Cook]
- *Recipe.spirou.cal_ wave_ master_ spirou.py + science.calib.wave1.py* - continue work on EA fixes. [Neil Cook]
- *Plotting.plot_ functions.py* - remove line and add markers to wave night plot. [Neil Cook]
- *Core.math.general.py* - deal with median = 0 (over half the points are zero) [Neil Cook]
- *Core.instruments.*.default_ constants.py + core.instruments.spirou.recipe_ defintions.py* - add *PLOT_ WAVENIGHT_ HISTPLOT.* [Neil Cook]
- *Documentation.working._ static.yed* - add yed diagrams. [Neil Cook]

5.3.1.383 0.6.025 (2020-01-21)

- *Misc.tools.nirps_ lsf.py* - EA tool to get the line spread function for NIRPS. [Neil Cook]
- *Recipes.spirou.cal_ wave_ master_ spirou.py*, *cal_ wave_ night_ spirou.py* and *science.calib.wave1.py* - continue work on EA changes to wave solution master/night combo. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - correct *cal_ wave_ night* outputs and plots. [Neil Cook]
- *Core.instruments.spirou.file_ defintions.py* - correct typo in *out_ wavem_ fp WAVE_ FP –> WAVEM_ FP.* [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - update *WAVE_ HC_ TFIT_ ORDER_ FIT_ CONT.* [Neil Cook]
- *Core.core.drs_ file.py* - added exclude groups to *copy_ original_ keys.* [Neil Cook]

5.3.1.384 0.6.024 (2020-01-20)

- *Recipes/spirou.cal_ wave_ *.py + science.calib.wave*.py* - continue work on implementing EA changes. [Neil Cook]
- *Science.telluric.general.py* - remove breakpoint. [Neil Cook]
- *Science.extract.general.py* - correct *add_ wave_ keys.* [Neil Cook]
- *Plotting.plot_ functions.py* - correct where we get nbo + add title. [Neil Cook]
- Update language database. [Neil Cook]
- Data.core..pdbrc - add alias commands to pdbrc for ease of use. [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - change wave fit degree from 4 –> 5 (EA: 4th order does not catch structure) [Neil Cook]
- *Core.core.drs_ startup.py* - add DebugExit class to catch pdb/ipdb exits. [Neil Cook]
- *Core.core.drs_ recipe.py* - add *make_ breakfunc* (special argument) [Neil Cook]
- *Core.core.drs_ log.py* - allow *display_ func* to have break at function name (if –breakfunc used) [Neil Cook]
- *Core.core.drs_ database.py* - fix display func. [Neil Cook]

- *Core.constants.param_functions.py* - fix breakpoint to have levels (set by .pdbrc) [Neil Cook]
- *Core.core.drs_argument.py* - add break function special argument. [Neil Cook]

5.3.1.385 0.6.023 (2020-01-17)

- *Io.drs_lock.py* - add some randomisation to the 240 reset. [Neil Cook]
- *Io.drs_lock.py* - reset the lock file after 240 seconds (can help with stuck lock files) [Neil Cook]
- *Science.extract.berv.py* - must define iteration for using *use_barycorrpy* (due to locking – both iterations will use same lock files) [Neil Cook]
- *Recipes/spirou.cal_wave_master_spirou.py* + *science.calib.wave1.py* - make changes for *cal_wave_master* (UNFINISHED) [Neil Cook]
- *Science.calib.shape.py* - fix *poly_cavity* (should be un-inverted) [Neil Cook]
- *Io.drs_lock.py* - need to re-check that path exists when creating lock file. [Neil Cook]
- Misc nirps directory. [Neil Cook]

5.3.1.386 0.6.022 (2020-01-16)

- *Setup.install.py* and pythoninstallion.rst - update recommended way to install python and modules. [Neil Cook]
- *Setup/install.py* - add comments on how installed (after installing conda) [Neil Cook]
- *Reipces.spirou.cal_wave_master_spirou.py* - add *cavity_poly* for FP master lines (always use the most up-to-date version) [Neil Cook]
- *Science.calib.wave.py* - move master line const to const file, move location of cavity file, add valid line print out to *get_master_lines*, add *fp_fit* paramets to llprops. [Neil Cook]
- *Science.calib.shape.py* - replace getting cavity file from old to new location (made in wave solution) [Neil Cook]
- *Recipe.spirou.cal_wave_master_spirou.py* - make note that we need to decide when/how to update cavity file. [Neil Cook]
- *Io.drs_data.py* - remove cavity file loading. [Neil Cook]
- Data.spirou.calib - update cavity files. [Neil Cook]
- *Core.instruments.*.deafult_constants.py* - remove cavity length constants. [Neil Cook]
- *Cal_wave_master_spirou.py* - fix inputs to *get_master_lines*. [Neil Cook]
- *Plotting.plot_functions.py* - fix waveref plot (for *get_master_lines)* [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* - fix pep8 + change *hclist_master* nad *fplist_master* to *drs_finput.* [Neil Cook]
- *Core.instruments.*.default_constants.py* - add WAVEREF constants. [Neil Cook]

5.3.1.387 0.6.021 (2020-01-15)

- *Science.calib.wave.py* - correct typos. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - change *WAVEM_HCLL –> WAVE_HCLL.* [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* - remove WAVEHCLL master (redundant) [Neil Cook]
- *Scuebce.telluric.general.py* - add lower and upper bounds for hband coming from constants. [Neil Cook]
- *Plotting.plot_functions.py* - add better comments and fix pep8. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add *MKTELLU_HBAND_LOWER* and *MKTELLU_HBAND_UPPER* and change *MKTELLU_QC_AIRMASS_DIFF* from 0.1 –> 0.3. [Neil Cook]
- *Plotting.plot_functions.py* - change style on plot point. [Neil Cook]
- *Science.telluric.general.py* - only use *good_domain* for the absorption fit. [Neil Cook]
- *Science.telluric.general.py* - test of *good_domain* (1500 to 1750 nm) [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* + *science.telluric.general.py* - add –use_template. [Neil Cook]
- *Plotting.plot_functions.py* - normalise for plotting. [Neil Cook]
- *Plotting.plot_functions.py* - correct measured transmission for plotting. [Neil Cook]
- *Plotting.plot_function.py* + *science.telluric.general.py* - correct plotting when having a template. [Neil Cook]
- *Science.telluric.general.py* - add breakpoint. [Neil Cook]

- *Core.core.drs_log.py* - fix typo lists should be appended for qc values + add master log analysier (add to *apero_log_stats* later?) [Neil Cook]
- *Recipes.spirou.obj_mk_template_spirou.py* - fix qc params when skipping object (must be lists) [Neil Cook]

5.3.1.388 0.6.020 (2020-01-14)

- *Core.core.drs_log.py* - make log more readable + add qc columns. [Neil Cook]

5.3.1.389 0.6.019 (2020-01-13)

- Update *master_tellu_SPIROU.txt.* [Neil Cook]
- Update documentation. [Neil Cook]
- Update version/date/changelog/documentation. [Neil Cook]

5.3.1.390 0.6.018 (2020-01-10)

- *Recipes.spirou.obj_mk_template_spirou.py* - add logging for when file is skipped (and qc passes) [Neil Cook]
- *Recipe.dev.apero_changelog.py* and *module.documentation.drs_changelog.py* - need to format changelog so it works as .rst file (for documentation) [Neil Cook]
- Update documentation. [Neil Cook]
- *Tools.module.documentation.drs_documentation.py* - make sure we copy the contents of output folder not the folder itself. [Neil Cook]
- *Tools.recipes.dev.apero_documentation.py* - add update option to making documentation (for updating doc website) [Neil Cook]
- *Tools.module.testing.drs_log_stats.py* - make sure path is in nights list + sort by htime. [Neil Cook]
- *Tools.resources.setup.apero.bash.setup** - correct typo – missing speech mark. [Neil Cook]
- *Science.calib.wave.py* - seperate master and old wave writing functions + add in night qc and write functions. [Neil Cook]
- *Cal_wave_night_spirou.py* - add in ccf computation. [Neil Cook]
- *Cal_wave_master_spirou.py* - change writing functions to master functions (to separate from *cal_wave – old*) - master now writes to key WAVEM. [Neil Cook]
- Update the *master_*_SPIROU.txt* files - default master files now *WAVEM_D_{fiber}* [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - need a set of files for master (can remove non-master if we go with master/night recipes) [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* - need a set of files for master (can remove non-master if we go with master/night recipes) [Neil Cook]
- *Core.instruments.spirou.default_keywords.py* - group all wave header keys. [Neil Cook]
- *Core.core.drs_startup.py* - add argument 'required' to *get_file_definition* to allow not finding a key and return None if this is the case. [Neil Cook]
- *Core.core.drs_log.py* - add pipes to the end of each qc to ease splitting in log analysis. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.calib.wave.py* - move logs to language database. [Neil Cook]
- *Setup.install.py* - remove blank spaces. [Neil Cook]
- Update date/version/changelog/documentation. [Neil Cook]

5.3.1.391 0.6.017 (2020-01-08)

- *Setup.install.py* - add dev section to modules (sphinx, ipdb, gitchangelog) [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - change dtype to 'bool' [Neil Cook]
- *Tools.recipe.general.apero_ log_ stats.py* - allow saving of all the log files to one file. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - update recipe print outs. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - correct error/warn sample. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - correct typo. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - keep all error/warning messages and use error/warn samples to keep just one for each code. [Neil Cook]
- Update language database. [Neil Cook]
- *Tools.module.testing.drs_ log.stats.py* - add separations between warnings/errors. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - add print out of unique errors/warnings. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - change eval –> int. [Neil Cook]
- *Drs_ startup.py* log file should use group (only used to save where log files are correctly) [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - try to locate log file if not found immediately. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - add check if log file exists. [Neil Cook]
- *Plotting.core.py* - try fix to plt.show, plt.close. [Neil Cook]
- *Core.constants.constant_ functions.py* - add parent/author to set method. [Neil Cook]
- Correct README.md. [Neil Cook]
- *Sciecne.calib.wave.py* - correct typo *IC_ LITTROW –> WAVE_ LITTROW*, move wave night params to config. [Neil Cook]
- Constants - start adding parents to keywords and add *wave_ night* constants. [Neil Cook]
- *Tools.module.testing.drs_ log_ stats.py* - change where we get the log fits file from. [Neil Cook]
- *Data/spirou/reset/runs/batch_ run.ini* - correct batch run as example of EA *mini_ data*. [Neil Cook]
- *Tools/resource/setup/** - update all environmental variables. [Neil Cook]
- *Misc.tools.ccf_ plot.py* - basic plot to plot all ccfs for a given object (minus the mean) [Neil Cook]
- *Setup.install.py* - astropy must be v3.2 or greater. [Neil Cook]
- *Tools.recipes.dev.apero_ changelog.py* - update locations of docs. [Neil Cook]
- *Tools.recipes.dev.apero_ documentation* - add codes to build documentation [unfinished] [Neil Cook]
- Re-build documentation. [Neil Cook]
- Update documentation (add fontawesome icons) [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - add *remake_ doc (apero_ documentation)* to recipe definitions. [Neil Cook]
- Reorganise documentation - move build into working dir and have an output dir. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- Update docs - *known_ issues* and todo. [Neil Cook]
- *Tools.module.documentation.drs_ changelog.py* - add function to update a file based on a prefix and add in a suffix. [Neil Cook]
- *Tools.recipes.dev.apero_ changelog.py* - add doc changes to changelog (including copying changelog) [Neil Cook]

5.3.1.392 0.6.016 (2020-01-06)

- *Misc.updates_ to_ drs.mk_ night_ wave.py* - question for EA. [Neil Cook]
- *Science.calib.wave.py* - continue work adding wave night functions. [Neil Cook]
- *Recipe.spirou.cal_ wave_ night_ spirou.py* - continue work on EA code. [Neil Cook]
- *Plotting.plot_ functions.py* - add wave night plots. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add debug plots to wave night recipe def. [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add wave night plots to constants. [Neil Cook]
- *Science.velocity.general.py* - add ccf per order normalisation to table 2 of ccf output. [Neil Cook]
- Continue work adding *cal_ wave_ night* functionality. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add *cal_ wave_ night* recipe. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - correct typo in raw file definition. [Neil Cook]
- *Io.drs_ lock.py* - mkdir can be accessed by two parallel processes at the same time - try 10 times with a sleep timer to allow one to complete and other to pass on before raising an error (due to e.g. bad file path) [Neil Cook]

- *Tools.module.setup.drs_processingl.py* - if we have a master item do not skip if file is missing (cause error) [Neil Cook]
- *Tools.resources.setup.** - add alias to installation dir. [Neil Cook]
- *Setup/inall.py* - add –name to *install.py* to allow different profiles to be set up on the same system. [Neil Cook]
- Update changelog/version/date. [Neil Cook]
- Add apero-data and gitignore contents. [Neil Cook]
- *Core.instruments.default.deafult_ config.py* - change default locations to a relative location. [Neil Cook]
- *Core.core.drs_ startup.py* - do not index if there are no outputs (including lock) [Neil Cook]
- *Tools.recipe.general.apero_ validate.py* - remove recipe log from non- instrument recipe. [Neil Cook]

5.3.1.393 0.6.015 (2020-01-04)

- *Io.drs_ lock.py* - remove unused imports. [Neil Cook]
- *Io.drs_ fits.py* - all writing to file must be locked (for parellisation) based on filename. [Neil Cook]
- *Science.telluric.general.py* - change write −> *write_ file.* [Neil Cook]
- *Science.polar.general.py* - change write −> *write_ file.* [Neil Cook]
- *Science.extract.general.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.wave.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.shape.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.localisation.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.flat_ blaze.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.dark.py* - change write −> *write_ file.* [Neil Cook]
- *Science.calib.badpix.py* - change write −> *write_ file.* [Neil Cook]
- *Recipe.spirou.cal_ wave_ spirou.py* - change write −> *write_ file.* [Neil Cook]
- *Recipe.spirou.cal_ Wave_ master_ spirou.py* - change write −> *write_ file.* [Neil Cook]
- *Recipe.spirou.cal_ thermal_ spirou.py* - change write −> *write_ file.* [Neil Cook]
- *Recipes.spirou.cal_ preprocess_ spirou.py* - change write −> *write_ file.* [Neil Cook]
- *Recipes.spirou.cal_ extract_ spirou.py* - change write −> writelog. [Neil Cook]
- *Core.core.drs_ file.py* - change write −> *write_ file* (more unique) [Neil Cook]

5.3.1.394 0.6.014 (2020-01-03)

- *Io.drs_ lock.py* - make all lock files under the *DRS_ DATA_ MSG* path (not the group modified path) [Neil Cook]
- *Io.drs_ lock.py* - add absolute path to the files. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- *Core.core.drs_ log.py* - if *use_ group=False* need to reset *drs_ data_ msg* (otherwise it will already have group name in even if group=None) [Neil Cook]
- *Tools.module.setup.drs_ reset.py* - remove breakpoint. [Neil Cook]

5.3.1.395 0.6.013 (2020-01-02)

- Continue work on sphinx documentation (html and linux) [njcuk9999]
- *Recipes.spirou.cal_ extract_ spirou.py* - remove breakpoint. [Neil Cook]
- *Core.core.drs_ startup.py* - make sure log file does not use group (different groups may need to lock same file) [Neil Cook]
- *Core.core.drs_ log.py* - give an option to turn off using group. [Neil Cook]
- *Recipes.spirou.cal_ extract_ spirou.py* - force breakpoint. [Neil Cook]
- *Recipes.spirou.cal_ extract_ spirou.py* - add breakpoint to help find problem. [Neil Cook]
- *Core.core.drs_ log.py* - pep8 correction. [Neil Cook]

5.3.1.396 0.6.012 (2019-12-31)

- Start of documentation with Sphinx. [njcuk9999]

5.3.1.397 0.6.011 (2019-12-23)

- *Core.core.drs_ log.py* - try to catch log problems. [Neil Cook]
- Update date/version/changelog/readme. [Neil Cook]

5.3.1.398 0.6.010 (2019-12-19)

- *Science.calib.wave.py + recipes.spirou.cal_ wave_ master_ spirou.py* - add hc/fp line creation from EA. [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add *PLOT_ WAVEREF_ EXPECTED*. [Neil Cook]
- *Plotting.plot_ functions.py* - add *plot_ waveref_ expected*. [Neil Cook]
- *Io.drs_ data.py* - add a raw mode for getting the cavity file. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.py* - add plot *WAVEREF_ EXPECTED* for hc/fp lines. [Neil Cook]
- *Core.instrumnets.*.pseudo_ const.py* - add *FIBER_ DPR_ POS* (correct dpr type for fiber) [Neil Cook]
- *Core.instruments.spirou.file_ defintions.py* - add dbname,key and datatype for hc and fp master line files. [Neil Cook]
- Re-make directories (if they don't exist) [Neil Cook]
- *Io.drs_ lock.py* - replace *_ _ remove_ _ empty_ _* function. [Neil Cook]
- *Core.core.drs_ log.py* - only continue with *DRS_ DATA_ MSG_ FULL* if it exists. [Neil Cook]
- *Core.core.drs_ startup.py* - fix location of where we define *drs_ data_ msg_ full* the first time. [Neil Cook]
- *Core.core.drs_ startup.py* - must pass group to log dir. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - deal with KeyboardInterrupt. [Neil Cook]
- *Drs_ log.py* - sort out log structure. [Neil Cook]
- *Drs_ reset.py* - should not remove read of path. [Neil Cook]
- Update the reset codes to reset log.fits files. [Neil Cook]
- *Core.core.drs_ startup.py* - only use recipe.log if *recipe_ kind* = 'recipe' [Neil Cook]
- *Core.core.drs_ log.py* - set logfitsfiles name from constants. [Neil Cook]
- *Core.instruments.default.default_ config.py* - add *DRS_ LOG_ FITS_ NAME*. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_ lock.py* - replace print statements for WLOG. [Neil Cook]
- Add reset options to run files. [Neil Cook]
- Remove recipe.log from non-recipe scripts (i.e. tools) [Neil Cook]
- *Core.core.drs_ startup.py* - address not initially having instrument for *DRS_ RECIPE_ KIND*. [Neil Cook]
- *Core.core.drs_ startup.py* - correctly manage KeyboardInterrupts. [Neil Cook]
- Correctly manage KeyboardInterrupts. [Neil Cook]
- *Core.core.drs_ log.py* - add way to add an error (if found at the right time) [Neil Cook]
- *Core.instruments.default.pseudo_ const.py* and *io.drs_ lock.py* - update *drs_ data_ msg* path (to full path) [Neil Cook]
- *Core.core.drs_ startup.py* - get recipe kind and add to params and figure out how to log to files only once we have correct information. [Neil Cook]
- *Core.core.drs_ log.py* - add *recipe_ kind* to *recipe_ log*. [Neil Cook]
- *Core.instruments.*.recipe_ definitions.py* - add a kind to every recipes ("test","recipe","tool","processing") for logging. [Neil Cook]
- *Core.core.drs_ recipe.py* - add a recipe kind (for logging) [Neil Cook]
- *Core.core.drs_ log.py* - sort logs into night names and by *recipe_ kind*. [Neil Cook]
- *Core.core.drs_ log.py* - add group and runstring to recipe log fits file. [Neil Cook]
- Update date/version/changelog/readme. [Neil Cook]
- Update doc string. [Neil Cook]

5.3.1.399 0.6.009 (2019-12-18)

- *Core.core.drs_log.py + drs_log_stats.py* - add option to save time of file and then do log analysis on –since –before log files only. [Neil Cook]
- *Recipes/test/blank_spirou.py* - blank recipe. [Neil Cook]
- Update doc strings for recipes. [Neil Cook]
- *Misc/updates_to_drs/mk_night_wave.py* - EA code to do nightly wavelength solution. [Neil Cook]
- *Plotting.plot_functions.py* - log scale on some wave plots. [Neil Cook]
- *Science.calib.wave.py* - update wave triplet fit by EA. [Neil Cook]
- *Science.calib.wave.py* - add breakpoint to look at wave res map problem. [Neil Cook]
- *Science.calib.wave.py* - EA changes to triplets fit. [Neil Cook]
- *Recipe/spirou/cal_wave_spirou.py* - force initial wavelength solution as the master. [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - change the number of triplet iterations to 1. [Neil Cook]
- *Science.calib.wave.py* - EA modifications to triplet fitting. [Neil Cook]
- Update changelog.md to include *core.core.drs_recipe* fixes. [Neil Cook]
- *Core.core.drs_recipe.py* - add other list arguments – attempt to correct bug. [Neil Cook]
- *Core.core.drs_recipe.py* - add other list arguments (i.e. –fpfiles=X Y Z) as separate elements of *str_arg_list.* [Neil Cook]
- *Core.core.drs_recipe.py* - add other list arguments (i.e. –fpfiles=X Y Z) as separate elements of *str_arg_list.* [Neil Cook]
- Update date/version/changelog/readme. [Neil Cook]

5.3.1.400 0.6.008 (2019-12-17)

- README.md - correct typo "processing" –> *"apero_processing"* [Neil Cook]
- *Setup/install.py* - install.update does not require "args" as input. [Neil Cook]
- *Drs_log_stat* - reset the code to remove xytext change (doesn't work currently) [Neil Cook]
- *Science.calib.wave.py* - add EA changes (no *linear_minimisation* now use *wave_lmfit)* [Neil Cook]
- Update language database. [Neil Cook]
- *Core.core.drs_startup.py* - only start in quiet mod if fkwargs['quiet'] is True. [Neil Cook]
- *Core.core.drs_recipe.py* - fix bug introduced by having –arguments only (need to append all list items to string for *self.str_arg_list.* [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - tweak hc tfit order fit continuum parameters (EA) [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - change hc tfit order fit continuum constants (EA) [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - lower the values of the wave hc tfit order fit continnum (EA) [Neil Cook]
- *Science.calib.wave.py* - add breakpoint to test problem. [Neil Cook]
- *Science.calib.wave.py* - attempt fix of wave solution triplets rms diverging. [Neil Cook]
- *Science.calib.wave.py* - add breakpoint. [Neil Cook]
- *Science.calib.flat_blaze.py* - EA played with bounds. [Neil Cook]
- *Tools.recipes.general.apero_log_stats.py* - tweak plot. [Neil Cook]
- *Tools.recipes.general.apero_log_stats.py* - tweak plot. [Neil Cook]
- *Tools.recipes.general.apero_log_stats.py* - add recipe mode - correct bug. [Neil Cook]
- *Tools.recipes.general.apero_log_stats.py* - add recipe mode. [Neil Cook]
- *Plotting.plot_functions.py* - correct pep8. [Neil Cook]
- *Science.calib.wave.py* - remove break points. [Neil Cook]
- *Science.calib.flat_blaze.py* - add comments to EA new additions. [Neil Cook]
- *Science.calib.dark.py* - correct bug *dark_time* must be an array. [Neil Cook]
- Changelog/readme/date/version. [Neil Cook]

5.3.1.401 0.6.007 (2019-12-16)

- *Tools/bin/apero_log_stats.py* - start adding options for stats on specific recipes. [Neil Cook]
- *Science/extract/other.py* - add extra printout to show files were extracted and loaded from extraction (before silent in log) [Neil Cook]
- *Science/extract/extraction.py* - add extra arguments for *calculate_blaze_flat_sinc.* [Neil Cook]
- *Science.calib.flat_blaze.py* - fix issue with fitting blaze function (and given better error if *curve_fit* fails) [Neil Cook]
- *Science.calib.dark.py* and *science.calib.shape.py* - make sure files for cubes are deep copied (try to prevent memory issues) [Neil Cook]
- *Cal_wave_spirou.py* - update convergence test on hc solution (EA bug fix) [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* - add recipe argument to log stats. [Neil Cook]
- Data.core.runs - *limited_run.ini* - update the default limited run. [Neil Cook]
- *Install.py / drs_installation.py* - Allow user to define all userinputs from the command line (Issue #579) [Neil Cook]
- *Drs_startup.py* - need to re-set the instrument when found in params. [Neil Cook]
- Update changelog/data/version/readme. [Neil Cook]

5.3.1.402 0.6.006 (2019-12-13)

- Update non-instrument specified recipes (and make sure *apero_processing* can be run correctly from main call. [Neil Cook]
- *Drs_startup.py* - need to be careful when we don't have an instrument set. [Neil Cook]
- *Setup.install.py* - correct help string. [Neil Cook]
- *Tools.module.testing.drs_log_stats.py + tools.recipes.general.py* - add log stat code to *apero_log_stats.py.* [Neil Cook]
- *Plotting.plot_functions.py* - add *plot_logstats_bar* plot. [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* - add logstats recipe. [Neil Cook]
- Update language database and add recipe to *apero_tools.* [Neil Cook]
- *Tools.module.documentation.drs_changelog.py* - update VERSIONSTR/DATESTR with changes to const files. [Neil Cook]
- Update *default_config/default_constants* with groups and some descriptions. [Neil Cook]
- *Core.core.drs_startup.py* - allow quiet to be passed from fkwargs. [Neil Cook]
- *Core.core.drs_log.py* - move textwrap to constants. [Neil Cook]
- *Core.constants.param_functions.py* - add *"from_file"* and "cache" optiosn to *load_config* (for installation purposes) [Neil Cook]
- *Core.constants.constant_functions.py* - move textwrapper here, add description to constants, add *write_line* method for writing user configs + add '=' to end of update string to make constants unique. [Neil Cook]
- *Setup.install.py + drs_installation.py* - add an update mode to the *install.py* (and fix reset bug) [Neil Cook]

5.3.1.403 0.6.005 (2019-12-12)

- Updates to installation script (UNFINISHED) [Neil Cook]
- *Io.drs_lock.py* - change warning message (name.lock) [Neil Cook]
- *Cal_preprocessing_spirou.py* - typo fix qc inputs. [Neil Cook]
- *Core.core.drs_recipe.py* - change "-" to "–" [Neil Cook]
- Update tools with recipe log. [Neil Cook]
- *Science.telluric.genearl.py* - return *qc_params* and passed in qc functions. [Neil Cook]
- *Core.core.drs_log.py* - add *no_qc* and RECIPE to log file and only write newlog on *add_level.* [Neil Cook]
- *Cal_thermal_spirou.py* - add *no_qc.* [Neil Cook]
- *Science.preprocessing.general.py* - add quality control to function. [Neil Cook]
- *Science.calib.badpix.py* - remove redundant code. [Neil Cook]
- Modify recipes and add recipe logging. [Neil Cook]

5.3.1.404 0.6.004 (2019-12-12)

- *Recipe.spirou.** - test locking [not working yet] [Neil Cook]
- *Io.drs_lock.py* - provide function to lock function. [Neil Cook]
- *Core.ocre.drs_startup.py* - setup the recipe log. [Neil Cook]
- *Core.core.drs_recipe.py* - add a self.log to store to RecipeLog. [Neil Cook]
- *Core.core.drs_log.py* - add RecipeLog. [Neil Cook]
- Make sure all arguments that are words start with – [Neil Cook]
- Update date/changelog/version. [Neil Cook]

5.3.1.405 0.6.003 (2019-12-10)

- Update README.md. [Neil Cook]
- *Tools.module.listing.file_explorer.py* - deal with no ds9 path set (Issue #576) [Neil Cook]
- Fix typos for *apero_validate* and *apero_reset* (Issue #577) [Neil Cook]
- *Core.instruments.default.pseudo_const.py* - modify logfile to have .log and latex to replace .log (make unique) [Neil Cook]
- *Core.instruments.default.default_config.py* - *DRS_DS0_PATH* and *DRS_PDFLATEX_PATH* should be str not 'path' (Issue #576) [Neil Cook]
- Localisation - remove breakpoints. [Neil Cook]
- Update readme *(cal_preprocessing –> cal_preprocess)* [Neil Cook]
- *Localisation.py* - fix bug with loc order 0. [Neil Cook]
- *Science.calib.localisation.py* - move break point. [Neil Cook]
- *Science.calib.localisation.py* - changes to fix loc. [Neil Cook]
- *Cal_loc_spirou.py* - move break point. [Neil Cook]
- *Cal_loc_spirou.py* - add breakpoint to test qc failure. [Neil Cook]
- *Tools.module.setup.py* - *drs_installation.py* - add to clean install message. [Neil Cook]
- README.md - update read me with extra comments. [Neil Cook]
- Prepare *cal_wave_master_spirou.py.* [Neil Cook]
- *Tools.module.setup.drs_installation.py* - update 'apero-validate.py' –> 'apero_validate.py' [Neil Cook]
- *Recipes.spirou.cal_wave_spirou.py* - correct typo in comment. [Neil Cook]
- *Science.calib.wave.py* - add a TODO. [Neil Cook]
- *Tools.modules.setup.drs_processing.py* - correct returns for *prerun_test()* [Neil Cook]
- Change the *file_explorer* name. [Neil Cook]
- *Core.core.drs_recipe.py* - fix telluric test. [Neil Cook]
- Update config/changelog/readme/version. [Neil Cook]

5.3.1.406 0.6.002 (2019-12-09)

- *Core.core.drs_recipe.py* - change souce of tellurics (shouldn't be here) [Neil Cook]
- Get whitelist for tellurics in *drs_processing.py.* [Neil Cook]
- *Tools.module.setup.drs_processing.py* - add a pre-run test to test if files exist before running. [Neil Cook]
- *Tools.module.listing.file_explorer.py* - update plotting function and check before loading ds9. [Neil Cook]
- *Science.velocity.general.py* - remove old function *(create_drift_file)* [Neil Cook]
- *Science.extract.crossmatch.py* - add simbad query (when we have no ra and dec and only have object name) [Neil Cook]
- *Science.calib.wave.py* - remove todo. [Neil Cook]
- *Science.calib.localisation.py* - add rorder to params (for plotting) [Neil Cook]
- *Science.calib.flat_blaze.py* - make it clear *calculate_blaze_flat* should not be used. [Neil Cook]
- *Recipes.spirou.cal_shape_master_spirou.py* - remove master cube npy debug. [Neil Cook]
- Plotting - add general use image/plot functions + add cursor + add main() and allow use without recipe defined + add new graph type "show" [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_table.py* - remove redundant lock checks (new system works better) [Neil Cook]
- *Io.drs_lock.py* - push messages into language database. [Neil Cook]
- *Io.drs_data.py* - remove todo. [Neil Cook]
- *Core.math.gauss.py* - remove todo here. [Neil Cook]

- *Core.instruments.spirou.recipe_ definitions.py* - add plots that were missing. [Neil Cook]
- *Core.instruments.default.file_ defintions.py* - remove unused file objects. [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - add Help strings. [Neil Cook]
- *Core.instruments.*.default_ *.py* - add config/constants/keyword args. [Neil Cook]
- *Core.core.drs_ recipe.py* - deal with *TELLURIC_ TARGETS* being set to None (get all) [Neil Cook]
- *Core.core.drs_ log.py* - remove old WLOG string warning. [Neil Cook]
- *Core.core.drs_ database.py* - set Database constants from constants files. [Neil Cook]
- *Core.core.drs_ argument.py* - add help string for *set_ quiet.* [Neil Cook]
- Convert readme.md to pdf. [Neil Cook]
- Add subsections to contents in README.md. [Neil Cook]
- Add descriptions for each recipe in the README.md. [Neil Cook]
- Correct typo in readme. [Neil Cook]
- Update changelog/version/date. [Neil Cook]
- Correct typos in *file_ definitions.* [Neil Cook]
- Update the read me with recipe + output descriptions. [Neil Cook]

5.3.1.407 0.6.001 (2019-12-06)

- Remove old breakpoints. [Neil Cook]
- *Science.calib.wave.py* - add breakpoint for debugging. [Neil Cook]
- *Flat_ blaze.py* - fix bug with sinc fitting (bounds for quad and cube parameters to constraining) [Neil Cook]
- Add error dumps directory. [Neil Cook]
- *Io.drs_ lock.py* - make all lock files go to the log/lock dir and add a way to remove all empty ones of these (after processing is complete) using *drs_ lock.reset_lock_ dir.* [Neil Cook]
- Update the Lock (not longer need lockdir –> will all go to log directory (under the a lock dir) [Neil Cook]
- Update README.md. [Neil Cook]
- Update README.md. [Neil Cook]
- *Io.drs_ lock.py* - remove the lock directory if directory is empty. [Neil Cook]
- *Science.calib.wave.py* - badvalues must be a string list. [Neil Cook]
- *Core.core.drs_ startup.py* - random seed needs to be set to randomise the cores. [Neil Cook]

5.3.1.408 0.5.124 (2019-12-05)

- *Tools.module.setup.drs_ processing.py* - set *multi_ process* back to group by core (Process) [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - correct typo manager.event –> manger.Event. [Neil Cook]
- Update language database. [Neil Cook]
- Parallel test2 - test out Pool (from @cusher) [Neil Cook]
- *Tools.modules.setup.drs_ processing.py* - test out Pool (from @cusher) [Neil Cook]
- Add second parallel check based on @cusher example. [Neil Cook]
- Update log and group names (slightly shorter - no host) [Neil Cook]
- Update *analyse_ logs.py.* [Neil Cook]
- *Core.core.drs_ startup.py* - add a random set of charaters to the end of pid to make unique. [Neil Cook]
- Add contents to main README.md. [Neil Cook]
- Update default run scripts. [Neil Cook]
- *Tools.module.setup.drs_ reset.py* - change empty dir param (typo) [Neil Cook]
- Update paths given changes to tool name/location. [Neil Cook]
- Update paths given changes to tool name/location. [Neil Cook]
- Remove dashes from program names to allow importing. [Neil Cook]

5.3.1.409 0.5.123 (2019-12-05)

- *Core.drs_startup.py* - make sure pids are really unlikely to be the same (add random component) [Neil Cook]
- *Io.drs_lock.py* - deal with folder/queue files disappear during lock process. [Neil Cook]
- *Misc/problems/** - add copy to analyse log files for preprocessing + modify the parallel test. [Neil Cook]
- *Tools.module.setup.drs_processing.py* - change grouping –> only number of cores files per group (instead of total/cores per group per recipe) [Neil Cook]
- *Recipe/spirou/cal_preprocess_spirou.py* - change error message. [Neil Cook]

5.3.1.410 0.5.122 (2019-12-04)

- *Misc.problems.parellel_test_20191203.py* - minimum working version of parallisation problem. [Neil Cook]
- *Misc.problems.parellel_test_20191203.py* - minimum working version of parallisation problem. [Neil Cook]
- *Core.core.drs_startup.py* - add SystemExit to the possible exceptions to catch. [Neil Cook]
- Add an export command to *file_explorer.* [Neil Cook]
- *Tools.module.setup.drs_installation.py* - make optional programs not create "None" path. [Neil Cook]
- *Tools.module.setup.drs_installation.py* - fix typo. [Neil Cook]
- *Setup/install.py* - check for python 3. [Neil Cook]
- Add ds9/pdflatex to the codes. [Neil Cook]
- Add *DRS_DS9_PATH* and *DRS_PDFLATEX_PATH* to constants. [Neil Cook]
- *Tools.module.setup.drs_installation.py* - macs still suck. [Neil Cook]
- *Tools.module.setup.drs_installation.py* - macs suck. [Neil Cook]

5.3.1.411 0.5.121 (2019-12-02)

- Add README.md to bin and dev tool folders. [Neil Cook]
- Change $\_\_INSTRUMENT\_\_$ = None to $\_\_INSTRUMENT\_\_$ = 'None' and move tools/bin and tools/dev to the new loc + add chmod + symlinks. [Neil Cook]
- – make *file_explorer.py* work again. [Neil Cook]
- Add runs to default user config files. [Neil Cook]
- Add README.md to reset run files. [Neil Cook]
- *Tools.bin.reset.py + drs_reset.py* - add run files to reset. [Neil Cook]
- *Core.instruments.*.default_config.py* - add *DRS_RESET_RUN_PATH.* [Neil Cook]
- Add reset run files. [Neil Cook]
- *Science.preprocessing.identification.py* - fileset must be string to go into .join. [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* - add the *pp_lfc_lfc* to *pp_file* set. [Neil Cook]
- *Science.calib.general.py* - catch warnings for unphysical pixel nan setting. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.412 0.5.120 (2019-11-29)

- Replace old locking mechanism with new one. [Neil Cook]
- *Science.calib.general.py* - fix upper and lower limit after conversion to electrons. [Neil Cook]
- *Science.extract.extraction.py* - change breakpoint location. [Neil Cook]
- Change breakpoint location. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.calib.flat_blaze.py* - add breakpoint. [Neil Cook]
- *Tools.module.setup.drs_installation.py* - correct install messages. [Neil Cook]
- *Apero/tools/module/setup/drs_installation.py + setup.install.py* - update the installation after Etienne's first attempt. [Neil Cook]
- Update README.md. [Neil Cook]
- Processing add to README.md. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]

- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Drs_startup + drs_lock* - continue to test the locking mechanism. [Neil Cook]
- *Core.core.drs_database.py* - correct typo. [Neil Cook]

5.3.1.413 0.5.119 (2019-11-29)

- *Io.drs_lock.py* - change name of function in @sync call. [Neil Cook]
- *Drs_startup + drs_lock* - try to improve locking. [Neil Cook]
- *Core.core.drs_startup.py* - correct name of function. [Neil Cook]
- *Io.drs_table.py* - remove use of locking (for debug) [Neil Cook]
- *Io.drs_lock.py* - add a randomisation to the wait time (so multiple hits don't start at the same time) [Neil Cook]
- Add to readme. [Neil Cook]
- Test out new lock. [Neil Cook]
- Add more readme.md. [Neil Cook]
- Merge remote-tracking branch 'origin/dev' into dev. [Neil Cook]
- Update README.md. [Neil Cook]
- Update readme.md. [Neil Cook]
- Update readme.md. [Neil Cook]
- *Io.drs_lock.py* - add a printout when file unlocks (debug?) [Neil Cook]
- Update language database. [Neil Cook]
- Update the README.md with new installation instructions. [Neil Cook]
- *Tools.module.setup.drs_installation.py* - add in skipping of reset if not *clean_install* (and print that we are doing reset) [Neil Cook]
- Update *data_example.* [Neil Cook]
- *Science.calib.general.py shape.py* - fix typo and remove breakpoint. [Neil Cook]
- *Scence.calib.general.py* - remove unphysical pixel values (set to NaN) [Neil Cook]
- *Io.drs_image.py* - fix for high bad pixels (clean with border) [Neil Cook]
- *Core.instruments.*.default_keywords.py* - add frmtime and saturate + add comments for input header keys. [Neil Cook]
- *Io.drs_table.py* - change the locking order. [Neil Cook]
- *Science.calib.shape.py* - move breakpoint. [Neil Cook]
- Update debug table. [Neil Cook]
- *Science.calib.shape.py* - remove old breakpoint. [Neil Cook]
- Add breakpoints and saving of fpcube for debug. [Neil Cook]
- *Science.calib.background.py* - correct axis order in *sz_small.* [Neil Cook]
- Add *dark_fp_sky* and *lfc_lfc* file types. [Neil Cook]
- *Core.core.drs_startup.py* - fix for quiet always being found (even when None) [Neil Cook]
- *Core.instruments.spirou.default_config.py* - remove INTROOT references. [Neil Cook]
- *Io.drs_table.py* - try to add more informative error in *write_table* (index.fits is not saving every time in parallel) [Neil Cook]

5.3.1.414 0.5.118 (2019-11-27)

- Etiennes speed up codes. [Neil Cook]
- *Tools.module.setup.drs_reset.py* - update *__NAME__* [Neil Cook]
- *Tools.module.setup.drs_installation.py* - add print headers, add validation command, add quiet mode to reset, add paths before executing os.system commands. [Neil Cook]
- *Tools.dev.requirement_check.py* - add code (from SpirouDRS) to check requirements. [Neil Cook]
- *Tools.bin.validate.py* - add code to validate (for now just a splash screen) [Neil Cook]
- *Setup.install.py* - add validation check for required/recommended modules. [Neil Cook]
- Remove unused imports. [Neil Cook]
- *Misc.fast_convolve_correct_local_background.py* - etiennes correct to add (speed up) [Neil Cook]
- Remove unused imports. [Neil Cook]

- *Core.instruments.default.recipe_ definitions.py* - add *required_ check* program (in tools) [Neil Cook]
- Update permissions. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.core.*.py* - add quiet option so setup info/splash is not displayed. [Neil Cook]
- *Core.constants.param_ functions.py* - add window size function. [Neil Cook]
- Tools.resources.setup - rename from terrapipe –> apero. [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - fix problem with listing.instrument name and add validate placeholder. [Neil Cook]
- Update .gitignore. [Neil Cook]
- Terrapipe –> apero, move INTROOT2 to .., move INTROOT to misc. [Neil Cook]
- Terrapipe –> apero, move INTROOT2 to .., move INTROOT to misc. [Neil Cook]
- Terrapipe –> apero, move INTROOT2 to .., move INTROOT to misc. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - correct *out_dark_master* (accept *dark_dark_tel* and *dark_ dark_ int)* [Neil Cook]
- *Setup.install.py* - add a todo (need to make sym links) [Neil Cook]
- *Tools.module.setup.drs_ reset.py* - add functionality to skip warning if folder is empty (there is no point warning if we have an empty folder) [Neil Cook]
- *Tools.module.setup.drs_ installation.py* - add functionality to install drs. [Neil Cook]
- *Setup/install.py* - fill out the installation code (formally in *drs_installation.py)* [Neil Cook]
- *Tools.bin.reset.py* - add directory to *reset_ confirmation.* [Neil Cook]
- *Tools.bin.validate.py* - add placeholder (needs filling out) [Neil Cook]
- *Tools.resources.setup/** - add env setup codes. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.415 0.5.117 (2019-11-26)

- *Recipes.spirou.obj_ fit_ tellu_ db_ spirou.py + obj_ mk_ tellu_ db_ spirou.py + obj_ spec_ spirou.py* - add global output list for displaying errors at the end. [Neil Cook]
- *Recipes.spirou.obj_ fit_ tellu_ db_ spirou.py + obj_ mk_ tellu_ db_ spirou.py + obj_ spec_ spirou.py* - add global output list for displaying errors at the end. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - *run_ process* and *combine_ outlist.* [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add *run_ process* function to run a recipe. [Neil Cook]
- *Science.extract.other.py* - remove breakpoint. [Neil Cook]
- Recipes.spirou - change *pol_ spirou* name + add place holders for *obj_ spec_ spirou* and *obj_ pol_ spirou.* [Neil Cook]
- *Recipes.spirou.obj_ fit_ tellu_ db_ spirou.py obj_ mk_ tellu_ db_ spirou.py* - add new functions to *run_ process.* [Neil Cook]
- *Recipes.spirou.obj_ fit_ tellu_ db_ spirou.py obj_ mk_ tellu_ db_ spirou.py* - add new functions to *run_ process.* [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add *obj_ spec_ spirou* and *obj_ pol_ spirou.* [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - add white/black list kwarg to processing. [Neil Cook]
- *Core.core.drs_ startup.py* - Add a group title to header (if in group) [Neil Cook]
- *Core.constants.param_ functions.py* - if we have a list then just return *(map_ listparameter* function) [Neil Cook]
- *Recipes.spirou.cal_ thermal_ spirou.py* - add log message for writing thermal files. [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - set *thermal_ always_ extract* to False. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - move *group_ name* to *drs_ startup.* [Neil Cook]
- *Tools.bin.processing.py* - update link to *group_ name* (now in *drs_ startup)* [Neil Cook]
- *Science.extract.other.py* - add breakpoint to test code. [Neil Cook]
- *Recipes.spirou.cal_ thermal_ spirou.py* - remove breakpoint. [Neil Cook]
- *Core.core.drs_ startup.py* - move *group_ name* construct from processing to *drs_ startup.* [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - construct group name and pass it to recipe via *linear_ process.* [Neil Cook]
- *Tools.bin.processing.py* - generate group name. [Neil Cook]
- *Recipes.spirou.cal_ thermal_ spirou.py* - add breakpoint for debugging. [Neil Cook]
- *Core.instruments.spirou.default_ keywords.py* - change order to reflect current and wanted input header keys.

[Neil Cook]

- *Core.core.drs_ log.py* - add group handling. [Neil Cook]
- *Core.core.drs_ startup.py* - add group handling. [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - update the dtype setting for –cores in processing recipe. [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - update the default setting for –cores in processing recipe. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add blacklist, whitelist, cores and test run arguments from user input. [Neil Cook]
- *Tools.bins.processing.py* - update instrument name. [Neil Cook]
- *Core.instruments.default.recipe_ definitions.py* - add arguments to processing recipe. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.calib.wave.py* - correct input to *get_ input_ files.* [Neil Cook]
- *Core.core.drs_ database.py* - add in debug function names to find problem. [Neil Cook]
- *Science.calib.dark.py* - add dprtype to dprtypes for dark master table. [Neil Cook]
- *Recipes.spirou.cal_ dark_ master_ spirou.py* - get allowed types as a list. [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - add $DARK\_ DARK\_ INT$ to dark master allowed types. [Neil Cook]
- *Science.calib.dark.py* - add dprtype to dark table. [Neil Cook]
- *Recipes.spirou.cal_ dark_ master_ spirou.py* - allow dark master to use multiple *dark_ dark* types. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - allow *cal_ badpix* to use *dark_ dark_ tel* and *dark_ dark_ int.* [Neil Cook]
- *Io.drs_ fits.py* - improve id file error. [Neil Cook]
- Update language database. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.416 0.5.116 (2019-11-15)

- *Tools.module.setup.drs_ processing.py* - remove breakpoint. [Neil Cook]
- *Science.extract.general.py* - fix input to *get_ input_ files.* [Neil Cook]
- *Science.extract.berv.py* - remove breakpoint. [Neil Cook]
- *Science.calib.wave.py* - correct pep8. [Neil Cook]
- *Science.calib.general.py* - add darkfile, abdpixfile, backfile from kwargs. [Neil Cook]
- *Core.constants.param_ functions.py* - disable the Ctrl+C –> breakpoint functionality it doesn't work well. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - deal with optional file args being requested. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add extra keys to default run keys. [Neil Cook]
- *Core.core.drs_ startup.py* - set the source when debug mode taken from arguments. [Neil Cook]
- *Core.constants.param_ functions.py* - add info and history functions to ParamDict and cache some settings for immediate use. [Neil Cook]
- *Science.preprocessing.identification.py* - fix return to *fix_ header* (for case where we have an input infile) [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add defaults after only if not found and warn user. [Neil Cook]
- Update language database. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - add default run keys (for when values are not in files) [Neil Cook]
- *Science.velocity.general.py* - add ccf mask to suffix of output file. [Neil Cook]
- *Science.velocity.general.py* - add ccf mask to suffix of output file. [Neil Cook]
- Add masks from Andres. [Neil Cook]
- *Science.prprocessing.identification.py* - *fix_ header*: fix return when no infile given. [Neil Cook]
- *Tools.module.setup.drs_ processing.py* - *fix_ header* make sure header comes in as keyword argument. [Neil Cook]
- Science.preprocessing - add recipe as arg in *fix_ header* (and push to *pseudo_ const.py)* [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- *Science.velocity.general.py* - make sure users input of ccf step and width is good (ccfstep < ccfwidth / 10) [Neil Cook]
- *Core.instruments.default.*.default_ constants.py* - add $CCF\_ MAX\_ CCF\_ WID\_ STEP\_ RATIO.$ [Neil Cook]

5.3.1.417 0.5.115 (2019-11-14)

- Update language database. [Neil Cook]
- *Science.velocity.general.py* - add break point to test crash. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_lock.py* - add way to get out of lock loop (Ctrl + C) will now delete file - elsewise Ctrl + C goes to debugger (and then exits) [Neil Cook]
- *Core.core.drs_database.py* - deal with not having a night name. [Neil Cook]
- *Core.core.drs_database.py* - make sure all strings are stripped of whitespaces (before and after) [Neil Cook]
- Add new ccf mask. [Neil Cook]
- Rename *error.py –> language_db.py.* [Neil Cook]
- *Tools.bin.remake_db.py* -fix *db_time.* [Neil Cook]
- *Tools.bin.remake_db.py* - do not open all files at once (save to master one by one) [Neil Cook]
- *Tools.modeul.setup.drs_reset.py* - split *reset_dbdir* to allow accessing *copy_default_db.* [Neil Cook]
- *Tools.dev.error.py* - add a TODO here. [Neil Cook]
- *Tools.bin.remake_db.py* - add code to remake databases. [Neil Cook]
- *Science.preprocessing.py* - replace *drs_infile_id* with call to *fits.drs_fits.* [Neil Cook]
- *Science.extract.general.py* - add fiber. [Neil Cook]
- *Science.calib.flat_blaze.py* + localisation + wave - add fiber to outputs. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* - add *id_drs_file* to identify any filename in a *drs_file_set* (and return its DrsInputFile/DrsFitsFile instance) [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* - add *remake_db* (generalised *remake_cdb)* [Neil Cook]
- *Core.instruments.default.default_constants.py* - *remake_database_default.* [Neil Cook]
- *Core.instruments.spirou.pseudo_const.py* - pep8 clean up. [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* - add *remake_cdb* recipe definition. [Neil Cook]
- *Core.instruments.*.file_definitions.py* - add *calib_file* set and clean up (pep8 wise) [Neil Cook]
- *Core.core.drs_file.py* - check if drsfile has recipe (and if not set it to self.recipe) [Neil Cook]
- *Core.core.drs_database.py* - make *_get_time* more specific to using header/hdict. [Neil Cook]
- *Core.instrument.spirou.default_constants.py* - change to gl581. [Neil Cook]
- *Science.velocity.general.py* - correct plot keyword *found_rv –>* rv. [Neil Cook]

5.3.1.418 0.5.114 (2019-11-14)

- Science.preprocessing.identification - add the *fix_headers* wrapper (passes it to instrument pseudo constants) + add a debug in id process to show which drs file we are currently looking at. [Neil Cook]
- *Tools.module.setup.drs_processing* - add header keys via *fix_header* (non-instrument specific) [Neil Cook]
- *Science.calib.dark.py* - make sure get dark is getting dark master only (dark master is *DARK_DARK_TEL* by default) [Neil Cook]
- *Cal_thermal_spirou.py* - deal with different types of darks (OBJ –> *dark_tel*, HC,FP–> *dark_int)* + add switch to turn off thermal correction. [Neil Cook]
- *Recipe.spirou.cal_loc_spirou.py* - add *center_fits* to qc (diff of order cols must be positive) [Neil Cook]
- *Recipe.spirou.cal_preprocessing.py* - add *fix_header* to fix keys before *drs_infile_id.* [Neil Cook]
- *Io.drs_fits.py* - change *get_mid_obs_time* assuming it is now always present in header. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.file_definitions* + *recipe_definitions* - split *dark_dark* in to *dark_dark_int*, *dark_dark_tel*, *dark_dark_sky.* [Neil Cook]
- *Core.instruments.*.pseudo_const.py* - add *HEADER_FIXES* (to control instrument specific header fixes required) [Neil Cook]
- *Core.instruments.*.default_keywords.py* - add calibwh and *target_type* keywords. [Neil Cook]
- *Core.core.drs_file.py* - fix how we check read before copying. [Neil Cook]
- *Core.instruments.*.default_constants.py* - remove skydark references and update references to *DARK_DARK –> DARK_DARK_INT, DARK_DARK_TEL, DARK_DARK_SKY.* [Neil Cook]

5.3.1.419 0.5.113 (2019-11-12)

- *Core.instruments.spirou.recipe_ defintions.py* - add blazefile, flatfile and thermal file arguments to required recipes. [Neil Cook]
- *Science.calib.flat_ blaze.py* - allow user to set flat and blaze file. [Neil Cook]
- *Calib.general.py* - allow user defined thermal file to come from calibDB. [Neil Cook]
- *Calib.general.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.wave.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.shape.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.localisation.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.dark.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.badpix.py* - allow user defined file to come from calibDB. [Neil Cook]
- *Calib.background.py* - allow user defined file to come from calibDB. [Neil Cook]

5.3.1.420 0.5.112 (2019-11-12)

- *Recipes/spirou/obj_pol_spirou.py* and *science/polar/general.py* - add polar s1d (calculation, file writing and plotting) [Neil Cook]
- *Core.instruments.spirou.py* - add s1d plotting. [Neil Cook]
- *Plotting.plot_functions.py* - allow s1d plot to not have fiber argument. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py recipe_ definitions.py* - add polar s1d outputs. [Neil Cook]
- *Core.instruments.default.default_ config.py* - update author list. [Neil Cook]
- *Misc/dispatch_ object.py* - add argparse arguments. [Neil Cook]

5.3.1.421 0.5.111 (2019-11-09)

- *Tools.module.setup.drs_ installation.py* - add *user_interface*, *copy_ configs* and *update_ configs*. [njcuk9999]
- *Core.constants.constant_ functions.py* - add *get_ constants_ from_file* and *update_file* functions. [njcuk9999]
- *Core.instruments.default.pseudo_ const.py* - add print function to Color class (to print in colour) [njcuk9999]
- *Tools.module.setup.drs_ installation.py* - first commit of the installation script. [njcuk9999]

5.3.1.422 0.5.110 (2019-11-09)

- *Obj_ pol_ spirou.py* - add generate stats + plotting + writing of files. [Neil Cook]
- *Science.calib.dark.py* - add text entry for error 40-011-00006. [Neil Cook]
- *Recipe.spirou.cal_ shape_ spirou.py* - add recipe to args + add new debug plot. [Neil Cook]
- *Plotting.plot_ functions.py* - add polar plots. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_ text.py* - add text entry for error 00-008-00020. [Neil Cook]
- *Io.drs_ fits.py* - add text entry for error 00-008-00019. [Neil Cook]
- *Io.drs_ data.py* - add text entry for error 09-021-00009. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py + file_ definitions.py* - add plot and file definitions for polar + extra debug plot for *shape/shape_ master*. [Neil Cook]
- *Core.instruments.spirou.py* - add *file_ definitions* for polar outputs. [Neil Cook]
- *Core.core.drs_ startup.py* - remove input params from *plotter.close_ plots*. [Neil Cook]
- *Core.core.drs_ file.py* - make sure all filenames in *add_ hkey_ 1d* and 2d are basenames only. [Neil Cook]
- *Instruments.*.default_ constants.py* and *default_ keywords.py* - add polar keywords/constants/plot constants. [Neil Cook]
- *Core.constants.param_ functions.py* - ParamDict.copy - add doc string (with return type) [Neil Cook]
- *Misc.dispatch_ object.py* - code to process tar of objects. [Neil Cook]
- *Misc.dispatch_ object.py* - code to process tar of objects. [Neil Cook]
- *Recipes/spirou/cal_ ccf_ spirou.py* - fix that we need to check whether *wprops['WFP_DRIFT']* is None. [Neil Cook]
- *Science.velocity.general.py* - fix bug in plotting. [Neil Cook]
- *Recipes/spirou/cal_ ccf_ spirou.py* - fix bug with *compute_ ccf_ fp*. [Neil Cook]

- *Recipes/spirou/cal_ccf_spirou.py* - fix bug with *compute_ccf_fp*. [Neil Cook]
- *Science.polar.general.py* - update polar class. [Neil Cook]

5.3.1.423 0.5.109 (2019-11-07)

- Update *construct_filename –> construct_path*. [Neil Cook]
- *Tools.module.setup.drs_reset.py* - change call to *construct_filename –> construct_path*. [Neil Cook]
- *Science.polar.** - add whole lsd module. [Neil Cook]
- *Recipes/spirou/obj_pol_spirou.py* - add call to lsd analysis wrapper. [Neil Cook]
- *Io.drs_data.py* - add lsd mask getting. [Neil Cook]
- *Data/spirou/lsd/lsd_order_mask.dat* - add order wavelength file for lsd. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add polar lsd constants. [Neil Cook]
- Data/spirou/lsd - add lsd masks and meta data. [Neil Cook]

5.3.1.424 0.5.108 (2019-11-07)

- *Science.telluric.general.py* - curve fit forces floats - cast kp as bool after it was forced to floats. [Neil Cook]
- *Science.telluric.general.py* - add breakpoint to investigate bug. [Neil Cook]
- *Tools.dev.cal_update_berv.py* - re-fix erv measurement - group all files by odometer code. [Neil Cook]
- *Tools.dev.cal_update_berv.py* - need to group files to make this quicker + skip those that use barycorrpy already. [Neil Cook]

5.3.1.425 0.5.107 (2019-11-06)

- *Recipe/spirou/obj_pol_spirou.py* - continue adding to polar recipe. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.maths.*.py* - add continuum calculation function. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add polar constants. [Neil Cook]

5.3.1.426 0.5.106 (2019-11-05)

- *Berv.py* - set *leap_update* to False, add file update to *cal_update_berv.py*. [njcuk9999]
- Update *object_query_list*. [njcuk9999]
- *Cal_update_berv.py* - print filename processing. [njcuk9999]
- *Science.extract.berv.py* - catch iers warning and display. [njcuk9999]
- *Science.extract.berv.py* - split exception in barycorrpy and iers. [njcuk9999]
- *Science.extract.berv.py* - add force=False (force recalculation of berv) [njcuk9999]
- *Science.extract.berv.py* - add warn=False (when True prints exception when barycorrpy fails) [njcuk9999]
- Merge remote-tracking branch 'origin/dev' into dev. [njcuk9999]
  pirou_py3 into dev
  # Please enter a commit message to explain why this merge is necessary, # especially if it merges an updated upstream into a topic branch. # # Lines starting with '#' will be ignored, and an empty message aborts # the commit.
- Add *cal_update_berv.py* - to update bervs. [njcuk9999]
- Add gui stuff. [njcuk9999]

5.3.1.427 0.5.105 (2019-11-03)

- First commit of a gui module. [njcuk9999]
- Add trigger place-holders. [njcuk9999]
- Rename *drs_reprocess –> drs_processing.* [njcuk9999]
- Rename *drs_reprocess –> drs_processing.* [njcuk9999]
- *Plotting.core.py* - fix *__NAME__* [njcuk9999]
- *Core.instruments.default.recipe_definitions.py* - rename reprocess.py to processing.py. [njcuk9999]

5.3.1.428 0.5.104 (2019-11-01)

- *Science.calib.dark.py* - rearrange steps. [njcuk9999]
- *Science.calib.dark.py* - clean out data. [njcuk9999]
- *Science.calib.dark.py* - replace median with a smart median (smaller) [njcuk9999]

5.3.1.429 0.5.103 (2019-11-01)

- *Io.drs_table.py* - fix problem with hdu lists. [njcuk9999]
- *Tools.modules.setup.drs_reprocess.py* - fix bug in keepmask for engineering files. [njcuk9999]
- *Drs_reprocess.py* - fix error in remove engineering (fdata–>ftable) [Neil Cook]
- Add option to listing code to regenerate rawindex.fits (for all raw files) [Neil Cook]
- Add *PI_NAME* to raw columns in index files. [Neil Cook]

5.3.1.430 0.5.102 (2019-10-30)

- Merge remote-tracking branch 'origin/dev' into dev. [njcuk9999]
- *Module.setup.drs_reprocess.py* - add *_remove_engineering* option. [njcuk9999]
- *Core.core.drs_recipe.py* - change break for continue if DrsRecipeException. [njcuk9999]

5.3.1.431 0.5.101 (2019-10-29)

- *Science.calib.localisation.py* - remove break point. [Neil Cook]
- *Science.calib.localisation.py* - pep8 add second blank line. [Neil Cook]
- Test changes to localisation. [njcuk9999]
- Update date/version/changelog. [Neil Cook]

5.3.1.432 0.5.100 (2019-10-28)

- *Science.telluric.general.py* - catch all berv = nan (not allowed) [Neil Cook]
- *Science.telluric.general.py* - should be using *USE_BERV* not BERV. [Neil Cook]
- Berv update - add in additional barycorrpy parameters. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.telluric.general.py* - catch bad berv value. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.extract.berv.py* - correct setting *use_berv* from estimate. [Neil Cook]
- *Science.telluric.general.py* - add break point to identify bug in *_wave_to_wave.* [Neil Cook]
- *Science.calib.wave.py* - hc only solution has no CCF –> set CCF used keys to None. [Neil Cook]
- *Science.calib.wave.py* - deal with header not having fiber kwarg (is a pp file header) [Neil Cook]
- *Science.calib.wave.py* - need to add more empty constants for hc only wave sol. [Neil Cook]
- *Obj_pol_spirou.py* - start filling out polarisation code (from SPIRou DRS) [Neil Cook]
- Update language database. [Neil Cook]
- *Science.calib.wave.py* - fix differing fiber values from header vs usefiber. [Neil Cook]
- *Plot_functions.py* - only add suffix if kind is not None. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.433 0.5.099 (2019-10-25)

- *Science.polar.general.py* - add PolarObj class and *validate_polar_files + valid_polar_file* functions. [Neil Cook]
- *Recipes.spirou.obj_pol_spirou.py* - first commit - start filling out polar recipe. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add *obj_pol_spirou.* [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add polar constants. [Neil Cook]
- Plotting - fix *loop_allowed* switch. [Neil Cook]
- *Plotting.** - fix summary plots using plotloop. [Neil Cook]
- *Plotting.plot_functions.py* - make sure all plots in loops update the filename. [Neil Cook]
- *Plotting.plot_functions.py* - fix generators in *plot_shape_angle_offset.* [Neil Cook]
- *Flat_blaze* - fix problem with *SHAPE_ANGLE_OFFSET_ALL* arguments. [Neil Cook]
- *Flat_blaze* - make threshold for scut = 0.1 + add a cubic term to sinc function + adjust the flat/blaze rms calculation. [Neil Cook]
- *Science.calib.shape.py* - try to fix bug with *corr_dx_from_fp.* [Neil Cook]
- *Science.calib.shape.py* - remove breakpoint for *lin_mini.* [Neil Cook]
- *Cal_shape_master_spirou.py* - add in breakpoint to address bug. [Neil Cook]
- *Core.math.general.py* - fix *linear_minimization* (need to re-calculate shapes after masking) [Neil Cook]
- *Recipe.spirou.cal_shape_master_spirou.py + science.calib.shape.py* - add breakpoint to identify crash. [Neil Cook]
- *Plotting.core.py* - do not clean html warning messages and add text in one paragraph. [Neil Cook]
- *Science.calib.wave.py* and *plotting.plot_functions.py* - add fiber to *WAVE_FP_IPT_CWD_LLHC* and *SUM_WAVE_FP_IPT_CWID_LLHC* plots. [Neil Cook]
- *Science.calib.wave.py* and *plotting.plot_functions.py* - add fiber to *WAVE_FP_IPT_CWD_LLHC* and *SUM_WAVE_FP_IPT_CWID_LLHC* plots. [Neil Cook]
- *Cal_wave_spirou.py* - fix hcprops not having fpprops values (for summary) + don't base summary plot on pass/fail just *fp_e2ds_file* being set. [Neil Cook]
- *Core.math.fast.py* - fix and catch jit (numba) [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.434 0.5.098 (2019-10-24)

- *Recipe.spirou.cal_wave_spirou.py + sciecne.calib.wave.py* - add summary plot functionality. [Neil Cook]
- *Plotting.** - add summary plots. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add wave solution summary plots. [Neil Cook]
- *Flat_blaze.py* and *extraction.py* - add sloping sinc fit for blaze and move summary/qc to modules. [Neil Cook]
- *Obj_fit_tellu_spirou, obj_mk_tellu_spirou* and *obj_mk_template_spirou* - add telluric plotting. [Neil Cook]
- Move summary + qc + writing to modules (not in main recipes) [Neil Cook]
- *Plotting.** - add telluric plots. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.math.general.py* - add sloped sinc function. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add *fit_tellu* plots and *mk_template* plots. [Neil Cook]
- *Core.instruments.*.default_*.py* - add blaze sinc constants + plotting constants for *fit_tellu.* [Neil Cook]
- Misc - copy of Etiennes sinc function for blaze correction. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.435 0.5.097 (2019-10-23)

- *Science.velocity.general.py* - change arguments *(found_rv –> rv)* [Neil Cook]
- *Science.telluric.general.py* - add recipe to inputs (for plotting) [Neil Cook]
- *Science.calib.wave.py* - fix plots + force wave modes to ints (were strings) [Neil Cook]
- *Recipe.obj_mk_tellu_spirou.py* - add debug and summary plots. [Neil Cook]
- *Recipe.spirou.cal_loc_spirou.py* - fix check coeffs (Etiennes fix) [Neil Cook]
- *Plotting.*.py* - add mktellu plots, fix ioff in pdb, fix mask order in html, add warnings to summary document. [Neil Cook]
- *Plotting.*.py* - add mktellu plots, fix ioff in pdb, fix mask order in html, add warnings to summary document. [Neil Cook]
- Update the language database. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add mktellu plot outputs. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add wave and mktellu plot constants. [Neil Cook]
- *Drs_log.py* - allow use of *output_param_dict* without updating parameter dictionary. [Neil Cook]

5.3.1.436 0.5.096 (2019-10-17)

- Update language database. [Neil Cook]
- *Science.velocity.general.py* - add *rv_fit* plot. [Neil Cook]
- *Science.calib.wave.py* - add plotting. [Neil Cook]
- *Plotting.plot_functions.py* - add wave plotting functions. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add wave plots (and a ccf plot) [Neil Cook]
- *Core.instruments.*.default_constants.py* - add WAVE plot constants. [Neil Cook]
- *SpirouWAVE2.py* - remove todo statement. [Neil Cook]

5.3.1.437 0.5.095 (2019-10-16)

- *Math.fast.py* - rearrange imports. [Neil Cook]
- *Recipes/spirou/cal_loc_spirou.py* - fix problems with clean loc coeffs. [Neil Cook]
- *Lin_mini_upgrade.py* - raw source code from Etienne. [Neil Cook]
- *Plotting.plot_functions.py* - close plots if we have an open (before plot loop) + fix loc ceoff plot. [Neil Cook]
- *Plotting.py* - add *self.plots_active* (flag that is true when we have plots open in interactive mode) [Neil Cook]
- *Core.math.fast.py + general.py* - add linear minimisation speed up using numba (if present on system) [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add *master_run*, *calib_run* and *science_run* (for trigger?) [Neil Cook]
- *Core.instruments.*.default_constants.py* - add loc plot/clean up coeff constants. [Neil Cook]
- *Core.core.drs_recipe.py* - in *add_extras* value can now be objects other than string –> re-test instance. [Neil Cook]
- *Core.core.drs_recipe.py* - fix how we identify special list keys (arguments that come from params but are lists) [Neil Cook]
- *Core.core.drs_recipe.py* - fix *new_runs* in *_gen_run*. [Neil Cook]
- *Core.core.drs_recipe.py + tools.module.setup.drs_reprocess.py* - deal with multiple extra arguments better (from sequences) [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - *obj_mk_template* need objname arguments. [Neil Cook]

5.3.1.438 0.5.094 (2019-10-15)

- *Core.instruemnts.spirou.recipe_ definitions.py* - fix the full run and remove science run sequences. [Neil Cook]
- *Core.instruemnts.spirou.recipe_ definitions.py* - add back mk and fit tellu limited run individual commands (for object specific) [Neil Cook]
- *Science.calib.wave.py* - remove interactive plot sections and add *WAVE_ HC_ GUESS* plot. [Neil Cook]
- *Science.calib.shape.py* - deal with *norm_fp* being zero (skip) [Neil Cook]
- *Science.calib.localisation.py* - add *check_ coeffs* function. [Neil Cook]
- *Recipe.spirou.cal_ loc_ spirou.py* - check coefficient and sigma clip / smooth them between orders. [Neil Cook]
- *Plotting.plot_ functions.py* - add *plot_ loc_ check_ coeffs* and *plot_ wave_ hc_ guess*. [Neil Cook]
- *Core.math.general.py* - add *robust_ polyfit*. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add loc and wave plots. [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add loc and wave plot constants. [Neil Cook]
- Plotting - make sure location is set in all recipes. [Neil Cook]

5.3.1.439 0.5.093 (2019-10-14)

- *Core.instruments.spirou.recipe_ definitions.py + recipes.spirou.obj_ fit_ tellu_ spirou.py* - must add s1d plot args to *fit_ tellu*. [njcuk9999]

5.3.1.440 0.5.092 (2019-10-13)

- *Plotting.core.py + latex.py* - update layout for stat + qc tables + try to latex floating orders. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.extract.general.py* - add fiber to *e2ds_ to_ s1d* inputs (for plotting) [Neil Cook]
- *Plotting.*.py* - continue work on plotting. [Neil Cook]
- *Core.instruments.spirou.default_ constants.py* - adjust extract s1d zoom parameters. [Neil Cook]
- *Recipe.spirou.*.py* - add *recipe.plot.set_ location* (need iterator) [Neil Cook]
- *Plotting.plot_ functions.py* - remove full spectrum plot (too big) [Neil Cook]
- *Science.extract.general.py* - move qc and file writing to functions. [Neil Cook]
- *Cal_ extract_ spirou.py* - add plots + summary document. [Neil Cook]
- *Plotting.plot_ functions.py* - add extraction plots. [Neil Cook]
- *Plotter.core.py* - update test case. [Neil Cook]
- Update object query list file. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add plot definitions to recipe. [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add extract plot constants. [Neil Cook]
- *Core.core.drs_ recipe.py* - correct problem with recipes that have no file arguments (were just being skipped) [Neil Cook]
- *Core.core.drs_ file.py* - correct a problem with using fibers = [None] [Neil Cook]
- *Plotting.core.py* - fix the addition of fibers to *qc_ params* and stat table. [Neil Cook]

5.3.1.441 0.5.091 (2019-10-11)

- Add a section to how to (to fill in later) [Neil Cook]
- *Science.calib.shape.py* - move qc and file writing to module + todo identified problem. [Neil Cook]
- *Science.calib.localisation.py* - move qc and file writing to module. [Neil Cook]
- *Science.calib.flat_ blaze.py* - move qc and file writing to module. [Neil Cook]
- Recipe.spirou. badpix, dark, flat, loc, shape, *shape_ master* - add plotting. [Neil Cook]
- *Plotting.*.py* - continue adding plotting functionality. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add plots to shape and flat recipes. [Neil Cook]
- *Core.math.general.py* - fix sigfig (deal with zero and non-finites) [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add plotting constants. [Neil Cook]

5.3.1.442 0.5.090 (2019-10-10)

- *Recipe.spirou.cal_shape_master_spirou.py + science.calib.shape.py* - add plots. [Neil Cook]
- *Recipe.spirou.cal_loc_spirou.py* - fix typo in qc. [Neil Cook]
- *Plotting.*.py* - continue work on plotting functionality. [Neil Cook]
- *Core.math.general.py* - add the sigfig function. [Neil Cook]
- Update the language database. [Neil Cook]
- *Core.instruments.spirou.recipe_defintions.py* - add some plots to *cal_shape_master*. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add plot constants. [Neil Cook]

5.3.1.443 0.5.089 (2019-10-10)

- Continue adding plotting. [Neil Cook]
- Update how to terrapipe guide. [Neil Cook]
- Update language database. [Neil Cook]
- Data.core..pdbrc - need to go up two levels (up via exception) [Neil Cook]
- *Core.isntruments.spirou.recipe_definitions.py* - add loc graphs. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add plot constants. [Neil Cook]
- *Core.core.drs_startup.py* - change plotter –> plot, move end plotting to plotter. [Neil Cook]
- *Core.core.drs_recipe.py* - change plotter –> plot. [Neil Cook]
- *Core.constants.param_functions.py* - fix ipdb exception on exit. [Neil Cook]

5.3.1.444 0.5.088 (2019-10-08)

- *Tools.module.setup.drs_reprocess.py* - add plot closing and fix bugs with *nightname/str_arg_list* and self.recipe.args. [Neil Cook]
- *Reprocess.py + telluric_db* recipes - change how *process_run_list* works (now needs recipe) [Neil Cook]
- *Recipe.spirou.cal_dark_spirou.py* - add plots. [Neil Cook]
- *Recipe.spirou.cal_badpix_spirou.py* - add plots. [Neil Cook]
- *Plotting.*.py* - add html, fix some latex issues and add dark/badpix plot definitions. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add debug/summary plot definitions to *cal_dark* and *cal_badpix*. [Neil Cook]
- *Core.instruments.default.pseudo_const.py* - fix night name in *index_lock_filename* definition. [Neil Cook]
- *Core.instruments.output_filenames.py* - fix nightname. [Neil Cook]
- *Core.instruments.*.defaul_** - add plotting constants. [Neil Cook]
- *How_to_terrapipe.md* - add readme file on how to develop using terrapipe. [Neil Cook]
- *Core.core.drs_recipe.py* add *set_debug_plots* and *set_summary_plots*. [Neil Cook]

5.3.1.445 0.5.087 (2019-10-07)

- *Core.constants.param_functions.py* - if breakpoints does not have params force *allow_breakpoints*. [Neil Cook]

5.3.1.446 0.5.086 (2019-10-06)

- *Tools.module.setup.drs_reprocess.py* - deal with input nightname and filename. [njcuk9999]
- *Science.calib.wave.py* - change *'night_name'* to nightname. [njcuk9999]
- Update language database. [njcuk9999]
- *Core.core.drs_recipe.py* - remove breakpoint. [njcuk9999]
- *Core.instruments.default.default_config.py* - add *allow_breakpoints* constant. [njcuk9999]
- *Core.core.drs_recipe.py + drs_startup.py* - add breakpoint special argument. [njcuk9999]
- *Core.core.drs_argument.py* - add breakpoint special argument. [njcuk9999]
- *Core.constants.constant_functions.py* - add break point to allow stopping at certain point in the code easily. [njcuk9999]

- *Core.constants.__init__.py* - add break point to aliases. [njcuk9999]

5.3.1.447 0.5.085 (2019-10-05)

- *Tools.module.setup.drs_reprocess.py* - add filename and nightname from inputs. [njcuk9999]
- Replace . imports with terrapipe imports. [njcuk9999]
- *Plotting.core.py* - replace . imports with terrapipe + store debug plots. [njcuk9999]
- *Locale.core.*.py* - replace . imports with terrapipe imports. [njcuk9999]
- Update language database. [njcuk9999]
- *Io.*.py* - replace . imports with terrapipe imports. [njcuk9999]
- *Core.__init__.py* - replace . imports with terrapipe imports. [njcuk9999]
- *Core.math.** - replace . imports with terrapipe imports. [njcuk9999]
- *Core.instruments.default.file_definitions.py* - remove call to *output_filenames*. [njcuk9999]
- *Core.instruments.*.recipe_definitions.py* - remove *drs_interactive* and add filename to reprocess definition. [njcuk9999]
- *Core.instruments.*.default_config* - remove *drs_interactive* and add *drs_plot_ext* and *drs_summary_ext*. [njcuk9999]
- *Core.core.** - remove . imports and add plotter to *drs_startup*. [njcuk9999]
- *Core.core.__init__.py* - remove imports. [njcuk9999]
- Core.constants - move . imports to terrapipe imports. [njcuk9999]

5.3.1.448 0.5.084 (2019-10-04)

- Update language database. [Neil Cook]
- *Core.core.drs_recipe.py* - record sys.argv to *self.str_arg_list* if not from fkwargs. [Neil Cook]
- Plotting - add in latex functions and summary plot. [Neil Cook]

5.3.1.449 0.5.083 (2019-10-03)

- *Tools.modules.setup.drs_reprocess.py* - change closeall (now in plotter) [Neil Cook]
- Modify inputs to *core.post_main* (tools) [Neil Cook]
- Modify inputs to *core.post_main* (tools) [Neil Cook]
- Continue work on plotting functions. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_path.py* - add makedirs function. [Neil Cook]
- *Core.core.drs_startup.py* - remove call to plotter module (and get via recipe) [Neil Cook]
- Change inputs to *core.post_main()* [Neil Cook]
- Start work on plotting. [Neil Cook]
- Update the language database. [Neil Cook]
- *Core.instruments.spirou.py* - only calculate ccf for science targets. [Neil Cook]
- *Core.core.drs_file.py* - fix type keyword in *check_table_filename* should be "allowedfibers" not "fiber" [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - change default ccf width to 300 km/s. [Neil Cook]
- Update object list. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - add ccf to limited run. [Neil Cook]
- *Core.instruments.default.output_filenames.py* - need to re-get insuffix in fiber loop. [Neil Cook]
- *Core.core.drs_file.py* - fix adding fiber to historic files. [Neil Cook]
- Update changelog/version/date. [Neil Cook]
- Update object list. [njcuk9999]

5.3.1.450 0.5.082 (2019-10-02)

- *Tools.module.setup.drs_ reprocess.py* - deal with traceback as a list or string. [Neil Cook]
- *Science.telluric.general.py* - fix bug if we have template must divide image by it! [Neil Cook]
- *Science.calib.wave.py* - check for empty wfp variables and set to None. [Neil Cook]
- *Recipe.spirou.cal_ extract_ spirou.py* - correct typo in text entry. [Neil Cook]
- *Recipe.spirou.cal_ ccf_ spirou.py* - add saving of files (via *write_ ccf)* [Neil Cook]
- Update language database. [Neil Cook]
- Update object list. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py + recipe_ defintions.py* - add *out_ ccf_ fits*. [Neil Cook]
- *Core.instruments.*.default_ keywords.py* - add CCF keywords. [Neil Cook]
- *Core.constants.param_ functions.py* - correct typo in merge function "source" –> "sources" [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.451 0.5.081 (2019-10-01)

- *Science.velocity.general.py* - add *locate_ reference_ file* function and work on calculating ccf (now combining with nanmean) [Neil Cook]
- *Science.telluric.general.py* - add *make_ 1d_ template_ cube* and *mk_ 1d_ template_ write* functions. [Neil Cook]
- *Science.extract.berv.py* - add option not to log obtaining berv (log=True/False) [Neil Cook]
- *Science.calib.wave.py* - get wave time in wprops. [Neil Cook]
- *Recipe.spirou.obj_ mk_ template_ spirou.py* - add s1d template code to *mk_ template*. [Neil Cook]
- *Recipe.spirou.cal_ ccf_ spirou.py* - start adding in ccf fp stuff. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_ fits.py* - correct typo "fornat" –> "format" [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - add s1d files to set outputs. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - add the s1d template files + s1d lists for e2ds files. [Neil Cook]
- *Core.instruments.*.default_ constants.py* - add new *mk_ template* constants. [Neil Cook]
- *Core.core.drs_ file.py* - add s1d property and fix shape for table. [Neil Cook]

5.3.1.452 0.5.080 (2019-09-30)

- *Tools.module.setup.drs_ reprocess.py* - fix error in printing errors at end (and add these errors to the log properly) [Neil Cook]
- *Core.core.drs_ log.py* - add wlog.logmessage (to manually add a message to the log file) [Neil Cook]
- *Neil_ TODO.md* - update list. [Neil Cook]
- *Terrapipe.science.velocity.general.py* - add test plots while ccf is not working. [Neil Cook]
- *Terrapipe.recipes.spirou.py* - add *TEST_ RUN* to *obj_ fit_ tellu_ db_ spirou* and *obj_ mk_ tellu_ db_ spirou* and uncomment *mk_ obj_ template*. [Neil Cook]
- Update language database. [Neil Cook]
- *Terrapipe.io.drs_ fits.py* - make sure values are striped of whitespaces before comparison. [Neil Cook]
- *Core.core.recipe_ definition.py* - add *obj_ mk_ telludb* and *obj_ fit_ telludb* instead of *obj_ mk_ tellu/obj_ fit_ tellu* and *obj_ mk_ template*. [Neil Cook]
- *Tools.module.setup.drs_ reprocess.py* - deal with adding extra arguments to reprocessing recipes. [Neil Cook]
- *Science.calib.wave.py* - remove maxcpp references. [Neil Cook]
- *Core.core.drs_ recipe.py* - add extras to recipe (to overwrite arguments from reprocessing) [Neil Cook]
- *Core.core.drs_ log.py* - update debugging in print function mode. [Neil Cook]
- *Core.core.drs_ file.py* - do not continue if not valid. [Neil Cook]
- Update language database. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.453 0.5.079 (2019-09-26)

- *Tools.module.setup.drs_reprocess.py* - take out pushing skip to recipes and add in pushing debug to recipes, rename DEBUG –> *TEST_RUN* to do a test run. [Neil Cook]
- *Sciecne.velocity.general.py* - new ccf calculation functions + work on ccf for science/fp. [Neil Cook]
- *Science.preprocessing.detectory.py* - remove unused functions/imports. [Neil Cook]
- *Science.calib.wave.py* - clean up and move ccf stuff to velocity module. [Neil Cook]
- *Cal_preprocess_spirou.py* - pep8 empty line clean up. [Neil Cook]
- *Cal_ccf_spirou.py* - remove nan filling and copy image from infile when tellurics are not removed. [Neil Cook]
- Update language database. [Neil Cook]
- Add Etiennes ccf mask for Gl699. [Neil Cook]
- Update run files. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add mask file definition and add path in –mask kwarg. [Neil Cook]
- *Core.instruments.*.pseudo_const.py* - add *FIBER_CCF* (defines what is a science fiber and what is a reference fiber for CCF calculation. [Neil Cook]
- *Core.instruments.*.default_constants.py + default_keywords.py* - fix/modify constants/keywords for wavecf-f/ccf. [Neil Cook]
- *Core.core.drs_startup.py* - *_get_arg_strval*: deal with DrsInputFile as well as DrsFitsFile. [Neil Cook]
- *Core.core.drs_recipe.py* - add *display_func* and deal with no *drs_files* added to files when dtype=file/files, add function *_check_arg_path*. [Neil Cook]
- *Core.core.drs_log.py* - *find_param*: add required and default inputs (and allow them to return without error) [Neil Cook]
- *Core.core.drs_file.py* - add methods *has_correct_extension*, *header_keys_exist*, *has_correct_header_keys*, read, write for DrsInputFile. [Neil Cook]
- *Core.core.drs_argument.py* - need to deal with drsfiles being a single drsfile + add attribute "path" [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - do not force get the wave solution from the calibDB (use header) [Neil Cook]
- *Core.instruments.spirou.default_constants.py* - default wave mode now C Lovis method. [Neil Cook]
- *Science.telluric.general.py* - for *drs_data.load_text_file* must define dtype. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.454 0.5.078 (2019-09-25)

- *Misc.mk_template_s1d.py* - etiennes code to be added to *mk_template*. [Neil Cook]
- *Recipe_definitions.py* - only process e2dsff files for *obj_mk_tellu* and *obj_fit_tellu*. [Neil Cook]
- *Core.drs_file.py* - make sure tested keys have no white spaces at start/end and all are upper case (case insensitive) [Neil Cook]
- *Science.velocity.general.py* - coravelation - fix reporting of number of lines found. [Neil Cook]
- *Science.calib.wave.py* - change name of *fp_wavelength_sol_new* to *add_fpline_calc_cwid*, remove unused outputs of *assign_abs_fp_numbers*, make two method consistent with FP equation d = m * ll/2, fix *no_overlap_match_calc*, and try to fix NaNs in fp e2ds for ccf calculation. [Neil Cook]
- Add cavity length ll and m fit files to data. [Neil Cook]
- Update language database. [Neil Cook]
- *Recipes.spirou.cal_wave_spirou.py* - print that we are updating hc/fp files with new wave solution. [Neil Cook]
- *Io.drs_data.py* - load text file needs to default to floats in an array. [Neil Cook]
- *Core.instruments.spirou.default_keywords.py* - correct typos in keywords. [Neil Cook]
- *Core.instrument.*.default_constants.py* - *cavity_length_m_fit.dat*. [Neil Cook]

5.3.1.455 0.5.077 (2019-09-24)

- *Science.velocity.general.py* - add *compute_ccf_sciecne* and *fill_e2ds_nans* functions (continued work on *cal_ccf_spirou)* [Neil Cook]
- *Science.calib.wave.py* - add some extra wave keys (from ccf process) [Neil Cook]
- *Cal_wave_spirou.py* - add a TODO for *cal_wave_spirou.* [Neil Cook]
- *Recipe.spirou.cal_ccf_spirou.py* - continue to port code from SpirouDRS –> terrapipe. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.isntruments.spirou.recipe_definitions.py* - correct typo in *cal_wave* -fpmode definitions (found by @melissa-hobson) [Neil Cook]
- *Core.instruments.*.default_constants.py + default_keywords.py* - add CCF/RV keys. [Neil Cook]
- *Core.core.drs_file.py* - add option in *read_header_key_1d_list* to try to guess dim1 (if manually set to None) [Neil Cook]
- *Core.constants.param_functions.py* - add merge function (to merge one param dict into another) [Neil Cook]
- *Tools.module.setup.drs_reprocess.py* - fix how we set infile.filetype (look at output.intype and deal with None/list/str) [Neil Cook]

5.3.1.456 0.5.076 (2019-09-23)

- *Science.telluric.general.py* - re calculate *tapas_water* and *tapas_other* after shift. [Neil Cook]
- *Science.extract.general.py* - fix s1d how we interpolate over NaN gaps. [Neil Cook]
- *Core.instruments.spirou.file_definitions.py/recipe_definitions.py* - fix intypes for file definitions and tellu *default_refs.* [Neil Cook]
- Udpate object list. [Neil Cook]
- *Core.instruments.spirou.default_keywords.py* - fix *KW_MKTELL_AIRMASS/WATER* values. [Neil Cook]
- *Core.instruments.*.default_constants* - change telluric filetype/dprtype/fiber type definitions. [Neil Cook]
- *Core.core.drs_log.py* - always have log file (put it in home directory) [Neil Cook]
- Update changelog/date/version. [Neil Cook]

5.3.1.457 0.5.075 (2019-09-20)

- *Tools.module.setup.drs_reprocess.py* - set filemod and recipemod for srecipes that do not have them set. [Neil Cook]
- *Science.telluric.general.py* - guess the sed that goes in (not just ones) + sigma clip around *fit_dd* + add a bad mask for sp2 (set to NaN) [Neil Cook]
- *Drs_recipe.py* - for process adds method (in DrsRunSequence) add filemod and recipemod is frecipe does not have them set. [Neil Cook]
- Update *object_query_list.* [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.458 0.5.074 (2019-09-19)

- *Science.telluric.general.py* - add an upper and lower limit to keep for the pca fit. [Neil Cook]
- *Science.extract.general.py* - fix some minor bugs + pep8 correction. [Neil Cook]
- Calib.wave.py, velocity module - change module rv–> velocity, add *remove_telluric_domain* function. [Neil Cook]
- *Recipe.spirou.cal_extract_spirou.py* - add *KW_EXT_TYPE.* [Neil Cook]
- *Recipe.spirou.cal_ccf_spirou.py* - first commit + testing of inputs. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - change –add2calib to –database, add *cal_ccf* definition. [Neil Cook]
- *Core.instruments.*.default_constants.py + default_keywords.py* - add first CCF constants. [Neil Cook]
- *Core.core.drs_startup* - change p to param. [Neil Cook]
- *Core.core.drs_database.py* - add a check for params['INPUTS']['DATABASE'] to check whether we should save to database when *add_file* is used. [Neil Cook]
- *Core.constants.param_functions.py* - deal with copying ParamDict inside ParamDict. [Neil Cook]

- Update language database. [Neil Cook]
- *Io.drs_lock.py* - add debug printout for locking. [Neil Cook]
- *Core.math.fast.py* - bn.nansum return bool arrays as bools we don't want this. [Neil Cook]
- *Core.core.drs_log.py* - only turn off wrapping for debug wlog entries. [Neil Cook]
- *Core.core.drs_database.py* - move locking/checking into copy db file function. [Neil Cook]
- Update changelog.md. [Neil Cook]
- *Tools.module.setup.drs_reprocess.py* - add shortname to Run class, check that all recipes in run table are valid, print group name (recipe short name) on group print out. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.math.gauss.py* - mp references should be "fast" references within math module. [Neil Cook]
- *Core.instruments.spirou.py* - remove unused recipes + give names to wavehc and wavefp. [Neil Cook]
- *Core.core.drs_recipe.py* - *process_adds* should look for ['files', 'file'] in arg dtype. [Neil Cook]
- *Core.core.drs_log.py* - params may be None - deal with this. [Neil Cook]
- *Drs_database.py* - lock the input and output files before copying to database. [Neil Cook]
- *Recipes.spirou.cal_loc_spirou.py* - need to import math as mp. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.459 0.5.073 (2019-09-18)

- Core.math - add a fast *medfilt_1d* function. [Neil Cook]
- *Core.math.fast.py* - first commit numpy nan functions from bottleneck if available. [Neil Cook]
- Change nan numpy functions to mp.nan functions (use bottleneck if available for speed up) [Neil Cook]
- *Science.calib.shape.py* - test cube as array. [Neil Cook]
- *Science.calib.shape.py* - add length of cube for printout. [Neil Cook]
- *Science.calib.shape.py* - add printouts to check. [Neil Cook]
- *Science.calib.shape.py* - set transforms/xres/yres to zero. [Neil Cook]
- *Science.calib.shape.py* - test the fpmaster loop (without long parts) [Neil Cook]
- Update date/changelog/version. [Neil Cook]

5.3.1.460 0.5.072 (2019-09-17)

- *Tools.bin.reset.py* - remove instrument re-definition (now done in core.setup) [Neil Cook]
- *Science.telluric.general.py* - change *KW_DPRTYPES –> KW_DPRTYPE.* [Neil Cook]
- *Science.calib.shape.py* - add filename and basename (just for printing/logging) [Neil Cook]
- *Recipes.spirou.obj_fit_tellu_db_spirou.py* - fix inputs. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - fix kwargs –objname. [Neil Cook]
- *Core.core.drs_argument.py* - checks for arg/kwarg/special arg on naming - kwarg and special should have '-' positional should not. [Neil Cook]
- *Science.core.shape.py* - correct type *fpfile_it.image –> fpfile_it.data.* [Neil Cook]
- Correct *vstack_cols* (needs to handle single row as well as astropy table) [Neil Cook]
- *Science.telluric.general.py* - change function *get_objects* to *get_non_tellu_objs* and generalise. [Neil Cook]
- *Recipes.spirou.obj_fit_tellu_db_spirou.py* - get dprtypes and robjnames in main code. [Neil Cook]
- *Science.calib.shape.py* - calibrate after combining group of FPs. [Neil Cook]
- *Core.insturments.spirou.recipe_definitions.py* - change default to None. [Neil Cook]
- *Science.telluric.general.py* - add function *get_objects* to get non telluric objects. [Neil Cook]
- *Recipe.spirou.obj_fit_tellu_db_spirou.py* - first commit (mostly just copy of *obj_mk_tellu_db_spirou)* but does *fit_tellu, mk_template, fit_tellu* on all objects except telluric stars) [Neil Cook]
- *Recipes.spirou.obj_mk_template_spirou.py* - add ending script when files are skipped. [Neil Cook]
- *Recipes.spirou.obj_mk_tellu_db_spirou.py* - remove todo (dealt with internally) [Neil Cook]
- Update the language database. [Neil Cook]
- *Core.io.drs_table.py* - lock the index file when reading (and don't try to open when closing) [Neil Cook]
- *Io.drs_fits.py* - update *find_files* to allow returning of a astropy table for all files found (a stack of the valid entries in the index files) [Neil Cook]
- *Core.instruments.spirou.recipe_deinfitoins.py* - fix help files + add *obj_fit_tellu_db* + add options to feiltypes and fiber arguments. [Neil Cook]

- *Cpre.instruments.default.pseudo_const.py* - remove *EXT_TYPE* (and add DPRTYPE) to list of indexing columns. [Neil Cook]
- *Core.instruments.*.default_** - add telluric db keys. [Neil Cook]
- *Core.core.drs_recipe.py* - make vstack a public function and change how coluns are added (via list comprehension) [Neil Cook]

5.3.1.461 0.5.071 (2019-09-16)

- *Tools.module.setup.drs_reprocess.py* - add *generate_run_table* to generate *run_table* from a set of args/kwargs. [Neil Cook]
- *Tools.module.listing.general.py* - functions for listing.py. [Neil Cook]
- *Tools.bin.listing.py* - first commit - code to re-index directories. [Neil Cook]
- *Recipes.spirou.obj_mk_template_spirou.py* - correct typo (get filetype and fiber from inputs) [Neil Cook]
- *Recipe.spirou.obj_mk_tellu_db_spirou.py* - first commit. [Neil Cook]
- *Io.drs_fits.py* - correct typo and add required switch to *get_index_files*. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.recipe_defintions.py* - add *mk_tellu_db* and *obj_fit_tellu_db*. [Neil Cook]
- *Core.instruments.default.recipe_definitions.py* - add listing recipe. [Neil Cook]
- *Core.core.drs_startup.py* - make indexing and *save_index_file* non private functions. [Neil Cook]
- *Core.core.drs_recipe.py* - test log message in *group_run_files* + remove old olg test message. [Neil Cook]
- *Core.core.drs_recipe.py* - change how we stack tablelist. [Neil Cook]
- *Core.core.drs_recipe.py* - test wlog statements. [Neil Cook]
- *Core.core.drs_recipe.py* - test wlog statements. [Neil Cook]
- *Core.core.drs_recipe.py* - add print statements. [Neil Cook]
- *Tools.module.setup.drs_reprocess.py* - add nightname for all (for when ftable is empty) [Neil Cook]
- *Tools.module.listing.file_explorer.py* - change where params comes from. [Neil Cook]
- *Io.drs_table.py* - try to fix index file error. [Neil Cook]
- *Core.core.drs_startup.py* - remove unused import. [Neil Cook]
- *Core.core.drs_recipe.py* - clear printer after printing filenames. [Neil Cook]
- *Science.preprocessing.identification.py* - need kind to be set (even if file not found) for error message. [Neil Cook]
- *Science.calib.shape.py* - need to only copy extract parameters for those that are not skiped. [Neil Cook]
- *Io.drs_table.py* - remove table before writing it (to try to get rid of "file exists" error) [Neil Cook]
- Add "runs" folder to data. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- *Science.extract.berv.py* - fix bug that berv will be set to NaN if coming from header (need to check both key and output[0] for kwargs) [Neil Cook]
- *Core.instruments.default.pseudo_const.py* - fix bug that p is locked (so set manually) [Neil Cook]
- *Drs_changelog.py* - fix bug in updating version/date. [Neil Cook]

5.3.1.462 0.5.070 (2019-09-13)

- *Tools.bin.reprocess.py* - change how master table is defined (keys *'KW_MID_OBS_TIME'* and *'KW_DPRTYPE'* need values creating as not in raw file headers), filters need to check for lists. [Neil Cook]
- *Science.telluric.general.py* - add some new logging. [Neil Cook]
- *Sciecne.calib.dark.py* - add some new logging for dark master creation. [Neil Cook]
- *Recipes.spirou.obj_fit_tellu_spirou.py* - change how image2 is normalised by blaze (not the same as *mk_tellu)* [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* - add *get_dprtype*. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - move filemod to pseudo consts + add *KW_DPRTYPE* to limited run for *fit_tellu/mk_tellu*. [Neil Cook]
- *Core.instruments.spirou.py* - add some new intypes. [Neil Cook]
- *Core.instruments.*.pseudo_const.py* - add FILEMOD and RECIPEMOD definitions. [Neil Cook]
- *Core.instruments.*.default** - add end of file and debug constants. [Neil Cook]

- *Core.core.drs_ startup.py* - get filemod and recipemod from pseudo constants (and re-get them if we change instrument) [Neil Cook]
- *Core.core.drs_ recipe.py* - add some *display_func*, and debug logging + add params to *check_ table_ keys*. [Neil Cook]
- *Core.core.drs_ log.py* - add *display_func* and put debug numbers into params (not hard coded) [Neil Cook]
- *Core.core.drs_ file.py* - add *generate_ reqfiles* (for checking infile name in *construct_ filename)* [Neil Cook]
- *Science.calib.dark.py* - add some extra print outs. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - fix bad shape intypes (some should be *hc1_ hc1* not *fp_fp)* [Neil Cook]
- *Core.core.drs_ recipe.py* - when running a master recipe only do one run (multiple are not needed) [Neil Cook]
- *Tools.module.setup.drs_ reprocess.py* - add changes to *generate_ runs* and add allowed fibers getting. [Neil Cook]
- *Sciecne.telluric.general.py* - change message in recon s1d writing. [Neil Cook]
- *Sciecne.extract.berv.py* - fix berv - properties weren't copying. [Neil Cook]
- *Sciecne.calib.background.py* - do not check file for debug (could be any input file and we don't care here) [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_ fits.py* - add changes to *RAW_ OUTPUT_ KEYS/REDUC_ OUTPUT_ KEYS*. [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - change sequences (must start with full preprocess - master dark + master shape wont work otherwise) [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - add intypes to all out files (for file history lookup) [Neil Cook]
- *Core.instruments.spirou.default_ keywords.py* - KW_ OBJNAME from OBJNAME –> OBJECT. [Neil Cook]
- *Core.instruments.default.pseudo_ const.py* - re-work output columns (now only *output_ keys)* [Neil Cook]
- *Core.instruments.default.py* - add additional features to general output file (infile suffix removal) [Neil Cook]
- *Core.core.drs_ startup.py* - change how we index using raw and reduc output columns –> keys (allows more flexible changing of header keys without rewriting full index) [Neil Cook]
- *Core.core.drs_ recipe.py* - fix how we generate file names for runs (follow file history) [Neil Cook]
- *Core.core.drs_ file.py* - add remove insuffix, control better construct filename. [Neil Cook]
- *Recipes.spirou.cal_ extract_ spirou.py + cal_flat_spirou.py* - transform localisation coefficients to master grid. [Neil Cook]
- *Science.calib.shape.py* - add *ea_ transform_ coeff* function to transform per night localisation coefficients to master grid. [Neil Cook]
- *Science.extract.berv.py* - fix problem when we don't have BERV variables (set header keys to None) [Neil Cook]
- *Core.instruments.spirou.recipe_ definitions.py* - update shortname of *fit_ tellu*. [Neil Cook]
- Update language database. [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - deal with fact RunSequence recipes are lost after generation (run must take inrecipe when recipe is given) [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - deal with fact RunSequence recipes are lost after generation (run must take inrecipe when recipe is given) [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - take out stop just use *event.is_ set*. [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - deal with recipe finishing (but not successfully) [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - extra stopping criteria added. [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - extra stopping criteria added. [Neil Cook]
- *Toolts.module.setup.drs_ reprocess.py* - make master stop at exception always. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.463 0.5.069 (2019-09-11)

- *Science.extract.general.py* - fix loading of tapas (in thermal correction 1) [Neil Cook]
- *Science.extract.berv.py* - fix how berv is obtained from header. [Neil Cook]
- *Science.calib.wave.py* - add a way to get dimensions from header (NAXIS2 and NAXIS1) if image (via infile) is not defined. [Neil Cook]
- *Recipe.spirou.obj_fit_tellu_spirou.py + obj_mk_tellu_spirou.py + obj_mk_template_spirou.py* - continue work on telluric functions (SpirouDRS –> terrapipe) [Neil Cook]
- *Recipe.spirou.cal_extract_spirou.py* - add fiber key to header. [Neil Cook]
- *Locale.core.drs_text.py* - add way to deal with TextEntry args being a int/float/bool (still not a list)–> list. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* - fix *find_files* (now deals with having a fiber filter as well) [Neil Cook]
- *Io.drs_data.py* - return both table and outfilename in *load_tapas* function. [Neil Cook]
- *Data.spirou.reset.telludb.master_tellu_SPIROU.txt* - add objname to default telluDB entries. [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add outputs to telluric recipes. [Neil Cook]
- *Core.instruments.spirou.pseduo_const.py* - fix typo in bervmaxest key. [Neil Cook]
- *Core.instruments.spirou.file_definitions.py* - make adjustments to telluric files. [Neil Cook]
- *Core.instruments.default.output_filenames.py* - allow suffix to be added to *set_file.* [Neil Cook]
- *Core.instruments.*.default_constants/default_keywords* - add missing *make_tellu*, *fit_tellu* and *make_template* constants/keywords. [Neil Cook]
- *Core.core.drs_file.py* - by default overwrite data if already read in DrsFitsFile.read() [Neil Cook]
- *Core.core.drs_database.py* - add objname to telludb column. [Neil Cook]
- *Tools.module.setup.drs_reprocess.py =* add total time calculation. [Neil Cook]
- *Science.telluric.general.py* - add *make_template_cubes* placeholder. [Neil Cook]
- *Recipe.spirou.obj_mk_template_spirou.py* - first commit - port from SpirouDRS. [Neil Cook]
- *Recipe.spirou.cal_dark_master/cal_spirou_master* - update call to *find_files.* [Neil Cook]
- Recipe.spirou - add *KW_OUTPUT* (needs to be added everywhere we *copy_hdict* to separate different files) [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* - remove *find_filetypes* and add (more generic) *find_files* function. [Neil Cook]
- *Core.instrumets.spirou.py* - add in *obj_mk_template.* [Neil Cook]
- *Core.instruments.*.default_constants.py* - add in *mk_template* constants. [Neil Cook]
- *Core.core.drs_database.py* - add in default mode *(CALIB_DB_MATCH)* [Neil Cook]
- *Core.constants.constant_functions.py* - for bool arguments make sure they are strings to do .lower and change second if to elif. [Neil Cook]
- *Core.core.drs_file.py* - update pep8 remove redundant lines. [Neil Cook]
- Update version/date/changelog. [Neil Cook]

5.3.1.464 0.5.068 (2019-09-10)

- *Tools.modlue.setup.drs_reprocess.py* - load "adds" when checking sequences (taken out of recipe init) [Neil Cook]
- *Science.extract.berv.py* - do not report estimate used when we are meant to be return no berv. [Neil Cook]
- *Science.calib.general.py + science.telluric.general.py* - need to enumerate around entries. [Neil Cook]
- *Locale.core.drs_text.py* - cache data - do not load a textdict again for an instrument (now cached) [Neil Cook]
- *Core.math.gauss.py* - import general (for fwhm) [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add *obj_mk_temp.* [Neil Cook]
- *Drs_recipe.py* - remove second deep copy (now copied internally to constants.load) [Neil Cook]
- *Core.core.drs_file.py* - replace *KW_DRS_QC* with *params['KW_DRS_QC'][0]* [Neil Cook]
- *Core.core.drs_argument.py* - move textdict loading to error handling (only needed here) [Neil Cook]
- *Core.constants.param_functions.py* - add caches to speed up loading. [Neil Cook]
- Update language database. [Neil Cook]
- Rename *obj_mk_tellu* and *obj_fit_tellu* (add _spirou suffix) [Neil Cook]
- Make recipes executable. [Neil Cook]
- Update language database. [Neil Cook]

- *Obj_fit_tellu.py + obj_mk_tellu.py* - keep porting telluric code from SpirouDRS. [Neil Cook]
- Recipe.spirou - pep8 changes. [Neil Cook]
- *Core.math.__init__.py* - add fwhm alias. [Neil Cook]
- Core.instruments - add telluric constants/keywords/definitions. [Neil Cook]

5.3.1.465 0.5.067 (2019-09-06)

- *Science.extract.berv.py* - add additional flag for when estiamte is used/not used. [njcuk9999]
- *Extract.berv.py* - add *USE_BERV*, *USE_BJD* and *USE_BERV_MAX* to berv props (these are the ones that should be used and will be either estimate or barycorrpy values. [njcuk9999]
- *Science.telluric.general.py* - add *gen_abso_pca_calc*, *shift_all_to_frame* and *calc_recon_and_correct* functions. [njcuk9999]
- *Obj_fit_tellu.py* - continue porting content from SpirouDRS to terrapipe. [njcuk9999]
- Update language database. [njcuk9999]
- *Core.core.drs_database.py* - add default parameters to *get_db_file.* [njcuk9999]

5.3.1.466 0.5.066 (2019-09-05)

- *Obj_fit_tellu.py* - update how far we have got. [njcuk9999]
- Update language database. [njcuk9999]
- Science.calib and science.extract - fix calls to *load_calib_file.* [njcuk9999]
- *Obj_fit_tellu.py/obj_mk_tellu.py* - continue to port from SpirouDRS to terrapipe. [njcuk9999]
- *Core.io.drs_path.py* - add *'get_most_recent'* function. [njcuk9999]
- Core.instruments - add *mk_tellu* constants/keywords. [njcuk9999]
- *Core.core.drs_database.py* - change how loading works (rearrange functionality) [njcuk9999]
- *Obj_fit_tellu.py* - start to copy over code from SpirouDRS to terrapipe. [njcuk9999]

5.3.1.467 0.5.065 (2019-09-04)

- Update language database. [njcuk9999]
- *Core.core.drs_file.py* - add overall pass/fail QC key. [njcuk9999]
- *Obj_mk_tellu.py* - continue work on adding SpirouDRS code to terrapipe. [njcuk9999]
- *Cal_loc_spirou.py* - remove blank space. [njcuk9999]
- Core.instruments - add *mk_tellu* constants. [njcuk9999]
- Update language database. [njcuk9999]
- *Science.rv.general.py* - remove empty lines. [njcuk9999]
- *Recipe.spirou.obj_mk_tellu.py* - continue copying over SpirouDRS code *(obj_mk_tellu)* [njcuk9999]
- Core.maths - split out some functions into own scripts (separate from general.py) [njcuk9999]
- *Core.instruments.spirou.py* - add *obj_mk_tellu* an *obj_fit_tellu* as DrsRecipes. [njcuk9999]
- *Core.core.drs_database.py* - add option to get header from database file. [njcuk9999]

5.3.1.468 0.5.064 (2019-09-02)

- *Science.calib.wave.py* - add NBPIX to wprops. [njcuk9999]
- *Core.core.drs_startup.py* - add success and passed to outdict. [njcuk9999]
- Fix *end_main* calls. [njcuk9999]
- Tools.module.setup - fix some small bugs. [njcuk9999]
- *Obj_mk_tellu.py* - first commit and functions ported from SpirouDrs. [njcuk9999]
- Science.extract - add fiber key and fix orderp logging in npy read/write functions. [njcuk9999]
- *Science.calib.wave.py* - allow *get_wavelength* solution to force to master. [njcuk9999]
- *Science.calib.general.py* - move *load_calib_file* to *drs_database.* [njcuk9999]
- Update language database. [njcuk9999]
- Data.core..pdbrc - update pdb rc file (print out) [njcuk9999]
- *Core.core.recipe_definitions.py* - add reprocess=True to *cal_wave* + add wave to *limited_run.* [njcuk9999]
- *Core.instruments.*.default_keywords* - add fiber and *KW_MID_OBS_TIME.* [njcuk9999]

- *Core.core.drs_startup.py* - fixes to indexing + pdb debug mode and exit functionality. [njcuk9999]
- *Core.core.drs_recipe.py* - *add_output_file* method and remove params['OUTPUTS'] [njcuk9999]
- *Core.core.drs_file.py* - add *get_fiber* method. [njcuk9999]
- *Core.core.drs_database.py* - *load_db_file load_db_file_from_filename* functions. [njcuk9999]
- *Core.core.drs_argument.py* - add a reprocess key as well as required key. [njcuk9999]
- *Recipes.spirou.** - *add_output_file* to allow indexing to work. [njcuk9999]

5.3.1.469   0.5.063 (2019-08-31)

- Data.core..pdbrc - add pdb/ipdb script to run on execution (after copying to working directory) [njcuk9999]
- *Tools.module.error.find_error.py tools.module.listing.file_explorer.py* - change exit/cleanup function calls. [njcuk9999]
- *Tools.dev.changelog.py* - change exit/cleanup function calls. [njcuk9999]
- *Science.extract.other.py* - fix problem with thermal (was returning e2ds instance not thermal e2ds instance) [njcuk9999]
- Update the exit/clean up function calls in main and *__main__* functions. [njcuk9999]
- Update language database. [njcuk9999]
- Update object query list. [njcuk9999]
- *Core.__init__.py* - add aliases to new exit/cleanup functions. [njcuk9999]
- *Core.instruments.default.default_config.py* - add idebug constants. [njcuk9999]
- *Core.core.drs_startup.py* - change the way ending is cleared up (ipdb + ll redo + locals sorting) [njcuk9999]
- *Core.core.drs_recipe.py* - add special *set_ipython_return* (for idebug mode) [njcuk9999]
- *Core.core.drs_argument.py* - add SetIpythonReturn class (for idebug mode) [njcuk9999]
- *Core.constants.param_functions.py* - add *get_relative_folder* and. [njcuk9999]
- *Tools.module.setup.drs_reprocess.py* - change when to lock/unlock params + handle deep copying / deletion better. [njcuk9999]
- *Tools.dev.** - change call to *core.end_main.* [njcuk9999]
- *Tools.bin.** - change call to *core.end_main.* [njcuk9999]
- *Science.calib.localisation.py* - use fiber params to get some parameters. [njcuk9999]
- *Science.calib.dark.py* - change where filetype comes from (not params) [njcuk9999]
- *Receipes.spirou.** - change call to *core.end_main.* [njcuk9999]
- *Core.instruments.*.pseudo_const.py* - fix writing to params (now *fiber_params)* [njcuk9999]
- *Drs_startup.py* - get params from llmain. [njcuk9999]
- *Param_functions.py* - add a way to set while being locked (only for use when really know what you are doing) [njcuk9999]

5.3.1.470   0.5.062 (2019-08-30)

- *Tools.module.setup.drs_reprocess.py* - fix copying (deep copy) [njcuk9999]
- *Tools.dev.changelog.py* - fix *end_main* and *get_locals()* [njcuk9999]
- *Tools.bin.** - fix main function *(end_main + get_locals)* [njcuk9999]
- *Science.extract.other.py* - remove params['QC'] –> passed. [njcuk9999]
- *Science.extract.general.py* - fix *order_profiles* (must be DrsNpyFile) [njcuk9999]
- Science.calib.wave,py - continue work to get *cal_wave_spirou.py* to work. [njcuk9999]
- *Science.calib.shape.py* - fix spelling in comment. [njcuk9999]
- *Recipe.spirou.** - remove params['QC'] –> passed, fix *core.end_main* params call. [njcuk9999]
- Update the language database. [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - add a hcmode and fpmode (for changing the *WAVE_MODE_HC* and *WAVE_MODE_FP)* [njcuk9999]
- *Output_filenames.py* - add output function to *func_name* (for error printing - need to locate the problem better) [njcuk9999]
- Core.core.instruments - deal with copying better (deep copies) + check used/unused keys. [njcuk9999]
- *Core.core.drs_startup.py* - deal with copying params better + lock after copies. [njcuk9999]
- *Core.core.** - deal with deep copying better. [njcuk9999]
- *Core.constants.param_functions.py* - add locking/unlocking function - stop setting keys to params. [njcuk9999]

5.3.1.471 0.5.061 (2019-08-29)

- *Science.rv.general.py* - fix tabbing typo + other fixes (found after first run) [njcuk9999]
- *Science.calib.shape.py* - fix error in log args (C pos 3 –> 4) [njcuk9999]
- *Cal_wave_spirou.py* + *science.calib.wave.py* - continue work on converting spiroudrs to terrapipe. [njcuk9999]
- *Recipes.spirou.cal_shape_spirou.py* - add shape keywords. [njcuk9999]
- *Recipes.spirou.cal_extract_spirou.py* - add shape keywords. [njcuk9999]
- Update language database. [njcuk9999]
- *Io.drs_data.py* - add colnames to ccf mask data function. [njcuk9999]
- *Core.__init__.py* - add *fiber_processing_update*. [njcuk9999]
- *Core.math.general.py* - fix nanpolyfit (if kwargs['w'] is None it breaks) [njcuk9999]
- *Core.instruments.spirou.recipe_definitions.py* - add new wave fp outputs. [njcuk9999]
- *Core.instruments.spirou.file_definitions.py* - add wave definitions and make sure name == *KW_OUTPUT*. [njcuk9999]
- Data.spirou.ccf - add CCF masks. [njcuk9999]
- *Core.instruments.*.output_filenames.py* - add *set_file* function. [njcuk9999]
- *Core.instruments.** - add wave constants/keyword args. [njcuk9999]
- *Core.core.drs_startup.py* - *get_file_definition* needs to remove fiber if present + add function 'fiber_processing_update' [njcuk9999]
- *Core.core.drs_file.py* - add group option to *copy_original_keys* (including checking *_check_keyworddict)* [njcuk9999]
- *Core.constants.param_functions.py* - add *get_keyword_instances* (for obtaining dictionary of header keys linked to params + their instances) [njcuk9999]
- *Core.constants.constant_functions.py* - add group. [njcuk9999]
- *Cal_wave_spirou.py* - corrections from Melissa commit + nanpolyfit change. [njcuk9999]

5.3.1.472 0.5.060 (2019-08-28)

- *Tools.module.setup.drs_reprocess.py* - fix updating keys in Run (runstring/args/kwargs), deal with wrong nightname. [njcuk9999]
- Update language database. [njcuk9999]
- *Io.drs_fits.py* - correct formatting of Time (need to use dtype) [njcuk9999]
- *Core.instruments.spirou.default_keywords.py* - correct typo in constants. [njcuk9999]

5.3.1.473 0.5.059 (2019-08-27)

- Science.rv.general - add *get_ccf_mask*, coravelation, *delta_v_rms_2d calculate_ccf* correlbin and *fit_ccf* functions. [njcuk9999]
- *Cal_wave_spirou.py* - continue updating from SpirouDRS –> terrapipe. [njcuk9999]
- Update language database. [njcuk9999]
- Update language database. [njcuk9999]
- *Drs_data.py* - add *load_ccf_mask* function. [njcuk9999]
- *Core.math.** - add fitgauss, *get_dll* and *get_ll* functions. [njcuk9999]
- *Core.instruments.*.py* - continue adding wave constants/keywords. [njcuk9999]
- *Drs_reprocess.py* - fix the return to *self.find_recipe*. [njcuk9999]
- *Drs_reprocess.py* - fix the return to *self.find_recipe*. [njcuk9999]

5.3.1.474 0.5.058 (2019-08-22)

- *Neil_ TODO.md* - currently needed before release of terrapipe. [Neil Cook]
- *Tools.module.setup.drs_ reprocess.py* - change SystemExit to LogExit. [Neil Cook]
- *Science.calib.wave.py* - continue convert spiroudrs wave fp solution to terrapipe. [Neil Cook]
- Update test files with new _ _ *main* _ _ and exception handling (from default and spirou) [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ exceptions.py* - add LogExit and Exit classes. [Neil Cook]
- *Io.drs_ text.py* - add save text file. [Neil Cook]
- *Terrapipe.io.drs_ data.py* - add load + save cavity files. [Neil Cook]
- *Core.instruments.** - add *WAVE_ FP* constants. [Neil Cook]
- *Core.core.drs_ startup.py* - change SystemExit catch to LogExit catch. [Neil Cook]
- *Core.core.drs_ log.py* - change exit system (now via LogExit) [Neil Cook]
- *SpirouWAVE2.py* - another question for Melissa. [Neil Cook]

5.3.1.475 0.5.057 (2019-08-21)

- *Science.calib.wave.py* - continue to add wave fp code. [Neil Cook]
- Update language database. [Neil Cook]
- *SpirouWAVE2.py* - add a todo on progress of terrapipe adding. [Neil Cook]
- *Cal_ wave_ spirou.py* - continue adapting SpirouDRS wave codes to terrapipe. [Neil Cook]
- *Science.rv.general.py* - add *measure_ fp_ peaks (create_ drift_ file)* and *remove_ wide_ peaks*. [Neil Cook]
- *Core.math.general.py* - add *gauss_ function*. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.** - continue to add *wave_ fp* constants. [Neil Cook]

5.3.1.476 0.5.056 (2019-08-21)

- *Constants_ SPIROU_ H4RG.py* - add comments for @melissa-hobson to try to explain. [Neil Cook]
- *Cal_ wave_ spirou.py* and *science.calib.wave.py* - continue work on converting from SpirouDRS. [Neil Cook]
- *Cal_ loc_ spirou.py* - fix comment indentation. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py* - add *out_ wave_ hc*, *out_ wave_ fp*, *out_ wave_ hcline*, *out_ wave_ hcres* and update recipe definitions accordingly. [Neil Cook]
- *Core.instruments.** - continue adding wave constants + keywords. [Neil Cook]
- *Core.core.drs_ file.py* - fix *add_ hkey_ 1d* function (no longer using kwstore in same way) [Neil Cook]

5.3.1.477 0.5.055 (2019-08-19)

- *Science.calib.wave.py* - continued integration of wave from SpirouDRS. [Neil Cook]
- *Cal_ wave_ spirou.py* - update call to *wave.hc_ wavesol*. [Neil Cook]
- *Core.math.general.py* - add *fit_ gauss_ with_ slope* function. [Neil Cook]
- Update language database. [Neil Cook]
- Core.instruments - add wave constants. [Neil Cook]
- *Core.constants.param_ functions.py* - *_ map_ listparameter* and *_ map_ dictparameter* - deal with value == '' [Neil Cook]
- *SpirouWAVE2.py* - clean up (for integration into terrapipe) [Neil Cook]

5.3.1.478 0.5.054 (2019-08-16)

- *Tools.module.setup.drs_reprocess.py* - change how *find_recipe* works. [Neil Cook]
- *Science.extract.other.py* - add other extraction functions (specifically for extracting files in recipes) [Neil Cook]
- *Recipe.spirou.cal_wave_spirou.py* - start conversion of *cal_wave* / wave.py. [Neil Cook]
- *Recipes.spirou.*.py* - add *DATA_DICT* and change average/sum to median for combining. [Neil Cook]
- Udpate language database. [Neil Cook]
- *Io.drs_image.py* - only check fiber in params['inputs'] if it is in inputs. [Neil Cook]
- *Core.instruments.recipe_definitions.py* - add *cal_wave*. [Neil Cook]
- *Core.instruments.file_definitions.py* - add *out_hcline*. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add wave constants. [Neil Cook]
- *Core.core.drs_startup.py* - add *DATA_DICT* functionality + recipemod saving. [Neil Cook]
- *Core.core.drs_recipe.py* - add unset recipemod to recipe class. [Neil Cook]
- *Core.core.drs_file.py* - change combine to include median. [Neil Cook]
- Merge branch 'melissa' into dev. [Neil Cook]
  Conflicts:
    > *INTROOT/config/constants_SPIROU_H4RG.py INTROOT/misc/cal_HC_E2DS_spirou.py*
- *Cal_wave_spirou*: new QC: consecutive pixels along an order must have increasing wavelengths. [melissa-hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
  Conflicts:
    > *INTROOT/bin/cal_CCF_E2DS_FP_spirou.py INTROOT/misc/cal_CCF_wrap_MH.py*
- SpirouWAVE2 - bug fixes. [melissa-hobson]
- *SpirouWAVE2.py* - implementation of *fit_1d_solution* method for *wave_new*. [melissa-hobson]
- *SpirouWAVE2.py* - move polynomial fitting to function. [melissa-hobson]
- SpirouWAVE2 - corrections to saves for line list table. [melissa- hobson]
- *Cal_wave_spirou, spirouWAVE2.py* - fixed line list table for *wave_new* method. [melissa-hobson]
- *Cal_wave_spirou, spirouWAVE2.py* - fixed results table for *wave_new* method. [melissa-hobson]
- SpirouPlot, spirouWAVE2 - plot fixes. [melissa-hobson]
- Merge branch 'melissa' of *https://github.com/njcuk9999/spirou_py3* into melissa. [melissa-hobson]
- *Constants_SPIROU_H4RG*: added wave constants spirouPlot.py: added plots for *cal_wave_new spirouWAVE2.py* - *cal_wave_new* adaptation - *update_cavity* switch and proper paths, plots moved to spirouPlot, fitting cleaned up. [melissa-hobson]
- *Cal_wave_new_final* save. [melissa-hobson]
- *Cal_HC_E2DS_EA* - corrected QC mistake. [melissa-hobson]
- *Constants_SPIROU_H4RG*: added wave constants spirouPlot.py: added plots for *cal_wave_new spirouWAVE2.py* - *cal_wave_new* adaptation - *update_cavity* switch and proper paths, plots moved to spirouPlot. [melissa-hobson]
- *Constants_SPIROU_H4RG*: added wave constants for FP peak ID *spirouWAVE2.py* - *cal_wave_new* adaptation - FP peak ID. [melissa- hobson]
- *Constants_SPIROU_H4RG*: added wave constants *spirouWAVE2.py* - *cal_wave_new* adaptation. [melissa-hobson]
- *SpirouWAVE2.py* - clarification of *all_lines* creation; fix of start and end orders for FP method 0; common parts of FP solution (Littrow, CCF) moved outside if loop. [melissa-hobson]
- *Cal_wave_spirou.py*, spirouWAVE2 - cleanup. [melissa-hobson]
- *Cal_wave_spirou.py* - bug fixes. [melissa-hobson]
- *Cal_wave_spirou.py, spirouWAVE2.py* - C Lovis method incorporation. [melissa-hobson]
- *Cal_wave_spirou.py, spirouWAVE2.py* - creation of single unified wavelength solution codes. [melissa-hobson]
- *Cal_WAVE_NEW_E2DS_spirou_2.py* - fixes to correctly handle NaNs. [melissa-hobson]
- *Cal_HC_E2DS_EA, cal_WAVE_E2DS_EA*: New QC that verifies that the difference in wavelength fits between consecutive orders is positive. [melissa-hobson]
- SpirouWAVE.py, *spirouRV.py* - fixes to correctly deal with NaN warnings. [melissa-hobson]
- *SpirouWAVE.py* - in *find_hc_gauss_peaks*, segments with fewer not-nan values than gaussian parameters + 1 are ignored. [melissa-hobson]
- Merge branch 'master' into melissa. [melissa-hobson]
  # Conflicts: # *INTROOT/bin/cal_CCF_E2DS_FP_MH_spirou.py* # *INTROOT/bin/-*

---

cal_CCF_E2DS_FP_spirou.py # INTROOT/misc/cal_CCF_wrap_MH.py # INTROOT/misc/-cal_WAVE_NEW_E2DS_spirou_2.py
- Merge remote-tracking branch 'origin/melissa' into melissa. [melissa- hobson]
  # Conflicts: # INTROOT/bin/cal_CCF_E2DS_FP_spirou.py # INTROOT/misc/-cal_CCF_wrap_MH.py
- Cal CCF bla. [melissa-hobson]
- Merge branch 'master' into melissa. [Melissa Hobson]
  Conflicts:
  INTROOT/bin/cal_CCF_E2DS_FP_MH_spirou.py INTROOT/bin/-cal_CCF_E2DS_FP_spirou.py INTROOT/misc/cal_CCF_wrap_MH.py INTROOT/misc/-cal_WAVE_NEW_E2DS_spirou_2.py
- *Cal_HC* function updates *cal_WAVE_NEW* save all input files. [melissa- hobson]
- *Cal_CCF_MH*: allows wavesols as arguments *cal_CCF_wrap*: calls all CCFs. [melissa-hobson]
- *Cal_WAVE_E2DS_EA*: fix wave file reading. [melissa-hobson]
- *Recipes.spirou.cal_wave_spirou.py* - first commit. [Neil Cook]

5.3.1.479 0.5.053 (2019-08-15)

- *Tools.module.setup.drs_reprocess.py* - correct how we determine whether we have errors in odict. [Neil Cook]
- *Core.instruments.spirou.py* - add *hc_run*. [Neil Cook]
- Update object list. [Neil Cook]
- *Tools.module.setup.drs_reprocess.py* - add shortname to processing list and skip RUN=False before generation (speed up) [Neil Cook]
- *Science.extract.berv.py* - make columns lower case (to fix table) [Neil Cook]
- *Core.core.drs_startup.py* - lock before making directories (for parallisation) [Neil Cook]
- Update language database. [Neil Cook]
- *Science.preprocessing.identification.py* - fix problem shallow copying fileset instance (use completecopy) [Neil Cook]
- *Science.preprocessing.detector.py* - add dx/dy and suppress warnings for nan problems in pp functions. [Neil Cook]
- *Science.calib.** - change times to *mid_obs_time* + change *debug_back* to recipe.outputs definition. [Neil Cook]
- Berv - shift around berv code + make time used come from *mid_obs_time*. [Neil Cook]
- *Cal_preprocess_spirou.py* - add in fix for 1 pixel shift + add in calculation of mid observation time. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_fits.py* - add *header_end_time* and *get_mid_obs_time* functions. [Neil Cook]
- *Core.instrument.spirou.recipe_definitions.py* - add *debug_back* to outputs. [Neil Cook]
- *Core.instruments.*.file_defintions.py* - move *debug_back* to instrument setup. [Neil Cook]
- *Drs_database.py* - correct typo need to return t for *get_mid_obs_time* call. [Neil Cook]
- *Core.instruments.*.py* - add new time constants. [Neil Cook]
- *Drs_database.py* - go from *start_time* −> *mid_obs_time*. [Neil Cook]

5.3.1.480 0.5.052 (2019-08-14)

- Update object query list. [Neil Cook]
- Update language database. [Neil Cook]
- Reprocessing fix - continue work. [Neil Cook]

5.3.1.481 0.5.051 (2019-08-13)

- Reprocessing - continue work on reprocessing. [Neil Cook]
- Reprocessing - continue work on reprocessing. [Neil Cook]
- *Recipe.spirou.cal_thermal_spirou.py* - fix bug with *THERMAL_E2DS_FILE* –> *recipe.outputs['THERMAL_E2DS_FILE']* [Neil Cook]
- *Data.core.object_query_list.fits* - update query list. [Neil Cook]
- *Core.instruemnts.spirou.recipe_definitions.py* - update shortnames + add science run. [Neil Cook]
- *Core.core.drs_recipe.py* - copy arguments/files properly (avoid shallow copying) [Neil Cook]
- *Core.core.drs_log.py* - add printmessage to WLOG. [Neil Cook]
- *Core.core.drs_file.py* - allow copying of drsfiles (required to allow recipe copying) [Neil Cook]
- *Core.core.drs_argument.py* - add changes to allow copying of arguments (needed for new recipe copies) [Neil Cook]
- *Drs_reprocess.py* - fix problems with modulemain. [Neil Cook]
- *Recipes.spirou.cal_extract_spirou* - remove unused imports. [Neil Cook]
- *Core.instrument.** - add reprocessing constants. [Neil Cook]
- *Drs_startup.py* - every call to *import_module* should call *func_name* (so we know where they come from) [Neil Cook]
- *Drs_recipe.py* - remove *_import_module* without path. [Neil Cook]
- *Core.constants.param_functions.py* - every call to *import_module* should have *func_name* as argument (so we know where it came from) [Neil Cook]
- *Core.constants.constant_functions.py* - every use of *import_module* should have *'func_name'* as argument (so we know where it came from) [Neil Cook]
- *Recipes.spirou.cal_badpix_spirou.py* - fix bug BACKMAP –> recipe.outputs['BACKMAP'] [Neil Cook]
- Update old version file. [Neil Cook]
- Update changelog/version/date. [Neil Cook]

5.3.1.482 0.5.050 (2019-08-12)

- Tools.reprocess - add processing (linear/parallel) functionality. [Neil Cook]
- *Science.telluric.general.py* - first commit - add *get_whitelist* and *get_blacklist* functions. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_text.py* - first commit - add text reading functionality. [Neil Cook]
- *Io.drs_data.py* - add *load_text_file* functionality. [Neil Cook]
- *Data.spirou.tellu_*list.txt* - add telluric black/white list. [Neil Cook]
- Core.instruments - add white/black list for tellurics (needed for reprocessing) [Neil Cook]
- *Core.core.drs_startup.py* - get recipe definitions module from call. [Neil Cook]
- *Drs_recipe.py* - changes to *generate_runs.* [Neil Cook]
- *Core.core.drs_file.py* - outfile should just be the basename. [Neil Cook]

5.3.1.483 0.5.049 (2019-08-10)

- *Drs_reprocess.py* - address new bugs. [Neil Cook]
- *Drs_reprocess.py* - address new bugs. [Neil Cook]
- Core.instruments - add outfunc=out.blank (and blank description) [Neil Cook]
- *Drs_recipe.py* - add return of runs. [Neil Cook]
- *Drs_reprocessing.py* - update for continued work on reprocessing. [Neil Cook]
- Update language database. [Neil Cook]
- Core.instruments - add repreocessing constants. [Neil Cook]
- *Drs_file.py* - add functionality for reprocessing. [Neil Cook]

5.3.1.484 0.5.048 (2019-08-08)

- *Tools.reset.py* - remove *update_params* and set _ _ *INSTRUMENT* _ _ from recipe update. [Neil Cook]
- *Reprocess.py/drs_reprocess.py* - continue work on reprocessing (unfinished) [Neil Cook]
- *Cal_preprocess_spirou.py* - allow skipping of files if done and –skip=True. [Neil Cook]
- Update language database. [Neil Cook]
- *Core._ _init_ _.py* - remove *update_params* (now done in setup) [Neil Cook]
- *Core.instruments.spirou.recipe_definitions.py* - add file module to DrsRecipe calls, add shortname and master to master recipes, add section defining run sequences (run order + filters) [Neil Cook]
- *Core.instruments.spirou.py* - add outfunc for *pp_file*. [Neil Cook]
- *Core.instruments.*.output_filenames.py* - fix how _ *calibration_prefix* works and add an error if "outpath" is None. [Neil Cook]
- *Core.instruments.*.default_constants.py* - add and update constants. [Neil Cook]
- *Drs_startup.py* - update parameters if instrument is in inputs (go from no instrument to using an instrument) [Neil Cook]
- *Drs_recipe.py* - add copy function to DrsRecipe add DrsRunSequence class. [Neil Cook]
- *Drs_argument.py* - remove debug print statement. [Neil Cook]

5.3.1.485 0.5.047 (2019-08-07)

- *Drs_reprocess.py* - add RUN and SKIP names (unfinished) [Neil Cook]
- Add outfiles from recipe.outputs. [Neil Cook]
- *Recipe_definitions.py* - add *set_outputs* and outputs to all recipes. [Neil Cook]
- *Drs_recipe.py* - add *set_outputs* method and outputs attribute (for adding output file definitions to files) [Neil Cook]

5.3.1.486 0.5.046 (2019-08-06)

- Tools.bin - first commit of reprocessing (not finished) [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_table.py* - fix problem with no *data_start* keyword in fmt='fits' [Neil Cook]
- Core.instruments - add in reprocessing constants. [Neil Cook]
- *Core.core.drs_startup.py* - allow *find_recipe* not be non-private. [Neil Cook]
- *Core.core.drs_recipe.py* - add a way to skip checks (for getting arg list from runlist) [Neil Cook]
- *Core.core.drs_argument.py* - add a way to skip checks (for getting arg list from runlist) [Neil Cook]
- *Core.constants.constant_functions.py* - modify *import_module* to have quiet mode. [Neil Cook]
- Update todo statements (more specific) [Neil Cook]

5.3.1.487 0.5.045 (2019-07-27)

- *Sciecne.extract.extraction.py* - remove use of params['FIBER'] [Neil Cook]
- *Sciecne.extract.berv.py* - fix *assign_properties*. [Neil Cook]
- *Science.calib.** - add in the option to get filename from call and from params['INPUTS'] [Neil Cook]
- *Cal_thermal_spirou.py* - check if *cal_extract* (for the *DARK_DARK)* failed before continuing. [Neil Cook]
- *Cal_shape_master_spirou.py* - remove use of params['FIBER'] [Neil Cook]
- *Cal_loc_spirou.py* - remove use of params['FIBER'] [Neil Cook]
- *Cal_flat_spirou.py* - remove use of params['FIBER'] [Neil Cook]
- *Cal_extract_spirou.py* - add options to skip on DPRTYPE and OBJNAME. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_image.py* - remove use of params['FIBER'] [Neil Cook]
- *Recipe_definitions.py* - add more options (calibration files) [Neil Cook]
- *Pseduo_const.py* - remove use of params['FIBER'] [Neil Cook]
- *File_definitions.py* - add *KW_OBSTYPE* to raw files. [Neil Cook]
- *Pseudo_const.py* - remove use of params['FIBER'] [Neil Cook]
- *Recipe_definition* - replace kwarg –> *set_kwarg* and arg –> *set_arg*. [Neil Cook]
- Update language database. [Neil Cook]
- *Berv.py* - add things left to do. [Neil Cook]
- Update *example_run_list.txt*. [Neil Cook]
- Update *example_run_list.txt*. [Neil Cook]
- *Core.instruments.spirou.file_defintions.py* - correct suffix for *out_shape_debug_ihc*. [Neil Cook]
- *Cal_flat_spirou.py* - correct order call. [Neil Cook]
- *Misc.update_wave_header.py* - script to update *master_wave* header with new keys. [Neil Cook]
- *Misc.example_run_list.txt* - list of test codes to run (while reprocessing script is being built) [Neil Cook]
- Tools.bin - add reset code (formally *cal_reset.py)* [Neil Cook]
- *Identification.py* - fix *drs_outfile_id* to find files with a different prefix. [Neil Cook]
- Science.calib - *get_file_definition* must specify kind (raw/tmp/red) [Neil Cook]
- *Cal_preprocess_spirou.py* - correct problems with *drs_outfile_id*. [Neil Cook]
- *Cal_dark_master_spirou.py* - deal with no dark files being found. [Neil Cook]
- *Drs_data.py* - *construct_filename* function all filename/directory name to be unset. [Neil Cook]
- Data.spirou.reset - update *MASTER_WAVE.fits* (new header keys) [Neil Cook]
- *Core.__init__.py* - add some new aliases and rearrange order. [Neil Cook]
- Update language database. [Neil Cook]
- Core.instruments - add reset functionality + small fixes to run codes. [Neil Cook]
- *Core.core.drs_startup.py* - pipe errors in main end script to WLOG (were just raising) + add function *update_params* (to update param with instrument params) [Neil Cook]
- *Core.core.drs_recipe.py* - add exceptions for bad sys.argv and misbehaving parsing to argparse. [Neil Cook]
- *Core.core.drs_file.py* - fix error message (should be the drs file not just the name) [Neil Cook]
- Data.spirou.reset - add reset files for calibdb and telludb. [Neil Cook]
- Reorganisation of the tools folder. [Neil Cook]
- Tools - update tools now have bin folder and dev folder (rest are modules) [Neil Cook]
- *Science.calib.shape.py* - add log for *ea_transform*. [Neil Cook]
- Update language database. [Neil Cook]
- *Object_query_list.fits* - first commit - the gaia query database (so we don't have to query online every time) [Neil Cook]
- *Science.extract.general.py* - fix problems with thermal. [Neil Cook]
- *Science.extract.crossmatch.py* - correction to new berv functionality including plx limit and mag limit. [Neil Cook]
- *Science.extract.berv.py* - correction to new berv functionality (including dberv and rv when present) [Neil Cook]
- *Cal_loc_spirou.py* - add calibs to header. [Neil Cook]
- *Cal_extract_spirou.py* - add rest of the cdb keywords. [Neil Cook]
- *Drs_data.py* - correct problems with *construct_filename* and add unique error message for *obj_list* function. [Neil Cook]
- *Core.math.general.py* - apply fix #567 by @melissa-hobson. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.** - added calibration and extraction (berv) keyword defintions. [Neil Cook]

- *SpirouMath.py* - correct issue #567 (fix by @melissa-hobson) [Neil Cook]

5.3.1.488 0.5.043 (2019-07-25)

- *Science.extract.berv.py* - add features to query gaia / lookup table. [Neil Cook]
- .gitignore - add .lock to ignore list. [Neil Cook]
- *Science.extract.crossmatch.py* - first commit – adding to query gaia/lookup table. [Neil Cook]
- *Science.extract.extraction.py* - change warning keys 0016 –> 016. [Neil Cook]
- *Cal_extract_spirou.py* - fix typo *add_berv_keys* requires params. [Neil Cook]
- *Drs_data.py* - add return file option to data functions. [Neil Cook]
- Update language database. [Neil Cook]
- Core.instruments - add *obj_list* constants (for gaia crossmatch) [Neil Cook]
- *Param_functions.py* - add *set_instance* and *set_instances*. [Neil Cook]

5.3.1.489 0.5.042 (2019-07-23)

- *Science.extract.berv.py* - continue work on adding berv calculation. [Neil Cook]
- *Cal_extract_spirou.py* - add header to *get_berv*. [Neil Cook]
- *Dsr_fits.py* - use param.instances to get fmt and dtype for *KW_ACQTIME*. [Neil Cook]
- Core.constants - add instance dictionary (like source dictionary) for ParamDict. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.** - add constants for berv. [Neil Cook]
- Changelog.md: refractor *header_time –> header_start_time*. [Neil Cook]
- Science.extract - add berv functionality. [Neil Cook]
- *Science.extract.wave.py* - add function *add_wave_keys*. [Neil Cook]
- Science.calib.dark/shape - refractor *header_time–>header_start_time*. [Neil Cook]
- *Cal_extract_spirou.py* - add berv stuff. [Neil Cook]
- Update language database. [Neil Cook]
- *Io.drs_fits.py* - rename *header_time –> header_start_time*. [Neil Cook]
- *Drs_database.py* - rename *header_time –> header_start_time*. [Neil Cook]

5.3.1.490 0.5.041 (2019-07-19)

- *Science.extract.general.py* - correct typo: *red_limt –> red_limit*. [Neil Cook]
- *Science.extract.general.py* - correct corrtype2 type: *THERMAL_CORRETION_TYPE1 –> THERMAL_CORRETION_TYPE2*. [Neil Cook]
- *Cal_extract_spirou.py* - print process of extraction fiber {0} of [{0} {1} {2}] [Neil Cook]
- Update language database. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.491 0.5.040 (2019-07-19)

- *Science.extract.general.py* - add s1d funtionality and add log message to thermal correction. [Neil Cook]
- *Science.calib.wave.py* - get the wfp keys and store in wprops. [Neil Cook]
- *Science.calib.localisation.py* - return locofile instance with localisation properties. [Neil Cook]
- *Science.calib.flat_blaze.py* - correct blaze getting function (was set to get flat) [Neil Cook]
- *Cal_extract_spirou.py* - add s1d functionality. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_fits.py* - fix problem that table cannot be primary hdu (start from ext=1 in these cases) [Neil Cook]
- Core.instruments - add s1d constants. [Neil Cook]
- *Drs_file.py* - fix hdict copying header cards, make sure header keys only copy basename for paths, add key formating for 1d and 2d keys. [Neil Cook]

5.3.1.492 0.5.039 (2019-07-18)

- *Science.extract.general.py* - fix typo *"red_limt" –> "red_limit"* [Neil Cook]
- *Wave.py* - make wave master use specific fibers and search for file defintion. [Neil Cook]
- *Shape.py* - correct program with shape finding (dymap y0[:, ix] –> y0[:, dim2//2]) [Neil Cook]
- *Cal_thermal_spirou.py* - add program name for when *cal_thermal* uses *cal_extract (thermal_extract)*, make sure header is added to outfile before adding to calibDB. [Neil Cook]
- *Cal_flat_spirou.py* - add textentry for qc fail message (missed before) [Neil Cook]
- *Cal_extract_spirou.py* - update QC should just check for NaN image. [Neil Cook]
- *Drs_table.py* - remove *"data_start"* for fits files (in *read_table)* [Neil Cook]
- *File_definitions.py* - add wavem file and correct thermal file (should be a *general_file* not a *calib_file)* [Neil Cook]
- *Drs_startup.py* - always plot the header line before file processing message. [Neil Cook]
- *Drs_database.py* - update the error when there is not hdict or header present (must be one or the other) [Neil Cook]
- *Drs_argument.py* - make debug message a text entry. [Neil Cook]
- Update language database. [Neil Cook]
- *SpirouImage.py* - fix the shape problem with dymap bending (fit y0 for center pixel not ix'th pixel) [Neil Cook]
- Data.core - add *tapas_all_sp.fits*. [Neil Cook]
- *Extract.general.py* - continue to port thermal correction code. [Neil Cook]
- *Shape.py* - remove test cases for dymap generation (still unfixed/unworking) [Neil Cook]
- *General.py* - reorganise *load_calib_file* (no *load_calib_table)* [Neil Cook]
- *Drs_image.py* - allow fiber type "ALL" [Neil Cook]
- *Drs_data.py* - add *load_tapas*. [Neil Cook]
- *Core.__init__.py* - *copy_kwargs* alias. [Neil Cook]
- *Cal_extract/cal_thermal* - continue work on porting from spirou drs. [Neil Cook]
- Update language database. [Neil Cook]
- Core.instruments - add constanst for extraction (thermal mostly) [Neil Cook]
- *Drs_startup.py* - add *copy_kwargs* function. [Neil Cook]
- *Drs_recipe.py* - add *set_program* special argument. [Neil Cook]
- *Drs_log.py* - set default values for params. [Neil Cook]
- *Drs_argument.py* - correct how to handle string instead of list for files. [Neil Cook]
- *SpirouImage.py* - remove test cases. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - correct comment. [Neil Cook]

5.3.1.493 0.5.037 (2019-07-10)

- Extraction/flat/blaze - continue work to port changes from spiroudrs. [Neil Cook]
- Extraction/flat/blaze - continue work to port changes from spiroudrs. [Neil Cook]
- Update language database. [Neil Cook]
- *Recipe_definitions.py* - change –extfiber to –fiber. [Neil Cook]
- *Pseudo_const.py* - update constants (add *FIBER_DATA_TYPE)* [Neil Cook]
- *SpirouMath.py* - pep8 change. [Neil Cook]
- *Cal_shape_master_spirou.py* - fix problem FP file should be FPfiles. [Neil Cook]
- *Science.extract.py* - work on completing the extraction functions (for *cal_flat)* [Neil Cook]
- *Science.calib.shape.py* - fix getting the calibration files (don't want to use *file_definitons* for specific instrument) [Neil Cook]
- *Science.calib.localisation.py* - fix *load_orderp*. [Neil Cook]
- *Science.calib.general.py* - check dtype in *add_calibs_to_header*. [Neil Cook]
- *Cal_flat_spirou.py* - continue porting over code from spiroudrs. [Neil Cook]
- *Recipes.spirou.py* - add missing keywords to header. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_image.py* - fix *get_fiber_types*. [Neil Cook]
- *Drs_fits.py* - add *check_dtype_for_header* function. [Neil Cook]
- *Recipe_definitions.py* - remove extract method. [Neil Cook]
- *Pseudo_const.py* - add *FIBER_WAVE_TYPES*. [Neil Cook]

- *Core.instruments.spirou.file_definitions.py* - fix types in calls. [Neil Cook]
- *Core.instruments..output_filenames.py* - tweak *npy_file.* [Neil Cook]
- *Core.instruments.py* - add *cal_flat* constants/keywords. [Neil Cook]
- *Drs_startup.py* - make sure name == file.name if we aren't returning all files. [Neil Cook]
- *Drs_log.py* - add dtype to allow listp/dictp to test/convert elements before returning. [Neil Cook]
- *Drs_file.py* - fix NpyFile to overwrite needed functions of InputFile. [Neil Cook]
- *Core.constants.param_function.py* - modify params.listp and params.dictp to add a dtype for list/dict elements. [Neil Cook]

5.3.1.494 0.5.035 (2019-07-08)

- Update language database. [Neil Cook]
- *Science.extraction.py* - first commit (port from spiroudrs) [Neil Cook]
- *Science.calib.shape.py* - change shape files to load from *general.load_calib_file.* [Neil Cook]
- *Science.calib.localisation.py* - add *load_orderp.* [Neil Cook]
- *Science.calib.general.py* - add *load_calib_file* and *load_calib_table.* [Neil Cook]
- *Cal_extract_spirou.py/cal_flat_spirou.py* - start porting code. [Neil Cook]
- *Drs_image.py* - add function *get_fiber_types.* [Neil Cook]
- *Drs_data.py* - change error code. [Neil Cook]
- *File_definitions.py* - add *drs_ninput* and *out_orderp_straight.* [Neil Cook]
- *Output_filenames.py* - add *npy_file.* [Neil Cook]
- *Drs_log.py* - allow *find_param* (pcheck) to get listp or dictp as well as constant. [Neil Cook]
- *Drs_file.py* - add DrsNpyFile and move some functionality to DrsInputFit. [Neil Cook]
- *Param_functions.py* - add *_map_dictparameter* and redefine *_map_listparameter.* [Neil Cook]
- *Science.calib.shape.py* - update how shape files are obtained from calibDB (including new function *get_shapelocal)* [Neil Cook]
- *Science.calib.localisation.py* - update how we get loco files from calibDB. [Neil Cook]
- *Recipes.spirou.cal_loc_spirou.py* - change outfile definiton (and how we identify which fiber file is for) [Neil Cook]
- *Cal_extract/cal_flat* – continue porting functionality from spiroudrs. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_path.py* - correct *__NAME__* [Neil Cook]
- *Drs_fits.py* - allow read function to take function name as argument + correct pep8. [Neil Cook]
- *Drs_data.py* - correct typoe in relfolder and filename for *load_full_flat_pp()* [Neil Cook]
- *Recipe_defintions.py* - update filetypes (no need to distiguish fiber files) [Neil Cook]
- *File_defintions.py* - update all filedefinitions with prefix, suffix, filetype where needed. [Neil Cook]
- *Output_filenames.py* - change how getting filenames work (now uses prefix/suffix/filetype and deal with having a fiber defined) [Neil Cook]
- *Drs_startup.py* - allow *get_file_definition* to return all files found (and name to be a string within drs file instance name) [Neil Cook]
- *Drs_recipe.py* - change variable index –> indextable. [Neil Cook]
- *Drs_file.py* - add suffix, prefix, fiber, fibers and rename ext –>filetype, index –> indextable, add method *get_dbkey* (adding use for fibers) [Neil Cook]
- *Drs_database.py* - change how dbkey is obtained. [Neil Cook]

5.3.1.495 0.5.034 (2019-07-05)

- README.md - move from recipes to terrapipe.recipes. [Neil Cook]
- README.md - move from recipes to terrapipe.recipes. [Neil Cook]
- *File_definitions.py* - remove *slit_shape.* [Neil Cook]
- Constants - add *FIBER_TYPES.* [Neil Cook]
- *Param_functions.py* - add listp method (to turn a string list into a list) [Neil Cook]
- *Cal_thermal_spirou.py* - get the nightname from parameter dict. [Neil Cook]
- *Science.calib.shape.py* - test how to deal with out of bounds coefficients in dymap [UNFINISHED + NOT WORKING] [Neil Cook]
- *Science.calib.general.py* - get number of files (from DrsFitsFile instance) and push this into dark correction (for average) [Neil Cook]

- *Science.calib.dark.py* - DARK key should be DARKM. [Neil Cook]
- *Core.instruments.spirou.pseduo_ const.py* = flip A and B coefficients to match spiroudrs. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ file.py* - add and set numfiles constant (for use when combining files to know how many files were combined) [Neil Cook]
- *Cal_shape_ master_ spirou.py* [terrapipe] - sum files don't average them, do not correct background (to make similar to spiroudrs code) and fix typo for dxmap0. [Neil Cook]
- *SpirouStartup.py* - only return unique files when returning multiple files. [Neil Cook]
- *SpirouImage.py* - fpdata1 –> masterfp, test how to deal with bounds in dymap. [Neil Cook]
- *Cal_shape_ master_ spirou.py* - change fpfile to fpfiles, set frames to use all fp files, make fpdata1 not masterfp. [Neil Cook]
- *Science.calib.shape.py* - add *shape_local* functions. [Neil Cook]
- *Science.calib.localisation.py* - change where we add one to the coefficient numbers. [Neil Cook]
- *Science.calib.general.py* - add calibration log message. [Neil Cook]
- Update language database. [Neil Cook]
- *Core.instruments.spirou.file_ definitions.py/rcipe_ defintions* - add shape *outputs/shape_local* recipe definition. [Neil Cook]
- *Cal_shape_ spirou.py* - first commit - push over code from spiroudrs. [Neil Cook]
- *Cal_shape_ master_ spirou.py* - fix bugs with saving. [Neil Cook]
- *Cal_loc_ spirou.py* - change math from average to sum. [Neil Cook]

5.3.1.496 0.5.032 (2019-07-03)

- *Science.calib.wave.py* - correct bug in loading keys from wave header. [Neil Cook]
- *Science.calib.shape.py* - add dymap functionality + correct some dxmap bugs. [Neil Cook]
- *Science.calib.localisation.py* - correct *get_ coefficients* function. [Neil Cook]
- *Science.calib.general.py* - add *add_ calibs_ to_ header* function. [Neil Cook]
- Update language database. [Neil Cook]
- Constants - continue adding shape constants + add pseudo constant functions. [Neil Cook]
- *Drs_ log.py* - *find_param* function: function call takes prescendence over params[key] [Neil Cook]
- *Cal_shape_ master_ spirou.py* - continue work on adding spiroudrs code (file saving) [Neil Cook]
- *Cal_loc_ spirou.py* - change the way calibration files are added to header. [Neil Cook]
- *Cal_dark_ master_ spirou.py* - fix comment. [Neil Cook]
- *SpirouBERV.py* - replace "t" with "jdutc" so all bjds returned. [Neil Cook]
- *Calib.science.preprocessing.detector.py* - move loading of full flat to *drs_ data.py.* [Neil Cook]
- *Calib.science.shape.py* - continue to add functionality from SpirouDRS. [Neil Cook]
- *Calib.science.localisation.py* - fix getting localisation coefficients. [Neil Cook]
- *Calib.science.badpix.py* - move loading of full flat to *drs_ data.py.* [Neil Cook]
- *Core.math.general.py* - fix when there are no NaNs (don't interpolate linearly) [Neil Cook]
- *Drs_ data.py* - first commit: module to control loading of internal drs data. [Neil Cook]
- Update language database. [Neil Cook]
- Add line lists and cavity length file. [Neil Cook]
- Add to config parameters. [Neil Cook]
- *Cal_shape_ master_ spirou.py* - add dxmap and start dymap conversion. [Neil Cook]
- *Calib.science.shape.py* - continue to add functionality from SpirouDRS. [Neil Cook]
- *Localisation.py/wave.py* - change output return (props only) [Neil Cook]
- *Core.math.py* - add fwhm, *iuv_ spline, median_ filter_ ea, gaussian_ function_ nn, gauss_ fit_ nn, gauss_ fit_ s.* [Neil Cook]
- *Default_ constants.py* - add shape constants. [Neil Cook]
- *Cal_shape_ master_ spirou.py* - change the *get_ coefficients*, *get_ wavesolution.* [Neil Cook]
- *Science.calib.shape.py* - start adding constants for shape master dxmap. [Neil Cook]
- *Default_ constants.py* - start adding constants for shape master dxmap. [Neil Cook]
- *Cal_shape_ master_ spirou.py* - placeholder for *calculate_ dxmap.* [Neil Cook]
- *Reprocess.py* - do not scan tmp and reduced files. [Neil Cook]
- *Reprocess.py* - pep8 - remove extra blank space. [Neil Cook]
- *SpirouBACK.py* - correct typo *th_blue_limit = p['THERMAL_ RED_ LIMIT']* –> *th_blue_limit = p['THERMAL_ BLUE_ LIMIT']* [Neil Cook]

- *Constants_SPIROU_H4RG.py* - correct typo *THERMAL_BLUE_LIMIT* = 24580 –> *THER-MAL_BLUE_LIMIT* = 2450 and add *ALLOWED_TELLURIC_DPRTYPES*. [Neil Cook]
- *Obj_fit_tellu.py obj_mk_tellu.py* - should only process files if DPRTPYE is correct, QC should fail if transmission map is all NaNs. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - QC should fail if file is all NaNs. [Neil Cook]

5.3.1.497 0.5.029 (2019-06-27)

- Update date/version/changelog. [Neil Cook]
- *Science.calib.shape.py* - fix rows missing from *fp_table*. [Neil Cook]

5.3.1.498 0.5.028 (2019-06-27)

- *Science.calib.shape.py* - fix *construct_master_fp* (add *fp_table* results) + place holder for *calculate_dxmap*. [Neil Cook]
- *Science.calib.localisation.py* - add *get_coefficients* function. [Neil Cook]
- *Science.calib.general.py* - add logging to various steps of *calibrate_ppfile*. [Neil Cook]
- *Science.calib.badpix.py* - fix a comment. [Neil Cook]
- *Science.calib.wave.py* - first commit add *get_masterwave_filename* and *get_wavesolution* functions. [Neil Cook]
- Update language database. [Neil Cook]
- *File_definitions.py* - add more files to *out_file* file set. [Neil Cook]
- *Recipe_definitions.py* - remove instances of tilt file. [Neil Cook]
- Add default constants/keywords for *shape_master*. [Neil Cook]
- *Drs_startup.py* - fix error reporting in *get_file_definition* and fix *found_file* when file not found. [Neil Cook]
- *Drs_file.py* - fix the way keys are read in read/read1d and read2d keys. [Neil Cook]
- *Cal_shape_master_spirou.py* - add plan for rest of code add localisation and wave files. [Neil Cook]
- *Science.calib.shape.py* - first commit add *fp_master* functions - *construct_fp_table*, *construct_master_fp*, *get_linear_transform_params*, *ea_transform*, *_max_neighbour_mask* and *_xy_acc_peak*. [Neil Cook]
- *Science.calib.general.py* - first commit add *calibrate_ppfile* function. [Neil Cook]
- Science.calib.background/badpix/dark - change the return of calib correction functions - now returns fileused + corrected image. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_image.py* - add *clean_hotpix* function. [Neil Cook]
- *Core.math.py* - add fit2dpoly, *linear_minimization* functions. [Neil Cook]
- *Recipe_definitions.py* - add *cal_shape_master* and remove *cal_slit*. [Neil Cook]
- *Default_constants.py* - add shape master *(fp_master)* constant definitions. [Neil Cook]
- *Cal_shape_master_spirou.py* - add master fp generation (untested) [Neil Cook]
- *Cal_loc_spirou.py* - update *cal_loc* with changes to how we calibrate ppfiles. [Neil Cook]
- *Cal_shape_master_spirou.py* - first commit (placeholder that needs filling) [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.499 0.5.027 (2019-06-26)

- *Drs_path.py* - make sure *night_name* does not start with a separator in *"get_nightname"* function. [Neil Cook]
- *Drs_database.py* - allow the addition of the night name to *"add_file"* function. [Neil Cook]
- *Cal_dark_master_spirou.py* - add nightname from reference file. [Neil Cook]
- *SpirouStartup.py* - remove unused import. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_fits.py* - integrate *_get_time* functionality into *header_time*. [Neil Cook]
- *Pseudo_const.py* - add back nirps logo. [Neil Cook]
- *Drs_database.py* - update *_get_time* to use *drs_fits.header_time*. [Neil Cook]
- Reorganize config and constants (now all in core sub-module) - update module order. [Neil Cook]
- Reorganize config and constants (now all in core sub-module) [Neil Cook]

- Reorganize where default settings are kept (now in config.instruments.default) – modifications to fix bugs. [Neil Cook]
- Reorganize where default settings are kept (now in config.instruments.default) – modifications to fix bugs. [Neil Cook]
- Reorganize where default settings are kept (now in config.instruments.default) [Neil Cook]
- *Science.calib.dark.py* - correct *dark_master* functionality including setup to infile. [Neil Cook]
- *Background.py* - update how debug file is made (with updates to *write_multi)* [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_path.py* - change conditions on finding *time_unit* to be astropy unit/quantity. [Neil Cook]
- *Drs_fits.py* - update Header class (from @cusher work) [Neil Cook]
- Constants/keywords - add/update values for *dark_master*. [Neil Cook]
- *Drs_startup.py* - fix *get_drs_params* inputs and make warning that code did not complete successfully red. [Neil Cook]
- *Drs_file.py* - make corrections to *write_multi* (including new *update_header_with_hdict* function) [Neil Cook]
- *Cal_dark_master_spirou.py* - finish converting *dark_master* to terrapipe. [Neil Cook]

5.3.1.500 0.5.026 (2019-06-25)

- *Science.calib.dark.py* - add dark master functionality. [Neil Cook]
- Update language database. [Neil Cook]
- Terrapipe.io - add *find_filetypes*, *get_index_files* and *header_time* functions. [Neil Cook]
- Constants - add dark master constant definitions. [Neil Cook]
- *Drs_startup.py* - add function *get_file_definition* and update pid getting (to add htime) [Neil Cook]
- *File_definitions* - add *dark_master* file definition. [Neil Cook]
- *Cal_dark_master_spirou.py* - first commit and transfer from SpirouDRS. [Neil Cook]
- Remove old drsmodule files. [Neil Cook]
- Update version/changelog and date. [Neil Cook]

5.3.1.501 0.5.025 (2019-06-24)

- *Obj_mk_obj_template.py* + spirouTelluric - move location of GetBERV. [njcuk9999]
- *SpirouTable.py* - change order of backup operations (always close lock file last) [njcuk9999]
- *SpirouTable.py* - fix problem with closing/replacing index.fits. [njcuk9999]

5.3.1.502 0.5.024 (2019-06-24)

- *SpirouTable.py* - remove the index file before writing it. [Neil Cook]
- *SpirouRfiles.py* - if reset is true make user confirm it. [Neil Cook]
- *SpirouRfiles.py* - add a raw index file that should save time opening already read headers. [Neil Cook]

5.3.1.503 0.5.023 (2019-06-23)

- *SpirouRgen.py* - fix problem when two independent file types defined (i.e. *DARK_FLAT* and *FLAT_DARK)* [Neil Cook]
- *SpirouRgen.py* - check that master night name exists (raise error if it doesn't) [Neil Cook]

5.3.1.504 0.5.022 (2019-06-21)

- *SpirouRgen.py* - rename *obj_mk_tellu_new –> obj_mk_tellu*. [Neil Cook]
- *SpirouFITS.py* - try to create lock directory. [Neil Cook]
- *SpirouBERV.py* - add keys for processing. [Neil Cook]
- *SpirouDB.py* - try to create lock folder if needed. [Neil Cook]
- *SpirouMath.py* - linear bad pix must have at least two non-NaN pixels. [Neil Cook]
- *SpirouBACK.py* - deal with thermal being empty or NaN filled entirely. [Neil Cook]
- *Obj_mk_tellu_db.py* - renamed *obj_mk_tellu_new* to *obj_mk_tellu*. [Neil Cook]
- *Obj_mk_tellu.py* - renamed from *obj_mk_tellu_new.py*. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add berv dtypes. [Neil Cook]
- *Cal_dark_master_spirou.py* - fix type *dark_cube –> dark_cube1*. [Neil Cook]

5.3.1.505 0.5.021 (2019-06-20)

- *SpirouBERV.py* - update comments to be more specific about inputs. [njcuk9999]
- *SpirouBERV.py* - update berv codes to be more specific about units etc. [njcuk9999]
- Update berv tests. [njcuk9999]
- *Constants_SPIROU_H4RG.py* - update observatory location. [njcuk9999]

5.3.1.506 0.5.020 (2019-06-19)

- *SpirouKeywords.py* - add keywords to list. [njcuk9999]
- *Berv_error_test.py* - continue testing of berv. [njcuk9999]
- *Reprocess.py* - add back main function. [njcuk9999]
- *SpirouBERVest.py* - degtorad –> deg2rad. [njcuk9999]
- SpirouBERV - testing berv calculation. [njcuk9999]
- SpirouImage/spirouStartup - make sure files is a list (if string make a list) [njcuk9999]
- *SpirouLog.py* - add colour option in wlog.printmessage. [njcuk9999]

5.3.1.507 0.5.019 (2019-06-18)

- *SpirouImage.py* - add warning capture for oweight (divide by NaNs okay) [njcuk9999]
- *SpirouRfiles.py* - add run directory from param dict. [njcuk9999]
- *Config.py* - add run directory. [njcuk9999]

5.3.1.508 0.5.018 (2019-06-17)

- *SpirouTelluric.py* - add *tau_h20* and *tau_rest* to code. [Neil Cook]
- *SpirouReprocess.py* - add skipping into code. [Neil Cook]
- *SpirouLog.py* - add method: "print message" [Neil Cook]
- *SpirouKeywords.py* - add *tau_h20* and *tau_rest* header keys. [Neil Cook]
- *SpirouConst.py* - update file name function defintions. [Neil Cook]
- *SpirouBACK.py* - correct typo dim2 –> dim1. [Neil Cook]
- *Obj_fit_tellu.py* - add *tau_h20* and *tau_rest* to header. [Neil Cook]
- *Cal_shape_spirou.py* - change debug file defintions (need filename defined) [Neil Cook]
- *Cal_preprocess_spirou.py* - make file name come from definition. [Neil Cook]

5.3.1.509 0.5.017 (2019-06-14)

- SpirouReprocess - update the reprocessing codes. [Neil Cook]
- *Recipe_ defintions.py* - fix some recipe definitions. [Neil Cook]
- *File_ definitions.py* - update file definitions. [Neil Cook]

5.3.1.510 0.5.016 (2019-06-13)

- SpirouReprocessing - continue work. [Neil Cook]
- Correct recipe and file definitions for non-input-redo. [Neil Cook]
- *Obj_fit_tellu_db.py* - correct number of required arguments. [Neil Cook]

5.3.1.511 0.5.015 (2019-06-12)

- *SpirouReprocess.py* - continue writing code. [Neil Cook]
- *SpirouBACK.py* - fix a problem with one of the returns in *correction_thermal*. [Neil Cook]
- *Multiprocess_ test.py* - add an event (to terminate all current and future jobs on crash) [Neil Cook]
- *Constants_ SPIROU_H4RG.py* - update a comment. [Neil Cook]
- Merge branch *'input_ redo'* into dev. [Neil Cook]
- Merge branch 'dev' into *input_ redo*. [njcuk9999]
- Merge branch 'dev' into *input_ redo*. [njcuk9999]
- Merge branch 'dev' into *input_ redo*. [njcuk9999]
  # Conflicts: # *INTROOT2/drsmodule/io/drs_lock.py*
- *Drs_ lock.py* - Merged 10b82f1 from @cusher into *input_ redo*. [njcuk9999]
- Localisation - update parameters for @melissa-hobson. [njcuk9999]
- Merge branch 'master' into *input_ redo*. [Neil Cook]
- *Localisation.py* - continue work for *cal_loc*. [Neil Cook]
- *Background.py* - fix backfile. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ fits.py* - fix write function having no dtype. [Neil Cook]
- *Constants.default.default_ constants.py* - add *fiber_ set_ num* key. [Neil Cook]
- *Config.instruments.spirou.*.py* - add/correct loc keys. [Neil Cook]
- *Drs_ file.py* - correct problems with *add_ hkeys_ 2d*. [Neil Cook]
- *Cal_ loc_ spirou.py* - continue work on input redo *cal_loc*. [Neil Cook]
- *Background.py* - change key for *add_ hkey*. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ fits.py* - fix import of *drs_ log*. [Neil Cook]
- *General.py* - fix imports. [Neil Cook]
- *Config.instruments.spirou.*.py* - correct keys and constants. [Neil Cook]
- *Drs_ log.py* - correct the *find_ param* function. [Neil Cook]
- *Drs_ file.py* - fix when key = keywordstore. [Neil Cook]
- *Drs_ database.py* - correct call to *find_ param*. [Neil Cook]
- *File_ definitions.py* - correct bad extension. [Neil Cook]
- *Cal_ loc_ spirou.py* - continue fixes to *input_ redo* changes. [Neil Cook]
- Update language database. [Neil Cook]
- *Localisation.py* - add *image_ superimp* function. [Neil Cook]
- *Drs_ fits.py* - move the resize/flip images add convert functions. [Neil Cook]
- *Constants.defaults.*.py* - add constants/headers from localisation. [Neil Cook]
- Config.math - add *calculate_ polyvals* function. [Neil Cook]
- *Instruments.spirou.*.py* - add constants/keywords for localisation. [Neil Cook]
- *Drs_ file.py* - add method *'copy_ hdict'* [Neil Cook]
- *Cal_ loc_ spirou.py* - continue work on adapting recipe for terrapipe. [Neil Cook]
- *Cal_ loc_ spirou.py* - continue work on adapting recipe for terrapipe. [Neil Cook]
- Recipes.spirou - move flip/resize functions. [Neil Cook]
- Update language database. [Neil Cook]
- *Science.calib.localisation.py* - continue work on localisation functions. [Neil Cook]
- *Constants.default.*.py* - add localisation constant defintions. [Neil Cook]

- *Config.math.general.py* - add *measure_ box_ min_ max*, nanpolyfit. [Neil Cook]
- *Config.instruments.spirou.*.py* - add localisation constants. [Neil Cook]
- *Output_ filenames.py* - make output file function generic. [Neil Cook]
- *File_ definitions.py* - make *debug_ back* output generic to debug outputs. [Neil Cook]
- *Cal_ loc_ spirou.py* - continue work on porting over *cal_ loc.* [Neil Cook]
- *Cal_ dark_ spirou.py* - modify how combine works for header input files. [Neil Cook]
- *Cal_ badpix_ spirou.py* - modify how combine works for header input files. [Neil Cook]
- Merge branch 'master' into *input_ redo.* [Neil Cook]
- *Localisation.py* - continue development from *cal_ loc.* [Neil Cook]
- *Dark.py* - continue development from *cal_ loc.* [Neil Cook]
- *Badpix.py* - continue development from *cal_ loc.* [Neil Cook]
- *Background.py* - continue development from *cal_ loc.* [Neil Cook]
- Update the language database. [Neil Cook]
- *Drs_ fits.py* - work on read/write single and multi functions (should be universal) + use @cusher Header class. [njcuk9999]
- *Constants.defaults.*.py* - add *cal_ loc* constants. [Neil Cook]
- *Config._ _ init_ _ .py* - add *find_ param* (aliased to pcheck) to _ _ init_ _ [Neil Cook]
- Config.math - add a general math functions module (and nanpad/killnan functions) [Neil Cook]
- *Config.instruments.spirou.*.py* - add *cal_ loc* constants and definitions. [Neil Cook]
- *Drs_ log.py* - upgrade the *find_ param* function to look in kwargs if definied. [Neil Cook]
- *Drs_ file.py* - move read and write to io module. [Neil Cook]
- *Config.core.default.*.py* - add loc constants and definitions. [Neil Cook]
- *Cal_ loc_ spirou.py* - continuing copying over and converting code. [Neil Cook]
- *Cal_ badpix_ spirou.py* - make sure images are np.array copies. [Neil Cook]
- *Science/calib/dark.py* - add dark correction function. [Neil Cook]
- *Drs_ table.py* - generalise lock functions. [Neil Cook]
- *Drs_ path.py* - pep8 corrections. [Neil Cook]
- *Drs_ lock.py* - generalise lock functions. [Neil Cook]
- Constants/default - add initial *cal_ loc* constants. [Neil Cook]
- Config/instruments/spirou - add initial *cal_ loc* constants. [Neil Cook]
- *Drs_ startup.py* - make lock functions more general and only index if recipe was successful. [Neil Cook]
- *Drs_ database.py* - add first methods for new Database class. [Neil Cook]
- Update language database. [Neil Cook]
- *Cal_ loc_ spirou.py* - first commit [unfinished] [Neil Cook]
- *Badpix.py* - fix bugs with conversion. [Neil Cook]
- Update language database. [Neil Cook]
- *Default_ keywords* - add default badpix keyword definitions. [Neil Cook]
- *Default_ constant.py* - add input kwargs. [Neil Cook]
- *Recipe_ definitions.py* - finalise *cal_ badpix* definition. [Neil Cook]
- *Output_ filenames.py* - add *badpix_ file* and *backmap_ file.* [Neil Cook]
- *File_ definitions.py* - add *out_ badpix* and *out_ backmap* output files. [Neil Cook]
- *Default_ keywords.py* - add badpix header keywords. [Neil Cook]
- *Default_ constants.py* - add input kwargs. [Neil Cook]
- *Cal_ preprocess_ spirou.py* - add dimanme for header of *KW_ INFILE1.* [Neil Cook]
- *Cal_ dark_ spirou.py* - change _ _ *NAME_ _* to all lower case. [Neil Cook]
- *Cal_ badpix_ spirou.py* - update and finish first test. [Neil Cook]
- *Badpix.py* - first commit - space for bad pixel map functions. [Neil Cook]
- *Background.py* - first commit space for background functions. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ fits.py* - add *flip_ image* function. [Neil Cook]
- *Default_ config.py* - add badpix values. [Neil Cook]
- *Default_ config.py* - add badpix values. [Neil Cook]
- *Cal_ dark_ spirou.py* - change name of parmeter for combining files on input. [Neil Cook]
- *Cal_ badpix_ spirou.py* - first commit [UNFINISHED] [Neil Cook]
- *Default_ config.py* - update version. [Neil Cook]
- Merge branch 'master' into *input_ redo.* [Neil Cook]
- *Drs_ reset.py* - first commit of reset code. [Neil Cook]
- *Drs_ changelog.py* - add comments and move text to language database. [Neil Cook]

- Update language database. [Neil Cook]
- Update language database. [Neil Cook]
- *Default_config.py* - update version and date. [Neil Cook]
- *Drs_changelog.py* - make sure we define outputs=None for recipe without outputs. [Neil Cook]
- *Psuedo_const.py* - deal with *DRS_DATA_MSG* being None. [Neil Cook]
- *Drs_changelog.py* - preview is in params['INPUT'] [Neil Cook]
- *Recipe_definitions.py* - add definition for *drs_changelog.* [Neil Cook]
- *Drs_startup.py* - allow no instrument to search for recipe name. [Neil Cook]
- Update language database. [Neil Cook]
- *Param_functions.py* - force printing to string. [Neil Cook]
- *Drs_changelog.py* - update with new locations. [Neil Cook]
- *Default_config.py* - give more space for version. [Neil Cook]
- *Drs_changelog.py* - correct number of arguments for *get_relative_folder.* [Neil Cook]
- *Recipe_definitions.py* - add change log definition. [Neil Cook]
- Update database. [Neil Cook]
- *Drs_changelog.py* - first commit of drs changelog for input redo. [Neil Cook]
- Merge branch 'master' into *input_redo.* [Neil Cook]
- *Drs_startup.py* - end with header. [Neil Cook]
- *Drs_log.py* - tidy up logging messages. [Neil Cook]
- *Drs_log.py* - tidy up logging messages. [Neil Cook]
- *Drs_file.py* - remove references to hdict comments (now in fits.Header) [Neil Cook]
- *Drs_argument.py* - do not print info. [Neil Cook]
- Change text message. [Neil Cook]
- Change text message. [Neil Cook]
- *Drs_startup.py* - edit title. [Neil Cook]
- *Dark.py* - remove warning about NaNs. [Neil Cook]
- *Drs_database.py* - change how we access hdict. [Neil Cook]
- *Drs_file.py* - deal with how to access hdict. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
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- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_startup.py* - edit logo. [Neil Cook]
- *Drs_file.py* - header is now fits.Header not OrderedDict. [Neil Cook]
- Rename drs to terrapipe. [Neil Cook]
- Rename drs to terrapipe. [Neil Cook]
- Merge branch 'dev2' into *input_redo.* [Neil Cook]
- Merge branch 'dev2' into *input_redo.* [Neil Cook]
- *Recipes.spirou.cal_preprocess_spirou.py* - chmod +x. [njcuk9999]
- *Recipes.spirou.cal_dark_spirou.py* - chmod +x. [njcuk9999]
- *Config.instruments.spirou.default_keywords.py* - correct *KW_EXT_TYPE* value (was a typo) [njcuk9999]
- *Drs_startup.py* - don't try to create folders when we don't have nightname. [njcuk9999]
- *File_explorer.py* - define a path for ds9 (will need moving to some installation specific place) and better deal with index col differences in error report. [njcuk9999]
- *Constants.default.pseudo_const.py* - add changes from old code (version and pversion in index.fits) [njcuk9999]
- *Config.core.drs_file.py* - fix bug "copy" −> "copyother" [njcuk9999]
- Refactor new −> newcopy and copy −> copyother. [Neil Cook]
- Update datacutmask. [Neil Cook]
- Update language database. [Neil Cook]
- Update constants/config/keywords. [Neil Cook]
- *Drs_recipe.py* - update functions after run through. [Neil Cook]

- *Drs_ file.py* - update functions after run through. [Neil Cook]
- *Drs_ database.py* - update functions after run through. [Neil Cook]
- Channge ErrorEntry and ErrorText to TextEntry and TextDict. [Neil Cook]
- *Drs_ fits.py* - deal with zero and one infiles separately. [Neil Cook]
- Update language database. [Neil Cook]
- Update constants files. [Neil Cook]
- Delete drsmodule.config.database (moved to core in single *.py* file) [Neil Cook]
- *Drs_ startup.py* - add run function (to keep recipes clean) [Neil Cook]
- *Drs_ database.py* - update datebase setting (combine calib and telluric) [Neil Cook]
- *Cal_ preprocess_ spirou.py* - update qc to match *cal_ dark.* [Neil Cook]
- *Cal_ dark_ spirou.py* - flesh out functionality. [Neil Cook]
- *Drsmodule.science.calib.dark.py* - add *measure_ dark_ badpix* function. [Neil Cook]
- Update language database. [Neil Cook]
- Drsmodule.constants.default - add dark keys. [Neil Cook]
- Drsmodule.config.instrument.spirou - add dark keys. [Neil Cook]
- Drsmodule.config.database - first commit of database.py, calibdb.py, telludb.py. [Neil Cook]
- *Cal_ dark_ spirou.py* - fill out more of the sections. [Neil Cook]
- *Dark.py* - first commit add *measure_ dark* function. [Neil Cook]
- *Drs_ fits.py* - add combine and resize functions. [Neil Cook]
- Update language database. [Neil Cook]
- Add new constants to constants/keyword files. [Neil Cook]
- *Drs_ log.py* - add *find_ param* logger function. [Neil Cook]
- *Drs_ file.py* - add combine and *get_ key* functions. [Neil Cook]
- *Blank_ spirou.py* - update the blank example script. [Neil Cook]
- *Cal_ preprocess_ spirou.py* - move file processing to *config.file_ processing_ update.* [Neil Cook]
- *Cal_ dark_ spirou.py* - start filling out code. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_ fits.py* - add skeleton for combine function. [Neil Cook]
- *Drsmodule.constants.default.default_ constants.py* - add *COMBINE_ IMAGES* constant. [Neil Cook]
- *Drsmodule.config._ _ init_ _ .py* - link to *file_ processing_ update.* [Neil Cook]
- *Instruments.spirou.recipe_ definitions.py* - add default value for combine option. [Neil Cook]
- *Instruments.spirou.default_ constants.py* - add *combine_ images* constant. [Neil Cook]
- *Drs_ startup.py* - add general file processing logger. [Neil Cook]
- *Recipes.spirou.cal_ preprocessing_ spirou* - continue *input_ redo.* [Neil Cook]
- Drsmodule.science.preprocessing - continue *input_ redo.* [Neil Cook]
- Drsmodule.locale - continue *input_ redo.* [Neil Cook]
- Drsmodule.io - continue *input_ redo.* [Neil Cook]
- Drsmodule.constants.default - continue *input_ redo.* [Neil Cook]
- Drsmodule.config.instruments - continue *input_ redo.* [Neil Cook]
- Drsmodule.config.core - continue *input_ redo.* [Neil Cook]
- Drsmodule.science.preprocessing - continue *input_ redo.* [Neil Cook]
- Drsmodule.locale - continue *input_ redo.* [Neil Cook]
- Drsmodule.io - continue *input_ redo.* [Neil Cook]
- Drsmodule.data - continue *input_ redo.* [Neil Cook]
- Drsmodule.constants.default - continue *input_ redo.* [Neil Cook]
- Drsmodule.constants.core - continue *input_ redo.* [Neil Cook]
- Drsmodule.config.instruments.spirou - continue *input_ redo.* [Neil Cook]
- Drsmodule.config.core - continue *input_ redo.* [Neil Cook]
- *SpirouRecipe.py* - continue *input_ redo.* [Neil Cook]
- *Test_ spirou.py* - remove bad code (test to crash) [Neil Cook]
- *Identification.py* - check file by copying *drs_file* over *given_ drs_ file* and then use *self.check_ file()* [Neil Cook]
- *Drs_ recipe.py* - move checking functionality to *drs_ file.* [Neil Cook]
- *Dsr_ file.py* - add copy function to *drs_ file.* [Neil Cook]
- Update language file. [Neil Cook]
- Merge branch 'master' into *input_ redo.* [Neil Cook]
- *Identification.py* - start writing code to identify drs file. [Neil Cook]
- *File_ definitions* - change append to addset. [Neil Cook]

- *Drs_file.py* - addset functions and plan new checking functions. [Neil Cook]
- Update input redo - work on *cal_preprocess*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Continue working on upgrade. [Neil Cook]
- Continue working on upgrade. [Neil Cook]
- Update language database. [njcuk9999]
- Add placeholders for preprocessing functions. [njcuk9999]
- Add spirou preprocessing recipe. [njcuk9999]
- Update test recipes. [njcuk9999]
- Fix module pathing system. [njcuk9999]
- *Config.__init__.py* - add alias to *get_locals*. [njcuk9999]
- *Recipe_definitions* - update preprocessing defintion. [njcuk9999]
- *Default_config.py* - make plot variables an int. [njcuk9999]
- *Drs_startup.py* - add temp messgae for loading arguments + add a code unsuccessful message. [njcuk9999]
- *Drs_recipe.py* - change INPUT –> INTPUTS + make param dict. [njcuk9999]
- *Drs_log.py* - sort out *LOGGER_ERROR* etc (now stored per PID + add Printer class (TLOG) to print temporary messages which disappear if no other text inbetween. [njcuk9999]
- *Drs_argument.py* - add a new line in the debug messages (for Printer to be on new line) [njcuk9999]
- Add *__init__.py* files to new folders. [njcuk9999]
- *Port_database.py* - output more log messages. [njcuk9999]
- *Test_spirou.py* - fix function call. [njcuk9999]
- Update language database. [njcuk9999]
- *Constants_functions.py* - fix problem with relative imports. [njcuk9999]
- *Recipe_definitions.py* - make plot and integer and only allow values 0, 1, 2. [njcuk9999]
- *Drs_startup.py* - fix the printing of arg log strings (arguments used) [njcuk9999]
- *Drs_recipe.py* - fix missed error (should be from database) [njcuk9999]
- *Drs_arguemnt.py* - allow arguments to specify a min and max value (and check for it) [njcuk9999]
- Attempt to remove relative imports. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- *File_explorer.py* - move data loading / mask applying to different threads. [Neil Cook]
- **.__init__.py* - fix imports (should be empty) [Neil Cook]
- *Locale.core.__init__.py* - fix imports (should be empty) [Neil Cook]
- *File_explorer.py* - update length and add new instrument box. [Neil Cook]
- *File_explorer.py* - update about statement. [Neil Cook]
- *File_explorer.py* - continue upgrade. [Neil Cook]
- *File_explorer.py* - continue upgrade. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- *File_explorer.py* - continue to write code. [Neil Cook]
- *File_explorer.py* - add table. [Neil Cook]
- *Config.__init__.py*: add aliases to *__all__* [Neil Cook]
- Drsmodule.io - need to import *drs_log* separately *(drs_startup* uses *drs_table)* [Neil Cook]
- *Find_error* - change comment to better represent section. [Neil Cook]
- *Combine_index_files.py* - pep8 changes. [Neil Cook]
- *File_explorer.py* - app to find drs files. [Neil Cook]
- *Drs_table.py* - update doc strings. [Neil Cook]
- *Drs_table.py* - update doc strings. [Neil Cook]
- *Drs_lock.py* - update doc strings. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Added a misc folder and a first misc script. [Neil Cook]
- *Recipes/test/** - update paths to *drs_setup* (via config) [Neil Cook]
- *__init__.py* - add a functions section (currently blank) [Neil Cook]
- *Tools.** - update paths to *drs_setup* (via config) [Neil Cook]
- *Plotting.** - update paths to *drs_setup* (via config) [Neil Cook]
- *Io.** - update paths to *drs_setup* (via config) [Neil Cook]
- *Config.__init__.py* - add aliases to functions that will be used lots. [Neil Cook]
- *Drs_startup.py* - continue improvements to documentation. [Neil Cook]
- *User_config.ini[NIRPS]* - update *DRS_PLOT* value and comment (now an int [0, 1, 2]) [Neil Cook]
- *Drs_text.py* - make *get_relative_folder* a public function. [Neil Cook]

5.3. Update notes

- *Find_error.py* - update doc strings to pep8 standards. [Neil Cook]
- *Find_error.py* - update comments. [Neil Cook]
- *Find_error.py* - add drop down instrument box. [Neil Cook]
- *Find_error.py* - improve gui. [Neil Cook]
- *Drs_setup* - add better doc strings. [Neil Cook]
- *Find_error.py* - continued to work on application. [njcuk9999]
- *Drs_text.py* - got args for language database reads. [njcuk9999]
- *Constant_functions.py* - added the source to dtype errors in config files. [njcuk9999]
- *Drs_startup.py* - allowed instrument to be None. [njcuk9999]
- Tool to find error codes in database/code. [njcuk9999]
- Drs general - initialise new sub package folders. [Neil Cook]
- Drs general - initialise new sub package folders. [Neil Cook]
- Merge remote-tracking branch *'origin/input_redo'* into *input_redo*. [Neil Cook]
  Conflicts:
    INTROOT2/drsmodule/config/core/drs_startup.py
- *Default_config.py* - add *DRS_DATA_PLOT*. [Neil Cook]
- Add *drs_data_plot* to start up parameters. [Neil Cook]
- *Drs_recipe.py* - change plotting mode - only if *drs_plot* is 1 (to screen) [Neil Cook]
- *User_config.ini* - add plot modes (instead of bool) [Neil Cook]

5.3.1.512 0.5.014 (2019-06-11)

- *SpirouReprocess.py* - add processing (parallalised) to reprocess. [Neil Cook]
- *SpirouImage.py* - fix small bug with position of log message. [Neil Cook]
- *Multiprocess_test.py* - test of multiple. [Neil Cook]

5.3.1.513 0.5.013 (2019-06-10)

- *SpirouReprocess.py* - first commit reworking of reprocessing script and run files (works for unit test and any/all reprocessing) [Neil Cook]
- Correct names. [Neil Cook]
- Bin folder - add *__args__* and *__required__* [Neil Cook]
- *SpirouImage.py* - add in shape qc. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add in shape qc. [Neil Cook]
- *Cal_shape_master_spirou.py* - add in QC (std of shape map) [Neil Cook]
- *SpirouConst.py* - remove overlap file and add *SLIT_SHAPE_BDXMAP_FILE* debug file. [Neil Cook]
- *Cal_shape_spirou.py* - produce debug plots to check transform for the input fp file + save master shape (x/y) files to header. [Neil Cook]
- *Cal_shape_master_spirou.py* - straighten the dxmap (using dymap) and save the bent dxmap as debug product. [Neil Cook]
- *SpirouBACK.py* - add *correction_thermal2* functionality. [Neil Cook]
- *Recipe_control.txt* - add new name for *cal_shape_master (cal_shape_master_spirou)* [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add more thermal constants and correct thermal correction types to single fiber values. [Neil Cook]
- *Cal_shape_master_spirou.py* - correct both dx and dy maps. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - thermal correction must be based on individual fiber type not DPRTYPE. [Neil Cook]

5.3.1.514 0.5.012 (2019-06-08)

- *SpirouUnitRecipes.py* - remove *cal_SHAPE_spirou* and add *cal_shape_spirou.* [Neil Cook]
- *SpirouImage.py* - add new loading functions (for new calibDB files) [Neil Cook]
- *SpirouPlot.py* - add new *thermal_background_debug_plot* function. [Neil Cook]
- *SpirouKeywords.py* - add shape and new cdb keys. [Neil Cook]
- *SpirouConst.py* - add *SLIT_SHAPE_LOCAL_FILE* + fix *slit_SHAPE* functions. [Neil Cook]
- *SpirouBACK.py* - add *correction_thermal*, *correction_thermal1* and *correction_thermal2*. [Neil Cook]
- *Reset_calibDB* - add *tapas_all_sp.fits.gz* to calibDB. [Neil Cook]
- *Recipe_control.txt* - add *cal_shape_spirou.py*. [Neil Cook]
- *Output_keys.py* - add local shape to tags. [Neil Cook]
- *Cal_SHAPE_spirou.py* - moved from bin folder (now old code) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add thermal constants. [Neil Cook]
- *Cal_shape_spirou.py* - first commit new local shape recipe. [Neil Cook]
- *Cal_shape_master_spirou.py* - put FPMASTER in calibDB. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - add FP master file getting. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add thermal correction (untested) [Neil Cook]

5.3.1.515 0.5.011 (2019-06-07)

- *Cal_shape_master.py* - apply dxmap and dymap + remove reference to FPFILES (–> FPFILE) [Neil Cook]
- *SpirouLOCOR.py* - add modifications for new shape parameters. [Neil Cook]
- *SpirouImage.py* - continue working on new shape functionality. [Neil Cook]
- *SpirouEXTOR.__init__.py* - add alias to CleanHotpix. [Neil Cook]
- *SpirouMath.py* - change how IUVSpline deals with NaNs (full set of NaNs and group of Nans –> fill with linear interp) [Neil Cook]
- *SpirouKeywords.py* - add backgroun key and new shape header keys. [Neil Cook]
- *SpirouBACK.py* - return background filename for adding to header. [Neil Cook]
- *Cal_shape_master.py* - correct change to table (needed extra term) [Neil Cook]
- *Cal_SHAPE_spirou_old.py* - add changes for background file loading. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add shape master/local qc parameters. [Neil Cook]
- *Cal_SLIT_spirou.py* - add changes for background file loading. [Neil Cook]
- *Cal_shape_master.py* - add changes from Etiennes redo. [Neil Cook]
- *Cal_loc_RAW_spirou.py* - add changes for background file getting. [Neil Cook]
- *Cal_ff_raw_spirou.py* - add changes for new shape files. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add changes for new shape files. [Neil Cook]

5.3.1.516 0.5.010 (2019-06-06)

- *SpirouImage.py* - add *get_x_shape_map* and *get_y_shape_map* functions and aliases. [Neil Cook]
- *SpirouPlot.py* - add *shape_linear_trans_param_plot* debug plot. [Neil Cook]
- *SpirouConst.py* - add dxmap, dymap and fpmaster file defintions. [Neil Cook]
- *Output_keys.py* - add dxmap, dymap and fpmaster file tags. [Neil Cook]
- *Register_fp_2.py* - add etiennes additional changes. [Neil Cook]
- *Cal_SHAPE_spirou_old.py* - refractor file name. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add new *shape_master* constants. [Neil Cook]
- *Cal_shape_master.py* - continue adapting *cal_shape_master* to handle dxmap and dymap. [Neil Cook]
- *Cal_SHAPE_spirou.py* - refractor filename (now need sape x and shape y) [Neil Cook]
- *Cal_shape_master.py* - continue adding etiennes changes. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - write todos. [Neil Cook]

5.3.1.517 0.5.009 (2019-06-05)

- *SpirouImage.py* - start adding etiennes new adaptations to *register_fp_2*. [Neil Cook]
- *Register_fp_2.py* - add etiennes new register fp code. [Neil Cook]
- *Calc_berv.py* - add berv source / berv est. [Neil Cook]
- *SpirouTelluric.py* - move *get_berv_value* to spirouImage(spirouBERV) [Neil Cook]
- *SpirouBERV.py* - add *get_berv_value* and modify current functions to add berv estimate + lock berv while calculating barycorrpy. [Neil Cook]
- *SpirouTDB.py* - correct pep8. [Neil Cook]
- *SpirouKeywords.py* - add berv est and berv source. [Neil Cook]
- *Test_bigcube_berv.py* - add *berv/berv_est* test. [Neil Cook]
- *Obj_mk_tellu_new.py* - change how berv is obtained. [Neil Cook]
- *Obj_fit_tellu.py* - change how berv is obtained. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add berv estimate and berv source. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - add berv estimate and berv source. [Neil Cook]
- *Berv_estimate_comparison.py* - test and compare berv estimate to barycorrpy. [Neil Cook]

5.3.1.518 0.5.008 (2019-06-04)

- *SpirouImage.py* - correction to *register_fp*. [Neil Cook]
- *SpirouKeywords.py* - estimated BERV keys added. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - estimated BERV keys added to hdict. [Neil Cook]
- *SpirouBERV.py* - add implementation of *BERV_EST* and use lock file to only open one BERV instance. [Neil Cook]
- *SpirouEXTOR.py* - add quick mode for *clean_hotpix*. [Neil Cook]
- *Merge_fp_fp.py* - correct typo for print statement. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add a way to turn off certain features that slow down the code (not to be used for science data) [Neil Cook]
- *SpirouImage.py* - correct *construct_master_fp*. [njcuk9999]

5.3.1.519 0.5.007 (2019-06-03)

- *Cal_shape_master.py* - continued work integrating fp master function. [njcuk9999]
- *SpirouImage.py* - continued work on FP master functions. [njcuk9999]
- *Cal_shape_master.py* - change input to 1 hchc and 1 fpfp. [njcuk9999]
- *SpirouImage.py* - add *construct_master_fp*, *group_files_by_time* and *register_fp* functions (for *cal_shape_master* and *cal_dark_master)* [njcuk9999]
- *Recipe_control.txt* - add *cal_shape_master.py* to recipe control. [njcuk9999]
- *Merge_fp_fp.py* - etiennes merge fp code. [njcuk9999]
- *Constants_SPIROU_H4RG.py* - add the *cal_shape_master* constants. [njcuk9999]
- *Cal_shape_master.py* - first commit - copy of *cal_SHAPE_spirou.py* - with additions from Etienne for making the fp master file. [njcuk9999]
- *Cal_dark_master_spirou.py* - remove code in common with shape master into function. [njcuk9999]
- Merge branch 'neil' into dev. [njcuk9999]
- Merge pull request #566 from njcuk9999/header-copy-exact. [Neil Cook]
  Header Copy Exact – also implemented into INTROOT2 in *input_redo* branch
- Merge pull request #565 from njcuk9999/db-lock-fix. [Neil Cook]
  DB lock check retry bug - Okay this one I can merge with both INTROOT and INTROOT2!
- Fixed a bug with db locking check. [Chris Usher]

5.3.1.520 0.5.006 (2019-06-01)

- Updated to match changes on dev. [Chris Usher]
- Reworked how fits headers are used. [Chris Usher]
- Update test.run. [Neil Cook]
- *SpirouImage.py* - change dark calibration to *dark_master* calibration, make sure *read_raw_data* loading primary data array. [Neil Cook]
- *SpirouFITS.py* - adjust *read_raw_data* to add an imageext (otherwise defaults 0) [Neil Cook]
- *Recipe_control.txt* - add *cal_dark_master* and *cal_thermal_spirou*. [Neil Cook]
- *Cal_thermal_spirou.py* - renamed from *cal_thermal2_spirou.py*. [Neil Cook]

5.3.1.521 0.5.005 (2019-05-30)

- *SpirouBERVest.py* - first commit (test of berv estimate) [Neil Cook]
- *SpirouConst.py* - add filename to *EXTRACT_E2DS_FILE*. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add *always_extract*. [Neil Cook]
- *Cal_thermal_spirou.py* - continue work. [Neil Cook]
- *Cal_thermal2_spirou.py* - extraction of darks (using *cal_extract)* [Neil Cook]
- Merge branch 'thermal' into dev. [Neil Cook]
- Merge branch 'master' into thermal. [njcuk9999]
- First commit of thermal recipe for Low pass dark/thermal calibration. [njcuk9999]
- Add fiber to header. [Neil Cook]
- Add *"DRS_DATE"* and *"DATE_NOW"* to all recipes. [Neil Cook]
- *Cal_dark_master_spirou.py* - fix bugs in while loop. [Neil Cook]

5.3.1.522 0.5.004 (2019-05-29)

- *SpirouImage.py* - correct *get_files* function. [Neil Cook]
- *SpirouEXTOR.py* - fix comment typos. [Neil Cook]
- *SpirouKeywords.py* - add dark master keys. [Neil Cook]
- *SpirouConst.py* - add *DARK_FILE_MASTER* function. [Neil Cook]
- *Output_keys.py* - add *dark_master_file* tag. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add *cal_dark_master* constants. [Neil Cook]
- *Cal_DARK_spirou.py* - correct typo. [Neil Cook]
- *Cal_dark_master_spirou.py* - continue adapting new recipe. [Neil Cook]

5.3.1.523 0.5.003 (2019-05-28)

- *SpirouImage.py* - add *get_files* function. [njcuk9999]
- *SpirouImage.py* - add *get_files* function. [njcuk9999]
- *Hp_dark.py* - store EA *cal_dark_master* code (raw) [njcuk9999]
- *Constants_SPIROU_H4RG.py* - add *dark_master* constant to constants. [njcuk9999]
- *Cal_dark_master_spirou.py* - first commit - first integration of EA code. [njcuk9999]
- *SpirouKeywords.py* - INFILE should be INF1, INF2, INF3. [njcuk9999]
- Update date/version/changelog. [njcuk9999]
- *Cal_HC_E2DS_EA_spirou.py* - CDBBAD –> CDBLAZE. [njcuk9999]

5.3.1.524 0.5.002 (2019-05-27)

- *SpirouPlot.py* - add *output_rv* to *ccf_rv_ccf_plot*. [njcuk9999]
- *SpirouKeywords.py* - add new CCF keyword defintions. [njcuk9999]
- *Cal_CCF_E2DS_spirou.py* - renamed from *cal_CCF_E2DS_FP_spirou.py*. [njcuk9999]
- Deal with move of *cal_CCF_E2DS_FP_spirou.py*. [njcuk9999]
- Move older CCF recipes to misc folder. [njcuk9999]
- Removed old *cal_CCF_E2DS_spirou.py*. [njcuk9999]
- *Cal_CCF_E2DS_spirou.py* - from *cal_CCF_E2DS_FP.py* + cosmetic changes. [njcuk9999]
- *Cal_CCF_E2DS_FP_spirou.py* - add changes to allow science without FP. [njcuk9999]
- *Cal_FF_RAW_spirou.py* - *IC_EXTRACT_TYPE* –> *IC_FF_EXTRACT_TYPE* (always for *cal_FF)* [njcuk9999]
- *SpirouTelluric.py* - change parameter name *MKTELLU_MED_SAMPLING* –> *IMAGE_PIXEL_SIZE*. [njcuk9999]
- *SpirouLOCOR.py* - add curve drop parameter. [njcuk9999]
- *Constants_SPIROU_H4RG.py* - change loc threshold. [njcuk9999]
- *SpirouKeyword.py* - Add key word for CCF (telluric cut) [njcuk9999]
- *Constants_SPIROU_H4RG.py* - add new constants for CCF. [njcuk9999]
- *Cal_loc_RAW_spirou.py* - correct a bug in DEBUG (should be > 0) [njcuk9999]
- *Cal_CCF_E2DS_FP_spirou.py* - add changes from @Francois for CCF masked by tellurics. [njcuk9999]
- *Cal_CCF_E2DS_FP_spirou_new.py* - modify line endings. [njcuk9999]
- *Cal_CCF_E2DS_FP_spirou_new.py* - francois changes to cal ccf (to be integrated into *cal_CCF* actual) [njcuk9999]

5.3.1.525 0.5.001 (2019-05-27)

- Merge branch 'master' into neil. [Neil Cook]
- *SpirouConst.py* - fix s1d names. [Neil Cook]
- *SpirouStartup.py* - fix the windows/unix *night_name* bug. [Neil Cook]
- SpirouFITS.py, *spirouDB.py* - reset. [Neil Cook]
- SpirouFITS.py, *spirouDB.py* - fix problem with windows and lock file including paths that do not exist (i.e. when using night names with sub-directories) [Neil Cook]
- SpirouFITS.py, *spirouDB.py* - fix problem with windows and lock file including paths that do not exist (i.e. when using night names with sub-directories) [Neil Cook]
- SpirouFITS.py, *spirouDB.py* - fix problem with windows and lock file including paths that do not exist (i.e. when using night names with sub-directories) [Neil Cook]
- *Extract_trigger.py* - update run. [Neil Cook]
- *SpirouConst.py* - _w_ –> _v_ [Neil Cook]
- Update settings for reprocess extract tellu/obj run for May pernight/perrun runs. [Neil Cook]
- Move unused test modules to misc. [Neil Cook]
- *Drs_dependencies.py* - add a debug mode. [Neil Cook]
- *Select_per_tc_per_night_calibs.py* - add Feb and April runs to the per run selection. [Neil Cook]
- Update date/version/update notes/changelog. [Neil Cook]

5.3.1.526 0.5.000 (2019-05-10)

- *SpirouDB.py* - add lock file in waiting printout. [Neil Cook]
- *SpirouPlot.py* - attempt to *setup_figure* a second time before crashing. [Neil Cook]
- *SpirouPlot.py* - attempt to *setup_figure* a second time before crashing. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouPlot.py* - fix to plot crash. [Neil Cook]
- Update changelog.md. [Neil Cook]
- *Extract_trigger.py* - modify extract trigger. [Neil Cook]
- *SpirouTDB.py* - add locking of file in *put_file*. [Neil Cook]
- *SpirouCDB.py* - add locking of file in *put_file*. [Neil Cook]
- Update date and changelog. [Neil Cook]
- *SpirouCDB.py* - fix calibDB file copy in parallisation. [Neil Cook]

- *Extract_trigger.py* - note problem with parallisation. [Neil Cook]
- Update changelog.md. [Neil Cook]
- *Extract_trigger.py* - update comments. [Neil Cook]
- Changelog.md - update the change log with new commits. [Neil Cook]
- Update test.run. [Neil Cook]
- *Extract_trigger.py* - add email option (start + end) [Neil Cook]
- *SpirouPlot.py* - add fix for large files saved to disk (should be temporary fix) [Neil Cook]
- *SpirouLOG.py* - clear out logs after run. [Neil Cook]
- *SpirouImage.py* - replace *IC_S1D_BLAZE_MIN* with *TELLU_CUT_BLAZE_NORM.* [Neil Cook]
- *SpirouConst.py* - update version/changelog/constants file. [Neil Cook]
- *Comp_s1d_to_s2d.py* - add a normalised blaze cut. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - change the blaze min value. [Neil Cook]
- *Comp_s1d_to_s2d.py* - compare the output of s1d to s2d. [Neil Cook]
- Test.run - update text.run. [Neil Cook]
- *Time_log_file.py* - code to measure timing of log printouts. [Neil Cook]
- *Constnats_SPIROU_H4RG.py* - update s1d starting wavelength from 980 to 965. [Neil Cook]
- Changed permissions on new tools in spirouTools. [Neil Cook]
- *SpirouMath.py* - add nanpad and killnan functions. [Neil Cook]
- *SpirouBACK.py* - re-add warning around backmask condition. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - chagne *IC_BKGR_BOXSIZE* from 64 to 128. [Neil Cook]
- *Drs_local_background.py* - first commit - code to find amplitude scale for local background (using *DARK_FLAT)* [Neil Cook]
- *SpirouPlot.py* - add *local_scattered_light_plot.* [Neil Cook]
- *SpirouBACK.py* - add function *make_local_background_map* and *measure_local_background.* [Neil Cook]
- *Recipe_control.txt* - add *drs_local_background* to valid receipes. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add constants for *drs_local_background.py.* [Neil Cook]
- *Constants_SPIROU_H4RG.py* - update *ic_bkgr_percent* value. [Neil Cook]
- *SpirouBACK.py* - add adjustments to background correction. [Neil Cook]
- *SpirouBACK.py* - fix some bugs with measure background from map function. [Neil Cook]
- Update test.run. [Neil Cook]
- *Cal_BADPIX_spirou.py* - background addition - fix typo in new file upload to calibDB. [Neil Cook]
- *SpirouBACK.py* - return background image only. [Neil Cook]
- *Cal_extract,FF,loc,SHAPE,slit* - replace old background measurement with new one. [Neil Cook]
- *SpirouBACK.py* - correct bug in new function. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - change background from 5 to 10. [Neil Cook]
- *Cal_BADPIX_spirou.py* - resize flat as well as bad pixel. [Neil Cook]
- *SpirouImage.py* - add function *get_background_map.* [Neil Cook]
- *SpirouConst.py* - add function *BKGD_MAP_FILE.* [Neil Cook]
- *SpirouBACK.py* - add functions: *make_background_map* and *measure_background_from_map.* [Neil Cook]
- *Output_keys.py* - add background map tag. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add new background map constants. [Neil Cook]
- *Cal_BADPIX_spirou.py* - add the background map making and save to calibDB. [Neil Cook]
- Merge branch 'dev2' [Neil Cook]

  Conflicts:
      INTROOT/SpirouDRS/spirouUnitTests/Runs/test.run
- Remove CHANGELOG.md. [Neil Cook]
- Update changelog. [Neil Cook]
- Test.run. [Neil Cook]

5.3.1.527 0.4.123 (2019-05-03)

- *Drs_changelog_2.py* - update comments for new changelogger. [Neil Cook]
- *Extract_trigger.py* - update bugs. [Neil Cook]
- *SpirouUnitRecipes.py* - update for *fit_tellu_db*. [Neil Cook]
- *Extract_trigger.py* - update for *fit_tellu_db*. [Neil Cook]
- *SpirouTelluric.py* - remove the print statement. [Neil Cook]
- *Obj_fit_tellu_db.py* - add in second making of the target template. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- *Drs_changelog_2.py* - add changes to allow preview mode. [Neil Cook]
- *Obj_fit_tellu_db.py* - correct type in wlog message. [Neil Cook]
- *SpirouTelluric.py* - p['OBJECTS'] when None will be a string. [Neil Cook]
- *Obj_fit_tellu_db.py* - add full run through 1. *fit_tellu* 2. *mk_template* 3. *fit_tellu*. [Neil Cook]
- *SpirouTelluric.py* - need to clean out sys.argv before running codes. [Neil Cook]
- *SpirouDB.py* - need to make sure folder exists otherwise lock will persist. [Neil Cook]
- *Obj_fit_tellu_db.py* - correct bug in writing code. [Neil Cook]
- *SpirouTelluric.py* - add *find_objects* function and alias. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - correction to comments. [Neil Cook]
- *Obj_fit_tellu_db.py* - first commit of fit tellu db redo. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.528 0.4.122 (2019-05-02)

- *Drs_changelog_2.py* - add updating of drs files. [Neil Cook]
- *Drs_changelog_2.py* - add updating of drs files. [Neil Cook]
- *Update_fileversion.py* - add extra code to fix the fix. [Neil Cook]
- *Drs_changelog_2.py* - update new change log code. [Neil Cook]
- Add git tools to replace *drs_changelog*. [Neil Cook]
- Add git tools to replace *drs_changelog*. [Neil Cook]
- *Update_fileversion.py* - remove skip file check. [Neil Cook]
- *SpirouConst.py* - add new filenames. [Neil Cook]
- *Output_keys.py* - add tellu s1d keys. [Neil Cook]
- *Update_fileversion.py* - first commit fix code for bad header keys. [Neil Cook]
- *Obj_fit_tellu.py* - remove old header keys. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - remove old header keys. [Neil Cook]
- Update version. [Neil Cook]

5.3.1.529 0.4.121 (2019-04-30)

- Update trigger. [Neil Cook]
- *Obj_fit_tellu.py* - fix NBLAZE to BLAZE in uniform velocity s1d. [Neil Cook]

5.3.1.530 0.4.120 (2019-04-29)

- *Compare_outputs.py* - change paths. [Neil Cook]

5.3.1.531 0.4.119 (2019-04-26)

- *Extract_trigger.py* - correct mistake with extraction trigger. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouTable.py* - fix problem with NaNs in header (make string) [Neil Cook]
- *SpirouTable.py* - fix problem with NaNs in header (make string) [Neil Cook]
- *Extract_trigger.py* - should use *DRS_DATA_RAW* in preprocessing. [Neil Cook]
- *Obj_fit_tellu.py* - add s1d telluric corrected files. [Neil Cook]
- *SpirouImage.py* - correct s1d ith telluric NaNs. [Neil Cook]
- *Obj_fit_tellu.py* - change to NBLAZE. [Neil Cook]
- *SpirouImage.py* - new s1d - deal with full order being NaNs (for telluric) [Neil Cook]
- *Obj_fit_tellu.py* - save s1d for corrected spectrum. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - increase edge smoothing size. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - increase edge smoothing size. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - increase edge smoothing size. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - s1d fix problems with adding new s1d code. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - s1d fix problems with adding new s1d code. [Neil Cook]
- *SpirouImage.py* - new s1d - iuv spline wrong. [Neil Cook]
- *SpirouImage.py* - edges was wrong. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - correct s1d (now s1dw and s1dv) [Neil Cook]

5.3.1.532 0.4.118 (2019-04-25)

- *SpirouImage.py* - write new s1d function. [Neil Cook]
- *SpirouPlot.py* - add *ext_1d_spectrum_debug_plot* plot for debugging s1d plot. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add new s1d constants. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - added new s1d code (not finished) [Neil Cook]
- *SpirouRV.py* - update pearson r test for NaNs. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouRV.py* - catch NaN warnings that are valid. [Neil Cook]
- *SpirouRV.py* - catch NaN warnings that are valid. [Neil Cook]
- *SpirouRV.py* - catch NaN warnings that are valid. [Neil Cook]
- *SpirouRV.py* - catch NaN warnings that are valid. [Neil Cook]
- *SpirouRV.py* - looking for NaN warnings. [Neil Cook]
- *SpirouRV.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - looking for NaN warnings. [Neil Cook]
- *SpirouTelluric.py* - catch warnings from less than for NaNs. [Neil Cook]
- *Compare_outputs.py* - script to difference all outputs in two folders with files of the same name (output difference) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - turn off plotting all *fit_tellu* orders. [Neil Cook]
- *Obj_mk_tellu_new.py* - add warning around less than (for NaNs) [Neil Cook]
- *Obj_fit_tellu.py* - remove a NaN sum. [Neil Cook]
- Test.run - update just *mk_tellu/fit_tellu* to test. [Neil Cook]
- Test.run - update just *fit_tellu* to test. [Neil Cook]
- Change np.sum –> np.nansum, np.mean –> np.nanmean, np.median –> np.nanmedian etc. [Neil Cook]

5.3.1.533 0.4.117 (2019-04-24)

- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change all np.polyfit to SpirouDRS.spirouCore.spirouMath.nanpolyfit. [Neil Cook]
- Change the way InterpolatedUnivariateSpline works. [Neil Cook]
- Update test.run. [Neil Cook]
- Update test.run. [Neil Cook]

5.3.1.534 0.4.116 (2019-04-10)

- Update test.run. [njcuk9999]
- *SpirouRV.py* - deal with NaNs. [njcuk9999]
- *SpirouLOCOR.py* - deal with NaNs. [njcuk9999]
- *SpirouImage.py* - deal with NaNs. [njcuk9999]
- *SpirouPlot.py* - convert zeros to NaNs. [njcuk9999]
- *See_shift.py* - test for pixel shifting by different amounts. [njcuk9999]
- *Cal_WAVE_E2DS_EA_spirou.py* - convert zeros to NaNs. [njcuk9999]
- *Cal_SLIT_spirou.py* - change zeros to NaNs. [njcuk9999]
- *Cal_loc_RAW_spirou.py* - change zeros to NaNs. [njcuk9999]
- *Cal_extract_RAW_spirou.py* - change zeros to NaN. [njcuk9999]

5.3.1.535 0.4.115 (2019-04-08)

- *SpirouEXTOR.py* - add options in extraction method to test different weighting systems. [njcuk9999]
- *SpirouImage.py* - replace zeros with NaNs. [njcuk9999]
- *SpirouFLAT.py* - replace zero's with NaNs. [njcuk9999]
- *SpirouEXTOR.py* - replace zeros with NaNs. [njcuk9999]
- *SpirouPlot.py* - replace zeros with NaNs. [njcuk9999]
- *SpirouBACK.py* - replace zeros with NaNs. [njcuk9999]
- *Cal_FF_RAW_spirou.py* - replace zeros with nans. [njcuk9999]
- *SpirouEXTOR.py* - readd *raw_weights*. [njcuk9999]

5.3.1.536 0.4.114 (2019-04-07)

- *Cal_FF_RAW_spirou.py* - re-add in new background subtraction. [Neil Cook]
- *SpirouEXTOR.py* - reset *raw_weights*. [Neil Cook]
- *SpirouEXTOR.py* - reset *raw_weights*. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - try to match neil branch. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - try to match master. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - test force extractff type to 3c. [Neil Cook]
- *SpirouBACK.py* - add in old measure background function (as test) [Neil Cook]
- *Cal_FF_RAW_spirou.py* - redo debananafication. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - undo debananafication. [Neil Cook]
- Reset *cal_loc* (no background) for test. [Neil Cook]
- Reset *cal_loc* (no background) for test. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - remove background subtraction (for test) [Neil Cook]

5.3.1.537 0.4.113 (2019-04-06)

- *Cal_FF_RAW_spirou.py* - remove background subtraction (for test) [Neil Cook]
- Test.run - update test.run. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - unfix negative values set to zero. [Neil Cook]

5.3.1.538 0.4.112 (2019-04-05)

- *SpirouEXTOR.py* - remove weighting of raw pixels less than zero to very low value. [njcuk9999]
- *SpirouConst.py* - update date and version. [njcuk9999]
- *Cal_SHAPE_spirou_old.py* - edit background correction. [njcuk9999]
- *Cal_SLIT_spirou.py* - do not mask out the zeros. [njcuk9999]
- *Caal_loc_RAW_spirou.py* - do not mask out the zeros. [njcuk9999]
- *Cal_FF_RAW_spirou.py* - do not mask out the zeros. [njcuk9999]
- *Cal_extract_RAW_spirou.py* - do not mask out the zeros. [njcuk9999]
- Merge branch 'neil' into dev. [njcuk9999]
- *SpirouBACK.py* - add background debug plot to background finding function. [njcuk9999]
- *Cal_SLIT_spirou.py* - add hdr and cdr to background correction (to save debug file) [njcuk9999]
- *Cal_loc_RAW_spirou.py* - add hdr and cdr to background correction (to save debug file) [njcuk9999]
- *Cal_extract_RAW_spirou.py* - add hdr and cdr to background correction (to save debug file) [njcuk9999]
- *Cal_FF_RAW_spirou.py* - add hdr and cdr to background correction (to save debug file) [njcuk9999]
- *Misc/cal_SHAPE_spirou_old.py* - add changes to background subtraction. [njcuk9999]
- *Cal_low_RAW_spirou.py* - add changes to background subtraction. [njcuk9999]
- *Cal_FF_RAW_spirou.py* - add changes to background subtraction. [njcuk9999]
- *SpirouWAVE.py* - add initial keep parameter for line width. [njcuk9999]
- *SpirouBACK.py* - add Etienne's changes into *measure_background_flatfield*. [njcuk9999]
- *Cal_WAVE_NEW_E2DS_spirou_2.py* - add fix for updating the HC/Fp header for wave solution. [njcuk9999]
- *Constants_SPIROU_H4RG.py* - change background correction constants. [njcuk9999]
- *Cal_extract_RAW_spirou.py* - change background correction to Etienne's new method! [njcuk9999]

5.3.1.539 0.4.111 (2019-04-04)

- *Cal_SHAPE_spirou.py* - fix typo in output filenames (only affected debug outputs) [njcuk9999]
- *Cal_CCF_wrap_MH.py* - fix typo in return table values 'cloc' –> 'loc' [njcuk9999]
- *Cal_CCF_wrap_MH.py* - call from command line was missing. [njcuk9999]
- *Cal_CCF_wrapper* changes for Melissa (temporary addition of *cal_CCF_E2DS_FP_MH_spirou.py)* [njcuk9999]

5.3.1.540 0.4.108 (2019-04-03)

- *SpirouPlot.py* - allow all orders to be plot in tellu plot. [Neil Cook]

5.3.1.541 0.4.109 (2019-04-03)

- Update test.run. [njcuk9999]
- *SpirouWAVE.py* - comment out non-used line. [njcuk9999]
- SpirouDrs.data - undo changes from Melissa Branch. [njcuk9999]
- *Config.py* - undo changes from Melissa Branch. [njcuk9999]
- *Cal_WAVE_E2DS_EA_spirou.py* - undo changes from Melissa branch. [njcuk9999]
- *Cal_extract_RAW_spirou.py* - add WFP keys to cal extract and deal with not having values. [njcuk9999]
- Merge branch 'neil' into dev. [njcuk9999]
- *SpirouEXTOR.py* - fix normalisation of spelong (E2DSLL) [njcuk9999]
- *Cal_extract_RAW_spirou.py* - add WFP keys to cal extract. [njcuk9999]
- *Cal_CCF_E2DS_FP_spirou.py* - replace manual call to filename. [njcuk9999]

5.3.1.542 0.4.110 (2019-04-03)

- *Cal_WAVE_NEW*: fixes to m(x) residuals plot. [melissa-hobson]
- *Cal_CCF_E2DS_FP*: keeps base name only for WFP file. [melissa-hobson]
- *Cal_WAVE_E2DS_EA*: save wave FP CCF keys. [melissa-hobson]
- *Cal_WAVE_NEW*: save wave FP CCF target RV and width. [melissa-hobson]
- *Cal_CCF_E2DS_FP*: writes WFP keys to CCF headers properly. [melissa- hobson]
- *Cal_CCF_E2DS_FP*: read correct keyword for drift. [melissa-hobson]
- *Cal_CCF_E2DS_FP*: reads correct keyword for wave sol drift, writes WFP keys to CCF headers spirouKeywords: added unique WFP file source keyword. [melissa-hobson]
- SpirouKeywords: add wave FP CCF keys to list. [melissa-hobson]

5.3.1.543 0.4.107 (2019-04-02)

- *Cal_WAVE_NEW*: modified FP CCF keywords spirouKeywords: added unique WFP keywords for wave FP CCF keys. [melissa-hobson]
- Merge branch 'melissa' of *https://github.com/njcuk9999/spirou_py3* into melissa. [melissa-hobson]
- Merge branch 'master' into melissa. [Melissa Hobson]
  Conflicts:
    INTROOT/SpirouDRS/spirouTHORCA/spirouWAVE.py   *INTROOT/bin/- cal_WAVE_E2DS_EA_spirou.py*   *INTROOT/misc/cal_HC_E2DS_spirou.py*   *INTROOT/mis- c/wave_comp_night.py*
- Merge branch 'melissa' of *https://github.com/njcuk9999/spirou_py3* into melissa. [melissa-hobson]
- Config save. [melissa-hobson]

5.3.1.544 0.4.106 (2019-03-29)

- Github backup before merging with master. [melissa-hobson]
- *Cal_WAVE_NEW* improved cross-order matching. [melissa-hobson]

5.3.1.545 0.4.104 (2019-03-28)

- Fix bug in extraction modes for *cal_exposure_meter* and *cal_wave_mapper*. [Neil Cook]
- *Cal_FF_RAW_spirou.py* - missed the debananafication. [Neil Cook]
- *Cal_extract/cal_ff* - fix mode *extract_shape/ll*. [Neil Cook]
- *Cal_extract/cal_FF* - fix mode selection. [Neil Cook]
- *SpirouImage.py* - DeBananafication needs ParamDict in function call. [Neil Cook]
- *Make_1ds_etienne_new.py* - new s1d code to integrate into the drs. [Neil Cook]
- *SpirouImage.py* - fix for use of DeBananafication since change to function (for *cal_SHAPE* here) [Neil Cook]
- Update *date/version/changelog/update_notes*. [Neil Cook]

5.3.1.546 0.4.102 (2019-03-28)

- *Cal_extract_RAW_spirou.py* - turn off *ic_extract* debug. [Neil Cook]
- Merge branch *'extract_issue555'* into neil. [Neil Cook]
- *SpirouEXTOR.py* - do not round in dy statement. [Neil Cook]

5.3.1.547 0.4.105 (2019-03-28)

- *Cal_HC_E2DS_EA*: log statistics *cal_WAVE_NEW*: improved cross-order FP peak matching, store m(x) fits, remove modulo-1-pixel line center errors. [melissa-hobson]

5.3.1.548 0.4.101 (2019-03-25)

- *SpirouPlot.py* - add the debanana plot in. [Neil Cook]
- *Misc/new_plot_test.py* - test of plotting fixes. [Neil Cook]
- *Qc_examples.py* - add code to document qc parameters for each output in reduced. [Neil Cook]

5.3.1.549 0.4.100 (2019-03-22)

- *SpirouLOCOR.py* - add *get_fiber_data* function and *get_straightened_orderprofile* function. [Neil Cook]
- *SpirouEXTOR.py* - fix bug in modes which don't use *pos_a*. [Neil Cook]
- SpirouImage (spirouFile/spirouFITS/spirouImage) - add changes for new extraction mode. [Neil Cook]
- *SpirouEXTOR.py* - add etienne's changes to debananafication. [Neil Cook]
- *SpirouPlot.py* - add *ext_debanana_plot* to show straightened image. [Neil Cook]
- *SpirouConfig.py* - fix ParamDict copy function. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - change mode to '5b' and '5a' [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add changes to all modes '5a' and '5b' to work. [Neil Cook]
- Merge branch 'master' into *extract_issue555*. [Neil Cook]
- *Extract_test_5a_5b.py* - want a and b and c separately. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - fix bug in width getting. [Neil Cook]
- *SpirouLOCOR.py* - add function required to get AB + C fiber coefficients when needed. [Neil Cook]
- *SpirouEXTOR.py* - add changes required for extract mode 5a/5b. [Neil Cook]
- Test of extract mode 5a/5b. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add code required for mode 5a/5b. [Neil Cook]

5.3.1.550 0.4.099 (2019-03-20)

- *Tellu_file_number_test.py* - distinguish between *TELL_OBJ* and *TELL_MAP* in counting from telluDB. [Neil Cook]
- Merge pull request #557 from njcuk9999/neil. [Neil Cook]
  Neil –> Master. Confirmed successful unit tests.

5.3.1.551 0.4.098 (2019-03-19)

- *Cal_extract_RAW_spirou.py* - fix problem with width getting for fiber A. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.552 0.4.097 (2019-03-19)

- *SpirouKeywords.py* - remove the "1" suffix (no longer needed) [Neil Cook]
- *SpirouEXTOR.py* - set up two new extract functions to test adding of fractional contributions of pixels. [Neil Cook]
- Update test.run. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouFITS.py* - fix bug with index lock file (when path does not exist) [Neil Cook]
- *SpirouFITS.py* - add lock file descriptions for print message. [Neil Cook]
- *SpirouStartup.py* - allow *main_end* script to be used not at the end. [Neil Cook]
- *SpirouFITS.py* - modify open/close lock file functions. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - reduced max db wait time to 10 minutes. [Neil Cook]
- *Cal_preprocess_spirou.py* - index files separately. [Neil Cook]
- Update *extract_trigger* to be able to extract darks. [Neil Cook]

- Merge branch *'sky_dark_fix'* into neil. [Neil Cook]

  Conflicts:
  > INTROOT/SpirouDRS/spirouImage/spirouImage.py *UPDATE_NOTES.txt*
- Update notes. [Neil Cook]
- *SpirouImage.py* - re-add skydark in. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add option to switch between SKYDARK only and "DARK or SKYDARK" (depending which is closest) [Neil Cook]
- *SpirouImage.py* - correct bug in sky dark. [Neil Cook]
- Update *extract_trigger.py.* [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.553 0.4.096 (2019-03-18)

- *Tellu_file_number_test.py* - update the paths. [Neil Cook]
- *SpirouConst.py* - fix bug with *INDEX_LOCK_FILENAME* - must not use PID (must be unique to night name not individual process otherwise does not lock out other pids) [Neil Cook]
- Update *extract_trigger.py.* [Neil Cook]
- *SpirouTelluric.py* - remove *extract_file.* [Neil Cook]

5.3.1.554 0.4.095 (2019-03-16)

- *Obj_mk_obj_template.py* - copy all cdb from other outputs. [Neil Cook]
- *SpirouFITS.py* - separate forbidden keys into absolutely don't copy and drs don't copy (that will be copied for updating current files) [Neil Cook]
- *SpirouFITS.py* - separate forbidden keys into absolutely don't copy and drs don't copy (that will be copied for updating current files) [Neil Cook]
- *SpirouFITS.py* - need to copy all keys when updating wave solutions. [Neil Cook]
- Fix the references to old values of *fp_rv.* [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - plot duplicate plot correctly. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - correct typo in WMREF. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - correct typo in WSOURCE (was WAVESOURCE) [Neil Cook]
- *SpirouConst.py* - correct typo. [Neil Cook]

5.3.1.555 0.4.094 (2019-03-15)

- *SpirouConst.py* - remove *DRS_EOUT* from forbidden keys (it should follow extracted file) [Neil Cook]
- *Calc_berv.py* - make sure CopyOriginalKeys comes first before other calls to hdict. [Neil Cook]
- *SpirouFITS.py* - change *QC_HEADER_KEYS* to *FORBIDDEN_HEADER_PREFIXES.* [Neil Cook]
- *SpirouKeywords.py* - change some keyword to make them unique (thus can remove them) [Neil Cook]
- *SpirouConst.py* - add more forbidden keys, change *qc_keys* to any prefix that shouldn't be copied. [Neil Cook]
- *Obj_fit_tellu.py* - CopyOriginalKeys should be called before other hdict commands. [Neil Cook]
- Update unit test scripts. [Neil Cook]
- *SpirouRV.py* - fix problem with getting C file from header. [Neil Cook]
- *SpirouConst.py* - add *CCF_FP_TABLE1* and 2. [Neil Cook]
- *Recipe_control.txt* - do not allow *OBJ_DARK* files - only *OBJ_FP.* [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - add a C table as well as a fits table. [Neil Cook]
- *Extract_trigger.py* - update settings. [Neil Cook]
- *SpirouKeywords.py* - remove unused keywords. [Neil Cook]
- *SpirouConst.py* - add AB and C files for *CCF_FP.* [Neil Cook]
- *Tellu_file_number_test.py* - change path (for new test) [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - separate AB and C files for output. [Neil Cook]
- *SpirouTelluric.py* - fix list of col names for bigcube (only one bad file now) [Neil Cook]
- *Extract_trigger* - update trigger. [Neil Cook]

- *SpirouLOCOR.py* - fix localisation error - should be a median not an average (option was there but not used) [Neil Cook]
- *SpirouFITS.py* - remove a HUGE BUG - eval('2018-08-05') −> 2005 (as date is interpreted as a subtraction)!!!!! [Neil Cook]
- *Tellu_file_number_test.py* - add raw files and disk vs index.fits. [Neil Cook]
- *Log_analyser.py* - code to look for errors in set of log files. [Neil Cook]
- *Cal_DRIFT_E2DS_spirou.py* - fix typo in get wave sol return. [Neil Cook]
- *Cal_SHAPE_spirou.py* - fix typo in cdbbad value name. [Neil Cook]
- *Cal_SHAPE_spirou.py* - fix typo in cdbbad value name. [Neil Cook]

5.3.1.556 0.4.093 (2019-03-14)

- *Cal_preprocess_spirou.py* - fix filename (should only be filename not path) [Neil Cook]
- Update date/version/changelog/notes. [Neil Cook]

5.3.1.557 0.4.092 (2019-03-14)

- Make sure all input files are added to header in form: INF#### where the first digit shows the file-set and the other three the position i.e. for *recipe.py night_name* file1 file2 file3 file4 where inputs expected are 1 flat and multiple darks header would add INF1001 INF2001 INF2002 INF2003. [Neil Cook]
- Add header keys for calibration files used to create outputs (CDBDARK, CDBWAVE) etc, also add a source for the wave solution (WAVELOC) [Neil Cook]
- *SpirouImage.py* - correct the rms percentile to allow more darks to pass the rms test. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.558 0.4.091 (2019-03-13)

- *Cal_DARK_spirou.py* and *spirouImage.py* - tweak changes to all SKYDARK files to be used. [Neil Cook]
- *Extract_trigger.py* - readd the "skip" criteria. [Neil Cook]
- *Drs_reset.py* - skip the log file for this instance of *drs_reset* (otherwise can get stuck) [Neil Cook]
- *Drs_reset.py* - fix removal of files when in dir (if still present) [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - correct bad qc parameters. [Neil Cook]
- *Obj_mk_tellu_new.py* - fix typo in qc parameters. [Neil Cook]
- *Obj_mk_tellu_new.py* - fix typo in qc parameters. [Neil Cook]
- *Drs_reset.py* - fix typo in reset1. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - fix bug with new *qc_pass* criteria. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - fix bug with new *qc_pass* criteria. [Neil Cook]
- *Unit_test.py* - update logging (log all) [Neil Cook]
- *SpirouFITS.py* - add function *"add_qc_keys"* to take the keys and push them into hdict correctly. [Neil Cook]
- *SpirouConst.py* - change PPVERSION to VERSION for reduced index.fits. [Neil Cook]
- Update QC parameters (to store in order) [Neil Cook]
- Update changelog. [Neil Cook]
- *Drs_reset.py* - set DEBUG = False in reset, add the removal of all sub- directories in drs folders. [Neil Cook]
- *SpirouStartup.py* - fix bug that we only need lock file is outputs is not None. [Neil Cook]
- Update changelog. [Neil Cook]
- *SpirouConst.py* - add version to the index files. [Neil Cook]
- Update extraction trigger. [Neil Cook]

5.3.1.559 0.4.090 (2019-03-12)

- Update extraction trigger. [Neil Cook]
- *SpirouPOLAR.py* - add *qc_pass*. [Neil Cook]
- *SpirouFITS.py* - add a test for formatting defined in the keyword (for 1d and 2d lists only) [Neil Cook]
- *SpirouKeywords.py* - add *KW_DRS_QC_PASS* + change position of number in QCV, QCN, QCL. [Neil Cook]
- *SpirouConst.py* - change the *qc_keys* to look for. [Neil Cook]
- Add *qc_pass* parameter (flag for each qc parameter) [Neil Cook]

5.3.1.560 0.4.103 (2019-03-12)

- Updates to *cal_WAVE_NEW_2*. [melissa-hobson]
- Updated to *cal_HC*, *cal_WAVE_NEW*. [melissa-hobson]

5.3.1.561 0.4.089 (2019-03-11)

- *Extract_trigger.py* - update the settings ready for re-runs of extractions. [Neil Cook]
- *SpirouStartup.py* - fix where we lock the index file. [Neil Cook]
- *SpirouConst.py* - add an *INDEX_LOCK_FILENAME* to lock the indexing in parallel processes. [Neil Cook]
- *Tellu_file_number_test.py* - code to test the number of telluric files at difference stages of the DRS. [Neil Cook]
- Merge pull request #553 from njcuk9999/dev. [Neil Cook]
  cfht/melissa_fix–>Dev–>master. confirm unti test completed
- Update date/version/changelog. [Neil Cook]

5.3.1.562 0.4.088 (2019-03-09)

- *SpirouLSD.py* - fix str to float bug. [Neil Cook]
- Test.run - update. [Neil Cook]
- *SpirouPOLAR.py* - fix string - float bug. [Neil Cook]
- *SpirouTelluric.py* -fix berv from string. [Neil Cook]
- SpirouRV - must have finite BERV value – but should this be set to zero? [Neil Cook]
- *SpirouFITS.py* - undo hdr type fix. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouBERV.py* - correct strings coming from header (BERV, BJD, *BERV_MAX)* [Neil Cook]
- Update test.run. [Neil Cook]
- Update test.run. [Neil Cook]
- *SpirouLOCOR.py* - fix bug with strings not being ints. [Neil Cook]
- *SpirouFITS.py* - fix problem with changing output type (should not change) [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - fix typo in updatewavesolution. [Neil Cook]
- *SpirouWAVE.py* - fix typo in new masknaems ordermask–>omask. [Neil Cook]
- *SpirouFITS.py* - fix values now as strings –> cast to ints/floats. [Neil Cook]
- Fix problem with mjd being a string. [Neil Cook]
- Fix problem with mjd being a string. [Neil Cook]
- *SpirouFITS.py* - allow NaNs into header by converting to string. [Neil Cook]
- *SpirouFITS.py* - allow NaNs into header by converting to string. [Neil Cook]
- *SpirouFITS.py* - allow NaNs into header by converting to string. [Neil Cook]
- *SpirouFITS.py* - allow NaNs into header by converting to string. [Neil Cook]
- *SpirouFITS.py* - allow NaNs into header by converting to string. [Neil Cook]
- *SpirouBERV.py* - fix bug when we don't need a BERV still need BERVHOUR in loc. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - fix typo BCHOUR –> BERVHOUR. [Neil Cook]
- *Cal_loc_RAW_spirou.py* - fix mistake in assigned QCV value. [Neil Cook]
- *Cal_loc_RAW_spirou.py* - fix mistake in assigned QCV value. [Neil Cook]

5.3.1.563 0.4.087 (2019-03-08)

- Change AddKey –> AddKey1DList for QC names/values/logic. [Neil Cook]
- *Cal_preprocess_spirou.py* - correct qc missing from param dict. [Neil Cook]
- *SpirouKeywords.py* - fix missed comma in list. [Neil Cook]
- *SpirouBERV.py* - add BERVHOUR to loc (for saving to header) [Neil Cook]
- *SpirouBERV.py* - add BERVHOUR to loc (for saving to header) [Neil Cook]

5.3.1.564 0.4.086 (2019-03-08)

- *SpirouBERV.py* - add BERVHOUR to loc (for saving to header) [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - add some more TODO's for sections that need work. [Neil Cook]
- *Cal_HC* - allow multiple files (need to update all files + add files to header) [Neil Cook]
- Add WMEANREF for AB and C to header. [Neil Cook]
- Add PID to output header files (so one can find the log file for each) [Neil Cook]
- Add Quality control header keys QC, QCV# (value), QCN# (name), QCL# (name) - and make sure these are not copied over from inputs + some pep8 fixes. [Neil Cook]
- *SpirouWAVE.py* - clean up the code (pep8) [Neil Cook]
- *SpirouFITS.py* - clean up the code (pep8) [Neil Cook]
- *SpirouBERV.py* - clean up the code (pep8) [Neil Cook]
- *SpirouPlot.py* - clean up the code (pep8) [Neil Cook]
- *SpirouConst.py* - clean up the code (pep8) [Neil Cook]
- *Cal_WAVE_NEW_E2DS_spirou.py* - clean up the code (pep8) [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - clean up the code (pep8) [Neil Cook]
- Merge branch *'melissa_fixes'* into dev. [Neil Cook]
- Merge pull request #551 from njcuk9999/cfht. [Neil Cook]
  Fixed lock timer bug and added barycorr retry.

5.3.1.565 0.4.085 (2019-03-07)

- Fixed lock timer bug and added barycorr retry. [Chris Usher]

5.3.1.566 0.4.084 (2019-03-05)

- Delete *wave_comp_night.py*. [melissa-hobson]
- Update *cal_WAVE_E2DS_EA_spirou.py*. [melissa-hobson]
- Merge pull request #547 from njcuk9999/melissa. [melissa-hobson]
  Melissa

5.3.1.567 0.4.083 (2019-02-28)

- *SPlt.debug_locplot_finding_orders* pauses correctly after each plot; plot limit modified to improve visualization. [melissa-hobson]
- *SpirouBACK.measure_background_and_get_central_pixels*: removed duplicate call to *locplot_y_miny_maxy.* [melissa-hobson]

5.3.1.568 0.4.081 (2019-02-22)

- Littrow check plot: ylimits added based on QCs and results. [melissa- hobson]
- *Cal_ WAVE_ NEW* gets HC catalog lines correctly. [melissa-hobson]
- Merge pull request #542 from njcuk9999/master. [melissa-hobson]
  update
- Merge pull request #541 from njcuk9999/dev. [Neil Cook]
  Dev –> Master
- Update date/version/changelog. [Neil Cook]
- Correct error estimation for *cal_ WAVE_ NEW*. [melissa-hobson]
- Merge pull request #538 from njcuk9999/master. [melissa-hobson]
  update

5.3.1.569 0.4.076 (2019-02-22)

- *SpirouLOCOR.py* - fix problem with *locplot_ im_ sat_ threshold* plot. [Neil Cook]

5.3.1.570 0.4.082 (2019-02-22)

- *SpirouPlot.py* - fix problem with *locplot_ im_ sat_ threshold* plot. [Neil Cook]
- *Cal_loc_ RAW_ spirou.py* - fix problem with *locplot_ im_ sat_ threshold* plot. [Neil Cook]
- Merge remote-tracking branch 'origin/dev' into dev. [Neil Cook]
- Merge pull request #537 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date/version/changelog. [Neil Cook]

5.3.1.571 0.4.075 (2019-02-21)

- *SpirouTelluric.py* - need to stop if not index files found. [Neil Cook]

5.3.1.572 0.4.073 (2019-02-19)

- *Cal_validate_ spirou.py* - fix bug it version checking (found by Melissa) [Neil Cook]
- Merge branch 'dev' into neil. [Neil Cook]
- *Cal_validate_ spirou.py* - fix bug it version checking (found by Melissa) [Neil Cook]
- *SpirouWAVE.py* - add some more comments for resolution map. [Neil Cook]

5.3.1.573 0.4.074 (2019-02-19)

- *SpirouTelluric.py* - remove hard coded number of orders. [njcuk9999]
- *Obj_mk_ tellu_ new.py* - comment out unused lines. [njcuk9999]

5.3.1.574 0.4.080 (2019-02-18)

- Testing linear minimization FP wave sol fitting. [melissa-hobson]
- Merge branch 'master' into melissa. [Melissa Hobson]
- Merge pull request #536 from njcuk9999/neil. [Neil Cook]
  Neil –> Master. Confirm full tests complete.
- Update *date/version/changelog/update_ notes*. [Neil Cook]
- Tests: -new version of Lovis method (fit n(x) for all lines, rather than linear interpolation) - wave sol comparison. [melissa-hobson]

5.3.1.575 0.4.072 (2019-02-13)

- *Obj_ mk_ tellu_ db.py* - need to only print errors if we have errors. [Neil Cook]
- *Obj_ mk_ tellu_ db.py* - need to only print errors if we have errors. [Neil Cook]

5.3.1.576 0.4.071 (2019-02-12)

- *Extract_ trigger.py* - make sure *obj_ fit_ tellu* errors are stored. [Neil Cook]
- *Obj_ mk_ tellu_ db.py* - keep track of errors and exceptions - only print at end. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - fix bug when filtering by snr (all columns of fits table must be same length) [Neil Cook]
- *SpirouPlot.py* - fix bug with HC plot (from added save of plotting) [Neil Cook]
- *Cal_ preprocess_ spirou.py* - remove rms printout and add values to QC errors. [Neil Cook]
- *SpirouPlot.py* - deal with TclError (with new call for *setup_ figure)* [Neil Cook]
- *Cal_ loc_ RAW_ spirou.py* - add p to call to plotting function. [Neil Cook]
- *SpirouPlot.py* - modify figure setup to try to catch TclError's and deal with them. [Neil Cook]
- *Extract_ trigger.py* - modify printing to logfile (print input args) [Neil Cook]
- *Obj_ mk_ obj_ template.py* - change number of tell files to info. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - fix typo in new snr constraint. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - fix typo in new snr constraint. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - fix typo in new snr constraint. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - fix typo in new snr constraint. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.577 0.4.070 (2019-02-12)

- *SpirouFITS.py* - add UpdateWaveSolution *(update_ wave_ sol)* function to update correctly the HC and FP files. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - add criteria to check median SNR and remove any below half the median SNR (in specific order) [Neil Cook]
- *Cal_ WAVE_ E2DS_ EA_ spirou.py* - BUG FIX - hc and fp files have wrong headers when updating wave solution. [Neil Cook]

5.3.1.578 0.4.069 (2019-02-11)

- *Cal_ WAVE_ E2DS_ EA_ spirou.py* - Big Bug FIX ASAP. [Neil Cook]
- *SpirouPlot.py* - update *wave_ ea_ plot_ line_ profiles* fig size. [Neil Cook]
- *SpirouImage.py* - pep8 correction to corruption test. [Neil Cook]
- *Constants_ SPIROU_ H4RG.py* - add second criteria for corrupt files. [Neil Cook]
- *Cal_ preprocess_ spirou.py* - update corruption tests. [Neil Cook]
- *SpirouImage.py* - adjust rms values (scaled by percentile) [Neil Cook]
- *Cal_ preprocess_ spirou.py* - move qc cuts to main code (from function) [Neil Cook]
- *SpirouImage.py* - update corruption test. [Neil Cook]
- *SpirouPlot.py* - update some plot parameters. [Neil Cook]
- *SpirouPlot.py* - enforce a default fig size on all plots + only save in png and pdf. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
  Conflicts:
    INTROOT/SpirouDRS/spirouStartup/spirouStartup.py
- Merge remote-tracking branch *'origin/input_ redo'* into neil. [Neil Cook]
  Conflicts:
    .gitignore
- DRS startup - need to make data/msg etc folders if they don't exist. [njcuk9999]

5.3.1.579 0.4.068 (2019-02-10)

- *SpirouPlot.py* - make sure plots are unique. [njcuk9999]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - modifications to plotting changes. [njcuk9999]
- *Drs_reset.py* - add option to reset plot folder. [njcuk9999]
- *SpirouStartup.py* - deal with getting / setting / displaying plot level. [njcuk9999]
- *SpirouPlot.py* - add all functionality to support plotting to file. [njcuk9999]
- *SpirouConst.py* - add plot extensions and plot figsize to constants (for saving plots to file) [njcuk9999]
- Spirou modules - make all plot calls compatible with saving to file. [njcuk9999]
- Misc - make all plot calls compatible with saving to file. [njcuk9999]
- *Config.py* - make *DRS_PLOT* an int and change description of *DRS_INTERACTIVE*. [njcuk9999]
- Bin folder - modify all calls to plot to allow saving to file (all calls require "p" as an argument) [njcuk9999]

5.3.1.580 0.4.067 (2019-02-08)

- *Cal_preprocess_spirou.py* - print out the corruption check value. [Neil Cook]
- *Cal_preprocess_spirou.py* - print out the corruption check value. [Neil Cook]
- *Cal_preprocess_spirou.py* - better message for corrupt file. [Neil Cook]
- *Cal_preprocess_spirou.py* - better message for corrupt file. [Neil Cook]
- *SpirouImage.py* - catch warning "RuntimeWarning: All-NaN slice encountered r = func(a, **kwargs)" [Neil Cook]
- *Cal_preprocess_spirou.py* - pep8 tidy up of QC. [Neil Cook]
- *SpirouImage.py* - add *get_full_flat*, *get_hot_pixels*, *test_for_corrupt_files* functions (for checking corruption in preprocessing) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add corrupt file constants. [Neil Cook]
- *Cal_preprocess_spirou.py* - add QC for corrupt files. [Neil Cook]
- *Extract_trigger.py* - update conditions for *mk_tellu* and *fit_tellu*. [Neil Cook]
- *Extract_trigger.py* - update conditions for *mk_tellu* and *fit_tellu*. [Neil Cook]
- *Obj_mk_obj_template.py* - make sure BigCube table in both BigCube and BigCube0. [Neil Cook]
- *Obj_mk_obj_tempalte.py* - fit BADFILE –> BADPFILE keyword. [Neil Cook]
- *SpirouKeywords.py* - update *KW_OBJECT* (was a typo) [Neil Cook]
- *Obj_mk_obj_template.py* - add the data type to ReadParams (otherwise tries to make them floats) [Neil Cook]
- *SpirouImage.py* - deal with keylook up and report better error (via keylookup) [Neil Cook]
- *Obj_mk_obj_template.py* - fix another typo since last update. [Neil Cook]
- *SpirouKeywords.py* - add keyword *KW_OBJECT*. [Neil Cook]
- *Obj_mk_obj_template.py* - fix type in previous changes. [Neil Cook]
- *Check_for_corrupt_files.py* - add an extra fix from Etienne. [Neil Cook]
- *Obj_mk_tellu_db.py* - fix typo in printout text. [Neil Cook]
- *Obj_mk_obj_template.py* - correct mistake in calling ReadParams (from most recent edit) [Neil Cook]
- *SpirouTelluric.py* - add a function to construct the big cube table (added as a second import to BigCube) [Neil Cook]
- *SpirouFITS.py* - add a *write_image_table* function to write a image and a table to single fits file. [Neil Cook]
- *Check_for_corrupt_files.py* - adjust with Etiennes changes. [Neil Cook]
- *Obj_mk_obj_template.py* - add fits table to big table with rows of file parameters (used in the big cube) [Neil Cook]
- *Check_for_corrupt_files.py* - fix bugs in the test. [Neil Cook]

5.3.1.581 0.4.066 (2019-02-07)

- Update the leapseconds. [Neil Cook]
- *Check_for_corrupt_files.py* - worker code to check corrupt files functionality (before implementing into preprocessing) [Neil Cook]
- Update to only do *mk_tellu* and *fit_tellu.* [Neil Cook]
- Add / get functions for recon file. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - qc snr for *mk_tellu* and *fit_tellu.* [Neil Cook]
- *Obj_mk_tellu_*.py* - distinguish between SNR cut in *fit_tellu* and *mk_tellu.* [Neil Cook]
- *Obj_fit_tellu.py* - add qc of SNR > 100 for order 33. [Neil Cook]
- *Check_objname.py* - pep9 remove blank lines. [Neil Cook]
- *Check_objname.py* - check objnames and dprtype for preprocessed files in a given directory. [Neil Cook]
- Update *extract_trigger* settings. [Neil Cook]
- Update telluric white/black lists. [Neil Cook]
- *Extract_trigger.py* - add a comment. [Neil Cook]
- *Check_calibdb_2.py* - check calibdb and sort and make "pernight" and "pertc" calibdb entries. [Neil Cook]
- *SpirouTelluric.__init__.py* - Add aliases to blacklist and whitelist functions. [Neil Cook]
- *Extract_trigger.py* - get whitelist from file. [Neil Cook]

5.3.1.582 0.4.065 (2019-02-06)

- Add a note to locale README.md. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_table.py* - remove text to language database. [Neil Cook]

5.3.1.583 0.4.079 (2019-02-06)

- *Cal_WAVE_NEW* corrected Littrow extrapolation for reddest orders. [melissa-hobson]

5.3.1.584 0.4.064 (2019-02-05)

- *Drs_startup.py* - tweak display settings for interactive + debug mode in drs setup text. [Neil Cook]
- Update language database. [Neil Cook]
- *Drs_text.py* - tweak short codes and how length works with Entry(None) [Neil Cook]
- *Drs_exceptions.py* - tweak how exception work (and add string representation) [Neil Cook]
- Update language database. [Neil Cook]
- *Pseudo_const.py* - do not automatically write debug message language codes (only when debug >= 100) [Neil Cook]
- *Drs_startup.py* - continue editing how errors work. [Neil Cook]
- *Drs_recipe.py* - continue update to errors. [Neil Cook]
- *Drs_log.py* - do not use 'p' use params, update reporting (report all if debug >= 100) [Neil Cook]
- *Drs_file.py* - add extra param (pep8) [Neil Cook]
- *Drs_argument.py* - redo DrsArgument.exception and update _display_info. [Neil Cook]
- *Drs_text.py* - expand functionality of Entry classes (__add__, __radd__, __len__, __iter__, __next__, __eq__, __ne__, __contains__) and how .get() works. [Neil Cook]
- *Drs_exception.py* - add ArgumentException/Error/Warning. [Neil Cook]
- Update language database. [Neil Cook]
- *Param_functions.py* - get ArgumentError/Warning. [Neil Cook]
- *Drs_startup.py* - deal with changes to ErrorEntry (no "n" automatically added now) [Neil Cook]
- *Drs_recipe.py* - move argument classes/functions to separate script + continue string moving to language database. [Neil Cook]
- *Drs_loy.py* - add comment that some strings cannot be moved to language database. [Neil Cook]
- *Drs_argument.py* - move argument classes/function to separate script. [Neil Cook]

5.3.1.585 0.4.063 (2019-02-04)

- *Obj_mk_tellu_db.py* - do not reset tellu db in code (do it manually before) [Neil Cook]
- Update *extract_trigger.py* for *obj_mk_tellu_db.py*. [Neil Cook]
- Merge branch 'master' into neil. [Neil Cook]
- Merge branch 'master' into neil. [Neil Cook]
- *Extract_trigger.py* - add *obj_mk_tellu_db* to triggered files. [Neil Cook]
- Unit test runs - add *obj_mk_tellu_db* to runs. [Neil Cook]
- *SpirouTelluric.py* - fix bugs after moving functions here. [Neil Cook]
- Code to check the calibdb entries vs files. [Neil Cook]
- Add *obj_mk_tellu_db* to list of available unit tests. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.586 0.4.078 (2019-02-04)

- *Cal_WAVE_NEW* update: no longer breaks if FP peak(s) next to reference line are missing. [melissa-hobson]

5.3.1.587 0.4.062 (2019-02-03)

- *Port_database.py* - just try to open csv files as they are done in the drs – hits problems here and not later. [njcuk9999]
- *Drs_text.py* - edit the way csv databases are loaded (to avoid encoding errors) [njcuk9999]
- *Drs_exceptions.py* - add errorobj as possible input to exceptions (and exctract message/level accordingly) [njcuk9999]
- Update language database. [njcuk9999]
- *Drs_recipe.py* - continue moving errors to database. [njcuk9999]
- *Drs_log.py* - continue moving errors to database. [njcuk9999]
- *Drs_file.py* - continue moving errors to database. [njcuk9999]

5.3.1.588 0.4.061 (2019-02-01)

- Update language database. [Neil Cook]
- *Drs_file.py* - continue taking out error messages. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Add wiki plots. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Update langauge databases. [Neil Cook]
- *Drs_file.py* - continued error movement to database. [Neil Cook]

5.3.1.589 0.4.077 (2019-02-01)

- *Cal_WAVE_NEW_E2DS* attempt to fix issues with FP line adjacent to reference peak being missing. [melissa-hobson]
- Merge branch 'master' into melissa. [Melissa Hobson]
- Merge pull request #534 from njcuk9999/dev. [Neil Cook]
  Dev –> Master
- *SpirouWAVE.py* - fix a deprecated WLOG message (found by Melissa) [Neil Cook]
- *SpirouLog.py* - must catch WLOG error before trying to do anything with p. [Neil Cook]
- *Cal_WAVE_NEW_E2DS*: added plot axis titles, littrow check and extrapolation, saving to files spirouConst: added functions for *cal_WAVE_NEW* spirouWAVE: corrected logging error. [melissa-hobson]
- Merge pull request #533 from njcuk9999/master. [melissa-hobson]
  update
- Merge pull request #531 from njcuk9999/master. [melissa-hobson]
  update melissa

5.3.1.590 0.4.060 (2019-01-31)

- Update langauge databases. [Neil Cook]
- *Drs_file.py* - continue to take out error messages. [Neil Cook]
- *Recipe_definitions.py* - update location of locale module. [Neil Cook]

5.3.1.591 0.4.021 (2019-01-30)

- *SpirouTelluric.py* - continue to write/upgrade new *mk_tellu* functions and functions for *mk_tellu_db*. [Neil Cook]
- *SpirouPlot.py* - add new *mk_tellu* plot. [Neil Cook]
- *SpirouConst.py* - add definition of whitelist file. [Neil Cook]
- *Tellu_whitelist.txt* - add a white list of all possible telluric star names. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add constants from new recipes. [Neil Cook]
- *Obj_mk_tellu_db.py* - move constants to constants files and functions to spirouTelluric. [Neil Cook]
- *Obj_mk_tellu_new.py* - move constants to constants file. [Neil Cook]

5.3.1.592 0.4.059 (2019-01-30)

- *Obj_mk_tellu_new.py* - update code with Etienne's changes. [Neil Cook]
- *Obj_mk_tellu_db.py* - new wrapper script for *mk_tellu* + *fit_tellu* on tellurics – creates the telluric database. [Neil Cook]

5.3.1.593 0.4.020 (2019-01-29)

- Update .gitignore to ignore .npy files. [Neil Cook]
- *SpirouTelluric.py* - added aliases to two new *mk_tellu* functions. [Neil Cook]
- *SpirouTelluric.__init__.py* - added aliases to two new *mk_tellu* functions. [Neil Cook]
- *SpirouKeywords.py* - added two new keywords for new *mk_tellu* recipe. [Neil Cook]
- *SpirouConfig.py* - update bug in ConfigError (forced list) [Neil Cook]
- *Combine_tapas.py* - new *mk_tellu* recipe (original code from E.A.) [Neil Cook]
- *Obj_mk_tellu_new.py* - new *mk_tellu* recipe. [Neil Cook]

5.3.1.594 0.4.058 (2019-01-28)

- Upgrade of language database. [Neil Cook]
- *Drs_lock.py* - continued upgrade of error entry. [Neil Cook]
- *Drs_recipe.py* - continued upgrade of error entry. [Neil Cook]
- *Drs_log.py* - continued upgrade of error entry. [Neil Cook]
- *Drs_file.py* - continued upgrade of error entry. [Neil Cook]
- *Drs_log.py* - fix bug in log and how exceptions are handled. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge pull request #532 from njcuk9999/neil. [Neil Cook]
  Neil -> Master
- Update date/version/changelog. [Neil Cook]

5.3.1.595 0.4.017 (2019-01-28)

- *SpirouLog.py* - fix a bug in logger (only a problem when log breaks) [Neil Cook]

5.3.1.596 0.4.057 (2019-01-26)

- Modify test recipes with upgrades. [Neil Cook]
- Drsmodule.plotting - moved from drsmodule.plot. [Neil Cook]
- Drsmodule.locale - continue upgrade. [Neil Cook]
- Drsmodule.constants.io - continue upgrade. [Neil Cook]
- Drsmodule.constants.default - continue upgrade. [Neil Cook]
- Drsmodule.constants.core - continue upgrade. [Neil Cook]
- Drsmodule.config.instruments - continue upgrade. [Neil Cook]
- Drsmodule.config.core - continue upgrade. [Neil Cook]
- Update *DRS_VERSION / DRS_DATE / DRS_RELEASE.* [Neil Cook]
- Update *user_config.ini.* [Neil Cook]
- Update *user_config.ini.* [Neil Cook]

5.3.1.597 0.4.056 (2019-01-25)

- *Drs_startup.py* - tweak the system information display section. [Neil Cook]
- *Drs_log.py* - separate print and log (and use default language for log) [Neil Cook]
- Backup language database. [Neil Cook]
- *Drs_text.py* - fill language database empty with 'N/A' [Neil Cook]
- Update language databases. [Neil Cook]

5.3.1.598 0.4.055 (2019-01-24)

- Add READMEs to explain empty directories. [Neil Cook]
- Add instrument language packs and backup folder for language database. [Neil Cook]
- Drsmodule.locale - construct a readme. [Neil Cook]
- *Drsmodule.locale.__init__.py* - add *drs_exceptions* to internal imported modules. [Neil Cook]
- Drsmodule.locale.databases - update language databases. [Neil Cook]
- Drmodule.locale.core - move exceptions and make sure all are using basiclogger. [Neil Cook]
- Drsmodule.constants - update readme. [Neil Cook]
- Constants.default - make Const and Keywords have a source argument. [Neil Cook]
- Constants.core - change how exceptions work and where they are sourced from. [Neil Cook]
- Config.instruments.spirou - make copy have a source argument. [Neil Cook]
- Config.instruments.nirps - make copy have a source argument. [Neil Cook]
- *Drs_setup.py* - change how the exceptions work and where they are sourced from + continue to replace hard-coded text to text from database. [Neil Cook]
- *Drs_recipe.py* - carryon replacing text hard-coded to text in database. [Neil Cook]
- *Drs_log.py* - change how the exceptions work and where they are sourced from. [Neil Cook]

5.3.1.599 0.4.054 (2019-01-23)

- Moved locale module to drsmodule root. [Neil Cook]
- Locale.databases - continued to add to databases. [Neil Cook]
- Locale.databases - continued to add to databases. [Neil Cook]
- .gitignore - added ignoring of .npy files and .~lock files. [Neil Cook]
- *Constants.default.pseudo_const.py* - added *REPORT_KEYS* method. [Neil Cook]
- *Constants.core.param_functions.py* - started added language / basic log functionality. [Neil Cook]
- *Constants.core.constants_functions.py* - added tracking of warnings (so they only print once) [Neil Cook]
- *Config.math.time.py* - added *get_hhmmss_now* function (for log) [Neil Cook]
- Removed locale folder from config folder to separate sub-module directory. [Neil Cook]

- *Instruments.spirou.recipe_ definitions.py* - language implementation. [Neil Cook]
- *Instruments.nirps.recipe_ definitions.py* - language implementation. [Neil Cook]
- *Instruments.nirps.pseudo_ const.py* - format change. [Neil Cook]
- *Drs_ startup.py* - language implementation. [Neil Cook]
- *Drs_ recipe.py* - language implementation. [Neil Cook]
- *Drs_ log.py* - language implementation. [Neil Cook]

5.3.1.600 0.4.053 (2019-01-22)

- Added error.csv and "language.xls" - use language.xls to edit strings for each language (given a specific key) [Neil Cook]
- *Default_ config.py* - updated options (now with ENG and FR allowed - ENG as default) [Neil Cook]
- Updated help.csv. [Neil Cook]
- Removed *recipe_ descriptions.py* from config.locale.core. [Neil Cook]
- *Drs_ text.py* - (formally text.py) - continued work on upgrade. [Neil Cook]
- *Recipe_ definitions.py* - use HelpText to define strings (language support) [Neil Cook]
- *Drs_ recipe.py* - *COLOURED_ LOG –> DRS_ COLOURED_ LOG.* [Neil Cook]
- *Drs_ log.py* - update WLOG to deal with ErrorEntry objects as WLOG messages. [Neil Cook]
- Use HelpText to define strings (language support) [Neil Cook]
- Update *user_ config.ini* file. [Neil Cook]
- Update *user_ config.ini* file. [Neil Cook]
- Add default help file. [Neil Cook]
- Change from ./configuration –> ./config. [Neil Cook]
- Change from ./configuration –> ./config. [Neil Cook]
- Added alias to new function *"get_ file_ names"* [Neil Cook]
- Adjusted path name ./configuration –> ./config. [Neil Cook]
- Started adding language support. [Neil Cook]
- Renamed drsmodule.configuration to drsmodule.config. [Neil Cook]

5.3.1.601 0.4.052 (2019-01-21)

- Add source config file to error messages. [Neil Cook]
- Fixed printing of config errors in constants file. [Neil Cook]
- Added a test recipe for spirou and nirps. [Neil Cook]
- Added lock and table to drsmodule.io package. [Neil Cook]
- Added "getmodnames" to *drsmodule.constants._ _ init_ _* file. [Neil Cook]
- Continued upgrade to drsmodule.constants.default. [Neil Cook]
- Continued upgrade to drsmodule.constants.core. [Neil Cook]
- Added *_ _ init_ _* file to drsmodule.configuration. [Neil Cook]
- Continued upgrade to drsmodule.configuration.instruments.spirou. [Neil Cook]
- Added a drsmodule.configuration.core.default folder (for default file/recipe descriptions) [Neil Cook]
- Continued upgrade to drsmodule.configuration.core. [Neil Cook]
- Default file definitions and recipe defintions. [Neil Cook]
- Add test default config for NIRPS. [Neil Cook]
- Add test user config for NIRPS. [Neil Cook]

5.3.1.602 0.4.051 (2019-01-19)

- Add minor changes to *drs_recipe.py* and *drs_startup.py*. [Neil Cook]
- Add a test recipe to recipes.test. [Neil Cook]
- Added a plot module. [Neil Cook]
- Continued upgrade of constants.default packages. [Neil Cook]
- Added locale package. [Neil Cook]
- Continued update of instruments.spirou defintions. [Neil Cook]
- Adding *drs_recipe* + *drs_file* to configuration.core modules. [Neil Cook]

5.3.1.603 0.4.050 (2019-01-18)

- Move constants functions from package –> core (remove package module) [Neil Cook]
- Add init file for drsmodule (to be named something else eventually) [Neil Cook]
- Add configuration.instruments.spirou files. [Neil Cook]
- Remove the core.general package. [Neil Cook]
- Add init and README.md to constants module. [Neil Cook]
- Add a defaults folder (this has definitions of constants as well as default values) - sets up the classes for instruments to overwrite. [Neil Cook]
- Remove the const package (now "constants") [Neil Cook]
- Add a time module to the configurations.math module. [Neil Cook]
- Add a init file to configuration.instruments. [Neil Cook]
- Add spirou config files to configuration.instruments. [Neil Cook]
- Add logging to configuration.core. [Neil Cook]
- Add default user config files (will be commented out in future) [Neil Cook]
- *SpirouRecipe.py* - add "instrument" to attributes of spirouRecipe.py. [Neil Cook]
- *Files_spirou.py* - modify name and description docstring. [Neil Cook]
- *SpirouConst.py* - fix a bug in exit definition. [Neil Cook]

5.3.1.604 0.4.049 (2019-01-17)

- Added additional file to INTROOT 2 (remanage) [Neil Cook]
- *Test_processing.py* - remove need for replacing '.py' [Neil Cook]
- *Recipes_spirou.py* - added instrument name (will be needed in the future) [Neil Cook]
- First draft of INTROOT remanage. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge pull request #529 from njcuk9999/neil. [Neil Cook]
  Neil –> Master
- Update date/version/changelog. [Neil Cook]
- *Test_processing.py* - modify code to return errors and timings (via multiprocessing.Manager) [Neil Cook]
- *SpirouRecipe.py* - modified the *generate_runs_from_filelist* function to fix when there is no directory from pos args. [Neil Cook]
- *SpirouFile.py* - added *read_header/read_data* functions and optimized (with todo comment) the read function. [Neil Cook]
- *Wavecompy.py* - added some comments. [Neil Cook]

5.3.1.605 0.4.048 (2019-01-16)

- *Test_processing.py* - for now comment out main call (while testing) [Neil Cook]
- *SpirouRecipe.py* - reformat help printing, add required option to optional arguments (for when we do not have positional arguments) and rework the generation of runs from files (especially when we only have optional arguments) [Neil Cook]
- *Recipe_spirou.py* - add required keyword (for testing) [Neil Cook]
- *Wavecomp.py* - code to compare wavelength solutions (misc) [Neil Cook]

5.3.1.606 0.4.047 (2019-01-15)

- *Drs_dependencies.py* - remove looking in the /misc/ folder for dependecies/code stats. [Neil Cook]
- *Test_recipe.py* - test self. [Neil Cook]
- *Test_processing.py* - upgrade to allow execution of recipes (in single and in parallel) [Neil Cook]
- *SpirouStartup2.py* - allow overwriting of *drs_params* when they are obtained via kwargs *(get_params)* [Neil Cook]
- *SpirouRecipe.py* - continued upgrade of *input_redo*. [Neil Cook]
- *Recipe_spirou.py* - continued upgrade of *input_redo*. [Neil Cook]

5.3.1.607 0.4.016 (2019-01-15)

- *SpirouLog.py* - fixed an error with logging (if p not set crashes because there was no *DRS_DEBUG* key – fixed now) [Neil Cook]
- *SpirouRV.py* - fixed bug found with part of correlbin - only affects spectra which have peaks with start/end different by +2 (rare?) but for now using the old correlbin which works for these. [Neil Cook]

5.3.1.608 0.4.046 (2019-01-11)

- *Recipe_spirou.py* - change nomenclature require kwarg arguments have '-' optional have '–' [Neil Cook]
- *Test_recipe.py* - change comment to make clearer. [Neil Cook]
- *SpirouStartup2.py* - remove '-' in specials to allow them to work. [Neil Cook]
- *SpirouRecipe.py* - modify _parse_args to take into that we don't wont the '-' [Neil Cook]
- *Recipes_spirou.py* - testing file list as keyword arguments. [Neil Cook]
- *SpirouStartup2.py* - changed order of functions, modified display order, added functionality to deal with debug mode and other special keys. [Neil Cook]
- *SpirouRecipe.py* - continued upgrade (changes to parser handling of special arguments, check files + added debug as special argument) [Neil Cook]
- *SpirouFile.py* - small formatting changes in continued input redo. [Neil Cook]
- *Recipe_spirou.py* - remove references to debug (now a special command added to all recipes) [Neil Cook]
- *Recipe_descriptions.py* - remove unused help. [Neil Cook]
- *Files_spirou.py* - modify names to better suit input redo. [Neil Cook]

5.3.1.609 0.4.045 (2019-01-09)

- *Test_recipe.py* - test on *cal_HC_E2DS_spirou.py*. [Neil Cook]
- *SpirouStartup2.py* - modified which argument display on setup (now only those that were entered at run time) [Neil Cook]
- *SpirouRecipe.py* - redone error reporting on header check. [Neil Cook]
- *SpirouFile.py* - continued upgrade of input redo. [Neil Cook]
- *Recipes_spirou.py* - added *cal_hc* definition. [Neil Cook]
- *Recipe_descriptions.py* - added *cal_hc* text. [Neil Cook]
- *Files_spirou.py* - updated names to better represent files (i.e. added fiber name) [Neil Cook]
- *SpirouRecipe.py* - make some methods/function private (protected) using the "_" character as a prefix. [Neil Cook]
- *Recipe_spirou.py* - add more argument defintions (blazefile/flatfile/wavefile), add *cal_hc* test. [Neil Cook]

- *Recipe_ descriptions* - fix imports and define language in constants file. [Neil Cook]
- *SpirouConst.py* - add language constant (Not used yet) [Neil Cook]
- *SpirouStartup2.py* - modify *special_keys_present* function to look at altnames as well as names (i.e. DrsArgument.names instead of DrsArgument.name) [Neil Cook]
- *SpirouRecipe.py* - modify and add special actions (now: –help, –listing, –listall, –version, –info) [Neil Cook]
- *Recipe_spirou.py* - convert remaining descriptions/help to *recipe_ descriptions* calls. [Neil Cook]
- *Recipe_ descriptions.py* - continue to fill out recipe descriptions/examples/help. [Neil Cook]

5.3.1.610 0.4.044 (2019-01-08)

- SpirouConst.py, spirouRecipe, *spirouStartup2.py* - move around the header –> into spirouConst.py. [Neil Cook]
- *SpirouStartup2.py* - add a check for special keys and do not display normal "splash" if found. [Neil Cook]
- *SpirouRecipe.py* - update listing, add version/ epilog and other small fixes to input redo. [Neil Cook]
- *Recipe_spirou.py* - continued work on recipe definitions (including references to *recipe_ descriptions)* [Neil Cook]
- *Recipe_ descriptions.py* - storage for longer text (allowing possibility of language support later) [Neil Cook]
- *SpirouConst.py* - added constant to define the maximum display limit for files/directorys (when showing an argument error) [Neil Cook]
- Merge branch 'master' into *input_ redo*. [Neil Cook]
- Merge pull request #528 from njcuk9999/neil. [Neil Cook]
  Neil –> Master
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Update the reset files for the calibDB and telluDB. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- Merge branch 'master' into *input_ redo*. [Neil Cook]
  Conflicts:
        INTROOT/SpirouDRS/spirouCore/spirouLog.py
- Merge pull request #527 from njcuk9999/neil. [Neil Cook]
  Neil –> Master. Confirmed unit tests completed successfully.

5.3.1.611 0.4.015 (2019-01-08)

- *SpirouPOLAR.py* - fix dependence on *KW_ ACQTIME_KEY_ JUL –> KW_ ACQTIME*. [Neil Cook]
- *SpirouCDB.py/spirouDB.py* - change all human times to be in format *YYYY-mm-dd_ HH:MM:SS.f* for consistency. [Neil Cook]
- Test.run - update test.run to finish testing (start before last failure) [Neil Cook]
- *SpirouDB.py* - fix database definitions in modified *"get_ database"* function. [Neil Cook]
- Updated version/date/changelog. [Neil Cook]
- Move old tests to *spirouUnitTests/old_ tests*. [Neil Cook]

5.3.1.612 0.4.014 (2019-01-07)

- *SpirouDB.py* - changed from reading human date to reading julian date, changed to use astropy.timea. [Neil Cook]
- *SpirouCDB.py* - reformatted calibDB functions to use spirouDB wherever possible, changed from reading human date to reading julian date, changed to use astropy.time. [Neil Cook]
- *SpirouDB._ _ init_ _ .py* - moved location of *get_ acqtime* (moved to spirouDB) [Neil Cook]
- *SpirouKeywords.py* - removed *KW_ ACQTIME_KEY* and *KW_ ACQTIME_KEY_ JUL* in place of *KW_ ACQTIME* (which is the modified julian date) - with supporting format in case of change (uses astropy.time) [Neil Cook]
- *SpirouConst.py* - removed the use of *ACQTIME_KEY_ JUL* now uses *KW_ ACQTIME* (which is the modified julian date by definition) [Neil Cook]
- *Cal_ HC_ E2DS_ EA_ spirou.py* - changed acqtime to ACQTIME (for consistency) [Neil Cook]

5.3.1.613 0.4.043 (2018-12-21)

- *Test_processing.py* - continued work on *input_redo*. [Neil Cook]
- *SpirouRecipe.py* - continued work on *input_redo*. [Neil Cook]
- *Recipes_spirou.py* - continued work on *input_redo*. [Neil Cook]

5.3.1.614 0.4.013 (2018-12-19)

- *SpirouLog.py* - fix for printlogandcmd now having argument "colour" [Neil Cook]
- *SpirouLog.py* - update of ipdb to allow magic commands. [Neil Cook]

5.3.1.615 0.4.042 (2018-12-19)

- *SpirouRecipe.py* - continue input redo upgrade. [Neil Cook]
- *SpirouFile.py* - add some extra empty attributes to DrsInputFile and DrsFitsFile. [Neil Cook]
- *SpirouLog.py* - alias for embeded ipython (in ipdb type "ipython()") [Neil Cook]
- *Recipes_spirou.py* - update values during *input_redo* upgrade. [Neil Cook]
- *Test_processing.py* - script to test *input_redo* with processing. [Neil Cook]

5.3.1.616 0.4.041 (2018-12-18)

- *Test_recipe.py* - continued update of input redo. [Neil Cook]
- *SpirouStartup2.py* - continued update of input redo. [Neil Cook]
- *SpirouStartup.py* - update from spirouStartup2.py. [Neil Cook]
- *SpirouRecipe.py* - continued update of input redo. [Neil Cook]
- *SpirouFile.py* - continued update of input redo. [Neil Cook]
- Merge branch 'neil' into *input_redo*. [Neil Cook]

5.3.1.617 0.4.012 (2018-12-18)

- *SpirouStartup.py* - update display. [Neil Cook]
- *SpirouConst.py* - update colours and themes and Color Class. [Neil Cook]
- *SpirouLog.py* - add debug and custom colour modes to log messages. [Neil Cook]
- *SpirouLog.py* - add debug and custom colour modes to log messages. [Neil Cook]
- *SpirouConst.py* - update log constants. [Neil Cook]
- *Obj_mk_obj_template.py* - adjust log message to be more clear. [Neil Cook]
- Test codes for testing bug in BigCube/telluDB. [Neil Cook]
- *SpirouFile.sort_by_name* - return sort indices not array (so we can sort multiple arrays) [Neil Cook]
- *Obj_mk_obj_template.py* - fix bug in sorting files (wrong OBJNAME for filename) [Neil Cook]

5.3.1.618 0.4.040 (2018-12-17)

- *SpirouRecipe.py* - continued work on input redo. [Neil Cook]
- *SpirouStartup2.py* - continued work on input redo. [Neil Cook]
- *SpirouRecipe.py* - continued work on input redo. [Neil Cook]
- *SpirouFile.py* - continued work on input redo. [Neil Cook]
- *Test_recipe.py* - continued update for *input_redo*. [Neil Cook]
- *SpirouRecipe.py* - continued update for *input_redo*. [Neil Cook]
- *SpirouFile.py* - continued update for *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
  Conflicts:
     INTROOT/SpirouDRS/spirouUnitTests/extract_trigger.py

5.3.1.619 0.4.011 (2018-12-17)

- *Obj_mk_obj_template.py* - fix bug when forcing calibDB from wave solution (calibDB needs to be re-read each time) [Neil Cook]
- *Obj_mk_obj_template.py* - fix bug when forcing calibDB from wave solution (calibDB needs to be re-read each time) [Neil Cook]
- *Obj_mk_obj_template.py* - fix bug when forcing calibDB from wave solution (calibDB needs to be re-read each time) [Neil Cook]
- *SpirouLog.py* - update log to allow option to be added (by default uses "RECIPE" or *"LOG_OPT"* or ‘’) [Neil Cook]

5.3.1.620 0.4.010 (2018-12-16)

- *Wave_sol_to_header.py* - code to update header of all e2ds/e2dsff (object and fpfps) in a *night_name* or all files. [Neil Cook]
- Merge pull request #525 from njcuk9999/dev. [Neil Cook]
  Melissa –> Dev –> Master. Confirm tested.
- Update *date/version/changelog/update_notes.* [Neil Cook]

5.3.1.621 0.4.039 (2018-12-15)

- *SpirouFile.py* - continued work on input redo. [Neil Cook]
- *SpirouRecipe.py* - continued work on input redo. [Neil Cook]

5.3.1.622 0.4.009 (2018-12-14)

- *Cal_CCF_E2DS_FP_spirou.py* - fix if *CCF_RV2* not in whdr. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - fix if *CCF_RV2* not in whdr. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - fix if *CCF_RV2* not in whdr. [Neil Cook]
- Test.run - update for current testing. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - fix crash bug Exception –> SystemExit. [Neil Cook]
- Test.run - change for continued test. [Neil Cook]
- Test.run - change for continued test. [Neil Cook]
- *SpirouTHORCA.py* - fudge factor fix –> $n\_order\_init = p[$‘$IC\_LITTROW\_ORDER\_INIT\_\{0\}$’$.format(1)]$ [Neil Cook]
- *SpirouTHORCA.py* - test fix. [Neil Cook]
- *SpirouTHORCA.py* - fix for *n_order_init* (from init –> *init_1/init_2)* [Neil Cook]
- Update test.run - *cal_test.run* (from *cal_WAVE)* onwards. [Neil Cook]
- Merge branch ‘melissa’ into dev. [Neil Cook]
- *SpirouConst.py* - pep8 changes to *WAVE_FILE_EA_2.* [Neil Cook]
- *Cal_WAVE_NEW_E2DS_spirou.py* - pep8 changes. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - few logic checks and pep8 changes. [Neil Cook]
- *Extract_trigger.py* - update run time parameters. [Neil Cook]
- *Extract_trigger.py* - fix incompatible version of *cal_shape* in reprocessing code. [Neil Cook]

5.3.1.623 0.4.038 (2018-12-14)

- *SpirouRecipe.py* and *spirouStartup2.py* - continued update to input redo. [Neil Cook]
- *Extract_trigger.py* - fix incompatible version of *cal_shape* in reprocessing code. [Neil Cook]

5.3.1.624 0.4.037 (2018-12-13)

- *SpirouRecipe.py* - update to check code (put into DrsRecipe class as methods) [Neil Cook]
- *SpirouRecipe.py* - update to check code (put into DrsRecipe class as methods) [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]

5.3.1.625 0.4.008 (2018-12-13)

- *Constants_SPIROU_H4RG*: new constants for start/end littrow orders. [melissa-hobson]
- *Cal_WAVE_E2DS_EA*: littrow can now start and end at any order. Recalculation of littrow sigma handled for all cases. [melissa-hobson]
- *Extrapolate_littrow_sol*: correct initial littrow order. [melissa- hobson]
- *WAVE_FILE_EA_2* function adds fp filename to wavefilename. [melissa- hobson]
- *Cal_WAVE_NEW* shifted plots. [melissa-hobson]
- Merge pull request #523 from njcuk9999/master. [melissa-hobson]
  update
- Merge pull request #522 from njcuk9999/dev. [Neil Cook]
  Francois –> Dev –> Master
- Update date/version/changelog. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- Merge pull request #521 from njcuk9999/francois. [melissa-hobson]
  Francois
- Merge branch 'master' into francois. [Neil Cook]
- Merge pull request #520 from njcuk9999/master. [melissa-hobson]
  Update melissa from master

5.3.1.626 0.4.007 (2018-12-13)

- *Extract_trigger.py* - changes to reprocessing code (correct order) [Neil Cook]
- Merge branch 'master' into dev. [Neil Cook]
- Merge pull request #519 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Code to check the telluric corrections. [Neil Cook]

5.3.1.627 0.4.006 (2018-12-12)

- Add .idea to .gitignore. [Neil Cook]
- Re-do requirements files. [njcuk9999]
- Merge branch 'francois' into dev. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - pep8 clean up of Francois branch. [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - pep8 clean up of Francois branch. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - pep8 clean up of Francois branch. [Neil Cook]
- Format of flux ratio set to .3f. [FrancoisBouchy]
- Compute the absolute CCF drift of the FP and save it in the wavelength solution file as CCFRV2. [FrancoisBouchy]
- Absolute CCF drift of FP is read from the wavelength solution file. The relative CCF drift takes into account this Absolute drift. [FrancoisBouchy]

- Merge remote-tracking branch 'origin/master' [Neil Cook]
- Update README.md. [Neil Cook]
  Update with recent changes
- Update requirements (barycorrpy required) [Neil Cook]
- Add a minimum requirements and current requirements (as .txt files) [Neil Cook]
- Merge pull request #518 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date/version/changelog/ update notes. [Neil Cook]

5.3.1.628 0.4.005 (2018-12-11)

- *SpirouTable.py* - fix an error with missing end card. [Neil Cook]
- Update *extraction_trigger.py* run time parameters. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- *Cal_validate_spirou.py* - correct *cal_validate* for new wlog. [Neil Cook]

5.3.1.629 0.4.036 (2018-12-11)

- *Cal_validate_spirou.py* - correct *cal_validate* for new wlog. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]

5.3.1.630 0.4.004 (2018-12-10)

- *SpirouConst.py* - undo change to global file. [Neil Cook]
- *SpirouFITS.py* - fix for lock file on non-fits files. [Neil Cook]

5.3.1.631 0.4.035 (2018-12-10)

- *SpirouStartup2.py* - upgrade WLOG (requires *drs_params* to track pid) [Neil Cook]
- *SpirouRecipe.py* - upgrade WLOG (requires *drs_params* to track pid) [Neil Cook]
- *SpirouFile.py* - upgrade WLOG function (requires *drs_params* to track pid) [Neil Cook]
- *Recipes_spirou.py* - fix pep8 in helpstr. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge pull request #516 from *njcuk9999/dev_shape_redo*. [Neil Cook]
  Dev shape redo (confirmed testing on *cal_test*, *tellu_test* and *pol_test)*
- Update date/version/changelog. [Neil Cook]
- Merge branch 'master' into *input_redo*. [njcuk9999]

5.3.1.632 0.4.003 (2018-12-10)

- *Cal_WAVE_E2DS_EA_spirou.py* - correct pep8 and add TODO's for problems. [Neil Cook]
- *Cal_WAVE_NEW_E2DS_spirou.py* - correct pep8 and WLOG changes. [Neil Cook]
- Merge branch 'dev' into *dev_shape_redo*. [Neil Cook]
  Conflicts:
      INTROOT/misc/cal_WAVE_NEW_E2DS_spirou.py
- Remove hard-coded initial wavelenth solution. [melissa-hobson]
- Merge pull request #515 from njcuk9999/master. [melissa-hobson]
  update melissa from master
- Add new CCF mask *(masque_sept18.mas)* [njcuk9999]
- Improvements to *fp_wavelength_sol_new* fp m value determination correction to fp line insertion into *all_lines* assorted tests for fitting HC lines. [melissa-hobson]
- Littrow: get total orders from *echelle_orders*, not *all_lines*; save orders of min/max deviation. [melissa-hobson]
- SpirouMath: calculates wave coeff from chebyshev polynomials spirouPlot: correct wavelengths for fitted lines in *wave_ea_plot_single_order*. [melissa-hobson]

- *Cal_WAVE_NEW_E2DS_EA* update (calculates wave sol, does Littrow) [melissa-hobson]
- *Cal_WAVE_EA* order information on Littrow QC fail. [melissa-hobson]
- Update timings for V0.4.001. [Neil Cook]
- *SpirouRV.py* - change an info log message to general log message (too many for CCF) [Neil Cook]
- *SpirouLSD.py* - remove some of the info logs and make them general logs. [Neil Cook]
- *Pol_spirou.py* - remove some of the info logs and make them general logs. [Neil Cook]
- Update date/version/changelog. [Neil Cook]

5.3.1.633 0.4.001 (2018-12-08)

- *Unit_Test* runs - update test for run. [Neil Cook]
- *Extract_trigger.py* - update values for run time. [Neil Cook]
- *SpirouStartup.py* - define initial values for *log_opt* and program in Begin() [Neil Cook]

5.3.1.634 0.4.002 (2018-12-08)

- *Constants_SPIROU_H4RG.py* - add *"fitsopen_max_wait"* time. [Neil Cook]
- *Cal_reset.py* - fix fake p (with real p) [Neil Cook]

5.3.1.635 0.3.077 (2018-12-07)

- *SpirouTable.py* - add lock files around writing to fits file (avoids writing at the same time) [Neil Cook]
- *SpirouImage.__init__.py* - add links to check/close/open fits lock file. [Neil Cook]
- *SpirouFITS.py* - add fits file lock file (to avoid writing to same fits file at same time) [Neil Cook]
- *SpirouDB.py* - edit message and sleep time for waiting lock file. [Neil Cook]
- *Extract_trigger* - update to allow skipping of *mk_tellu* and *fit_tellu* files. [Neil Cook]
- *Obj_fit_tellu.py* - fix problems with WLOG update. [Neil Cook]
- *SpirouStartup.py* - add telluDB info to the start up printout/log. [Neil Cook]

5.3.1.636 0.3.076 (2018-12-05)

- SpirouDRS/spirouUnitTest folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouUnitTest folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouTools folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouTHORCA folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouTelluric folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouStartup folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouRV folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouPOLAR folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouLOCOR folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouImage folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouFLAT folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouEXTOR folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouDB folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouCore folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouConfig folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- SpirouDRS/spirouBACK folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- *Spirou_drs/misc* folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- *Spirou_drs/bin* folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- *Spirou_drs/bin* folder - major redo of logging system (to allow passing of process-id) [Neil Cook]
- *Cal_extract_RAW_spirou.py* - remove the need to a TILT file is mode == '4a' or '4b' [Neil Cook]
- *Cal_extract_RAW_spirou.py* - remove the need to a TILT file is mode == '4a' or '4b' [Neil Cook]
- *SpirouConfigFile.py* - update comment to make it clear why two tests are needed. [Neil Cook]

5.3.1.637 0.3.075 (2018-12-04)

- *SpirouImage.py* - adjust warning for getting *unix_time* from string (where time is not valid) - warning or error? [Neil Cook]

5.3.1.638 0.3.074 (2018-12-03)

- *SpirouConst.py* - modify colour for white screen people. [Neil Cook]
- *SpirouKeywords.py* - update keys (must be shorter with addition of numbers) [Neil Cook]
- *SpirouKeywords.py* - update keys (must be shorter) [Neil Cook]
- *SpirouUnitRecipes.py* - remove *cal_SHAPE_spirou2.* [Neil Cook]
- *Extract_trigger.py* - update run arguments. [Neil Cook]
- *Unit_tests* - update test.run and *Pol_Test.run.* [Neil Cook]
- *SpirouStartup.py* - add functionality to assign process id (on begin) –> timestamp. [Neil Cook]
- *SpirouTable.py* - update comment to give some idea of the IDL command to open table. [Neil Cook]
- *SpirouLog.py* - start process of having individual logs for each instance. [Neil Cook]
- Recipe control - adjust inputs to *cal_SHAPE_spirou.* [Neil Cook]
- *Cal_SHAPE_spirou.py* - change name of *cal_SHAPE_spirou2.py –> cal_SHAPE_spirou.py.* [Neil Cook]
- *SpirouLSD.py* - modify output of LSD table to be a FIT BINARY Table. [Neil Cook]
  Note to open fits tables in IDL see here:
      https://idlastro.gsfc.nasa.gov/ftp/pro/fits_table/aaareadme.txt
    lookup:
        ftab_print, 'file.fits'
    read:
        tab = readfits('file.fits', hdr, /EXTEN) col1 = tbget(hdr, tab, 'COLUMN1')
- *Extract_trigger.py* - update *extract_trigger* run constants. [Neil Cook]
- *SpirouLSD.py* - change format of output to FITS table. [Neil Cook]
- *SpirouTable.py* - add option in *write_table* to accept header (hdict) [Neil Cook]
- *SpirouUnitRecipes.py* - remove reference to *cal_SHAPE_spirou2.py.* [Neil Cook]
- *Extract_trigger.py* - update run parameters (and slightly change order of constants) [Neil Cook]
- *Cal_SHAPE_spirou.py* - change reference to GetShapeMap2 –> GetShapeMap. [Neil Cook]
- *SpirouImage.py* - change *get_shape_map2 –> get_shape_map* (change old *get_shape_map –> get_shape_map_old)* [Neil Cook]
- *Recipe_control.txt* - change *cal_SHAPE_spirou2 –> cal_SHAPE_spirou* (remove old one) [Neil Cook]
- *Cal_SHAPE_spirou.py* - renamed from *cal_SHAPE_spirou2.py* (old code moved to ./misc) [Neil Cook]

5.3.1.639 0.3.073 (2018-11-30)

- Update test.run. [njcuk9999]

5.3.1.640 0.3.072 (2018-11-28)

- Changes to parallelisation (test) [njcuk9999]
- *Extract_trigger.py* - updates to extraction trigger. [njcuk9999]
- *Tellu_whitelist.txt* - a white list of telluric stars. [njcuk9999]

5.3.1.641 0.3.071 (2018-11-27)

- *Extract_trigger.py* - correct problems with pre-processing automation. [njcuk9999]
- *Recipe_control.txt* - add some more options for *POL_STOKES_I*. [njcuk9999]
- Merge pull request #514 from *njcuk9999/dev_shape_redo*. [Neil Cook]
  Dev shape redo - tested on *Cal_test.run* and *Tellu_Test.run*

5.3.1.642 0.3.070 (2018-11-26)

- Update test.run. [njcuk9999]
- *Run_off_listing.py* - fix errors in code. [njcuk9999]
- Update date/version/changelog. [njcuk9999]

5.3.1.643 0.3.069 (2018-11-26)

- *Run_off_listing.py* - correct to try/except in *run_off_listing.py*. [njcuk9999]
- *Extract_trigger.py* - upgrades to extract trigger just do extractions. [njcuk9999]
- *Run_off_listing.py* - code to redo indexing. [njcuk9999]
- *SpirouStartup.py* - fix error with change to indexing (and old index files) [njcuk9999]
- *SpirouConst.py* - change *func_name* for *REDUC_OUTPUT_COLUMNS*. [njcuk9999]

5.3.1.644 0.3.068 (2018-11-24)

- Update extraction trigger. [njcuk9999]
- *SpirouConst.py* - add MJDATE to index.fit. [njcuk9999]
- Merge branch 'master' into *dev_shape_redo*. [njcuk9999]
  Conflicts:
  > INTROOT/SpirouDRS/spirouImage/spirouBERV.py
- Update spirouBERV.py. [Neil Cook]
  Correct error with *spriouBerv.get_earth_velocity_correction* - only calculate BERV for OBSTYPE = 'OB-JECT' (an do not look for ra/dec etc in the headers - it wont be there for lab files)
- *Cal_SHAPE_spirou/spirou2* - correct mistakes found by unit test run. [njcuk9999]
- Update date/version/changelog. [njcuk9999]

5.3.1.645 0.3.067 (2018-11-24)

- *Cal_Test.run* - add *cal_SHAPE_spirou2* to *Cal_Test.run*. [njcuk9999]
- Unit tests: add *cal_SHAPE_spirou2* to unit test definition. [njcuk9999]
- *SpirouImage.py* - update *get_shape_map2* and *get_offset_sp* in-line with Etienne's changes. [njcuk9999]
- *SpirouPlot.py* - update new shape plots in-ilne with Etiennes changes. [njcuk9999]
- *SpirouMath.py* - update *"gauss_fit_s"* (Etienne updated it) [njcuk9999]
- *SpirouKeywords.py* - add extra keys (for index.fits) and for wave-list in bigcubes. [njcuk9999]
- *SpirouConst.py* - update acquisition of filenames now we have "HCFILE" and "FPFILES" (not "HCFILES" and "FPFILE") [njcuk9999]
- *Constants_SPIROU_H4RG.py* - update constants inline with Etiennes changes. [njcuk9999]
- *Obj_mk_obj_template.py* - list wave files in header (along with file name and berv) for big cube. [njcuk9999]
- *Cal_SHAPE_spirou2.py* - continued work on shape upgrade + now 1 hcfile and multiple fp files. [njcuk9999]

5.3.1.646 0.3.066 (2018-11-23)

- *SpirouFits.py* - fix bug with hdict being empty (possible on some writes) [njcuk9999]

5.3.1.647 0.3.065 (2018-11-22)

- *SpirouTable.py* - updated the error outputs to include filename. [njcuk9999]
- *SpirouImage.py* - continued to modify *get_ offset_ sp* and *get_ shape_ file2* (for new SHAPE code) [njcuk9999]
- *SpirouPlot.py* - adjusted *slit_ shape_ angle_ plot* and added *slit_ shape_ offset_ plot* (for new SHAPE recipe) [njcuk9999]
- *SpirouMath.py* - adjusted problem in *gauss_ fit_ s* file "correction = (x - np.mean(x)) * slope" –> "correction = (x - x0) * slope" [njcuk9999]
- Updated the *catalogue_ UNe.dat* file and added *cavity_ length.dat* file (for new SHAPE code) [njcuk9999]
- *Master_ tellu_ SPIROU.txt* - updated the master calibdb with the new *MASTER_ WAVE.fits*. [njcuk9999]
- *Master_ calib_ SPIROU.txt* - updated the master calibdb with the new *MASTER_ WAVE.fits*. [njcuk9999]
- *Recipe_ control.txt* - added *cal_ SHAPE_ spirou2* to the recipe control (with two arguments for *FP_ FP* and *HC_ HC* files - pp fits not e2ds!) [njcuk9999]
- *Constants_ SPIROU_ H4RG.py* - added new constants and modified constants changed by Etienne. [njcuk9999]
- *Cal_ SHAPE_ spirou2.py* - continued work on adapting Etiennes changes into *cal_ SHAPE*. [njcuk9999]

5.3.1.648 0.3.064 (2018-11-21)

- Add copy of old xt code (to compare with new one for changes) [njcuk9999]
- Add function: *read_ cavity_ length*, *get_ shape_ map2*, *get_ offset_ sp* for new shape code. [njcuk9999]
- *SpirouConst.py* - add new file definitions. [njcuk9999]
- *Output_ keys.py* - add defintions for shape sanity check debug files. [njcuk9999]
- Notes on etiennes codes - no real changes just comments. [njcuk9999]
- *Constants_ SPIROU_ H4RG.py* - modify SHAPE constants to for new shape code. [njcuk9999]
- *Obj_ mk_ tellu.py* - fix copy of code - redundant. [njcuk9999]
- *Cal_ SHAPE_ spirou2.py* - modification of *cal_SHAPE_spirou.py* with changes to *cal_shape* needed. [njcuk9999]
- *SpirouBERV.py* - fix bug in berv code - non-objects should not look for star parameters. [njcuk9999]
- Update version/dates/changelog.txt. [njcuk9999]

5.3.1.649 0.3.063 (2018-11-20)

- Add test files to misc. [njcuk9999]
- Add Etiennes files in misc folder. [njcuk9999]
- Runs - update the unit tests. [njcuk9999]

5.3.1.650 0.4.034 (2018-11-14)

- *Test_ recipe.py* - change permissions for file. [njcuk9999]

5.3.1.651 0.3.062 (2018-11-14)

- *Fit_triplets* sigma-clip change. [melissa-hobson]
- *Cal_WAVE_E2DS_EA* - fix HC file being overwritten with FP data (fixes #513) [melissa-hobson]
- Merge pull request #512 from njcuk9999/master. [melissa-hobson]
  update Melissa
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
  Conflicts:
      INTROOT/bin/cal_WAVE_E2DS_EA_spirou.py
- Merge pull request #509 from *njcuk9999/master_copy*. [melissa-hobson]
  update melissa
- Merge branch 'melissa' into *master_copy*. [melissa-hobson]
- Bug fix for *fit_gaussian* triplet (fixes #507) [melissa-hobson]

5.3.1.652 0.4.033 (2018-11-09)

- Continued work on input redo. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge pull request #511 from njcuk9999/dev. [Neil Cook]
  Francois –> Dev, Neil–> Dev, Dev –> master

5.3.1.653 0.3.060 (2018-11-08)

- *Cal_WAVE_EA* match to master. [melissa-hobson]

5.3.1.654 0.3.061 (2018-11-08)

- Update date/version/changelog. [Neil Cook]

5.3.1.655 0.3.056 (2018-11-08)

- *SpirouWAVE.py* - Melissa's fix for Issue #507 -> "<" needs to be "<=" [Neil Cook]
- Merge branch 'neil' into dev. [Neil Cook]
- Add hcone files for the *cal_DRIFTCCF_E2DS* recipe. [FrancoisBouchy]

5.3.1.656 0.4.032 (2018-11-07)

- *SpirouFile.py* - continue to fill out drs file fits methods. [Neil Cook]

5.3.1.657 0.3.055 (2018-11-07)

- New UrNe CCF mask based on lines used for the wavelength solution and to be used to compute DRIFT on hcone files. [FrancoisBouchy]

5.3.1.658 0.4.031 (2018-11-06)

- *Test_recipe.py* - tested *cal_badpix_spirou.py*. [Neil Cook]
- *SpirouStartup2.py* - continue work on inputs update. [Neil Cook]
- *SpirouRecipe.py* - continue work on inputs update. [Neil Cook]
- *SpirouFile.py* - allow filename to be set in construction (via kwargs) [Neil Cook]
- *Recipes_spirou.py* - add and reformat options to set/take defaults. [Neil Cook]
- *SpirouConst.py* - add a variable that can globally update pp (for use when we don't have p) [Neil Cook]

5.3.1.659 0.4.030 (2018-11-05)

- *Test_recipe.py* - tested *cal_FF_RAW_spirou.py* inputs. [Neil Cook]
- *SpirouStartup2.py* - modified code to line up with continued work on spirouRecipe. [Neil Cook]
- *SpirouRecipe.py* - continued to develop new recipe class. [Neil Cook]
- *SpirouFile.py* - filled out some attributes/methods. [Neil Cook]
- *Recipe_spirou.py* - added more definitions and started to fill out drs recipes (badpix –> extract) [Neil Cook]
- *Files_spirou.py* - updated call to spirouFile.DrsInput –> spirouFile.DrsInputFile. [Neil Cook]

5.3.1.660 0.4.029 (2018-11-04)

- *SpirouRecipe.py* - move DrsInputs from here to spirouFile.py. [njcuk9999]
- *SpirouFile.py* - move DrsInputs from spirouRecipes to here. [njcuk9999]
- *Files_spirou.py* - update links to DrsInput: spirouRecipe –> spirouFile. [njcuk9999]

5.3.1.661 0.4.028 (2018-11-02)

- *SpirouRecipes.py* - add todo. [Neil Cook]
- *SpirouStartup2.py* - pushed renaming of recipes –> *recipes_spirou* into code. [Neil Cook]
- *Recipes_spirou.py* - renamed from recipes.py. [Neil Cook]
- *Files_spirou.py* - renamed from spirouFiles.py. [Neil Cook]
- *SpirouRecipe.py* - add doc strings for new classes (DrsArgument/DrsRecipe/DrsInputFile/DrsFitsFile) [Neil Cook]
- *Test_receip.py* - update with new name for "ufiles"–>"filelist" [Neil Cook]
- *SpirouStartup2.py* - continue work on input code - update with changes to spirouRecipe.py. [Neil Cook]
- *SpirouRecipe.py* - define how DrsArgument, DrsRecipe and DrsInput (+DrsFitsFile) interact - continued testing of input redo. [Neil Cook]
- *SpirouFiles.py* - define all raw/pp/out files as instances of DrsFitsFile. [Neil Cook]
- *Recipes.py* - continue to test new inputs with *test_recipe* definition. [Neil Cook]

5.3.1.662 0.3.059 (2018-11-01)

- Test of not using Littrow sols for *cal_WAVE_EA*. [melissa-hobson]

5.3.1.663 0.4.027 (2018-11-01)

- *SpirouStartup2.py* - continue work on input code. [Neil Cook]
- *SpirouRecipe.py* - continue work on input code. [Neil Cook]
- *SpirouFiles.py* - define file types using new classes. [Neil Cook]
- *Recipe.py* - update recipe definitions based on changes. [Neil Cook]

5.3.1.664 0.3.058 (2018-10-31)

- *Cal_WAVE_NEW* update. [melissa-hobson]

5.3.1.665 0.4.026 (2018-10-31)

- *Recipe.py* - add new comment. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
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- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]

5.3.1.666 0.3.054 (2018-10-30)

- *Test_wavsol.py* - fixed bugs and added STD for H band. [Neil Cook]
- *Test_wavsol.py* - added code to compare wave solutions from a calibDB (defined manually in the code) [Neil Cook]
- *HC_Test.run* - added run 47 back in (had been missed) [Neil Cook]

5.3.1.667 0.3.057 (2018-10-30)

- *Cal_WAVE_NEW* update. [melissa-hobson]
- Updates to C. Lovis method. [melissa-hobson]
- Merge pull request #500 from njcuk9999/master. [melissa-hobson]
  update melissa

5.3.1.668 0.3.053 (2018-10-29)

- Add *hc_test.run* back to unit tests. [Neil Cook]
- Merge pull request #501 from njcuk9999/neil. [Neil Cook]
  Neil –> Master - confirm unit tests
- Update date/version/changelog. [Neil Cook]

5.3.1.669 0.3.052 (2018-10-29)

- Pep8 clean up. [Neil Cook]

5.3.1.670 0.3.051 (2018-10-26)

- Pep8 clean up. [Neil Cook]
- Update TODO's, remove old H3RG dependencies and clean up. [Neil Cook]
- Merge pull request #497 from njcuk9999/dev. [Neil Cook]
  Dev –> Master (tested on *Cal_Test.run)*
- Update date/version/changelog/update-notes. [Neil Cook]

5.3.1.671 0.3.050 (2018-10-26)

- *SpirouKeywords.py* - add separate set of header keys for the FP analysis. [Neil Cook]
- *SpirouConst.py* - add *CCF_FP* versions so files are separate (for now) [Neil Cook]
- *Output_keys.py* - add new keys for *CCF_FP*. [Neil Cook]
- *SpirouConfig.py* - define a copy function for ParamDict - copy all keys into new ParamDict. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - separate and keep separate the FP analysis (cp and cloc) - including header keys. [Neil Cook]
- Merge pull request #495 from njcuk9999/dev. [Neil Cook]
  Neil –> Dev, Francois –> Dev, Dev –> Master. Confirm unit tested
- Update test files - mistake in run018b. [Neil Cook]
- *Gl699_Aug05-A_B.run* - unit test run for A and B files. [Neil Cook]
- Update date/version/update notes/changelog. [Neil Cook]

5.3.1.672 0.3.049 (2018-10-25)

- Tellurics2.run - add a second telluric run - to preprocess, extract and *mk_tellu* missed tellurics. [Neil Cook]
- Update test - only 1 telluric test + move others to *old_tests.* [Neil Cook]
- *SpirouTelluric.py* - template should be in MASTERWAVE frame not *WAVE_IT* frame. [Neil Cook]
- *SpirouPlot.py* - modify *tellu_fit_debug_shift_plot* to only plot one order. [Neil Cook]
- *Recipe_control.txt* - allow *cal_CCF_E2DS_FP_spirou* to use A, B files and *TELLU_CORRECTED/POL_* files. [Neil Cook]
- Update unit tests. [Neil Cook]
- *Obj_fit_telluy.py* - todo question about possibly broken plot. [Neil Cook]
- *SpirouFile.py* - better error message when wrong directory used for input files. [Neil Cook]
- New *unit_test* runs for maestria with missed Gl699 targets. [Neil Cook]

5.3.1.673 0.3.048 (2018-10-24)

- *SpirouRV.py* - need to deal with the differing fibers (for now manually) [Neil Cook]
- *SpirouRV.py* - added function *"get_foberc_e2ds_name"* to deal with the different file types expected –> need E2DS AB file for C fiber. [Neil Cook]
- *SpirouPOLAR.py* - adjusted calls to headers to not be hard coded (should have been called from p –> spirouKeywords.py) [Neil Cook]
- *SpirouKeywords.py* - add MJEND keyword (for *pol_spirou.py)* - also changed naming to all upper case. [Neil Cook]
- *Obj_mk_tellu.py* - turn off debug plot. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - get correct filename for fiber C (E2DS file only) [Neil Cook]
- *Cal_validate_spirou.py* - add option to check (check=0 just prints paths) [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - correct imports and catch warnings (As with *cal_CCF_E2DS_spirou)* [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - correct link to header key in p. [Neil Cook]
- *SpirouKeywords.py* - make tellu header keys shorter. [Neil Cook]
- *Cal_CCF_E2DS_FP_spirou.py* - load file C not from a telluric corrected spectrum but from the E2DS itself (using header) [Neil Cook]
- *SpirouExposeMeter.py* - fix some pep8 issues. [Neil Cook]
- *SpirouKeywords.py* - add header key definitions for options input in tellu. [Neil Cook]
- *Obj_fit_tellu.py* - add extra header keys to know how many components were fit in PCA etc. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - fix some pep8 convension. [Neil Cook]
- Merge branch 'neil' into dev. [Neil Cook]
- Update unit test runs. [Neil Cook]
- *SpirouUnitRecipes.py* - update input name for *cal_exposure_meter* and *cal_wave_mapper.* [Neil Cook]
- *Cal_exposure_meter.py* - correct input name: "reffile" –> "flatfile" [Neil Cook]
- *Cal_CCF_E2DS_spirou.py + spirouRV.py* - catch warnings for NaNs in mean and divide. [Neil Cook]
- *SpirouUnitRecipes.py* - add *cal_CCF_E2DS_FP_spirou* to unit tests. [Neil Cook]
- Update *date/version/update_notes/changelog.* [Neil Cook]

5.3.1.674 0.3.047 (2018-10-23)

- *Cal_ Test.run* - add *cal_wave_mapper* to tested recipes. [Neil Cook]
- *SpirouExoposureMeter.py* - use wave parameters instead of wave map + add normalisation option. [Neil Cook]
- *Constants_ SPIROU_ H4RG.py* - add constants for normalisation and *flat_ correction.* [Neil Cook]
- *Cal_ exposure_ meter.py* - try rescale for the flux (Issue #490) [Neil Cook]
- *Cal_ wave_ mapper.py* - divide through by flat field (on request) and attempt to rescale flux (Issue #490) [Neil Cook]
- *SpirouExoposeMeter.py* - Issue #490 - add ability to not re-calculate order profile image (if already processed) + add shape as well as tilt (use shape if in calibDB) [Neil Cook]
- *SpirouKeywords.py* - add infilelist as keyword (For use for pushing input file list to header) [Neil Cook]
- *SpirouConst.py* - define a tmp file for the order profile map (Issue #490) [Neil Cook]
- *Cal_ wave_ mapper.py* - Issue #490 - add shape + fix badpixel function returns. [Neil Cook]
- *Cal_ exposure_ meter.py* - fix Issue #490 - use shape file + correct output of badpix mask. [Neil Cook]

5.3.1.675 0.3.046 (2018-10-22)

- *Obj_ mk_ tellu.py* - make sure the NaNs do not propagate through to the convolution (NaN * 0.0 = NaN —> need 0.0) [Neil Cook]
- *Obj_ mk_ tellu.py* - make sure the NaNs do not propagate through to the convolution (NaN * 0.0 = NaN —> need 0.0) [Neil Cook]
- *Obj_ mk_ tellu.py* - catch warnings as sp now can have nans. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - change median to nan median and catch warnings with nanmedian of empty stack (all nans) [Neil Cook]
- *Obj_ mk_ tellu.py* - catch warnings in dev (nans allowed) [Neil Cook]
- *SpirouTelluric.py* - kernal resize. [Neil Cook]
- *Obj_ mk_ tellu.py* - shift data to master before (to match tapas) - instead of shifting transmission after. [Neil Cook]

5.3.1.676 0.3.045 (2018-10-22)

- Updated permissions on spirouUnitTest files (chmod +x) [Neil Cook]
- *Tellu_ Test.run* - added a test of cal_ CCF_ E2DS_ FP_ spirou.py (currently not working) [Neil Cook]
- *SpirouKeywords.py* - added *kw_DRIFT_ RV* definition to keywords files (for use in cal_ CCF_ E2DS_ FP_ spirou.py) [Neil Cook]
- *Recipe_ control.txt* - added *cal_ CCF_ E2DS_ FP_ spirou* to *recipe_ control* - for fiber AB only (will only work with fiber AB) [Neil Cook]
- *Cal_ CCF_ E2DS_ FP_ spirou.py* - added changes to integrate into DRS. [Neil Cook]
- Merge branch 'francois' into dev. [Neil Cook]
- *Cal_ CCF_ E2DS* with simultaneous CCFDrift on FP fiber C. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
- New CCF mask for FP. [FrancoisBouchy]
- Merge pull request #491 from njcuk9999/neil. [Neil Cook] Melissa –> Neil –> Master (confirm unit tests)
- Update tests. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.677 0.3.043 (2018-10-19)

- *Unit_test* runs - add maestria tests. [Neil Cook]
- Update *triggers/unit_tests* to catch and handle errors better. [Neil Cook]
- Update *triggers/unit_tests* to catch and handle errors better. [Neil Cook]
- Redo tests - comments where broken. [Neil Cook]
- *SpirouStartup.py* - remove print statement (was there to debug) [Neil Cook]
- *SpirouLog.py* - return useful message on sys.exit (after error log) [Neil Cook]
- *Error_test.py* - test catching errors for *trigger/unit_tests*. [Neil Cook]
- *SpirouWAVE.py* - make debug plot only show in debug mode (even with plotting on) [Neil Cook]
- Merge branch 'melissa' into neil. [Neil Cook]
- Merge branch 'master' into melissa. [Neil Cook]
- SpirouWAVE: plots will now appear in interactive mode only. [melissa- hobson]
- Merge pull request #487 from njcuk9999/master. [melissa-hobson]
  update melissa from master
- Update HC/WAVE test. [Neil Cook]
- *Unit_test.py* - better catching/recording of errors (for batch run that doesn't crash out) [Neil Cook]
- Update HC/WAVE test. [Neil Cook]
- Update HC/WAVE test. [Neil Cook]
- Update HC/WAVE test. [Neil Cook]
- Update HC/WAVE test. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #489 from njcuk9999/dev. [Neil Cook]
  Francois –> Dev, Neil –> Dev, Dev –> Master
- Update date/version/changelog. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- *Cal_DRIFTCCF_E2DS_spirou.py* - comment out saving of fits file - no loc['DRIFT'] defined. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- Merge branch 'neil' into dev. [Neil Cook]
  Conflicts:
      CHANGELOG.md INTROOT/SpirouDRS/spirouConfig/spirouConst.py VERSION.txt
- Fp.mas - added the fp mask to the *ccf_masks* folder (for *cal_driftccf)* [Neil Cook]
- Update HC/WAVE test. [Neil Cook]

5.3.1.678 0.3.042 (2018-10-18)

- Update date/version/changelog. [Neil Cook]
- *Unit_test.py* - fix comment. [Neil Cook]
- TelluricsAll.run - add a list of all tellurics for maestria. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add quality control parameters for *mk_tellu* (RMS) [Neil Cook]
- *Obj_mk_tellu.py* - add an RMS cut to the QC parameters checked. [Neil Cook]
- *Obj_mk_obj_template.py* - turn multi fits into fits cubes. [Neil Cook]
- *Unit_test_parallel.py* - test of multiprocessing on unit tests - DRS not stable to use this yet! [Neil Cook]
- *Extract_trigger.py* - for now only do up to extraction of *HC_HC* and *FP_FP*. [Neil Cook]
- *Gl699_small.run* - just extract and fit those across one glitch. [Neil Cook]
- *Cal_HC/cal_WAVE* only copy over original file parameters if QC passed. [Neil Cook]
- *SpirouFITS.py* - fix bug in *check_wave_sol_consistency.* [Neil Cook]
- *Obj_mk_tellu.py* - add notes for new QC check (TODO's) [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - remove print statement. [Neil Cook]
- *Cal_SHAPE_spirou.py* - update permissions on *cal_SHAPE.* [Neil Cook]
- Update run list (for maestria runs) [Neil Cook]
- *Extract_trigger.py* - full calibration trigger test. [Neil Cook]
- *Extract_trigger.py* - update imports. [Neil Cook]
- *Extract_trigger.py* - use spirouUnitRecipes to run recipes. [Neil Cook]
- *Extract_trigger.py* - print the error. [Neil Cook]
- *Extract_trigger.py* - print output before running. [Neil Cook]
- *Extract_trigger.py* - changes to test run printing. [Neil Cook]

- *Extract_ trigger.py* - fix for when there are no files found. [Neil Cook]
- *Extract_ trigger.py* - turn off test run. [Neil Cook]
- *Extract_ trigger.py* - add options to combine all files from a night and to limit the number of files used for a recipe. [Neil Cook]
- *Recipe_ control.txt* - do not support *FLAT_DARK* and *DARK_FLAT* in *cal_FF*. [Neil Cook]

5.3.1.679 0.3.040 (2018-10-17)

- *Extract_ trigger.py* - add filters to allow only certain files to be process based on DPRTYPE. [Neil Cook]
- *Clean_ calibDB* - custom script to remove all unwanted keys (set in the code) and remove files not in the calibDB and move all good files to new folder with a new master calibDB file. [Neil Cook]
- Reset the calibDB and telluDB with new MASTER wave solutions. [Neil Cook]
- *Extract_ trigger.py* - make test run - with printing/storing of commands only and add/modify printing/logging statements. [Neil Cook]
- *Extract_ trigger.py* - correct problem with preprocess trig. [Neil Cook]
- *Extract_ trigger* - fix bugs. [Neil Cook]
- *Extract_ trigger* - fix mistake. [Neil Cook]
- *Extract_ trigger* - correct mistake in ask function. [Neil Cook]
- *Extract_ trigger.py* - allow to skip pp and make function. [Neil Cook]
- *Extract_ trigger.py* - first working version. [Neil Cook]
- *SpirouStartup.py* - fix bug with inputs (numpy array not allowed) [Neil Cook]
- *Extract_ trigger.py* - start work on a simple calibration trigger (upto and including extraction) [Neil Cook]

5.3.1.680 0.3.041 (2018-10-17)

- *SpirouStartup.py* - fixed problem when no column is present (set to None) [Neil Cook]
- *Extract_ trigger.py* - start of a trigger that goes from pp –> extraction (including all calibrations) - [NOT FINISHED] [Neil Cook]
- *SpirouConst.py* - add DPRTYPE to index file for raw outputs. [Neil Cook]
- *SpirouFITS.py* - added *"check_ wave_ sol_ consistency"* function to check and remap coefficients if incorrect from constants file *(IC_ LL_ DEGR_ FIT)* [Neil Cook]
- *Cal_ HC/ cal_ WAVE* - added check for consistent number of coefficients in wave solution - if wrong refitted onto new coefficients with correct number. [Neil Cook]
- *SpirouFile.py* - add function to sort by base name *(sort_ by_ name)* with alias SortByName. [Neil Cook]
- *Explore_ headers.py* - code to explore headers of all files in given dir string (with wild cards) [Neil Cook]
- *Obj_ mk_ obj_ stack.py* - for making stacks of images (Nobs x *Nb_ xpix* x Nbo) [Neil Cook]
- *SpirouKeywords.py* - add new header keys to list + define them as keywordstores. [Neil Cook]
- *Obj_ mk_ obj_ template.py* - sort template files by base file name. [Neil Cook]
- *Cal_ WAVE_ E2DS_ EA_ spirou.py* - add some header keys to help identify the source of output. [Neil Cook]
- *Cal_ HC_ E2DS_ EA_ spirou.py* - add some more header keys to enable identifying source of output files. [Neil Cook]

5.3.1.681 0.3.038 (2018-10-16)

- Update version/date/changelog/update notes. [Neil Cook]
- *Cal_Test.run* - add *cal_ DRIFTCCF_ E2DS_ spirou* to tested codes. [Neil Cook]
- *SpirouUnitRecipes.py* - add *cal_ DRIFTCCF_ E2DS_ spirou* to unit recipe definitions. [Neil Cook]
- *SpirouKeywords.py* - add reference rv keyword and keywordstore definition. [Neil Cook]
- *SpirouConst.py* - fix tags in new DRIFTCCF file name definitions. [Neil Cook]
- *Recipe_ control.txt* - add *cal_ DRIFTCCF_ E2DS_ spiour* to the runable codes - for FP only. [Neil Cook]
- *Output_ keys.py* - add *DRIFTCCF_ E2DS_ FITS_ FILE* to output keys. [Neil Cook]
- *Constants_ SPIROU_ H4RG.py* - add driftccf constants to constants file. [Neil Cook]
- *Cal_ DRIFTCCF_ E2DS_ spirou.py* - re-save driftfits to file. [Neil Cook]
- *Cal_ DRIFTCCF_ E2DS_ spirou.py* - pep8 changes + load constants from file + add flux ratio + save reference RV to header. [Neil Cook]
- Merge branch 'francois' into dev. [Neil Cook]

- Merge pull request #488 from njcuk9999/dev. [Neil Cook]
  spirouEXTOR.py - undo debananafication all zeros check - does not work
- *SpirouEXTOR.py* - undo debananafication all zeros check - does not work. [Neil Cook]

5.3.1.682 0.3.039 (2018-10-16)

- New recipe to compute the drift of simultaneous FP on Fiber C with fp.mas. [FrancoisBouchy]

5.3.1.683 0.3.044 (2018-10-16)

- New function *DRIFTCCF_E2DS_TBL_FILE* to save driftccf file *DRIFTCCF_E2DS_FITS_FILE* still to be adapted. [FrancoisBouchy]

5.3.1.684 0.3.037 (2018-10-15)

- *SpirouKeywords.py* - add the two new header keys for bigcube list. [Neil Cook]
- *Obj_mk_obj_template.py* - add file names and bervs for input files to big cube header. [Neil Cook]
- *Update_note.txt* - update with telluric changes. [Neil Cook]
- *SpirouConst.py* - add prefix and change filename. [Neil Cook]
- *Obj_fit_tellu.py* - save and remove abso save files - massive speed up. [Neil Cook]
- *SpirouTelluric.py* - catch more NaN warnings from *order_tapas*. [Neil Cook]
- *SpirouFile.py* - add *get_most_recent* function to get most recent unix time of list of files. [Neil Cook]
- *SpirouConst.py* - add *TELLU_ABSO_SAVE* file (for saving loaded trans files) [Neil Cook]
- *Obj_fit_tellu.py* - store abso unless there are new *trans_files*. [Neil Cook]
- *SpirouTelluric.py* - swap sign on dv. [Neil Cook]
- *SpirouFITS.py* - fix for new output of *read_tilt_file*. [Neil Cook]
- *SpirouFITS.py* - add reading a key 1D list from header. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add constants for quality control in *obj_mk_tellu*. [Neil Cook]
- *Obj_mk_tellu.py* - quality control SNR in order *QC_TELLU_SNR_ORDER* greater than *QC_TELLU_SNR_MIN*. [Neil Cook]
- *Obj_mk_obj_tellu.py* - only use unique filenames for tellu files. [Neil Cook]
- *Obj_fit_tellu.py* - only use unique filenames from trans files. [Neil Cook]

5.3.1.685 0.3.036 (2018-10-14)

- *SpirouEXTOR.py* - fix bug where whole order is zeros - will break spline. [Neil Cook]
- Merge pull request #486 from njcuk9999/dev. [Neil Cook]
  Melissa –> Dev –> Master (Confirm test on *Cal_Test.run, Tellu_Test.run, Tellu_Test2.run, Pol_Test.run)*
- Update changelog and test.run. [Neil Cook]
- *SpirouTelluric.py* - catch known warnings and disregard. [Neil Cook]
- Update notes and changelog. [Neil Cook]

5.3.1.686 0.3.035 (2018-10-12)

- Update unit test runs. [Neil Cook]
- *SpirouTelluric.py* - modify *get_molecular_tell_lines* to use master wavelength solution, rename functions to better describe functionality, use relativistic dv correction function. [Neil Cook]
- *SpirouTDB.py* - rename functions to better describe functionality. [Neil Cook]
- *SpirouDB.__init__.py* - rename aliases to better describe functions. [Neil Cook]
- *SpirouPlot.py* - add *tellu_fit_debug_shift_plot* - Issue #478. [Neil Cook]
- *SpirouMath.py* - add *relativistic_waveshift* function. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - turn off the fit derviative part for principle components - Issue #478. [Neil Cook]
- *Obj_mk_obj_template.py* - further fixes for wavelength shift addition - Issue #478. [Neil Cook]
- *Obj_fit_tellu.py* - further fixes for wavelength shift addition - Issue #478. [Neil Cook]

- *Obj_fit_tellu.py* - fix bugs in shifting wavelength (Issue #478) [Neil Cook]
- *Cal_extract/FF_RAW_spirou.py* - catch warnings from extraction process. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - currently only supports one *FP_FP* and one *HC_HC* (due to file updating) - added check to error if more used. [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - currently only supports one *FP_FP* and one *HC_HC* (due to file updating) - added check to error if more used. [Neil Cook]
- *SpirouTelluric.py* - change bad mask from 0.999 to 0.5 to avoid NaN fringing - Issue #478. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]
- *SpirouWAVE.py* - small pep8 and visual changes / simplifications. [Neil Cook]
- *SpirouPlot.py* - bring new plot in-line with other plots + pep8 changes. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - small pep8 fixes to constants. [Neil Cook]
- Merge branch 'master' into melissa. [Melissa Hobson]
- Merge pull request #485 from njcuk9999/dev. [Neil Cook]
  Eder –> Dev –> Master
- Update *unit_tests*. [Neil Cook]
- *Unit_test.py* - make sure all plots are closed. [Neil Cook]
- *Cal_WAVE_EA*: moved plot of single HC order + fitted lines to spirouPlot constants: added *cal_WAVE_EA* constants spirouWAVE: improvements to FP line identification. [melissa-hobson]
- SpirouPlot: moved plot of single HC order + fitted lines here from *cal_WAVE_EA*. [melissa-hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- *Find_hc_gauss_peaks*: added log message when found lines are read from table, reporting the table file. [melissa-hobson]

5.3.1.687 0.3.034 (2018-10-11)

- *Unit_test.py* - make sure all plots are closed. [Neil Cook]
- *SpirouEXTOR.__init__.py* - add alias for *compare_extraction_modes* (CompareExtMethod) - Issue #481. [Neil Cook]
- *SpirouEXTOR.py* - add *compare_extraction_mode* function to test difference between flat and e2ds extraction modes (#481) [Neil Cook]
- *Cal_FF_RAW_spirou.py* - save extraction method to header (like *cal_extract)* [Neil Cook]
- *Cal_extract_RAW_spirou.py* - get flat header, compare flat extraction to extraction type (Issue #481) [Neil Cook]
- *SpirouFITS.py* - return header for flat file so we can get extraction type for the flat (Issue #481) [Neil Cook]
- *Unit_tests* - do not currently test *cal_WAVE_E2DS_EA_spirou.py* - comment out. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]
- *SpirouLSD.py* - add a few outstanding TODO comments and fix error print (filename may not be defined) [Neil Cook]
- *SpirouPOLAR.__init__.py* - chagen polarHeader –> PolarHeader (for convention) [Neil Cook]
- *Pol_spirou.py* - Update to alias for convention polarHeader –> PolarHeader. [Neil Cook]
- Merge branch 'master' into eder. [Neil Cook]
- Merge pull request #484 from njcuk9999/neil. [Neil Cook]
  Neil –> Master (confirm test on *Cal_Test.run, Tellu_Test.run* and *Tellu_Test2.run)*
- Update date/version/timings/changelog/update notes. [Neil Cook]
- Merge branch 'master' into eder. [Eder]
- Changed parameters for LSD analysis. [Eder]
- Implemented selection of CCFFILE in LSD analysis matching closest temperature to source observed. [Eder]
- Updated keyworks BERV, BJD, and MJD of polar products by central values calculated in the module. Also updated keyword EXPTIME by the sum of all EXPTIME values from individual exposures. [Eder]
- Updated keyworks BERV, BJD, and MJD of polar products by central values calculated in the module. Also updated keyword EXPTIME by the sum of all EXPTIME values from individual exposures. [Eder]
- Merge branch 'master' into eder. [Eder]
- Tuned parameters to improve LSD analaysis and added new statistical quantities calculated from LSD analysis. [Eder]
- Added new keywords in polar products, mainly the BJD time calculated at center of observations. Also fixed small bugs. [Eder]
- Added new keywords in polar products, mainly the BJD time calculated at center of observations. Also fixed

small bugs. [Eder]

- Added new keywords in polar products, mainly the BJD time calculated at center of observations. Also fixed small bugs. [Eder]
- Added new keywords in polar products, mainly the BJD time calculated at center of observations. Also fixed small bugs. [Eder]
- Added new keywords in polar products, mainly the BJD time calculated at center of observations. Also fixed small bugs. [Eder]
- Merge branch 'master' into eder. [Eder]
- Merge branch 'master' into eder. [Eder]
- Resolved merging conflicts. [Eder]

5.3.1.688 0.3.032 (2018-10-11)

- *Unit_tests* - update *tellu_test2* and test. [Neil Cook]
- *SpirouFITS.py* - fix output of wavelength solution - Issue #483. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #482 from njcuk9999/neil. [Neil Cook]
  Neil –> master - tested on *Cal_Test.run, Tellu_Test.run, Tellu_Test2.run*
- *SpirouConst.py* - after reading default config file must look for a user config file (parameters depend on it) [Neil Cook]
- *SpirouConfigFile.py* - moved *get_user_config* to here (to allow accessing from spirouConst.py) [Neil Cook]
- *SpirouConfig.py* - move *get_user_config* to *spirouConfigFile.py* - (needed to fix not obtaining constants from user config file) [Neil Cook]
- *SpirouLog.py* - add a possibility to debug in ipython. [Neil Cook]
- *SpirouFITS.py* - fix error - now if image is not defined tries to get dimensions from header before giving error - Issue #483. [Neil Cook]
- Update date/version/update notes and changelog. [Neil Cook]

5.3.1.689 0.3.031 (2018-10-10)

- *Tellu_Test2.run* - add additional test to test different wavelength solutions in telluric recipes. [Neil Cook]
- SpirouUnitTests/Runs - fix the units test with new recipes/names. [Neil Cook]
- *SpirouUnitRecipes.py* - fix for the change of name of *obj_mk_tell_template –> obj_mk_obj_template.* [Neil Cook]
- *SpirouWAVE.py* - Etienne's fix for *cal_HC* stability in *"fit_gaussian_triplets"* [Neil Cook]
- *SpirouFITS.py* - add a quiet mode (to not duplicate log) and fix bug in getting wavemap from header (from wave params) [Neil Cook]
- *SpirouConst.py* - add filenames for *obj_mk_obj_template.* [Neil Cook]
- *Master_calibDB_SPIROU.txt* - no longer need AB wave solutions and shape - only AB and C needed / shape generated online. [Neil Cook]
- *Output_keys.py* - add *obj_mk_obj_template* filenames to output keys + *recipe_control.* [Neil Cook]
- *Constnats_SPIROU_H4RG.py* - turn off force calibDB for wave solution + add HC parameters (Etienne's fix) [Neil Cook]
- *Obj_mk_obj_template* - renamed from *obj_mk_tell_template.py* + fixed for wavelength grid shift - Issue #478. [Neil Cook]
- *Obj_mk_tell_template.py* - update with shifted wavelength grid - Issue #478. [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - correct bug that wavelength solution parameters were not saved to header correctly. [Neil Cook]
- *Recipe_control.txt* - add *DARK_FP* to drift and driftpeak allowed inputs - Issue #475. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add *dark_fp* to the drift peak allowed constants (to all in use for drift/-driftpeak) - Issue #475. [Neil Cook]
- *Recipe_control.txt* - add *OBJ_DARK* to allowed files used in *cal_DARK_spirou.py* (Issue #479) [Neil Cook]
- *Cal_DARK_spirou.py* - all use of skydarks and push SKYDARK to calibDB if used (Issue #479) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add key *"use_skydark_correction"* to allow SKYDARKs to be use (and take presence over DARK in calibDB) [Neil Cook]
- *SpirouTelluric.py* - shift templates if they are not created at runtime from mastergrid to current wavelength grid - Issue #478. [Neil Cook]

- *SpirouTelluric.py* - fix bug with *convolve_files* (should not be re- copied into telluDB) [Neil Cook]
- *SpirouImage.py* - allow SKYDARK to be used (if present in calibDB) if *USE_SKYDARK_CORRECTION* = True - Issue #479. [Neil Cook]
- *Obj_mk_tellu.py* - fix headers in saved file (now wavelength is shifted) - Issue #478. [Neil Cook]
- *Obj_fit_tellu.py* - fix bug with shifting PCA components (Issue #478) [Neil Cook]
- *Pol_spirou.py* + all recipes use GetWaveSolution - force fiber A and B to use wave solution AB (Issue #480) [Neil Cook]
- All recipes using GetWaveSolution - force fiber A and B to use AB wave solution. [Neil Cook]

5.3.1.690 0.3.030 (2018-10-09)

- *SpirouUnitRecipes.py* - remove the moved HC/WAVE recipes from import (no longer in bin folder) [Neil Cook]
- SpirouTelluric - add function wave2wave to shift an image from one wavelength grid to another (Issue #478) [Neil Cook]
- *SpirouFITS.py* - allow wave solution to be obtained quietly. [Neil Cook]
- SpirouTDB - add *get_database_master_wave* to get the master wavelength grid from TelluDB (Issue #478) [Neil Cook]
- *Recipe_control.txt* - Allow sky objects for *cal_DARK_spirou* (Issue #479) [Neil Cook]
- *Master_tellu_SPIROU.py* + file - modify master telluric database to have a *MASTER_WAVE* key - containing the master wavelength grid [unfinished] - Issue #478. [Neil Cook]
- *Wave2wave.py* - backup of Etiennes function to shift images from one wavelength grid to another - Issue #478. [Neil Cook]
- HC/WAVE recipes - move all (older) recipes to misc folder - can still be used when in this directory - cannot currently be used with unit tests. [Neil Cook]
- *Obj_mk_tellu.py* - add code to shift transmission map [unfinished] - Issue #478. [Neil Cook]
- *Obj_fit_tellu.py* - add code to shift pca components and template components [unfinished] - Issue #478. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - fix bug with extraction method 4a and 4b - data2 shallow copied - shouldn't be! (Issue #477) [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.691 0.4.025 (2018-10-06)

- *Input_file.txt* - update list of inputs (Issue #475) [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]

5.3.1.692 0.3.029 (2018-10-06)

- *Cal_FF_RAW_spirou.py* - update extraction to deal with different outputs. [Neil Cook]
- *SpirouFile.py* - made sure pre-procesing always adds DPRTYPE even if file not recognised (#Issue 475) [Neil Cook]
- *SpirouEXTOR.py* - for modes 3c, 3d, 4a, 4b add the e2dsll extraction type. [Neil Cook]
- *SpirouConst.py* - add file definition for e2dsll. [Neil Cook]
- *Recipe_control.txt* - added and corrected *dark_fp*, *dark_flat* and *obj_obj*. [Neil Cook]
- *Output_keys.py* - added output type *extract_e2dsll_file*. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - added "un-sum" extraction output (E2DSLL) to see what the extraction is doing. [Neil Cook]
- Merge pull request #476 from *njcuk9999/extract_redo*. [Neil Cook]
  Extract redo –> Merge *(cal_WAVE_E2DS_EA_spirou* not working with new extraction)

5.3.1.693 0.3.028 (2018-10-05)

- *Update_note.txt* - update with note about setting extraction to 4b (default = 3d) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - set *extraction_type* back to 3d for now - until 4a/4b tested. [Neil Cook]
- Update - version/date/changelog/update notes. [Neil Cook]

5.3.1.694 0.3.027 (2018-10-05)

- Timings.txt - update timings with new runs. [Neil Cook]
- *Cal_Test.run* - comment out *cal_WAVE_E2DS_EA_spirou* - not working with extraction 4b? [Neil Cook]
- *SpirouTHORCA.__init__.py* - add alias to *generate_res_files* (GenerateResFiles) [Neil Cook]
- *SpirouWAVE.py* - add *generate_res_files* functions to generate arrays/header dictionary in correct format for wave resolution line profile map file. [Neil Cook]
- *SpirouConst.py* - add *WAVE_RES_FILE_EA* to file definitions. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - add saving of wavelength resolution line profiles to file. [Neil Cook]
- *Output_keys.py* - added "WAVE_RES" to output keys (for wave solution res map) [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - added saving of resolution map and line profiles to file. [Neil Cook]
- *SpirouUnitTest.py* - up date title of log timings. [Neil Cook]
- *Recipe_control.txt* - hide *dark_fp dark_flat* for now (test later) [Neil Cook]
- *SpirouFITS.py* - allow fiber-forcing in getting wave solution (otherwise when calibDB is used, uses p['FIBER']) [Neil Cook]
- *Off_listing_RAW_spirou.py* - correct mistake with *off_listing* (rawloc should be a list) [Neil Cook]
- *SpirouFITS.py* - make sure the source of the wavelength solution is reported (Issue #468) [Neil Cook]
- Update date/version/update notes and changelog. [Neil Cook]

5.3.1.695 0.3.026 (2018-10-05)

- *Cal_Test.run* - add *cal_SHAPE_spirou.py* to unit test. [Neil Cook]
- *SpirouUnitsRecipes.py* - add *cal_HC_E2DS_EA_spirou*, *cal_SHAPE_spirou*, *cal_WAVE_E2DS_EA_spirou* to unit tests. [Neil Cook]
- *Recipe_control.txt* - add *cal_SHAPE_spirou* (copy of *cal_SLIT_spirou*) [Neil Cook]
- *Cal_SHAPE_spirou.py* - change __NAME__ (after recipe control integration) [Neil Cook]
- *SpirouImage.py* - optimisation - moved a few things out of loop to speed up process. [Neil Cook]
- *SpirouPlot.py* - corrected type in constant name *(slit_shape_angle_plot)* [Neil Cook]
- *Constants_SPIROU_H4RG.py* - move *cal_SHAPE_spirou.py* constants to constants file. [Neil Cook]
- *Cal_SHAPE_spirou.py* - move constants to constants file. [Neil Cook]

5.3.1.696 0.3.025 (2018-10-04)

- *SpirouFITS.py* - get shape file from header. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add shape file to header (if mode 4a/4b) [Neil Cook]
- *Cal_SHAPE_spirou.py* - fix type - should be SHAPE file not TILT file. [Neil Cook]
- *SpirouImage.__init__.py* - add alias to *get_shape_map* (GetShapeMap) [Neil Cook]
- *SpirouImage.py* - move *get_shape_map* to spirouImage functions (And add imports as required) [Neil Cook]
- *SpirouPlot.py* - add slit shape plot. [Neil Cook]
- *SpirouKeywords.py* - add *kw_SHAPEFILE* to output keys. [Neil Cook]
- *SpirouConst.py* - add *SLIT_SHAPE_FILE* filename definition. [Neil Cook]
- *Output_keys.py* - add *slit_shape_file* output key. [Neil Cook]
- *New_bananarama.py* - fix to work with DRS. [Neil Cook]
- *Cal_SLIT_spirou.py* - replace old path function with new and correct small typo. [Neil Cook]
- *Cal_SHAPE_spirou.py* - add plotting, filesaving, calibDB movement and move functions to spirouImage (finally runs) [Neil Cook]
- *Cal_SHAPE_spirou.py* - added plotting, file saving and adding to calibDB. [Neil Cook]
- *Cal_SHAPE_spirou.py* - fix bugs that now produce identical results to *new_bananarama* code. [Neil Cook]

5.3.1.697 0.3.024 (2018-10-03)

- *Cal_SHAPE_spirou.py* - fix typo dx[iw] = coeffs[1] –> dx[iw] = gcoeffs[1] [Neil Cook]
- *New_bananarama.py* - added TODO questions for Etienne. [Neil Cook]
- *Cal_SHAPE_spirou.py* - more changes to update with Etiennes *new_bananarama* code. [Neil Cook]
- Merge branch 'master' into *extract_redo*. [Neil Cook]
- *Cal_Test.run* - must test HC/WAVE EA recipes - added to runs. [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - fix bug flatfile in header should be blazefile. [Neil Cook]
- *Cal_SHAPE_spirou.py* - updated code [unfinished/not working] [Neil Cook]
- Copy of etiennes shap finding code. [Neil Cook]
- Merge branch 'master' into *extract_redo*. [Neil Cook]
  Conflicts:
    .gitignore INTROOT/SpirouDRS/spirouImage/spirouFITS.py
- Merge pull request #473 from njcuk9999/neil. [Neil Cook]
  Neil –> Master
- Update timings and update notes. [Neil Cook]
- Test code for one target. [Neil Cook]
- Update version/date/changelog/update notes. [Neil Cook]
- Unit tests - remove some extractions (not needed for minimum test) [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Unit tests - add full telluric test for TC3. [Neil Cook]
- *SpirouImage.py* - *WAVE_FILE* is now WAVEFILE. [Neil Cook]
- *Dark_test.py* - test of the values supplied in the dark header file (for specific files + *night_name)* [Neil Cook]
- *Visu_E2DS_spirou.py* - readblazefile now need p returned. [Neil Cook]
- *Obj_fit_tellu.py* - re-add loc['WAVE'] (used for plotting) + *loc['WAVE_IT']* need filename returned. [Neil Cook]
- *Cal_wave_mapper.py* - remove flat file (not used or obtained) from header. [Neil Cook]
- *Cal_exposure_meter.py* - remove flatfile (not used or obtained) [Neil Cook]
- Update spirouImage.py. [Neil Cook]
  spirouImage.py - fix for bug in itable dtype being bytes not string (certain python installations only)
- Merge pull request #470 from njcuk9999/neil. [Neil Cook]
  Neil –> master
- *Cal_SHAPE_spirou.py* - working on integrating nuxtract from EA. [Neil Cook]
- Update gitignore to ignore misc folder. [Neil Cook]
- Sync file - not used. [Neil Cook]
- *Cal_SHAPE_spirou.py* - first commit [unfinished] [Neil Cook]
- *Reset_calibDB* file - add shape map file (placeholder - will be generated in new *cal_SLIT* code) [Neil Cook]
- .gitignore - remove unneeded ignore. [Neil Cook]
- *SpirouUnitRecipes.py* - remove references to *cal_extract_RAW_spirouAB* and C. [Neil Cook]
- *SpirouFITS.py* - add *read_shape_file* function to get shape file from calibDB. [Neil Cook]
- *SpirouEXTOR.__init__.py* - add aliases and remove old commented aliases. [Neil Cook]
- *SpirouEXTOR.py* - modify extraction wrapper function to accept new arguments of shape extraction functions, fill out shape extraction functions and add "debananafication" function. [Neil Cook]
- *SpirouCDB.py* - fix typo in error message. [Neil Cook]
- *Master_calib_SPIROU.txt* - add SHAPE file for reset (until new *cal_SLIT* code is running) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - update normal method to 4b. [Neil Cook]
- *Cal_extract_RAW_spirou*: add modifications required for extraction methods 4a and 4b. [Neil Cook]
- *Cal_extract_EA_test*: update test for EA changes 2018-09-20. [Neil Cook]
- Misc - backup old files. [Neil Cook]
- *SpirouEXTOR.py* - add todo and comment to remind to move afterwards. [Neil Cook]
- *SpirouEXTOR.py* - add shape extract method to test methods. [Neil Cook]
- *Cal_Extract_EA_test.py*: add test code to experiment with extraction methods. [Neil Cook]
- *Constants_SPIROU_H4RG*: add extra extraction types to allowed types. [Neil Cook]

5.3.1.698 0.3.023 (2018-10-02)

- *Cal_CCF_E2DS_spirou.py* - fix order out GetWaveSolution outputs (Issue #464) [Neil Cook]
- *Cal_Test.run* - change over *(cal_exposure_meter* last) [Neil Cook]
- *SpirouTelluric.py* - modify functions to allow filename saved to p - for insertion into header at hdict creation (Issue #471) [Neil Cook]
- *SpirouLOCOR.py* - modify functions to allow filename save to p - for insertion into header at hdict creation (Issue #471) [Neil Cook]
- *SpirouImage.py* - modify functions to allow filename to be saved to p - to insert into header at hdict creation (Issue #471) - fix bug with mask2 (in getting drift files function) [Neil Cook]
- *SpirouFITS.py* - mmodify read functions to save the filename to p - to inject into header at hdict creation (Issue #471) [Neil Cook]
- SpirouFLAT - add filenames to headers (Issue #471) [Neil Cook]
- *SpirouKeywords.py* - add the keywords for each file (that will go in the header) - Issue #471. [Neil Cook]
- *Obj_mk_tellu.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Obj_mk_tellu_template.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Obj_fit_tellu.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_wavE_mapper.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_[WAVE_E2DS]_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_SLIT_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_loc_RAW_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_HC_E2DS_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_FF_RAW_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_exposure_meter.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_DRIFT_E2D.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_DARK_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- *Cal_BADPIX_spirou.py* - add filenames to headers (Issue #471) [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- SpirouWAVE - replace *get_e2ds_ll* (Issue #468) [Neil Cook]
- *SpirouFITS.py* - allow header return. [Neil Cook]
- *SpirouPlot.py* - fix bug *plot_style* cannot be None - now '' when empty. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - fix bug - swap wave and param. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - add header to wave solution returns. [Neil Cook]

5.3.1.699 0.3.022 (2018-10-01)

- *SpirouTHORCA.__init__.py* - remove use of GetE2DSll - use GetWaveSolution (Issue #468) [Neil Cook]
- *SpirouTHORCA.py* - remove use of GetE2DSll - use GetWaveSolution (Issue #468) [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - remove use of GetE2DSll - use GetWaveSolution (Issue #468) [Neil Cook]
- *SpirouTHORCA.py* - re-work the obtaining of wave solution (Issue #468) [Neil Cook]
- *SpirouFITS.py* - re work wave solution functions (Issue #468) [Neil Cook]
- *SpirouImage.__init__.py* - remove old wave sol functions (Issue #468) [Neil Cook]
- *Cal_DRIFT_RAW_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Pol_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_extract_RAW_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Visu_[ALL]_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Obj_[fit/mk]_tellu.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_wave_mapper.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_HC_E2DS_EA_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_WAVE_[ALL].py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_exposure_meter.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *Cal_DRIFT_E2DS_spirou.py* - work on wave solution functions (Issue #468) [Neil Cook]
- *SpirouImage.py* - modify *get_all_similar_files* to add check of fiber for *OBJ_FP OBJ_HCONE* etc (i.e.

only allow on fiber C) and return filetype to show user which *DRS_EXTOUT* were allowed (Issue #464) [Neil Cook]

- *SpirouImage.__init__.py* - update alias to better represent what we are doing *get_all_similar_files* –> GetSimilarDriftFiles. [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add constant to check which fiber is being used (for *OBJ_FP* and *OBJ_HCONE* etc should only work on fiber C) - Issue #464. [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - fix code to allow *FP_FP* and *OBB_FP* (and report back on allowed types) - Issue #464. [Neil Cook]
- *Cal_DRIFT_E2DS_spirou.py* - fix code to allow *FP_FP* and *OBB_FP* (and report back on allowed types) - Issue #464. [Neil Cook]
- Teset.run - update tested files. [Neil Cook]
- Re-add misc folder to github sync. [Neil Cook]
- *SpirouImage.py* - change how *get_all_similar_files* works (now look for *kw_OUTPUT* based on "DRIFT_PEAK_ALLOWED_OUTPUT" - Issue #464. [Neil Cook]
- *Constnats_SPIROU_H4RG.py* - Issue #464 - add definitions for which outputs are allowed for "fp" and "hc" [Neil Cook]
- Add misc backup files. [Neil Cook]
- Removed problematic *fitgaus.py* from fortran (conflicts with fitgaus.f) and removed fitgaus.f from spirouTHORCA. [Neil Cook]
- *SpirouImage.py* - Issue #464 - *get_all_similar_files* - modify to run indexing if no index.fits exists. [Neil Cook]
- *Off_listing_REDUC_spirou.py* - Issue #464 - allow *off_listing* to run in quiet mode. [Neil Cook]

5.3.1.700 0.3.021 (2018-09-26)

- *SpirouWAVE.py* - adapt to allow force creating of linelist. [Neil Cook]
- *SpirouPlot.py* - adapt to be able to use different style. [Neil Cook]
- *SpirouConst.py* - add plot style (for alternate plotting) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - add control to force linelist re- computation. [Neil Cook]

5.3.1.701 0.3.020 (2018-09-25)

- *SpirouPlot.py* - pass font changes for all graphs (via matplotlib.rc) [Neil Cook]
- SpirouConst - add descriptions for plot font functions. [Neil Cook]
- *SpirouConst.py* - add plot pseudo constants (to enable changing plot fontsize easily - for all plots) [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - add inputs for *ccf_rv_ccf_plot* (modified inputs for plot title) [Neil Cook]
- Merge pull request #466 from njcuk9999/neil. [Neil Cook]
  fix typo in last commit
- Merge pull request #465 from njcuk9999/neil. [Neil Cook]
  Neil –> Master (Fixes for issue #464)

5.3.1.702 0.3.019 (2018-09-24)

- *Cal_DRIFTPEAK_E2DS_spirou.py* - fix typo bug with *drift_peak_allowed_types*. [Neil Cook]
- *Recipe_control.txt* - add *HCTWO_HCTWO* and *OBJ_FP* to *cal_DRIFT* and *cal_DRIFTPEAK* recipes - Issue #464. [Neil Cook]
- *Constnats_SPIROU_H4RG.py* - added new constant to control with files (with header key *KW_EXT_TYPE)* are associated with fp and hc (for setting other constants) - Issue #464. [Neil Cook]
- *Cal_extract_RAW_spirou.py* - note from Etienne to Francois re: negative fluxes to zero after background correction. [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou.py* - modified the lamp parameter to get from constants (for easier addition of different types) - Issue #464. [Neil Cook]
- Merge pull request #463 from njcuk9999/dev. [Neil Cook]
  Dev

5.3.1.703 0.3.018 (2018-09-21)

- Update timings. [Neil Cook]
- Update date/version/changelog/timings. [Neil Cook]

5.3.1.704 0.3.017 (2018-09-21)

- *SpirouTHORCA.py* - fix code to not have min/max of *HC/FP_N_ORD* START/FINAL for cal WAVE/cal HC. [Neil Cook]
- *Cal_WAVE_E2DS_spirou.py* - fix code to not have min/max of *HC/FP_N_ORD* START/FINAL for cal WAVE. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - fix code to not have min/max of *HC/FP_N_ORD* START/FINAL for cal WAVE. [Neil Cook]
- *Cal_HC_E2DS_spirou.py* - fix code to not have min/max of *HC/FP_N_ORD* START/FINAL for cal HC. [Neil Cook]

5.3.1.705 0.3.016 (2018-09-21)

- Remove user specific ignore (should not be needed) [Neil Cook]
- Update .gitignore to ignore misc folder. [Neil Cook]
- *SpirouWAVE.py* - Merge changes from Dev into Melissa. [Neil Cook]
- *SpirouTHORCA.py* - Merge changes from Dev into Melissa. [Neil Cook]
- *SpirouRV.py* - Merge changes from Dev into Melissa. [Neil Cook]
- *SpirouPlot.py* - Merge changes from Dev into Melissa (Issue #460) [Neil Cook]
- *Constants_SPIROU_H4RG.py* - Merge changes from Dev into Melissa. [Neil Cook]
- *Cal_WAVE_E2DS_EA_spirou.py* - Merge changes from Melissa. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - full header added to "*CCF_FITS_FILE*" [Neil Cook]
- Merge pull request #459 from njcuk9999/dev. [Neil Cook]
  Dev –> master
- Update version/changelog/date/update notes. [Neil Cook]

5.3.1.706 0.3.015 (2018-09-19)

- *Unit_tests*: fix bug in run names. [Neil Cook]

5.3.1.707 0.3.012 (2018-09-19)

- *Unit_tests*: add *cal_CCF* test to *Tellu_Test.run*. [Neil Cook]
- *Unit_tests*: update unit test with new hc files (from 2018-08-05) [Neil Cook]
- *Recipe_control.txt* - remove duplicate line in *cal_CCF* definition. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py* - update comments and remove extra spaces. [Neil Cook]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
- Update date/version/changelog. [Neil Cook]

5.3.1.708 0.3.013 (2018-09-19)

- New CCF mask provided by Xavier on 2018 Sept 19. [FrancoisBouchy]
- Add *E2DS_FF* for *cal_CCF_E2DS* recipe. [FrancoisBouchy]
- Adaptation for telluric corrected spectra. [FrancoisBouchy]

5.3.1.709 0.3.011 (2018-09-19)

- *Recipe_control.txt* - add e2dsff files to *cal_drift* codes and *cal_ccf*. [Neil Cook]
- *Cal_DRIFTPEAK_E2DS_spirou*: fix obtaining of lamp type with *hc_hc (ext_type == "HCONE_HCONE"* or *"HCTWO_HCTWO")* [Neil Cook]
- *Cal_extract_RAW_spirou.py*: better error message for no DPRTYPE in header (Issue #456) [Neil Cook]

5.3.1.710 0.4.024 (2018-09-18)

- *Test_recipe.py* - continue work on getting new input method to work. [Neil Cook]
- *SpirouStartup2.py* - continue work on getting new input method to work. [Neil Cook]
- *SpirouRecipe.py* - continue work on getting new input method to work. [Neil Cook]
- *Recipes.py* - add test recipe to test new definition method. [Neil Cook]
- SpirouConst.py: fix pep8 issue - brackets not needed. [Neil Cook]
- Merge branch 'master' into *input_redo*. [Neil Cook]

5.3.1.711 0.3.010 (2018-09-18)

- *Tellu_test.run*: add actual non-hot stars to telluric test. [Neil Cook]
- *Tellu_test.run*: add actual non-hot stars to telluric test. [Neil Cook]
- *Tellu_test.run*: reset for full test. [Neil Cook]

5.3.1.712 0.3.009 (2018-09-17)

- Test runs: update *tellu_test.run*. [Neil Cook]
- Update *cal_test.run*. [Neil Cook]
- SpirouStartup.py: extra check for no outputs in indexing (fixes crash) [Neil Cook]
- SpirouPlot: fix telluric plots (labels, titles, limits) [Neil Cook]
- *Obj_mk_tellu*: save SP to loc. [Neil Cook]
- *Obj_fit_tellu*: fix bug (blaze must be normalised to fit telluric) [Neil Cook]

5.3.1.713 0.4.023 (2018-09-17)

- *Test_recipe*: todo's added. [Neil Cook]

5.3.1.714 0.4.022 (2018-09-14)

- Input update: *spirouStartup.__init__.py* aliases / imports to spirouStartup2 (temporary) [Neil Cook]
- Input update: *recipes.py* - holder for recipe definitions. [Neil Cook]
- Input update: *spirouRecipe.py* - holder for new recipe classes. [Neil Cook]
- Input update: *spirouStartup2.py* - holder for new spirouStartup. [Neil Cook]
- Input update: *test_recipe.py* - test recipe to test new input functions. [Neil Cook]
- Input update: add *input_files.txt* - definition of input files. [Neil Cook]
- Merge pull request #453 from *njcuk9999/V0.3_Cand*. [Neil Cook]
  V0.3 cand –> master. Confirm unit tests successful.

5.3.1.715 0.3.008 (2018-09-13)

- Version.txt: update/check dependencies. [Neil Cook]
- *Drs_ dependencies.py*: fix for python 2 path. [Neil Cook]
- Update date/version/changelog. [Neil Cook]
- Timings.txt: For Neil reference only *unit_ test* timings. [Neil Cook]

5.3.1.716 0.3.007 (2018-09-13)

- *Drs_ changelog.py*: undo pep8 name change (and redo properly) [Neil Cook]
- *Update_ notes.txt*: add unit tests to update (files and some explanation) [Neil Cook]
- *Pol_ spirou.py*: fix error with new input/output to WriteImageMulti. [Neil Cook]
- SpirouWAVE.py: hide testing "print" statements. [Neil Cook]
- *Unit_ tests*: update unit test + add polarisation test. [Neil Cook]
- SpirouCDB.py: fix bad call to *DATE_ FMT_ HEADER* (p not required) [Neil Cook]
- *Cal_ reset.py*: exit script *has_ plots=False.* [Neil Cook]
- SpirouWAVE.py: fix issue with pep8 update *(ll_ prev* defined in wrong place) [Neil Cook]
- *SpirouWAVE.py* (Issue #452): *wave_ catalog* is now initialised as a NaN array (instead of an array of zeros) [Neil Cook]

5.3.1.717 0.3.006 (2018-09-12)

- *Off_ listing.py*: fix bug and add to index (if prompted by user) [Neil Cook]
- SpirouStartup.py: added Y/N question function. [Neil Cook]
- *Off_ listing.py*: fix to bug in code (rawloc –> list) [Neil Cook]
- *Off_ listing.py*: generic off listing that takes any directory as only input (no night name) and read's index.fits / *_ pp* fits file headers to get off listing for that directory. [Neil Cook]
- SpirouStartup.py: fix for not requiring night name in *load_ arguments.* [Neil Cook]
- SpirouConst.py: Added general off listing columns. [Neil Cook]
- Made spirouTools executable. [Neil Cook]
- Fix bad pep8 updates. [Neil Cook]
- Pep8 updates. [Neil Cook]

5.3.1.718 0.3.005 (2018-09-11)

- Pep8 updates. [Neil Cook]
- *Update_ notes.txt*: update with new unit tests. [Neil Cook]
- Unit tests: update unit test –> add *"Tellu_ Test.run"* and modify *"Cal_ Test.run"*, remove *test_ tellu.run.* [Neil Cook]
- *Recipe_ control.txt* –> add telluric and polarisation cases for *visu_ E2DS_ spirou.* [Neil Cook]
- *Obj_ fit_ tellu*, *obj_ mk_ tell_ template*, *obj_ mk_ tellu*: fix writing outputs to file. [Neil Cook]
- Update date/version/changelog/update notes. [Neil Cook]

5.3.1.719 0.3.033 (2018-09-11)

- Added BJD# and MEANBJD to header of polar products. [Eder]
- Minor changes. [Eder]
- Minor changes. [Eder]
- Minor changes. [Eder]

5.3.1.720 0.3.004 (2018-09-11)

- *Recipe_control.txt* –> add cases (for fiber) for *visu_E2DS_spirou*. [Neil Cook]
- *SpirouFile.py* - fix bad error output {0} –> {1} [Neil Cook]
- *Cal_test.run*: fix errors (typos . . . f –> . . . a) [Neil Cook]
- Update recipe control for *visu_RAW* and *visu_E2DS* recipes. [Neil Cook]
- Update notes with not done/finished. [Neil Cook]
- SpirouWAVE - re-add dict() –> OrderedDict() [Neil Cook]
- Config - merge fix - do NOT upload own config! [Neil Cook]
- *Cal_WAVE_E2DS_EA* - extra imports. [Neil Cook]
- Merge branch 'dev2' into melissa2. [Neil Cook]
  Conflicts:
  > *INTROOT/SpirouDRS/data/constants/recipe_control.txt*   INTROOT/SpirouDRS/spirouConfig/spirouConst.py   INTROOT/SpirouDRS/spirouTHORCA/spirouWAVE.py   *INTROOT/bin/cal_WAVE_E2DS_EA_spirou.py*
- *Cal_exposure_meter.py*: fix bad call to *get_telluric* (p, loc –> loc) [Neil Cook]
- Updated changelog/date/version/update notes. [Neil Cook]
- Update unit tests. [Neil Cook]
- SpirouUnitTests: fix outputs of *manage_run* (post H2RG removal) [Neil Cook]
- SpirouTelluric.py: fix kind when reading TAPAS file (was FLAT now TAPAS) [Neil Cook]
- SpirouStartup.py: fix indexing of files (add *"LAST_MODIFIED"* column) [Neil Cook]
- *SpirouStartup.__init__.py*: fix aliases. [Neil Cook]
- SpirouTable - increase width of table (now 9999) [Neil Cook]
- SpirouExoposeMeter.py: update where TAPAS file is taken from (now from telluDB) [Neil Cook]
- SpirouConst.py: update reduced output columns (need date and utc for drift) [Neil Cook]
- Update *master_calib_SPIROU.txt* for reset - now we don't need H2RG or TAPAS input. [Neil Cook]
- *Off_listing_RAW/REDUC_spirou* - fix bug in adding unix time - now called *"last_modified"* (to be more specific) [Neil Cook]
- *Cal_FF_RAW_spirou*: fix bug in H2RG removal. [Neil Cook]
- *Cal_exposure_meter/cal_wave_mapper* - update location of telluric ref file (TAPAS) now via telluDB. [Neil Cook]

5.3.1.721 0.3.003 (2018-09-10)

- Update notes - update. [Neil Cook]
- Unit test .run files - update after removing H2RG dependency. [Neil Cook]
- SpirouUnitTests.py: remove H2RG dependency (comparison not needed) [Neil Cook]
- *Unit_test.py*: replace dict() –> OrderedDict() + remove H2RG dependency. [Neil Cook]
- SpirouUnitTests.py: replace dict() –> OrderedDict() + remove H2RG dependency. [Neil Cook]
- SpirouUnitRecipes.py: remove H2RG dependency (no comparison needed) + replace dict() –> OrderedDict() [Neil Cook]
- *SpirouUnitTests.__init__.py*: remove H2RG dependency (remove *check_type* and *set_comp)* [Neil Cook]
- *Drs_tools*: replace dict() –> OrderedDict() [Neil Cook]
- *Drs_documentation*: replace dict() –> OrderedDict() [Neil Cook]
- *Drs_dependencies*: replace dict() –> OrderedDict() [Neil Cook]
- *Drs_changelog*: replace dict() –> OrderedDict() [Neil Cook]
- *Calc_berv*: replace dict() –> OrderedDict() and remove H2RG dependency. [Neil Cook]
- SpirouWAVE: replace dict() –> OrderedDict() [Neil Cook]
- SpirouTHORCA.py: remove H2RG dependency. [Neil Cook]
- SpirouTelluric.py: remove unused line (norm) [Neil Cook]
- SpirouStartup.py: remove H2RG dependency and add "UNIX" file column. [Neil Cook]
- SpirouRV.py: remove H2RG dependency. [Neil Cook]
- SpirouPOLAR.py: replace dict() –> OrderedDict() [Neil Cook]
- SpirouLOCOR.py: remove H2RG dependency. [Neil Cook]
- SpirouImage.py: remove H2RG dependency. [Neil Cook]
- SpirouFITS.py: remove H2RG dependency + replace dict() –> OrderedDict() [Neil Cook]
- SpirouBERV.py: remove H2RG dependency. [Neil Cook]

- SpirouEXTOR: replace dict() –> OrderedDict() [Neil Cook]
- SpirouDB: replace dict() –> OrderedDict() [Neil Cook]
- SpirouPlot.py: remove H2RG dependency. [Neil Cook]
- SpirouConst.py: update reduced output columns (remove obs date and utc from reduced products) [Neil Cook]
- SpirouConfig.py: replace dict() –> OrderedDict() [Neil Cook]
- *Main_drs_trigger*: remove H2RG dependency. [Neil Cook]
- *Constants_SPIROU_H2RG*: remove H2RG dependency (Delete file) [Neil Cook]
- *Off_listing_REDUC_spirou* - add column for last modified (unix time) [Neil Cook]
- *Cal_wave_mapper*: replace dict() –> OrderedDict() [Neil Cook]
- *Cal_SLIT_spirou*: remove H2RG dependency. [Neil Cook]
- *Cal_preprocess_spirou*: remove H2RG dependency. [Neil Cook]
- *Cal_loc_RAW_spirou*: remove H2RG dependency. [Neil Cook]
- *Cal_FF_RAW_spirou*: remove H2RG dependency. [Neil Cook]
- *Cal_extract_RAW_spirou*: remove H2RG dependency. [Neil Cook]
- *Cal_exposure_meter*: replace dict() –> OrderedDict() [Neil Cook]
- *Cal_DARK_spirou.py*: remove H2RG dependency. [Neil Cook]
- *Cal_CCF_E2DS_spirou.py*: replace dict() –> OrderedDict() [Neil Cook]

5.3.1.722 0.3.002 (2018-09-07)

- Added an *all_order* plot of fitted gaussians (as discussed in #442) Saved additional values to loc in spirouWAVE functions that were required for *cal_WAVE_E2DS_EA*. [melissa-hobson]
- *Fit_emi_line*: added check to not fit on lines with more than one zero- value (fix for #393) [melissa-hobson]

5.3.1.723 0.3.000 (2018-09-06)

- Issue #418 *spirouStartup.py* - Make directory for *NIGHT_NAME* in *TMP_DIR*, index.fits saves to *TMP_DIR*, files are now checked for RAW in *TMP_DIR*. [Neil Cook]
- Issue #418 spirouFile.py: obtaining tmppath and tmpfile to check for raw files (instead of rawpath which now throws error when used) [Neil Cook]
- Issue #418 spirouConfig: added *TMP_DIR* definition (as *DRS_DATA_WORKING* dir) [Neil Cook]
- Issue #418 *cal_preprocess_spirou.py*: made pp target raw folder but save to tmp dir. [Neil Cook]
- Updated notes. [Neil Cook]
- Updated the update notes. [Neil Cook]
- Added Update Notes. [Neil Cook]
- Update *20180805_test1.run* to extract FP sequences and run DRIFT recipes (with extracted FPs) [Neil Cook]
- Update 20180409 test to include *off_listing_RAW/REDUC* and not include *pol_spirou* (do not have the raw files needed) [Neil Cook]
- *Unit_test.py*: Move Reset after set up (so errors reported before reset questions) [Neil Cook]
- Issue #429: spirouUnitRecipes.py: modify the outputs of *off_listing* recipes (distinguish between RAW and REDUCED listing) [Neil Cook]
- Issue #429: *calc_berv* - modify input/output of WriteImage (for handling p['OUTPUTS']) [Neil Cook]
- Issue #429: *spirouStartup.py* modify *"main_end_script"* to index outputs or pre-processing - via functions *"index_pp"*, *"index_outputs"*, "indexing" and *"sort_and_save_outputs"* [Neil Cook]
- Issue #429: *spirouStartup.__init__.py*: alias *sort_and_save_outputs* to SortSaveOutputs. [Neil Cook]
- Issue #429: spirouLSD - modify WriteImage to accept new input/output for writing p['OUTPUTS'] [Neil Cook]
- Issue #429: spirouTable: Add ways of making, reading and writing fits table (via astropy.table.Table) - functions added = *make_fits_table*, *read_fits_table*, *write_fits_table*. [Neil Cook]
- Issue #429: spirouImage.py: replace *"get_all_similar_files"* function to look at header keys instead of file name (for *cal_DRIFT* recipes) [Neil Cook]
- SpirouFITS: modify *write_image* and *write_image_multi* to deal with writing output dict to p (via new function *"write_output_dict"*) [Neil Cook]
- SpirouFile: add *DRS_TYPE* to identify RAW and REDUCED recipes (and pass to output processing later) [Neil Cook]

- *SpirouImage.__init__*: add aliases for *make_fits_table*, *read_fits_table* and *write_fits_table*. [Neil Cook]
- SpirouMath: reformat exception on timestamp (to print the input –> helps with debugging) [Neil Cook]
- SpirouConst: add *OFF_LISTING_RAW_FILE*, *OFF_LISTING_REDUC_FILE*, *IN-DEX_OUTPUT_FILENAME*, *OUTPUT_FILE_HEADER_KEYS*, *RAW_OUTPUT_COLUMNS*, *REDUC_OUTPUT_COLUMNS* functions. [Neil Cook]
- Modify *unresize.py* with the output to WriteImage (outputs management) [Neil Cook]
- Update *cal_drift_raw* for outputs (but not file list) [Neil Cook]
- Re-work *off_listing* recipes to look at the index files first (Much faster) - and to update the index files. [Neil Cook]
- Modify *cal_preprocess_spirou* to sort out outputs and to skip index file. [Neil Cook]
- Issue #429 - Re-work "listfiles" to get files from the headers (and index files) + deal with outputs. [Neil Cook]
- Issue #429 - ReWork "WriteImage" to save to p['OUTPUTS'] and deal with spirouStartup.End dealing with outputs. [Neil Cook]

5.3.1.724 0.2.128 (2018-09-06)

- SpirouPlot: updated *wave_ea_plot_per_order_hcguess*: - plots stay open until manually closed - each plot shows only the gaussian fits corresponding to the order (Fixes #442) [melissa-hobson]

5.3.1.725 0.2.124 (2018-09-05)

- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data), and added the obtaining of DPRTYPE to add *EXT_TYPE* key to header (extraction output id key –> giving DPRTYPE for extracted files) [Neil Cook]
- Added a new log output to split up files to help see progress. [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - re-worked file identification only using header keys (no filename identification) [Neil Cook]
- Issue #429 - added *kw_OUTPUT* and *kw_EXT_TYPE* definitions for saving output header id and extraction output header id. [Neil Cook]
- Issue #429 - added TAGFOLDER and TAGFILE functions and modified all fits-file definition functions to accept tags. [Neil Cook]
- Issue #429 - added *get_tags* function. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Issue #429 - re-work *recipe_control.txt* to take into account added output keys (and check keys on start up) [Neil Cook]
- Issue #429 - definition of output header keys (based on output filename in spirouConst.py) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]
- Issue #429 - add output header key to identify output files *(KW_OUTPUT)* - defined in *output_keys.py* (SpirouDRS/data) [Neil Cook]

5.3.1.726 0.2.125 (2018-09-05)

- *Cal_WAVE_E2DS_EA_spirou*: updated HC section from *cal_HC_E2DS_EA_spirou.py*. [melissa-hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- *Visu_E2DS_spirou, recipe_control*: fiber is now obtained from file. [melissa-hobson]
- *Visu_E2DS_spirou, recipe_control*: fiber is now obtained from file (Fixes #437) [melissa-hobson]
- Commit local changes. [Melissa Hobson]
- Merge pull request #441 from *njcuk9999/master_copy*. [melissa-hobson]
  update melissa from Master copy
- Merge branch 'melissa' into *master_copy*. [melissa-hobson]
- Merge pull request #439 from njcuk9999/dev2. [Neil Cook]
  Dev2
- Merge remote-tracking branch 'origin/dev2' into dev2. [Neil Cook]
- Merge pull request #438 from njcuk9999/dev2. [Neil Cook]
  Dev2 –> Master (unit test complete and verified)
- Update version/changelog and date. [Neil Cook]

5.3.1.727 0.2.126 (2018-09-05)

- Commit local changes. [Melissa Hobson]

5.3.1.728 0.2.127 (2018-09-05)

- SpirouRV (for *cal_DRIFTPEAK_E2DS_spirou)* - Fix repetition of warning messages in while loop. [njcuk9999]

5.3.1.729 0.2.123 (2018-09-04)

- Move *cal_HC_E2DS_EA* constants to here. [Neil Cook]
- Prep *cal_HC_E2DS_EA* for recipe run (add main function, move constants etc) [Neil Cook]
- Updated date/version/changelog. [Neil Cook]

5.3.1.730 0.2.121 (2018-09-04)

- Add placeholder marker for the new *cal_HC_E2DS_EA_spirou* work. [Neil Cook]
- Modify *generate_resolution_map* –> fixes for integrating etiennes hcpeak functions. [Neil Cook]
- Enter todo to rename variable. [Neil Cook]
- Add plot for *cal_HC_E2DS_EA_spirou (wave_ea_plot_line_profiles)* and worker function *(remove_first_last_ticks)* [Neil Cook]
- Modify the *gauss_fit_s* function *(cal_HC_EA_E2DS* usuage) [Neil Cook]
- Separate input and output filename pseudo constant functions, added EA versions of *cal_HC* output filename definitions. [Neil Cook]
- Update leapsec log. [Neil Cook]
- Update to *cal_HC_E2DS_EA_spirou* - finish work on integrating Etienne's work. [Neil Cook]
- Fix for S1D spectra - there may be occasions when we cannot convert to S1D - print a warning if this is the case. [Neil Cook]
- Merge pull request #434 from njcuk9999/neil. [Neil Cook]
  Neil –> Dev 2

5.3.1.731 0.2.122 (2018-09-03)

- Manually incorporated possibility to read wavelength solution from calibDB (from dev2) [melissa-hobson]
- *Cal_WAVE_E2DS_EA_spirou.py*: incorporated FP lines into solution, corrected checks spirouWAVE.py: corrections to new FP functions. [melissa-hobson]

5.3.1.732 0.2.120 (2018-08-31)

- Update date and version. [Neil Cook]
- Script to manually add file to calibDB (from file in reduced folder) [Neil Cook]
- Update change log/version and date. [Neil Cook]
- Update master calibDB for reset. [Neil Cook]
- Reset *cal_CCF* set NaNs to zeros (Issue #389) [Neil Cook]

5.3.1.733 0.2.117 (2018-08-31)

- Added new wavelength solution and deleted files in *data_example* (not needed - run *cal_reset* or *cal_validate)* [Neil Cook]
- Merge pull request #432 from njcuk9999/melissa-hobson-patch-1. [Neil Cook]
  TC3 initial wavelength solution

5.3.1.734 0.2.116 (2018-08-30)

- Add *off_listing_REDUC_spirou* to recipes available for testing. [Neil Cook]
- Write a test for 18BQ01-Aug05 test files *(20180805_test1.run)* - Issue #400. [Neil Cook]
- Fix micro seconds = 1e-6 not 1e-3. [Neil Cook]
- Fix bug with PATH in bashrc file. [Neil Cook]
- Add the resolution map (work-in-progress) [Neil Cook]
- Fix bugs with *cal_HC_E2DS_EA*. [Neil Cook]
- Fix bug with timestamp in logging. [Neil Cook]
- Add writing of file for *off_listing*. [Neil Cook]

5.3.1.735 0.2.114 (2018-08-29)

- Added fixes to triplet fitting function. [Neil Cook]
- Added alias for the *get_night_dirs* function (GetNightDirs) [Neil Cook]
- Fixed number of *night_name* dirs displayed on error. [Neil Cook]
- Added *night_name* display limit (for when *NIGHT_NAME* is not an argument) [Neil Cook]
- Fix to bad copy and paste in spirouPlot. [Neil Cook]
- Improvements to having no FOLDER name - now displays all available folders. [Neil Cook]
- Improvements to *off_listing* - having no *night_name* argument now displays all available *night_names*. [Neil Cook]
- Improvements to *off_listing* - having no *night_name* argument now displays all available *night_names*. [Neil Cook]
- Added *off_listing_REDUC_spirou* to allow listing of reduced folders. [Neil Cook]
- Issue #428 - force calibDB wave solution - modify *get_wave_keys*. [Neil Cook]
- Issue #428 - force calibDB wave solution - modify *get_wave_solution*. [Neil Cook]
- Issue #428 - force calibDB wave solution - add constant switch. [Neil Cook]
- *Cal_HC_E2DS_EA* - Set up for local running. [Neil Cook]

5.3.1.736 0.2.115 (2018-08-29)

- TC3 initial wavelength solution. [melissa-hobson]

5.3.1.737 0.2.113 (2018-08-28)

- First commit - Etienne's *cal_HC* - added functions for *cal_hc_ea*. [Neil Cook]
- First commit - Etienne's *cal_HC* - added call to spirouMath. [Neil Cook]
- First commit - Etienne's *cal_HC* - moved *lin_mini* to spirouMath. [Neil Cook]
- First commit - Etienne's *cal_HC* - ReadTable/WriteTable/MakeTable correction when no formats. [Neil Cook]
- First commit - Etienne's *cal_HC* - *wave_ea_plots*. [Neil Cook]
- First commit - Etienne's *cal_HC* - gauss functions and *lin_mini*. [Neil Cook]
- First commit - Etienne's *cal_HC* - filename definition. [Neil Cook]
- First commit - Etienne's *cal_HC*. [Neil Cook]
- Merge pull request #427 from njcuk9999/melissa. [Neil Cook]
  Melissa –> Dev
- Merge branch 'dev2' into melissa. [Neil Cook]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Neil Cook]
- Set *pixel_shift_inter* and *pixel_shift_slope* back to zero (Issue #411) [Neil Cook]

5.3.1.738 0.2.118 (2018-08-27)

- Issue #399 - copied in extra files *(FILE_B* and read me files) required by iers (but not currently linked to) [njcuk9999]
- Issue #399 - modification to iers to make offline (hopefully) given testing offline. [njcuk9999]
- Issue #399 - fix *astropy_iers_dir* to be the actual directory. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #426 from njcuk9999/neil. [Neil Cook]
  Neil –> master (confirm tested on 20180409all.run and *test_tellu.run)*
- Merge pull request #424 from njcuk9999/neil. [Neil Cook]
  Neil –> Master

5.3.1.739 0.2.119 (2018-08-27)

- Added location to save astropy iers file (Issue #389) [Neil Cook]
- Possible fix for Issue #389: from @cusher - import astropy.utils.iers and set *iers_table* [Neil Cook]
- Issue #399: barycorrpy offline file. [Neil Cook]

5.3.1.740 0.2.112 (2018-08-27)

- Updated date, version and changelog. [Neil Cook]

5.3.1.741 0.2.107 (2018-08-27)

- Updated date, version and changelog. [Neil Cook]
- Issue with changelog (Version.txt not updating) –> corrected. [Neil Cook]

5.3.1.742 0.2.106 (2018-08-27)

- Set *pixel_shift_inter* and *pixel_shift_slope* back to zero (Issue #411) [Neil Cook]

5.3.1.743 0.2.105 (2018-08-24)

- Fix for Issue #406 - *cal_CCF* does not accept StokesI or e2dsff - fixed. [Neil Cook]
- Fix for issue #406 - CCF recipe does not accept Stokes I spectra –> replace '_A.fits' with '_AB_StokesI.fits' [Neil Cook]
- Fix for Issue #406 -CCF recipe does not accept stokes I spectra –> replace '_A.fits' with '_AB_StokesI.fits' [Neil Cook]
- Fix for Issue #423 - *cal_reset* fails if folder does not exist. [Neil Cook]
- Changed blacklist functino to look at objnames (Issue #419) [Neil Cook]
- Changed blacklist file to object names (Issue #419) [Neil Cook]
- Moved blacklist check to after we have the OBJNAME (Issue #419) [Neil Cook]

5.3.1.744 0.2.104 (2018-08-23)

- Add *check_blacklist* and *get_blacklist* functions (Issue #419) [Neil Cook]
- Add alias to check black list function (Issue #419) [Neil Cook]
- Add alias to raw text file function (Issue #419) [Neil Cook]
- Add blacklist filename (Issue #419) [Neil Cook]
- Add code to read raw text file (Issue #419) [Neil Cook]
- Add code to check for blacklisted file (Issue #419) [Neil Cook]
- Add blacklist file (Issue #419) [Neil Cook]
- Issue #389 - NaN values vauses error to be raised (Needs to be fixed properly) [Neil Cook]
- Update date version and changelog. [Neil Cook]

5.3.1.745 0.2.110 (2018-08-23)

- Update *cal_HC_E2DS_spirou.py.* [Neil Cook]
  correct indentation error
- Update spirouMath.py. [Neil Cook]
  update pep8

5.3.1.746 0.2.103 (2018-08-23)

- Re-write of *median_one_over_f_noise* function (Issue #420) [Neil Cook]
- New alias for function re-write (Issue #420) [Neil Cook]
- Using new function (re-write) from issue #420. [Neil Cook]

5.3.1.747 0.2.111 (2018-08-23)

- *Cal_WAVE_E2DS_EA_spirou.py* update. [melissa-hobson]

5.3.1.748 0.2.109 (2018-08-22)

- *Cal_WAVE_E2DS_EA_spirou.py*: moved FP solution to spirouWAVE. [melissa- hobson]

5.3.1.749 0.2.108 (2018-08-21)

- *Cal_WAVE_E2DS_EA_spirou.py*: - check to remove double-fitted or spurious FP peaks - incorporation of FP lines (now working with no jumps) [melissa-hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- Removed test prints. [melissa-hobson]
- SpirouMATH.py, spirouTHORCA.py: redo pixel shift implementation. [melissa-hobson]
- *Cal_HC_E2DS_spirou.py*: changed start and end orders of second pass to be min (max) of FP and HC start (end) orders. spirouWAVE.py: correctly defined orders for inserting FP lines to *all_lines_2* Fixes #411. [melissa-hobson]
- Merge pull request #414 from njcuk9999/master. [melissa-hobson]
  update melissa
- Update changelog. [njcuk9999]

5.3.1.750 0.2.102 (2018-08-18)

- Issue #411: reset *cal_wave* changes from Melissa (not working with *unit_test* 20180409all.run. [njcuk9999]
- Merge pull request #413 from njcuk9999/dev. [Neil Cook]
  Dev
- Update version. [njcuk9999]
- Update date version and changelog. [njcuk9999]

5.3.1.751 0.2.099 (2018-08-18)

- Fix to file name (allow e2ds and e2dsff by only replaceing *"_A.fits"* [njcuk9999]
- Allow LSD process (now it is fixed) [njcuk9999]
- Merge remote-tracking branch 'origin/dev' into dev. [njcuk9999]
- Merge pull request #412 from njcuk9999/eder. [Neil Cook]
  Eder
- Merge branch 'master' into eder. [Eder]
- Merge pull request #410 from njcuk9999/melissa. [Neil Cook]
  Merge Melissa's branch with dev (for testing)
- Merge pull request #409 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date, version, changelog. [njcuk9999]

5.3.1.752 0.2.101 (2018-08-18)

- Update spirouMath.py. [Neil Cook]
  fix pep8

5.3.1.753 0.2.096 (2018-08-18)

- Issue #382 - added a position to check for FLATFILE and DARKFILE (must agree with *recipe_ control.txt)* [njcuk9999]

5.3.1.754 0.2.095 (2018-08-17)

- Issue #401 - Added check that number of *TELLU_MAP* files > number of PCA components. [njcuk9999]
- Issue #392 change "PPVERSION" to "PVERSION" - header key too long. [njcuk9999]
- Issue #405 - add message when reset userinput is not "yes" [njcuk9999]

5.3.1.755 0.2.098 (2018-08-17)

- Fixed memory issue by avoiding direct use of an nxn S^2 matrix. [Eder]

5.3.1.756 0.2.094 (2018-08-16)

- Issue #392: added per-processed version keyword. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
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- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Issue #392: added version to outputs. [njcuk9999]
- Entries prepared ready to fix issues #394 and #406. [njcuk9999]
- Issue #407: fix bug where split lines not all printed to log file (only to screen) [njcuk9999]

5.3.1.757 0.2.097 (2018-08-16)

- NaN-to-zero change moved from *obj_fit_tellu* to *cal_CCF* - warning printed if there are NaNs in the e2ds input to *cal_CCF* - Ref: #389, #390. [melissa-hobson]
- Pixel shift incorporated to all wavelength solutions - added to constants file - read from constants for *cal_WAVE_E2DS_EA_spirou.py* - added to *spirouMATH.get_ll_from_coefficients* (and calls to it in spirouTHORCA) - warning is printed if the pixel shift is not zero. [melissa-hobson]
- SpirouFITS.py: removed *write_s1d.* [melissa-hobson]
- Merge pull request #408 from njcuk9999/master. [melissa-hobson]
  update Melissa
- Merge pull request #404 from njcuk9999/dev. [Neil Cook]
  Dev - tested against unit tests 20180409all.run and *test_tellu.run*
- Updated date, changelog and version. [njcuk9999]

5.3.1.758 0.2.093 (2018-08-15)

- Update telluric unit test. [njcuk9999]
- Add *obj_mk_tellu* and *obj_fit_tellu* to the unit tests. [njcuk9999]
- Turn off the LSD analysis (until problem fixed) [njcuk9999]
- Added a telluric test (based on Neil's files) [njcuk9999]
- Fix to issue #398: The first time running *obj_mk_tellu* fails with an I/O problem - *convolve_file* was being saved to the wrong location (and hence *put_file* was failing to copy it to telluDB) [njcuk9999]
- Updated descriptions (from Etienne) [njcuk9999]
- Updated date, changelog and version. [njcuk9999]
- Fixed import issue. [njcuk9999]
- Merge pull request #403 from njcuk9999/melissa. [Neil Cook]
  Merge Melissa's branch into Dev branch
- Merge pull request #402 from njcuk9999/eder. [Neil Cook]
  Merge Eder branch into Dev branch
- Update spirouConst.py. [Neil Cook]
  fix pep8 on doc string
- Merge pull request #396 from njcuk9999/cfht. [Neil Cook]
  Fixed _ _ NAME _ _ of *obj_fit_tellu*

5.3.1.759 0.2.092 (2018-08-15)

- Update config.py. [Neil Cook]
  Revert *config.py* (Copying over a custom *config.py* file)
- Update spirouFITS.py. [Neil Cook]
  Todo added to remove *write_s1d* this should not be used - but keeps coming up in Melissa's branch
- Delete vcs.xml. [Neil Cook]
  should be ignored by github

5.3.1.760 0.2.089 (2018-08-14)

- Implemented Least Squares Deconvolution (LSD) Analysis to polar module. [Eder]
- Merge branch 'master' into eder. [Eder]
- Implemented Least Squares Deconvolution (LSD) Analysis to polar module. [Eder]

5.3.1.761 0.2.090 (2018-08-14)

- *Obj_fit_tellu.py*: re-add blaze, set NaNs to zero in final e2ds (UNTESTED), as per #389, #390. [melissa-hobson]
- *SpirouLOCOR.py* now prints name of localization file (Discussed in #387) [melissa-hobson]
- SpirouStartup.py: removed lines that caused exit if *DRS_PLOT* was not set even when *DRS_INTERACTIVE* was set. Fixes #395. [melissa-hobson]

5.3.1.762 0.2.091 (2018-08-14)

- Fixed _ _ NAME _ _ of *obj_fit_tellu*. [Chris Usher]

5.3.1.763 0.2.088 (2018-08-13)

- *Cal_WAVE_E2DS_EA_spirou.py*: began incorporation of FP lines (work in progress) [melissa-hobson]

5.3.1.764 0.2.087 (2018-08-09)

- *Cal_WAVE_E2DS_EA_spirou.py*: incorporated extrapolation of Littrow solution for last two orders; added save to calibDB of good solutions. [Melissa Hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
  Conflicts:
  > INTROOT/SpirouDRS/spirouCore/spirouPlot.py   INTROOT/SpirouDRS/spirouImage/spirou-BERV.py INTROOT/SpirouDRS/spirouImage/spirouImage.py INTROOT/SpirouDRS/spirouTHOR-CA/spirouWAVE.py *INTROOT/bin/cal_FF_RAW_spirou.py INTROOT/bin/cal_SLIT_spirou.py INTROOT/bin/cal_WAVE_E2DS_EA_spirou.py   INTROOT/bin/cal_extract_RAW_spirou.py INTROOT/bin/cal_loc_RAW_spirou.py INTROOT/config/constants_SPIROU_H4RG.py*
- Merge pull request #386 from njcuk9999/cfht. [Neil Cook]
  Proposed fixes for minor issues
- Merge pull request #388 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date, version and change log. [njcuk9999]

5.3.1.765 0.2.083 (2018-08-08)

- Update spirouFITS.py. [Neil Cook]
  Made the warning handling more readable and added TODO, this should be handled properly not just ignored (i..e header cards should be corrected) - TODO will remind of this!

5.3.1.766 0.2.072 (2018-08-08)

- Correctioned some constants and added value to loc. [njcuk9999]
- Added definitions from FP files and EA wave files. [njcuk9999]
- Updated *cal_WAVE_E2DS* files to check for. [njcuk9999]
- Part2 test and updated/corrected some constants. [njcuk9999]
- Added background subtraction. [njcuk9999]
- Title to the plots + action TODO to find the right FIBER type. [njcuk9999]
- Refinement of the cut of the left edge of blue orders for localisation - merge from @FrancoisBouchy. [njcuk9999]
- Use only the part of E2DS > 0 to build the S1D spectra. [njcuk9999]
- Read the OBSTYPE before computing BERV - OBSTYPE should be OBJECT to derive the BERV (i.e. not for calibrations) - merge from @FrancoisBouchy. [njcuk9999]
- Some cosmetic / improvement for plot display - merged from @FrancoisBouchy. [njcuk9999]
- Updated constants + new definition for the blue window on DARK - *uc_fracminblaze* = 16, new param to restrict the wings of spectral orders with flux lower than *flux_at_blaze* / 16, spectral order 0 is not taken into account. [njcuk9999]
- Correction of center of the blaze window - put to zero edge of the spectra hwere flux is too low (less than *flux_at_blaze/ IC_FRACMINBLAZE)* - merged from @FrancoisBouchy. [njcuk9999]
- Put to zero part of spectra where the blaze is not defined. [njcuk9999]
- Add the background subtraction - from @FrancoisBouchy. [njcuk9999]
- @melissa-hobson correct call to GetLampParams. [njcuk9999]

5.3.1.767 0.2.084 (2018-08-08)

- Added fiber position identification from fiber type. [njcuk9999]
- First version *cal_WAVE* developed by @eartigau, adapted to DRS format by @melissa-hobson added informational printouts - fixed figures - fixed asymmetry that allowed lines to be found in two windows - added *all_lines* data structure, Littrow check and uncertainty calclulation added possibility to set a pixel shift. [njcuk9999]

5.3.1.768 0.2.085 (2018-08-08)

- *Cal_WAVE_E2DS_EA_spirou.py*: - added possibility to have a linear pixel shift when getting the initial wavelength solution (needed for TC2-TC3 change) - added QC - implemented storing of wavelength solution and tables (tables TBC) spirouConst.py: defined specific wave file names for outputs of *cal_WAVE_E2DS_spirou.py* and *cal_WAVE_E2DS_EA_spirou.py*. [Melissa Hobson]

5.3.1.769 0.2.086 (2018-08-08)

- Suppress warnings about truncating FITS comments. [Chris Usher]
- Prevent *measure_background_flatfield* from throwing error. [Chris Usher]
- Fixed scrambled FITS headers. [Chris Usher]

5.3.1.770 0.2.082 (2018-08-07)

- *Cal_WAVE_E2DS_EA_spirou.py*: added posibility to set a pixel shift *recipe_control.txt*: put correct DPRTYPE for *cal_WAVE* checks. [Melissa Hobson]

5.3.1.771 0.2.081 (2018-08-03)

- *Cal_WAVE_E2DS_EA_spirou.py*: - added informational printouts - fixed figures - fixed asymmetry that allowed lines to be found in two windows - added *all_lines* data structure, Littrow check, and uncertainty calculation. [Melissa Hobson]
  cal_WAVE_E2DS_spirou.py: test updates
  visu_WAVE_spirou.py: lines in adjacent orders are now plotted alternately in magenta or purple for visibility
  constants_SPIROU_H4RG.py: increased fit degrees, adjusted FP values
  spirouPlot.py: changed Littrow plot to rainbow colours to improve distinguishing x cuts
  spirouWAVE.py: small improvements
- Merge pull request #381 from njcuk9999/francois. [melissa-hobson]
  update Melissa from Francois

5.3.1.772 0.2.080 (2018-08-01)

- *Cal_WAVE_E2DS_EA_spirou.py*: first version of *cal_WAVE* developed by @eartigau, adapted to DRS format. [Melissa Hobson]
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- Merge pull request #379 from njcuk9999/master. [melissa-hobson]
  update melissa
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- Merge pull request #377 from njcuk9999/master. [melissa-hobson]
  update melissa
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
- Merge pull request #365 from njcuk9999/master. [melissa-hobson]
  Melissa
- Merge remote-tracking branch 'origin/melissa' into melissa. [Melissa Hobson]
  Conflicts:
  INTROOT/SpirouDRS/spirouTHORCA/spirouTHORCA.py

5.3.1.773 0.2.079 (2018-07-27)

- Title to the plots + Action TODO to find the right FIBER type. [FrancoisBouchy]
- Refinement of the Cut of the left edge of blue orders for localisation. [FrancoisBouchy]
- Use only the part of E2DS > 0 to build the S1D spectra. [FrancoisBouchy]
- Read the OBSTYPE Before computing BERV OBSTYPE should be OBJECT to derive the BERV (not for Calibrations) [FrancoisBouchy]
- Some cosmetic / improvemtn for plot display. [FrancoisBouchy]
- New definition for the blue window on DARK *ic_fracminblaze* = 16 –> New parameter to restrict the wings of spectral orders with flux lower than *flux_at_blaze* / 16 Spectral order 0 is not taken into account for QC of the Flat QC of Flat can be reduce to 5% [FrancoisBouchy]
- Add the background correction. [FrancoisBouchy]
- Correction of center of the blaze window Put to zero edge of the spectra where flux is too low (less than *flux_at_blaze* / *IC_FRACMINBLAZE*. [FrancoisBouchy]
- Put to zero part of spectra where the blaze is not define. [FrancoisBouchy]

5.3.1.774 0.2.077 (2018-07-25)

- Improvement for the localisation. [FrancoisBouchy]
- Adaptation parameters for localisation. [FrancoisBouchy]
- Add the background subtraction. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
  Conflicts:
  INTROOT/SpirouDRS/data/ccf_masks/gl581_july18_clean_rec2.mas INTROOT/SpirouDRS/spirouBACK/spirouBACK.py *INTROOT/SpirouDRS/spirouImage/__init__.py* INTROOT/SpirouDRS/spirouImage/spirouImage.py *INTROOT/bin/cal_FF_RAW_spirou.py INTROOT/bin/cal_extract_RAW_spirou.py INTROOT/bin/visu_WAVE_spirou.py INTROOT/config/-constants_SPIROU_H4RG.py*

5.3.1.775 0.2.078 (2018-07-25)

- Inserted filename, MJD, and MJDEND keywords from expsoures in polar sequence to the header of polarimetry products. [Eder]
- Merge branch 'master' into eder. [Eder]
- Merge pull request #378 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date/changelog/version. [njcuk9999]
- Merge branch 'master' into eder. [Eder]
- Merge branch 'master' into eder. [Eder]
- Removed small comment – nothing really. [Eder]
- Fixed formatting of doc strings. [Eder]
- Merge branch 'eder' of *https://github.com/njcuk9999/spirou_py3* into eder Removing function duplicated function *calculate_stokes_I*. [Eder]

5.3.1.776 0.2.071 (2018-07-20)

- Update test run. [njcuk9999]
- Misc functions. [njcuk9999]
- Fixed call to earth velocity correction function. [njcuk9999]
- Move *get_good_object_name* function. [njcuk9999]
- Add aliases for getting obj name and airmass. [njcuk9999]
- Fix acquisition time naming. [njcuk9999]
- Added file iteration to plot. [njcuk9999]
- Fix acquitision time naming (julian not unix) [njcuk9999]
- Add tellu template file definition. [njcuk9999]
- Remove extra recipe control key. [njcuk9999]

- Move objname and airmass to functions. [njcuk9999]
- Fix naming conversion time is julian not unix. [njcuk9999]
- Correct filename bug. [njcuk9999]
- Fixed bug with convolve file not being read correctly. [njcuk9999]
- Fxied bug with *get_param*. [njcuk9999]
- Fxied bug with *get_param*. [njcuk9999]
- Fxied bug with *get_param*. [njcuk9999]
- Fix bug in *get_wave_solution*. [njcuk9999]
- Fixed but with header key too long (9 > 8) [njcuk9999]
- Fix bug in assigned WAVEFILE. [njcuk9999]
- Fix bug in *get_param* call. [njcuk9999]

5.3.1.777 0.2.070 (2018-07-19)

- Add telluric database reset to *cal_validate*. [njcuk9999]
- Tellu recipes - bug fix for plot. [njcuk9999]
- Fix bug with timestamp (telluDB only) [njcuk9999]
- Integrate telluric recipes with test runs: compressed + binned *tapas_all_sp* file. [njcuk9999]
- Integrate telluric recipes with test runs: updated after test runs. [njcuk9999]
- Integrate telluric recipes with test runs: updated error message in *get_param*. [njcuk9999]
- *Cal_preprocess* - DPRTYPE = None rows of *recipe_control* should not be used to ID files. [njcuk9999]
- Integrate telluric recipes with test runs: fixes afer test runs. [njcuk9999]
- Integrate telluric recipes with test runs: updated aliases. [njcuk9999]
- Integrate telluric recipes with test runs: updated *TELL_MOLE* file (.gz) [njcuk9999]
- Integrate telluric recipes with test runs: fixes afer test runs. [njcuk9999]
- Integrate telluric recipes with test runs: fixes afer test runs. [njcuk9999]
- Integrate telluric recipes with test runs: fixes afer test runs. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]

5.3.1.778 0.2.069 (2018-07-18)

- Integrate telluric recipes with test runs: updated after test runs. [njcuk9999]
- Integrate telluric recipes with test runs: added *get_wave_keys* function. [njcuk9999]
- Integrate telluric recipes with test runs: updated aliases. [njcuk9999]
- Integrate telluric recipes with test runs: test run only. [njcuk9999]
- Integrate telluric recipes with test runs: updated plots (corrected) [njcuk9999]
- Integrate telluric recipes with test runs: resorted *use_keys* + added wave and telluric keys. [njcuk9999]
- Updated filename *(TELLU_FIT_OUT_FILE)* [njcuk9999]
- Integrate telluric recipes with test runs: added constants from Etienne and corrected bug in *tell_lambda_max*. [njcuk9999]
- Integrate telluric recipes with test runs: update after running *fit_tellu*. [njcuk9999]
- Integrate telluric recipes with test runs: update after running *fit_tellu*. [njcuk9999]
- Integrate telluric recipes with test runs: test run only. [njcuk9999]
- Modified *cal_extract* to save wavefile name and wave file dates (for telluric) [njcuk9999]

5.3.1.779 0.5.038 (2018-07-17)

- Merge pull request #376 from njcuk9999/neil. [Neil Cook]
  Neil
- Update date/version/changelog. [njcuk9999]
- Copy (same) [njcuk9999]
- Update tellu recipes: fix bug with file name. [njcuk9999]
- Update tellu recipes: drs telluDB reset now resets telluDB not calibDB (fix typos) [njcuk9999]
- Update tellu recipes: fix after test run FWHM is function not object. [njcuk9999]
- Update tellu recipes: fix after test run - telluDB get database values are already split on spaces. [njcuk9999]
- Update tellu recipes: fix after test run - fix bug (needed enumerate(lines)) [njcuk9999]

- Update tellu recipes: fix after test run - add alias to *update_ datebase_ tell_ temp.* [njcuk9999]
- Possible bug fix: tried to separate out interactive options in *end_ interactive_ session* function. [njcuk9999]
- Possible bug fix: tried to reduce repetition of displayed warnings. [njcuk9999]
- Update tellu recipes: added AIRMASS header key. [njcuk9999]
- Bug fix: fix file name '*_ s1d_ {0}.fits*' –> '*_ s1d_ {0}.fits'.format(p['FIBER']*) [njcuk9999]
- Update tellu recipes: add required line in master telluDB. [njcuk9999]
- Update tellu recipes: add *obj_ mk_ tell_ template* to recipe control. [njcuk9999]
- Update tellu recipes: move *obj_ mk_ tell_ template* constantsto here and correct some bugs after test run. [njcuk9999]
- Update tellu recipes: fix after test run. [njcuk9999]
- Update tellu recipes: fix after test run. [njcuk9999]
- Updated date/changelog/version. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- Merge pull request #375 from njcuk9999/neil. [Neil Cook]
  Neil
- Telluric integration: bug fixes (after move of functions) [njcuk9999]
- Updated call to plot. [njcuk9999]
- Moved debug plot back to main code. [njcuk9999]
- Updating integration of tellu files: added functions - *interp_ at_ shifted_ wavelengths*, *calc_ recon_ abso*, *calc_ molecular_ absorption* and *lin_ mini.* [njcuk9999]
- Updating integration of tellu files: added new function aliases. [njcuk9999]
- Updating integration of tellu files: added plot function *"tellu_ fit_ recon_ abso_ plot"* [njcuk9999]
- Updating integration of tellu files: Added abso output keyword. [njcuk9999]
- Updating integration of tellu files; Added filename pseudo constants. [njcuk9999]
- Updating integration of tellu files: added constants (need commenting!) [njcuk9999]
- Updating integration of tellu files. [njcuk9999]
- Updating integration of tellu files. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- Merge pull request #374 from njcuk9999/neil. [Neil Cook]
  add new mask from Xavier
- Updated date and veresion and changelog. [njcuk9999]

5.3.1.780 0.2.066 (2018-07-15)

- Add new mask from Xavier. [njcuk9999]
- Merge pull request #373 from njcuk9999/neil. [Neil Cook]
  Neil - runs with H4RG set up in data from 2018-04-09
- Changed encoding (copy/paste/revert) – ignore. [njcuk9999]
- Fixed log to not wrap this text - ONLY. [njcuk9999]
- Changed name of sub-module. [njcuk9999]
- Fixed cyclic imports (new sub-module - spirouBERV) [njcuk9999]
- Fixed cyclic imports. [njcuk9999]
- Added *character_ log_ length* pseudo constant. [njcuk9999]
- Added maximum log length (wraps to new row with a tab) wraps words but still problem with long filenames. [njcuk9999]
- Fixed typo in Merge from @FrancoisBouchy. [njcuk9999]
- Fixed cyclic importing and typos in keyword assignment. [njcuk9999]
- Fixed cyclic importing. [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Bring S1D *(cal_ extract)* in-line with rest of DRS (Fixing merges from @FrancoisBouchy) [njcuk9999]
- Added spirouTelluric to modules list. [njcuk9999]
- Fix pep8 issues (in-line comment should have at least two spaces between code and comment. [njcuk9999]

- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Merge @FrancoisBouchy changes - still need fixing (PEP8 and integration) [njcuk9999]
- Fix needed commented code (commented for testing) –> uncommented now. [njcuk9999]
- Updated *construct_convolution_kernal2* function. [njcuk9999]
- Added teullric aliases. [njcuk9999]
- Added *tellu_fit_tellu_spline_plot* function. [njcuk9999]
- Update ConstructConvKernel2 function. [njcuk9999]
- Continued to merge Etiennes code. [njcuk9999]

5.3.1.781 0.2.065 (2018-07-13)

- Add functions: *calculate_absorption_pca*, *get_berv_value*. [njcuk9999]
- Add telluric aliases. [njcuk9999]
- Add functions *get_database_tell_template*, *update_database_tell_temp*. [njcuk9999]
- Continue to integrate functions. [njcuk9999]
- Correct duplication of header is None. [njcuk9999]
- Added telluric alias. [njcuk9999]
- Added telluric pca plot. [njcuk9999]
- Corrected bad function call to GetNormalizedBlaze and duplicated call to loc=ParamDict() [njcuk9999]
- Moved getting berv to spirouTelluric. [njcuk9999]
- First attempt at integrating code (unfinished) [njcuk9999]
- Add keys defined in functions. [njcuk9999]
- Add new TDB aliases. [njcuk9999]
- Correct access to telluric database and update telluric database. [njcuk9999]
- First commit - direct integration of *mk_template.py* from Etienne. [njcuk9999]
- First commit - blank. [njcuk9999]
- Updated where we get the telluric molecular file (now from database) [njcuk9999]
- Added getting of absolute path for telluric files. [njcuk9999]
- Added switch between telluricand calibration databases. [njcuk9999]
- Added aliases from TDB. [njcuk9999]
- Added get and update functions (wrapping generic functions in spirouDB) [njcuk9999]
- Added todo's to make general. [njcuk9999]
- First commit - generic functions for database management. [njcuk9999]

5.3.1.782 0.2.076 (2018-07-13)

- New correlation Mask made by XD. [FrancoisBouchy]
- Background correction and set negative values to zero Read Blaze function Compute S1D spectra and archive it. [FrancoisBouchy]
- Background correction and negative values set to zero. [FrancoisBouchy]
- Typo correction to read the fitted lines. [FrancoisBouchy]
- New constant parameters for background correction and e2dstos1d. [FrancoisBouchy]
- Adaptation of function to measure the global background in the image. [FrancoisBouchy]
- Add the two new functions e2dstos1d and *write_s1d*. [FrancoisBouchy]
- New function to write S1D spectra with the same format than HARPS. [FrancoisBouchy]
- New function to build S1D spectra. [FrancoisBouchy]

5.3.1.783 0.2.064 (2018-07-12)

- First commit - added *obj_mk_tellu* functions. [njcuk9999]
- Added spirouTelluric aliases. [njcuk9999]
- Added wave param aliases. [njcuk9999]
- Added read andget wave param functions. [njcuk9999]
- Added plot for *obj_mk_tellu*. [njcuk9999]
- Added file name definitions for *obj_mk_tellu*. [njcuk9999]
- Added *obj_mk_tellu* to recipe control. [njcuk9999]
- Added *obj_mk_tellu* constants. [njcuk9999]
- Integrated *obj_mmk_tellu* into spirou drs (rea/write/constants etc) [njcuk9999]
- Added saving of wave parameters to header of E2DS. [njcuk9999]
- Remove. [njcuk9999]
- Copy of etiennes raw *mk_tellu* code. [njcuk9999]
- Added imports to python local namespace (for embeded run after code finish) [njcuk9999]
- Blank files for telluric functions. [njcuk9999]
- First commit of the spirou visu GUI. [njcuk9999]
- First commit of *obj_mk_tellu* - processing the telluric files and adding them to telluDB. [njcuk9999]

5.3.1.784 0.2.063 (2018-07-11)

- Add *master_tellu_spirou* file. [njcuk9999]
- Add *cal_wave_mapper* to recipe control file. [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Add reset tellu to *drs_reset* functions. [njcuk9999]
- Adde *dcal_wave_mapper* to recipe list (and unit recipe) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) + added printing of tilt/wave/blaze/flat file used. [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Fixed bug: *hdr['KW_X'] –> hdr[p['KW_X'][0]]* [njcuk9999]
- Add telluDB constants. [njcuk9999]
- Add telluDB (for now a copy of spirouCDB - but will change) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Update *cal_wave_mapper* (as main function with returns to local) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]
- Rename calibDB module: spirouCDB –> spirouDB (to add telluric database) [njcuk9999]

5.3.1.785 0.2.062 (2018-07-10)

- Added filename functions *(WAVE_ MAP_ SPE_ FILE* and *WAVE_ MAP_ SPE0_ FILE)* [njcuk9999]
- Added filenames in spirouConfig. [njcuk9999]
- Define todos. [njcuk9999]
- Fix bug: *night_ name* should only be a string (could be a int) [njcuk9999]
- Update to accept multiple fibers AB and C or A B and C or any combination. [njcuk9999]
- Change the files tested. [njcuk9999]
- Fix to a bug *ll_ line_ cat –> ll_ line_ fit.* [njcuk9999]
- E2ds back projection - first commit. [njcuk9999]
- Fix for choice of fiber(s) [njcuk9999]

5.3.1.786 0.2.061 (2018-07-09)

- Removed berv calculation from RV module. [njcuk9999]
- Added *print_ full_ table* function. [njcuk9999]
- Updated aliases and _ _ all_ [njcuk9999]
- Updated aliases and _ _ all_ [njcuk9999]
- Updated aliases and _ _ all_ [njcuk9999]
- Moved earth barycentric correction here. [njcuk9999]
- Test fitting versus interpolation. [njcuk9999]
- Updated test to only show "good" orders. [njcuk9999]
- Fixed a comment and updated the berv variable. [njcuk9999]
- Fixed logging all analysed files and printing to screen. [njcuk9999]
- Fixed *off_ listing* printing only a few rows (now prints all) [njcuk9999]
- Moved berv calculation to extraction. [njcuk9999]
- Moved berv calculation to extraction. [njcuk9999]

5.3.1.787 0.2.060 (2018-07-05)

- Fix and test of *find_ lines.* [Neil Cook]

5.3.1.788 0.5.033 (2018-07-04)

- Merge pull request #372 from njcuk9999/neil. [Neil Cook] Neil
- Update changelog/date/version. [Neil Cook]

5.3.1.789 0.2.059 (2018-07-04)

- Update change log. [Neil Cook]
- Update change log. [Neil Cook]
- The output changelog. [Neil Cook]
- Added functionality to update VERSION.txt and the version in the *spirouConst.py* file. [Neil Cook]
- DRS version added to VERSION.txt. [Neil Cook]
- Recipe to get/update change log (moved to spirouTools - final location) [Neil Cook]
- Recipe to get/update change log. [Neil Cook]
- Output: the change log (backup) [Neil Cook]
- Recipe to update change log. [Neil Cook]
- Merge pull request #371 from njcuk9999/neil. [Neil Cook] Neil

5.3.1.790 0.2.074 (2018-07-04)

- Removed duplicated function *calculate_stokes_I* in spirouPOLAR.py. [Eder]

5.3.1.791 0.2.058 (2018-07-03)

- Add generic change log (not used but for history) [Neil Cook]
- Make sure object name is "good" with function: *get_good_object_name.* [Neil Cook]
- Correct typo. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Remove change log. [Neil Cook]
- Add *user_dir* and *cal_reset* constants. [Neil Cook]
- Add pp mode variable. [Neil Cook]
- Update using the DRS with H4RG example. [Neil Cook]
- Update todo list (remove done + add new) [Neil Cook]
- Update quick installation. [Neil Cook]
- Update output keywords (not finished) [Neil Cook]
- Update installation. [Neil Cook]
- Update input keywords. [Neil Cook]
- Update date architecture. [Neil Cook]
- Removed old change log. [Neil Cook]
- Add *pp_mode* (the way to switch on/off) file type suffix adding. [Neil Cook]
- Add output files to p (and thus sent back to main() function call) [Neil Cook]
- Update commentation. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #370 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #369 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge remote-tracking branch 'origin/dev' into dev. [Neil Cook]
- Updated doc strings to be consistent with rest of DRS. [Neil Cook]
- Merge pull request #368 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed runs + some very minor fixes to pep8
- Update *pol_spirou.py.* [Neil Cook]
  fix to pep8
- Update spirouPOLAR.py. [Neil Cook]
  fix to pep8
- Merge pull request #367 from njcuk9999/eder. [Neil Cook]
  Eder
- Update spirouPlot.py. [Neil Cook]
  pep 8 fixes
- Improved polar continuum routine. [Eder]
- Improved polar continuum routine. [Eder]
- Swap exposure 3 and 4 to agree with actual SPIRou sequence, and added doc string to spirouPolar functions. [Eder]
- Swap exposure 3 and 4 to agree with actual SPIRou sequence, and added doc string to spirouPolar functions. [Eder]
- Fixed bugs in plot and added new keywords to polar products. [Eder]
- Fixed bugs in plot and added new keywords. [Eder]
- Updated module definitions in spirouPOLAR. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and version. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Added variable definitions to wave solution section and qulaity control section. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated date and version. [Neil Cook]

5.3.1.792 0.5.031 (2018-06-29)

- Merge pull request #366 from njcuk9999/neil. [Neil Cook]
  Neil - just document changes and some code clean up.
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Added variabels to *cal_hc/cal_wave* variable definitions. [Neil Cook]
- Added more *cal_hc/cal_wave* variable definitions. [Neil Cook]
- Removed old *cal_hc* constants. [Neil Cook]
- Removed old *cal_hc* code. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Update version, date and module root definitions. [Neil Cook]
- Update variable definitions. [Neil Cook]

5.3.1.793 0.5.030 (2018-06-28)

- Merge pull request #364 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.794 0.2.057 (2018-06-28)

- Updated date and version and added new recipes. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added more variable definitions. [Neil Cook]
- Update to variables - adding new ones. [Neil Cook]
- Update to comment. [Neil Cook]
- Tried to speed up plotting + fixed a bug with call to spirouTHORCA.GetLampParams (now requires header) [Neil Cook]
- Fix python 2/python 3 incompatibility with numpy change. [Neil Cook]
- Fix call to *fiber_params* change (from circular import bug) [Neil Cook]
- Doc string update - requires spirouPOLAR command. [Neil Cook]
- Fix circulate import bug –> move *fiber_params* from spirouLOCOR to spirouFile and update calls accordingly. [Neil Cook]

5.3.1.795 0.2.075 (2018-06-28)

- *Visu_WAVE_spirou.py*: correct call to GetLampParams. [melissa-hobson]

5.3.1.796 0.2.056 (2018-06-27)

- First commit of spirouPOLOAR module tex file. [Neil Cook]
- Update main init. [Neil Cook]
- Add spirouPOLAR to aliases. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Move functions around and add todo/fixme. [Neil Cook]
- Doc string update. [Neil Cook]
- Update date and version. [Neil Cook]
- Rebuild pdf after doc string update. [Neil Cook]

- Update date and versions. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Doc string update. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #361 from njcuk9999/neil. [Neil Cook]
  Neil
- Added new tool to calculate barycentric velocity and add it to the header of the input file. [Neil Cook]
- Added a skip check to *check_file*. [Neil Cook]

5.3.1.797 0.2.055 (2018-06-26)

- Added *cal_hc* and *cal_wave* to unit test definitions. [Neil Cook]
- Fix to *cal_HC* and *cal_WAVE* added to unit test runs. [Neil Cook]
- Added printout of max time for calibDB. [Neil Cook]
- Added *cal_HC*, *cal_WAVE* (and setup for *cal_WAVE_NEW)* to all run. [Neil Cook]
- We have FIBER therefore use FIBER not *FIB_TYP*, modified error reporting give we use header keys. [Neil Cook]
- Fixed bug that allows reduced files to be None (should be found by file name or generate error) [Neil Cook]
- Added e2dsff files to recipe control for *cal_HC* and *cal_WAVE*, added *cal_WAVE_NEW* files (same as *cal_WAVE)* [Neil Cook]
- Fixed typo (bug?) [Neil Cook]
- Updated to work with odometer identification (like rest of DRS) [Neil Cook]
- Merge pull request #360 from njcuk9999/melissa. [Neil Cook]
  Melissa
- Update spirouTHORCA.GetLampParams to identify lamp type from fiber position header key Update all functions using GetLampParams *(cal_HC*, *cal_WAVE*, *cal_WAVE_NEW) visu_WAVE)* to pass the header. [melissa- hobson]
- *Visu_WAVE_spirou*: higher base level for lines. [melissa-hobson]
- Update for *visu_WAVE_spirou.py* - now working. [melissa-hobson]
- *Cal_HC_E2DS_spirou.py*: added fiber position identification from fiber type *spirouTHORCA.decide_on_lamp_type*: - changed to identify lamp from fiber position (for use w/odometer names) - previous version moved to *decide_on_lamp_type_old*. [melissa-hobson]
- *Cal_HC_E2DS_spirou.py*: added fiber position identification from fiber type *spirouTHORCA.decide_on_lamp_type*: - changed to identify lamp from fiber position (for use w/odometer names) - previous version moved to *decide_on_lamp_type_old*. [melissa-hobson]
- Update for use with e2dsff files as well as e2ds files. [Neil Cook]
- Merge pull request #357 from njcuk9999/neil. [Neil Cook]
  Neil
- Fixed bug in header key *berv_max*. [Neil Cook]
- Add calibDB setup to *cal_validiate*. [Neil Cook]
- Add BERV corrections to header. [Neil Cook]
- Update *pol_spirou.py*. [Neil Cook]
  code duplicated in bad merge @edermartioli
- Merge pull request #356 from njcuk9999/eder. [Neil Cook]
  Eder
- Reset config.py. [Eder]
- Merging changes. [Eder]
- Merge branch 'master' into eder. [Eder]
- Updates from master. [Eder]
- Update output name without _A, save errors to output using WriteImageMulti. [Eder]
- Update output name without _A, save errors to output using WriteImageMulti. [Eder]
- Update output name without _A, save errors to output using WriteImageMulti. [Eder]
- Merged master and resolved conflict in *pol_spirou*. [Eder]

- Implemented total flux (Stokes I) calculation. [Eder]
- Merge branch 'master' into eder. [Eder]
- Merge pull request #354 from njcuk9999/neil. [Neil Cook]
  Neil - confirmed test of H4RG
- Added *cal_preprocess*, *off_listing*, *visu_raw*, *visa_e2ds* and *pol_spirou* to the unit testing. [Neil Cook]
- Modified a warning message to be slightly more descriptive. [Neil Cook]
- Merge pull request #353 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #351 from njcuk9999/dev. [Neil Cook]
  Dev
- Revert changes to get wave solution from calibDB (errors were due to badly set up calibDB) [Neil Cook]
- Merged changes from @edermartioli: added alias to *calculate_stokes_I* and added aliases to *__all__* [Neil Cook]
- Merged changes from @edermartioli: Update output name with *_A*, save errors to output using WriteImageMulti, Implemented total flux (Stokes I) calculation, implemented polarimetric error calculation. [Neil Cook]
- Merged changes from @edermartioli: aqdded stokesI plot, spelling correction + polarisation is now percentage (bug was missing in conversion) [Neil Cook]
- Merged changes from @edermartioli: Update output name with *_A*, save errors to output using WriteImageMulti, Implemented total flux (Stokes I) calculation, implemented polarimetric error calculation. [Neil Cook]
- Added warning in *config.py* to not change PATHs here (todo in docs) [Neil Cook]
- Merged changes from @edermartioli: Update output name with *_A*, save errors to output using WriteImageMulti, Implemented total flux (Stokes I) calculation, implemented polarimetric error calculation. [Neil Cook]
- Merge pull request #350 from njcuk9999/neil. [Neil Cook]
  Neil
- Issue #348 - fixed definition of WLOG in spirouPlot ("sometimes" causes a crash sometimes doesn't) [Neil Cook]
- Update date and version. [Neil Cook]
- Undo bad merge by @melissa-hobson. [Neil Cook]
- *Cal_HC_E2DS_spirou.py*: added fiber position identification from fiber type *spirouTHORCA.decide_on_lamp_type*: - changed to identify lamp from fiber position (for use w/odometer names) - previous version moved to *decide_on_lamp_type_old*. [melissa-hobson]
- Update date and version. [Neil Cook]
- Fix for loggers being out of range. [Neil Cook]

5.3.1.798 0.2.073 (2018-06-26)

- *Cal_HC_E2DS_spirou.py*: added fiber position identification from fiber type *spirouTHORCA.decide_on_lamp_type*: - changed to identify lamp from fiber position (for use w/odometer names) - previous version moved to *decide_on_lamp_type_old*. [Melissa Hobson]
- *Cal_HC_E2DS_spirou.py*: added fiber position identification from fiber type *spirouTHORCA.decide_on_lamp_type*: - changed to identify lamp from fiber position (for use w/odometer names) - previous version moved to *decide_on_lamp_type_old*. [Melissa Hobson]
- Log calibDB match method. [melissa-hobson]
- *Cal_WAVE_NEW_E2DS_spirou.py*: first version (untested) [melissa-hobson]
- Merge pull request #347 from njcuk9999/master. [melissa-hobson]
  Melissa
- Merge pull request #345 from njcuk9999/neil. [Neil Cook]
  Neil - confirmed tested on H4RG files
- Fixed to run with new setup. [Neil Cook]
- Fix for warninglogger. [Neil Cook]
- Log handled exits! [Neil Cook]
- Fixed setup for badpix. [Neil Cook]
- Fix set up changes. [Neil Cook]

- Update set up begin function. [Neil Cook]
- Updated setup (use of spirouStartup.Begin) [Neil Cook]
- Dealt with recipe name handling better. [Neil Cook]
- Fix program with recipe name instead of sys.argv (unless not present) [Neil Cook]
- Fix recipe setup. [Neil Cook]
- Updated master time. [Neil Cook]
- Fixed system exit quitting automated run. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Now cleaning WLOG in *run_begin* (via *WLOG.clean_log()*), and added *main_end_script* (to push logging to p and run *clean_log)* [Neil Cook]
- Added function *write_image_multi* (aliased to WriteImageMulti) to save multiple extensions to filename - for @edermartioli and the *pol_spirou* code specifically. [Neil Cook]
- Defined logger function into class (allows storage or any errors/warnings/info and piping back into p at the end of recipe. Must clear WLOG at start and end of recipes! [Neil Cook]
- Fix for issue #337 - add e2dsff as well as e2ds (defaults to e2dsff if present) and added *log_storage_keys* pseudo variable. [Neil Cook]
- Updated trigger to add error and logger values to HISTORY.txt. [Neil Cook]
- Updated recipes main end script (to allow piping of logging into p - thus accessible outside via *ll['p']['LOGGING_ERROR']* for example. [Neil Cook]
- *Cal_WAVE_NEW_E2DS_spirou.py*: first version (untested) [melissa-hobson]
- Merge pull request #344 from njcuk9999/master. [melissa-hobson] Update
- Merge pull request #343 from njcuk9999/neil. [Neil Cook] Neil
- Fix to print out. [Neil Cook]
- Updated files for reset. [Neil Cook]
- Added new wavesolution to cal reset. [Neil Cook]
- Merge pull request #342 from njcuk9999/neil. [Neil Cook] Work on Issue #338
- Work on Issue #338 - added possibility to enter debug mode and added the table printed to screen. [Neil Cook]
- Update date and version. [Neil Cook]
- Merge pull request #341 from njcuk9999/neil. [Neil Cook] fix - spirouUnitRecipes.wrapper requires true python strings
- Fix - spirouUnitRecipes.wrapper requires true python strings. [Neil Cook]
- Merge pull request #340 from njcuk9999/dev. [Neil Cook] Dev
- Added catch of warnings with polyfit. [Neil Cook]
- Added catch warning for polyfit, fixed bug with *lamp_type* in *decide_on_lamp_type*. [Neil Cook]
- Added missing plot function *(wave_fp_wavelength_residuals)*, added iteration number to plots for *wave_littrow_check_plot* and *wave_plot_final_fp_order*. [Neil Cook]
- Added doc string to *cal_HC* main function. [Neil Cook]
- Merge pull request #339 from njcuk9999/francois. [Neil Cook] Merge Francois to Dev
- Work on issue #337: modified *decide_on_lamp_type* function to accept *ic_lamps* values as lists (and iterate through) - still must only have one of the two. [Neil Cook]
- Updated constants in H2RG to match H4RG. [Neil Cook]
- Work on issue #337: changed *ic_lamps* values to be lists + cleaned up constants (pep8) [Neil Cook]
- Work on Issue #337: slight clean up of @FrancoisBouchy changes. Renamed part1b to part2 and commented out old part 2. [Neil Cook]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
- Merge pull request #336 from njcuk9999/neil. [Neil Cook] Neil
- Part 1b created as a copy of Part 2 and Modified Part 1b repeats the Littrow extrapolation for the second pass The second Littrow extrapolation is used for to join orders Part 2 is no more useful and we do not need CCF. [FrancoisBouchy]
- Adaptation of all the parameters for *cal_HC ic_lamps* still need to be adapted for hc1 and hcone exposures. [FrancoisBouchy]

- Change e2ds with e2dsff to define the wave filename but it will be useful to keep both possibility (e2ds and e2dsff) Correction on the format of the wave filename. [FrancoisBouchy]
- Define *ord_start* and *ord_final* for the first guess solution Compute correctly E2DS orders from echelle orders for the display LOG Display the right number of good lines Count the total number of good lines Add possibility to change Littrow fit degree for the two iterations For second iteration the initial catalog is used again Let the possibility to join extrapolated orders in the blue *ll_free-span* set as a list of two parameters in COnstante File Require at least 4 points to fit a Gaussian Order limits are define with min and max of *ll_lines*. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
  Conflicts:
  INTROOT/SpirouDRS/spirouEXTOR/spirouEXTOR.py *INTROOT/bin/off_listing_RAW_spirou.py*
- Merge pull request #334 from njcuk9999/master. [melissa-hobson]
  update branch
- *Cal_WAVE_NEW_E2DS_spirou.py*: first version (untested) [melissa-hobson]
- Merge pull request #328 from njcuk9999/master. [melissa-hobson]
  Update Melissa branch
- Fitgaus - python version. [melissa-hobson]
  Python version of the fitgaus.f functions. - contains two versions of Gauss-Jordan algorithm, an exact copy of the fortran code with all loops *(gaussj_fortran)* and an attempt to make it more efficient via numpy (gaussj, but is currently slower). - function covstr was omitted as it does nothing in our use case.
- Merge pull request #321 from njcuk9999/master. [melissa-hobson]
  Update branche
- Merge pull request #286 from njcuk9999/master. [melissa-hobson]
  update
- Merge pull request #273 from njcuk9999/master. [melissa-hobson]
  update melissa
- Merge pull request #269 from njcuk9999/master. [melissa-hobson]
  update melissa

5.3.1.799 0.2.052 (2018-06-21)

- Implemented polarimetric errors calculation. [Eder]
- Implemented polarimetric errors calculation. [Eder]
- Changed polarimetry stuff to adapt changes made by Neil. [Eder]
- Config.py. [Eder]
- Merge branch 'eder' of *https://github.com/njcuk9999/spirou_py3* into eder. [Eder]
  No big changes, just testing a few things

5.3.1.800 0.2.051 (2018-06-20)

- No main file. [Neil Cook]
- Must use unit test to run recipes. [Neil Cook]
- Undo print test. [Neil Cook]
- Updated chmod. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #335 from njcuk9999/neil. [Neil Cook]
  Neil
- Fixes to main raw trigger. [Neil Cook]
- Corrected bug where *OFF_LISTING_FILE* was missing. [Neil Cook]
- Corrected bug where no night name does give good error. [Neil Cook]
- Fixed bug that *arg_night_name* and files not checked any more. [Neil Cook]
- Fixed bug with no DRPTYPE assigned. [Neil Cook]
- Modified recipe control (added order and detector validity) [Neil Cook]
- Fisrt commit - raw file trigger *(cal_dark* to *cal_extract)* [Neil Cook]
- Merge pull request #333 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.801 0.2.049 (2018-06-19)

- Corrected bug in *night_name* error reporting. [Neil Cook]
- Updated documentation (function definitions) [Neil Cook]
- Improved functionality in reset (allow reset of calibDB or reduced or log or all via user input) [Neil Cook]
- Improved reporting of bad night name. [Neil Cook]
- Removed old misc files. [Neil Cook]
- Add obj name to raw files if no other suffix added (for objects) [Neil Cook]
- Added preprocessed trigger (for automating pre-processing on *DRS_RAW_DATA* directory) [Neil Cook]
- Fixed bug with processed suffix. [Neil Cook]

5.3.1.802 0.2.050 (2018-06-19)

- Changed config to my local paths. [Eder]
- Put config back. [Eder]
- Non. [Eder]
- Merge pull request #332 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #331 from njcuk9999/neil. [Neil Cook]
  Neil
- Update config.py. [Neil Cook]
  removed master need for user config file

5.3.1.803 0.2.048 (2018-06-18)

- Rebuilt pdfs. [Neil Cook]
- Updated doc strings. [Neil Cook]
- Updated author list. [Neil Cook]
- Udpated date and version and added spirouFile command. [Neil Cook]
- Updated some function descriptions. [Neil Cook]
- Issue #330 - fixed comment description. [Neil Cook]
- Issue #330 - fix WLOG message. [Neil Cook]
- Issue #330 - add *pol_spirou* to recipe control. [Neil Cook]
- Issue #330 - fix entry value, set sources keys, and float(nexp) −> int(nexp) [Neil Cook]
- Issue #330 - change scatter −> plot. [Neil Cook]
- Issue #330 - add keyword *kw_CMMTSEQ*. [Neil Cook]
- Issue #330 - fix constant value (run tested correction) [Neil Cook]
- Issue #330 - fix setup and a few other minor (run tested correction) [Neil Cook]
- Fix bug and cleanup the imports. [Neil Cook]
- Renamed and chmod files. [Neil Cook]
- Renaming file. [Neil Cook]
- Rename file. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
  Conflicts:
    INTROOT/SpirouDRS/spirouConfig/spirouConst.py
- Merge pull request #329 from njcuk9999/dev. [Neil Cook]
  Dev
- Issue #330 - Adding plots for polarimetry. [Neil Cook]
- Issue #330 - alaises for spirouPOLAR. [Neil Cook]
- Issue #330 - re-write of SPIROU polarimetry module (for DRS compatibility class −> functions) [Neil Cook]
- Issue #330 - Adding keywords for polarimetry. [Neil Cook]
- Updated date and version. [Neil Cook]
- Issue #330 - Adding file name definitions for polarimetry. [Neil Cook]
- Issue #330 - Adding constants for polarimetry. [Neil Cook]
- Issue #330: integrating *pol_spirou* from @edermartioli into DRS format. [Neil Cook]

5.3.1.804 0.2.046 (2018-06-15)

- Fixed hidden bug (formats should be allowed to be None - chosen by astropy. [Neil Cook]
- Fixed hidden bug. [Neil Cook]
- Added extra check for bad key in WLOG (dev issue only) [Neil Cook]
- Added some keys (OBJNAME, *SBCDEN_P)* [Neil Cook]
- Updated date and version and added *OFF_LISTING_FILE* function. [Neil Cook]
- @FrancoisBouchy - Added commit: Creation of *off_listing_RAW_spirou* - modified to conform with DRS standards + functions + keywords + parameters. [Neil Cook]
- @FrancoisBouchy - Added commit: Flux ratio display with 3 digit. [Neil Cook]
- @FrancoisBouchy - Added commit: Background correction of the ref file. [Neil Cook]
- @FrancoisBouchy - Added commit: Correction to avoid division by zero. [Neil Cook]
- Merge pull request #327 from njcuk9999/neil. [Neil Cook]
  verified - tested all recipes on H2RG and H4RG (except *cal_HC*, *cal_WAVE* - which just run through to end - untested + unverified)

5.3.1.805 0.2.047 (2018-06-15)

- Flux ratio display with 3 digit. [FrancoisBouchy]
- Background correction of the ref file. [FrancoisBouchy]
- #300 Bug on the *fit_ccf* on individual orders to investigate. [FrancoisBouchy]
- Correction to avoid division by zero. [FrancoisBouchy]

5.3.1.806 0.2.045 (2018-06-14)

- Work on Issue #155 - fix for new single file return. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #326 from njcuk9999/neil. [Neil Cook]
  Neil
- Work on issues #167, #176 and #231 - first commmit spirouWAVE file with *cal_WAVE* (only) functions. [Neil Cook]
- Work on issues #167, #176 and #231 - renamed 'DATA' to 'HCDATA', moved *get_ll*, *get_dll* to spirouMath. [Neil Cook]
- Work on Issue #155 - modified *multi_file_setup* function and return of *single_file_setup* work on issues #167, #176 and #231 - modified custom getting of *args/load_arguments* to help with *cal_wave*. [Neil Cook]
- Moved *get_dll* to spirouMath. [Neil Cook]
- Work on issues #167, #176 and #231 - added *read_hcref*, fixed bug with NBFRAMES *append_source –> set_source*. [Neil Cook]
- Work on Issue #155 - fixing bugs for multi file setup (custom) [Neil Cook]
- Added aliases. [Neil Cook]
- Added aliases. [Neil Cook]
- Renamed *correct_flat* to *get_flat*. [Neil Cook]
- Added aliases. [Neil Cook]
- Work on issue #167, #176, #231 - added *wave_plot_instrument_drift*, *wave_plot_final_fp_order*, *wave_local_width_offset_plot*, and *wave_fp_wavelength_residuals*. [Neil Cook]
- Moved *get_ll_from_coefficients* and *get_dll_from_coefficients* here. [Neil Cook]
- Added aliases. [Neil Cook]
- Updated date and version. [Neil Cook]
- Modified comment. [Neil Cook]
- Work on Issue #176, #167, #231 - added constants. [Neil Cook]
- Work on Issue #176, #167, #231. [Neil Cook]
- Work on Issue #155 - modified return of recipe. [Neil Cook]
- Work on Issue #155 - modified return of recipe. [Neil Cook]
- Work on Issue #155 - modified return of recipe. [Neil Cook]
- Work on Issue #155 - modified return of recipe. [Neil Cook]

5.3.1.807 0.2.044 (2018-06-13)

- Modified run order. [Neil Cook]
- Work on issue #176 - changes from variable names (in line with other recipes) [Neil Cook]
- Work on issue #155 - modified *initial_file_setup*, added *single_file_setup* and *multi_file_setup*, set todo's to remove now obsolete functions, added new *get_file* function. [Neil Cook]
- Added aliases. [Neil Cook]
- Added rotate function, fix non pre-processed files function. [Neil Cook]
- Work on issue #155 - finished id checking functions. [Neil Cook]
- Added aliases. [Neil Cook]
- Updated date and version, shortened *log_opt* (no suffix just program name) [Neil Cook]
- Shorterned calibration –> cal. in log messages (for copying/not copying cal files) [Neil Cook]
- Work on issue #155 - added more files to control. [Neil Cook]
- Updated constant name. [Neil Cook]
- Added constants (preprocessing, exposuremeter, *cal_hc*, *cal_wave)* [Neil Cook]
- Fix for non pre-processed files. [Neil Cook]
- Fixed bug in gfkwargs. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for non pre-processed files. [Neil Cook]
- Made rotation a function based on a given rotation from constant. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for non pre-processed files. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for non pre-processed files, added H2RG compatibility fix. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for non pre-processed files. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for non pre-processed files. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for H2RG compatibility, added H4RG kw objects needed for berv calculation. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via SingleFileSetup + MultiFileSetup) [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via SingleFileSetup) [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via SingleFileSetup) [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via InitialFileSetup), fix for H2RG compatibility. [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via SingleFileSetup) [Neil Cook]
- Work on issue #155 - modified set up to accommodate checks via filename and header (via SingleFileSetup) [Neil Cook]

5.3.1.808 0.2.043 (2018-06-12)

- Work on issue #155 - added recipe control file. [Neil Cook]
- Work on issue #155 - (un-finished) added new *initial_file_setup* and get file (now use *single_file_setup)* [Neil Cook]
- Work on issue #155 - modified *read_header* to optionally return comments. [Neil Cook]
- Work on issue #155 - added ID functions. [Neil Cook]
- Work on issue #155 - reworked aliases and _ _ *ALL* _ _ [Neil Cook]
- Work on issue #155 - updated DPRTYPE comment. [Neil Cook]
- Work on issue #155 - added some required keywords. [Neil Cook]
- Work on issue #155 - rearranged some constants, added data constant directory. [Neil Cook]
- Work on issue #155 - changed import to deal with change in location of spirouFile. [Neil Cook]
- Work on issue #155 - test of ID-ing files. [Neil Cook]
- Work on issue #155 - added section to ID files and modify the header accordingly (based on filename OR

header keys) [Neil Cook]

- Merge pull request #325 from njcuk9999/neil. [Neil Cook]
  updated date and version
- Merge pull request #324 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.809 0.2.041 (2018-06-11)

- Updated date and version. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added two masks for *cal_HC*. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - updated keywords, renamed some loc variables (for clarity) [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added some fixes to coravelation (to accommodate *cal_hc)* [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added merge table and added some fixes to small bugs. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added alias to *spirouTable.merge_table* (MergeTable) [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added FWHM calculation (from sigma) [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added keywords for *cal_hc*. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added wave file output filename definitions. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added constants. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - output to file + ccf calculation (from *cal_CCF* mainly) [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - fixed value of FWHM from sigma. [Neil Cook]

5.3.1.810 0.2.039 (2018-06-08)

- Continued work on *cal_HC* (Issue #176) - test of fit gauss functions. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - modified *first_guess_at_wave_solution*, *detect_bad_lines*, *fit_1d_solution*, *calculate_littrow_sol*, *extrapolate_littrow_sol*, *second_guess_at_wave_solution*. Added *join_orders*. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added alias to *spirouTHORCA.join_orders* (JoinOrders) [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added *wave_littrow_check_plot* and corrected *wave_littrow_extrap_plot*. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - corrected imports and a bug in fitgaussian functions. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added how to compile fortran. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - python version of fitgaus by @melissa-hobson. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added new constants. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) - added new constants. [Neil Cook]
- Continued work on *cal_HC* (Issue #176) [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- Merge pull request #323 from njcuk9999/dev. [Neil Cook]
  Dev

5.3.1.811 0.2.036 (2018-06-07)

- Find lines test *(cal_HC* test) [njcuk9999]
- Continued work on *cal_HC* - aliases for new THORCA functions. [njcuk9999]
- Continued work on *cal_HC* - wave littrow plot. [njcuk9999]
- Continued work on *cal_HC* - experimentation with fitting. [njcuk9999]
- Continued work on *cal_HC*. [njcuk9999]
- Continued work on *cal_HC* - constants for *cal_HC*. [njcuk9999]
- Continued work on *cal_HC*. [njcuk9999]

5.3.1.812 0.2.037 (2018-06-07)

- Added default user config path. [Neil Cook]
- Added my path. [Neil Cook]
- Merge pull request #322 from njcuk9999/dev. [Neil Cook]
  Dev
- @FrancoisBouchy changes - merge confirmed, added some pe8 and comments and simplifications. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed + added *ff_rms_plot* function. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed + added *ff_rms_plot_skip_orders*. [Neil Cook]
- Added *ff_rms_plot_skip_orders* (blank for H2RG) [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed, moved plotting to spirouPlot. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed, some pep8 and commenting. [Neil Cook]
- @FrancoisBouchy changes - merge confirmed. [Neil Cook]

5.3.1.813 0.2.035 (2018-05-29)

- Fix matplotlib bug. [njcuk9999]
- Fix small bug. [njcuk9999]
- Update date and version. [njcuk9999]
- Merge pull request #319 from njcuk9999/neil. [Neil Cook]
  Neil
- Update config.py. [njcuk9999]
- Re-added BERV correction just for H4RG. [njcuk9999]
- Added masks to correct folder. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- Merge pull request #318 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #317 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #316 from njcuk9999/cfht. [Neil Cook]
  new masks added on data
- New masks added on data. [Spirou DRS]
- Added new SpirouDRS data directories. [njcuk9999]
- Added new SpirouDRS data directories. [njcuk9999]
- Added new SpirouDRS data directories. [njcuk9999]
- Added new SpirouDRS data directories. [njcuk9999]
- Sorted SpirouDRS data folder. [njcuk9999]
- Barycorrpy leap sec files (moved to drs) [njcuk9999]
- Added constant for berv (ccf) [njcuk9999]
- Updated ccf function. [njcuk9999]
- Edited ccf. [njcuk9999]

5.3.1.814 0.2.034 (2018-05-28)

- Updated for *cal_hc*. [njcuk9999]
- Removed redundant comment. [njcuk9999]
- Added test from old drs. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]
- Merge pull request #314 from njcuk9999/neil. [Neil Cook]
  updated date and version number
- Merge pull request #313 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #312 from njcuk9999/neil. [Neil Cook]
  Update *cal_CCF_E2DS_spirou.py*
- Update value for speed of light, added *invert_1ds_ll_solution*. [njcuk9999]
- Added new trial method to newbervmain (using barycorrpy) [njcuk9999]

5.3.1.815 0.2.033 (2018-05-26)

- Updated date and version number. [njcuk9999]
- Update tests with CCF test. [njcuk9999]
- Update h2rg constant file (to be same as h4rg) [njcuk9999]
- Fix typos. [njcuk9999]
- Fix runtime errors on ccf test (set order to empty) [njcuk9999]
- Added ee. [njcuk9999]
- Removed fortran code. [njcuk9999]
- Update unit tests. [njcuk9999]
- Update fortran codes. [njcuk9999]
- Updated script doc string. [njcuk9999]
- Update unit tests *(cal_FF_raw* needs *flat_flat)* [njcuk9999]
- Synced h2rg and h4rg. [njcuk9999]
- Correct the comments and indentation of the background. [njcuk9999]
- Merge branch 'francois' into neil. [njcuk9999]
  Conflicts:
  > INTROOT/SpirouDRS/spirouConfig/spirouKeywords.py INTROOT/SpirouDRS/spirouRV/spirouRV.py
  > *INTROOT/bin/cal_CCF_E2DS_spirou.py   INTROOT/bin/cal_FF_RAW_spirou.py   INTROOT/-*
  > *config/constants_SPIROU_H4RG.py*
- First wavelength solution added to SpirouDRS/data. [FrancoisBouchy]
- Telluric mask added on SpirouDRS/data. [FrancoisBouchy]
- Fortran module for BERV computation : Require f2py -c -m newbervmain –noopt –quiet newbervmain.f. [FrancoisBouchy]
- Update of *cal_CCF_E2DS* with target parameters and BERV computation from the fortran module newbervmain. [FrancoisBouchy]
- Update of *cal_DRIFT_E2DS_spirou*. Results now comparable to *cal_DRIFTPEAK_E2DS_spirou*. [FrancoisBouchy]
- Background correctionis now an option. [FrancoisBouchy]
- *Cal_FF_RAW_spirou* must run on *flat_flat* and provide flat and blaze for A, B, AB and C fibers. [FrancoisBouchy]
- New recipes to display the full spectral range of an E2DS file. [FrancoisBouchy]
- Typo on the name corrected. [FrancoisBouchy]
- Added CFHT parameters and option for background correction on *cal_DRIFT*. [FrancoisBouchy]
- Add targets keywords + Date of observations for *cal_CCF_E2DS_spirou*. [FrancoisBouchy]
- All wavelength are in nm. [FrancoisBouchy]
- #300 Bug on the *fit_ccf* on individual orders to investigate. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
  Conflicts:
  > INTROOT/SpirouDRS/spirouCore/spirouPlot.py   *INTROOT/bin/cal_DARK_spirou.py   INT-*
  > *ROOT/bin/cal_DRIFTPEAK_E2DS_spirou.py   INTROOT/bin/cal_extract_RAW_spirou.py*
  > *INTROOT/bin/visu_RAW_spirou.py INTROOT/config/constants_SPIROU_H4RG.py*

- @FrancoisBouchy change (merged by @njcuk9999) - why comment out this line? [njcuk9999]
- @FrancoisBouchy change (merged by @njcuk9999) - plot labels should be in nm not angstrom. [njcuk9999]
- @FrancoisBouchy change (merged by @njcuk9999) - added new required input HEADER keywords. [njcuk9999]
- @FrancoisBouchy change (merged by @njcuk9999) [njcuk9999]
- @FrancoisBouchy change (merged by @njcuk9999) [njcuk9999]
- @FrancoisBouchy change (merged by @njcuk9999) [njcuk9999]
- Update H2RG dependency flag. [njcuk9999]
- @ Francois Bouchy - fixed changes *dark_flat/flat_dark −> flat_flat.* [njcuk9999]

5.3.1.816 0.2.029 (2018-05-25)

- Update of *cal_DRIFT_E2DS_spirou.* Results now comparable to *cal_DRIFTPEAK_E2DS_spirou.* [FrancoisBouchy]
  (cherry picked from commit 86ee03b)
- @FrancoisBouchy added *earth_velocity_correction,* newbervmain functions and modified coravelation. [njcuk9999]
- @FrancoisBouchy - added alias to *earth_velocity_correction.* [njcuk9999]
- @FrancoisBouchy added read star parameters and earth velocity calculation. [njcuk9999]
- Merge remote-tracking branch 'origin/neil' into neil. [njcuk9999]

5.3.1.817 0.2.030 (2018-05-25)

- Worked on *fit_1d_solution* (complete?), added to doc strings (gparams) [njcuk9999]
- Added alias to *fit_1d_solution* (Fit1DSolution) [njcuk9999]
- Added new *cal_hc* variables. [njcuk9999]
- Change FirstGuessSolution mode to new (to avoid needing fortran fitgaus code) [njcuk9999]

5.3.1.818 0.2.031 (2018-05-25)

- Update *cal_CCF_E2DS_spirou.py.* [melissa-hobson]
  Changed filetype to accept all E2DS files.
- Merge pull request #311 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.819 0.2.026 (2018-05-18)

- Update readme. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Fixed bug when config files only have one or zero lines. [Neil Cook]
- Reset constant back to default. [Neil Cook]
- Fix to Issue #232 - added *cal_exposure_meter* to unit tests. [Neil Cook]
- Fix to Issue #232 - added *cal_exposure_meter* to unit tests. [Neil Cook]
- Fix to Issue #232 - add file names for *cal_exposure_meter.* [Neil Cook]
- Fix to Issue #232 - add different outputs. [Neil Cook]
- Fix to Issue #232 - add different outputs. [Neil Cook]
- Fix to Issue #232 - bug in applying badpixmask. [Neil Cook]
- Commented out work-in-progress function. [Neil Cook]
- Fix to Issue #232 - added *get_badpixel_map* and modified *correct_for_badpix* functions. [Neil Cook]
- Fix to Issue #232 - added exposure-meter functions to new sub-module in spirouImage. [Neil Cook]
- Fix to Issue #232 - added alias to *get_badpixel_map* function (GetBadPixMap) [Neil Cook]
- Fix to Issue #232 - added output keywords to spirouKeywords. [Neil Cook]
- Fix to Issue #232 - added telluric exposure meter maps to calibDB. [Neil Cook]
- Fix to Issue #232 - added expsoure-meter constants. [Neil Cook]
- Fix to Issue #232 - produce expsoure-meter recipe (compatible with H2RG and H4RG) [Neil Cook]

- Work on *cal_HC* (restore from bad merge) [Neil Cook]
- Merge pull request #310 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Added wavelength solution file for H4RG. [Neil Cook]
- Added H4RG wavelength solution files to the calib DB default files (for reseting) [Neil Cook]
- @FrancoisBoucy - 4 digit to diplay the dark statistics. [Neil Cook]
- @FrancoisBouchy - new lower limit in dark level plot (with H2RG compatibility) [Neil Cook]
- Fix error message in *get_database* (calibDB) [Neil Cook]
- Update default *master_calib_spirou* file (with H2RG and H4RG default wave solutions) [Neil Cook]
- Update date and version. [Neil Cook]
- @FrancoisBouchy - update to dark constants. [Neil Cook]
- @FrancoisBouchy - *visu_RAW_spirou* adapted for preprocessed files. [Neil Cook]
- @FrancoisBouchy - Use the wavelength solution from the calibDB, set all negative pixels to zero and update *ext_sorder_fit* upper limit. [Neil Cook]
- @FrancoisBouchy - Use the wavelength solution from the calibDB. [Neil Cook]
- @FrancoisBouchy - Quality control of the dark level on the blue part of the detector. [Neil Cook]
- Added recipe to reset (while in development only) [Neil Cook]

5.3.1.820 0.2.027 (2018-05-18)

- 4 digit to diplay the dark statistics. [FrancoisBouchy]
- Range adjusted to display Dark frame Blue window displayed in White Cut parameter added in extract plotting function Wavelength solution used in extract plotting function. [FrancoisBouchy]
- Dark constant and Dark quality control adjusted. [FrancoisBouchy]
- *Visu_RAW_spirou* adapted for preprocessed files. [FrancoisBouchy]
- Negative pixels are set to zero Read wavelength solution on calibDB Set the cut to *max_signal/10* to display the order location. [FrancoisBouchy]
- Use the first wavelength solution from the calibDB *spirou_wave_H4RG_v0.fits*. [FrancoisBouchy]
- Quality control of the dark level on the blue part of the detector. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
- Merge pull request #307 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
- Merge pull request #305 from njcuk9999/master. [FrancoisBouchy]
  Update README.md
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
  Conflicts:
     INTROOT/SpirouDRS/spirouEXTOR/spirouEXTOR.py   INTROOT/SpirouDRS/spirouImage/spirouImage.py   *INTROOT/bin/cal_BADPIX_spirou.py*   *INTROOT/bin/-cal_DRIFTPEAK_E2DS_spirou.py*   *INTROOT/bin/cal_extract_RAW_spirou.py*   *INTROOT/-config/constants_SPIROU_H4RG.py*

5.3.1.821 0.2.025 (2018-05-17)

- Fix to Issue #227 - added *cal_drift* and drift peak to tests. [Neil Cook]
- Fix to Issue #227 - added *cal_drift* and drift peak to tests. [Neil Cook]
- Fix to Issue #227 - added *cal_drift* and drift peak to tests. [Neil Cook]
- Work on issue #176 - Attempt to get First Guess solution working and detection of badlines. [Neil Cook]
- Work on issue #176 - Attempt to get First Guess solution working and detection of badlines (aliases) [Neil Cook]
- Work on issue #176 - added three *cal_HC* constants. [Neil Cook]
- Work on issue #176 - Attempt to get First Guess solution working and detection of badlines. [Neil Cook]

5.3.1.822 0.2.024 (2018-05-16)

- Removed dependency on *cal_ drift_ raw.* [Neil Cook]
- Updated test.run. [Neil Cook]
- Fix to Issue #227 - dealt with warnings for *cal_ driftpeak.* [Neil Cook]
- Updated date and version. [Neil Cook]
- Fake file comments added. [Neil Cook]
- Added fake *fp_ fp* files for drift (copies of *fp_fp_ 001)* [Neil Cook]
- Fix to Issue #227 - removed support for *cal_ drift_ raw_ spirou.* [Neil Cook]
- Fix to Issue #227 - removed *cal_ DRIFT_ RAW_ spirou.* [Neil Cook]
- Fix to Issue #227 - refactored warnlog. [Neil Cook]
- Fix to Issue #227 - added *cal_ drift* and drift peak to tests. [Neil Cook]
- Fix to Issue #227 - deal with warnings. [Neil Cook]
- Fix to Issue #227 - refactor warnlog (+ fix bug) [Neil Cook]
- Update date and version. [Neil Cook]
- Fix to Issue #227 - refactor warnlog. [Neil Cook]
- Fix to Issue #227 - apply H4RG fixes to drift codes. [Neil Cook]
- Enhancement - compare function gets *ARG_ NIGHT_ NAME* from ll, prints old and new file locations (for extra confirmation) [Neil Cook]
- Update oldpath (don't include path) [Neil Cook]
- Updated test run. [Neil Cook]
- Fix for bug when HEADER time not string (should always be string but can be interpreted as number and thus break function) [Neil Cook]
- Fix - removed unneeded comment. [Neil Cook]
- Merge pull request #306 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]

5.3.1.823 0.2.023 (2018-05-15)

- Updated run. [Neil Cook]
- Fixed typo. [Neil Cook]
- Added runname to comparison table. [Neil Cook]
- Added run name to comparison table (to name table) [Neil Cook]
- Corrected bug with unit test (files were duplicated in list i.e. file1 file1 file2 file3. [Neil Cook]
- Tool file - clear out cached .pyc files (useful when rebuilding) [Neil Cook]
- H2RG compatibility - fitsfilename = *arg_ file_ names[-1]* and only adding SNR keys and EXTM/FUNC for H4RG, p returned to call. [Neil Cook]
- Fixed pep8 in *smoothed_ box_ mean_ image1* function. [Neil Cook]
- Updated date and version + rebuild pdfs. [Neil Cook]
- Updated date and version. [Neil Cook]
- H2RG compatibility - fitsfilename = *arg_ file_ names[-1]* and only adding SNR keys and EXTM/FUNC for H4RG. [Neil Cook]
- H2RG compatibility - fitsfilename = *arg_ file_ names[-1]* [Neil Cook]
- True on comparison in H2RG run. [Neil Cook]
- Fix to calling from python (bug introduced in last update) [Neil Cook]
- Fix to *unit_ test* comparison table. [Neil Cook]
- Fix to *unit_ test* comparison table. [Neil Cook]
- Fix to *unit_ test* comparison table. [Neil Cook]

5.3.1.824 0.2.022 (2018-05-14)

- Update README.md. [Neil Cook]
- Merge pull request #304 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #303 from njcuk9999/neil. [Neil Cook]
  Neil
- Updated date and versions. [Neil Cook]
- Fix for issue #296 - was mistake in argument to *test_suffix* = suffix.format - called dictionary incorrectly. [Neil Cook]
- Fix for issue #302 - *IC_COSMIC_THRES* –> *IC_COSMIC_THRESH*. [Neil Cook]
- Updated test run. [Neil Cook]
- Fix for issue #302 - added *IC_COSMIC_SIGCUT* and *IC_COSMIC_THRES*. [Neil Cook]
- Fix for issue #302 - added *IC_COSMIC_SIGCUT* and *IC_COSMIC_THRES*. [Neil Cook]
- Fix to Issue #296 - added alias (CheckPreProcess) for *spirouStartup.check_preprocess*. [Neil Cook]
- Fix to Issue #296 - added *IC_FORCE_PREPROCESS* and added all other preprcess constants to constants file. [Neil Cook]
- Fix to #296 - added .fits to suffix. [Neil Cook]
- Fix to Issue #296 - added call to CheckPreProcess - check for preprocessed files. [Neil Cook]
- Fix to #296 - added *check_preprocess* function. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #301 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #293 from njcuk9999/neil. [Neil Cook]
  Neil
- Fix to *unit_test* - bug in logic when file does not exist –> True to False. [Neil Cook]
- Fix to issue #292 - *get_fiber_type* modified to accept and require suffix to get fiber type. [Neil Cook]

5.3.1.825 0.2.021 (2018-05-12)

- Fix to issue #300 - added *correct_for_badpix* function. [Neil Cook]
- Fix to issue #300 - alias to *correct_for_badpix* function. [Neil Cook]
- Fix to issue #298 - exit script should deal with new *DRS_INTERACTIVE* parameter. [Neil Cook]
- Fix to issue #298 - *DRS_INTERACTIVE* should be set to 1 by default. [Neil Cook]
- Fix to bug identified - no exit script in AB or C. [Neil Cook]
- Fix to issue #298 - set *DRS_PLOT* to zero if *DRS_INTERACTIVE* == 0 and if *DRS_INTERACTIVE* == 0 do not prompt user at the end of recipes about exiting and plotting. [Neil Cook]
- Fix to issue #298 - set *DRS_PLOT* to zero if *DRS_INTERACTIVE* == 0 and if *DRS_INTERACTIVE* == 0 do not prompt user at the end of recipes about exiting and plotting. [Neil Cook]
- Fix to issue #298 - added *DRS_INTERACTIVE* to config.py. [Neil Cook]
- Fix to issue #297 - Unit test to display current files if no argument. [Neil Cook]
- Fixes to *unit_tests* for internal bugs and to correct for issue #295. [Neil Cook]
- Fix to issue #294 - H2RG needs to return "bstats2" too (set to zero) [Neil Cook]
- Fix to Issue #295 - complete reworking of wrapper function (which is now called from recipes) [Neil Cook]
- Fix to Issue #295 - updated alias functions. [Neil Cook]
- Fix to Issue #295 - added *E2DS_EXTM* and *E2DS_FUNC* HEADER keys to report extract type and extract function. [Neil Cook]
- Fix for Issue #295 - removed *EXTRACT_E2DS_ALL_FILES* - not needed any more. [Neil Cook]
- Fix to Issue #295 - change the way extraction is managed - modified *IC_EXTRACT_TYPE* and added *IC_FF_EXTRACT_TYPE*. [Neil Cook]
- Fix to Issue #295 - change the way extraction is managed - now type *IC_FF_EXTRACT_TYPE*. [Neil Cook]
- Fix to Issue #295 - change the way extraction is managed - now type 2. [Neil Cook]
- Fix to Issue #295 - change the way extraction is managed - now type 2. [Neil Cook]
- Fix to Issue #295 - change the way extraction is managed. [Neil Cook]
- Fix to Issue #294 - stats for *bad_pixel_map_2* in *cal_BADPIX_spirou*. [Neil Cook]

- Fix to Issue #294 - stats for *bad_pixel_map_2* in *cal_BADPIX_spirou*. [Neil Cook]
- Start of fix to issue #295 - Switch between extraction routines in *constants_SPIROU* file - unfinished. [Neil Cook]
- Fix to issue #294 - stats for *bad_pixel_map_2* in *cal_BADPIX_spirou*. [Neil Cook]
- Fix imports for python 2 and make runs sorted (again for python 2) [Neil Cook]
- Fix imports for python 2. [Neil Cook]
- Update units tests with new run names (sortable) - python 2 safe. [Neil Cook]
- Fix unit test import (should be inner call to function) [Neil Cook]
- Fix typo. [Neil Cook]
- Fix for typo. [Neil Cook]
- Fix to import statements (for python 2 compatibility) [Neil Cook]
- New *extraction_tilt_weight2cosm* with cosmic correction. Mode=2 is by default this new extraction. [Neil Cook]
- Display of bad pixels with 4 digits. [Neil Cook]
- *Ic_blake_fitn* set to 7 *ic_ext_sigdet* set to -1. [Neil Cook]
- ConvertToADU convert from ADU/s to ADU (not e-) Faction of dead pixels display with 4 digits Display the number of cosmic rays (bad pixels) detected by the extraction. [Neil Cook]
- Fake wavelength solution to run without WAVE fiel in the calibDB. [Neil Cook]
- Correction of the display of the image size. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #290 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #288 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.826 0.2.019 (2018-05-09)

- Fitgaus fortan code (for testing only) [Neil Cook]
- Example in ipynb and tex format. [Neil Cook]
- Modified test run unit test. [Neil Cook]
- Added new unit test runs (all and minimum required) [Neil Cook]
- Removed old unit test runs. [Neil Cook]
- Added *cal_extract_RAW_spirou* AB and C to unit tests. [Neil Cook]
- Fix problem with reset = False. [Neil Cook]
- Fix so wrapper extractions work with *unit_tests* (and can be called from python) [Neil Cook]
- *Ic_ext_sigdet* should be -1. [Neil Cook]
- Fix to Issue #289 - was a problem with WLOG message (argument missing from format) [Neil Cook]

5.3.1.827 0.2.020 (2018-05-09)

- Faction of dead pixels display with 4 digits Display the number of cosmic rays (bad pixels) detected by the extraction. [FrancoisBouchy]
- Fake wavelength solution due to missing WAVE in calibDB. [FrancoisBouchy]
- Display of the format of the resized image. [FrancoisBouchy]
- Merge remote-tracking branch 'origin/francois' into francois. [FrancoisBouchy]
  Conflicts:
  > *INTROOT/bin/cal_BADPIX_spirou.py INTROOT/bin/cal_DRIFTPEAK_E2DS_spirou.py INTROOT/bin/cal_extract_RAW_spirou.py*
- New *extraction_tilt_weight2cosm* with cosmic correction. Mode=2 is by default this new extraction. [FrancoisBouchy]
- Display of bad pixels with 4 digits. [FrancoisBouchy]
- *Ic_blake_fitn* set to 7 *ic_ext_sigdet* set to -1. [FrancoisBouchy]
- ConvertToADU convert from ADU/s to ADU (not e-) Faction of dead pixels display with 4 digits Display the number of cosmic rays (bad pixels) detected by the extraction. [FrancoisBouchy]
- Fake wavelength solution to run without WAVE fiel in the calibDB. [FrancoisBouchy]
- Correction of the display of the image size. [FrancoisBouchy]

- Merge pull request #271 from njcuk9999/master. [Neil Cook]
  update to master

5.3.1.828 0.2.018 (2018-05-07)

- Fix to latex format. [Neil Cook]
- Fix to install (cal validate from cmd line needs .py) [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added retrun possibility to *list_modules*, and added *find_all_missing_modules* wrapper function. [Neil Cook]
- Completed doc string. [Neil Cook]
- Corrected _ _ all_ _ [Neil Cook]
- Added missing doc strings. [Neil Cook]
- Added missing doc strings. [Neil Cook]
- Added missing functions from tex files. [Neil Cook]
- Added tex and pdf versions of the examples (auto-generated from notebooks) [Neil Cook]
- Added unit tests and tools to SpirouDRS _ _ all_ _ list (and imported) [Neil Cook]
- Example 10 in html format. [Neil Cook]
- Example 10 - how to use spirou tools. [Neil Cook]
- Fixed bug in *display_calibdb* (use LoadMinimum not LoadArguments) [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated variables (added CCF variables and missed *cal_BADPIX* variabels) [Neil Cook]
- Update to *ic_ext_tilt_bord* description. [Neil Cook]
- H4RG by default. [Neil Cook]
- Update to *unit_test* file (post *unit_test* changes) [Neil Cook]
- Fix to issue #287 - extra issue log statements with errors inside - print warnings first then internal errors after - set key after too (avoids printing errors inbetween warnings) [Neil Cook]
- Fix to issue #287 - extra issue of crash before config loads *(IC_IMAGE_TYPE)* missing from needed spirouKeyword *USE_PARAMS*. [Neil Cook]
- Fix to issue #287 - deal with *DRS_UCONFIG* warning printing. [Neil Cook]
- Update README.md. [Neil Cook]
- Merge pull request #285 from njcuk9999/neil. [Neil Cook]
  updated date and versions
- Merge pull request #284 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.829 0.2.017 (2018-05-04)

- Updated date and versions. [Neil Cook]
- Merge remote-tracking branch 'origin/neil' into neil. [Neil Cook]
- Merge pull request #283 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #282 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #275 from njcuk9999/neil. [Neil Cook]
  pep8 update all ParamDict constants to capitals
- Merge pull request #274 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #270 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #268 from njcuk9999/neil. [Neil Cook]
  Neil
- *Unit_test* fix - add total time to *log_timings* print out. [Neil Cook]
- Fix to Issue #278 - make *cal_extract_RAW_spirouAB* and *cal_extract_RAW_spirouC* work again. [Neil Cook]

- Fix to Issue #278 - make *cal_ extract_ RAW_ spirouAB* and *cal_ extract_ RAW_ spirouC* work again. [Neil Cook]
- Fix to issue #281 - small function to deal with some extensions being corrupted (will still crash if all extensions bad) and will assume first valid extension (i.e. with shape) is the image to be used. [Neil Cook]
- Fix to issue #277 - check "files" and if it is a string force it into a length=1 list, if not string or list throw error. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
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- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]
- Fix to issue #277 - added doc string to main functions to make it clear what inputs are expected. [Neil Cook]

5.3.1.830 0.2.016 (2018-05-03)

- Pep8 update all ParamDict constants to capitals. [Neil Cook]
- *Unit_ test* - added additional run files. [Neil Cook]
- *Unit_ test* fix - *DRS_ Reset* modification, loading arguments modification and *set_ type –> check_ Type* change. [Neil Cook]
- *Unit_ test* fix - *set_ type* doesn't work - just check type instead (and throw error) [Neil Cook]
- *Unit_ test* fix - rename *set_ type* to *check_ type*. [Neil Cook]
- *Unit_ test* fix - alias to *load_ minimum*. [Neil Cook]
- *Unit_ test* fix - *reset_ confirmation* modification and log successful completion. [Neil Cook]
- *Unit_ test* fix - do not require *night_ name*. [Neil Cook]

5.3.1.831 0.2.015 (2018-05-02)

- Notebook additions - conversion to html. [Neil Cook]
- Notebook additions - added a quiet mode for notebooks (no user input needed) [Neil Cook]
- Notebook additions - added *unit_ test* alias to init file (for loading up from python) [Neil Cook]
- Notebook additions - test unit test for notebooks. [Neil Cook]
- Notebook additions - example 9 - unit tests. [Neil Cook]
- Notebook additions - example 8 - wlog. [Neil Cook]
- Notebook additions - code to convert. [Neil Cook]

5.3.1.832 0.2.014 (2018-05-01)

- Rebuild pdfs. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Redefining unit tests - example run files (for unit test) [Neil Cook]
- Redefining unit tests - first commit - slight changes (logging) [Neil Cook]
- Redefining unit tests - first commit - new recipe for unit test. [Neil Cook]
- Redefining unit tests - first commit - new functions for unit test. [Neil Cook]
- Redefining unit tests - first commit - new recipe definitions for unit tests. [Neil Cook]
- Redefining unit tests - added new function aliases. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - moved old. [Neil Cook]
- Redefining unit tests - allowing silent reset (not advised) [Neil Cook]
- Updating versions. [Neil Cook]
- Redefining unit tests - add function alias. [Neil Cook]

5.3.1.833 0.2.012 (2018-04-30)

- Regarding issue #264 - change no longer needed - revert to earlier version. [Neil Cook]
- Fix to issue #267 - SNR saved in the headers - added keys to E2DS header. [Neil Cook]
- Fix to issue #267 - SNR saved in the headers - added new keyword to list. [Neil Cook]
- Fix to code dependency. [Neil Cook]
- Merge pull request #266 from njcuk9999/francois. [Neil Cook]
  Francois
- Update *cal_FF_RAW_spirou.py*. [Neil Cook]
  keep compatibility with H2RG version
- Update spirouLOCOR.py. [Neil Cook]
  keep compatibility with H2RG

5.3.1.834 0.2.013 (2018-04-30)

- Update constant parameters for localization, flat-field and blaze. [FrancoisBouchy]
- Plot the central column threshold for *DRS_DEBUG=0*. [FrancoisBouchy]
- Add the plot of the central column with miny and maxy for *DRS_DEBUG=0*. [FrancoisBouchy]
- Plot values of e2ds>0 and values of blaze>1. [FrancoisBouchy]
- Force the curvature of orders in case of no detection. [FrancoisBouchy]
- Merge pull request #265 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #260 from njcuk9999/neil. [Neil Cook]
  manually adding francois changes

5.3.1.835 0.2.009 (2018-04-27)

- Fix to issue #264 - spirouFLAT.MEasurEBlazeForOrder now requires p (for H2RG dependency) [Neil Cook]
- Fix to issue #264 - stop blaze setting zero or negative values to 1. [Neil Cook]
- Update? [Neil Cook]
- Issue #263 and Issue #262 - tilt borders added and mask for negative pixel added to all functions. [Neil Cook]
- Added function to extract valid order numbers from *constants_SPIROU* (via ParamDict) [Neil Cook]
- Added function to extract valid order numbers from *constants_SPIROU* (via ParamDict) [Neil Cook]
- Added function to extract valid order numbers from *constants_SPIROU* (via ParamDict) [Neil Cook]

- Addressing issues #225 and #226 - compatability with both H2RG and H4RG by adding "method" (switch between average and median), pep8 fixes. [Neil Cook]
- Pep8 fixes and Issue #226 - compatibility with both H2RG and H4RG. [Neil Cook]
- Issue #263 - allowed tilt border to be changed in constants and first and last order to be selected. [Neil Cook]
- Issue #250 - average –> median and dependency with H2RG. [Neil Cook]
- Allowed valid orders to be changed in constants. [Neil Cook]
- Dealt with dependency of H2RG (Issue #266) and allowed valid orders to be changed in constants. [Neil Cook]
- Merge pull request #261 from njcuk9999/francois. [Neil Cook]
  Francois

5.3.1.836 0.2.010 (2018-04-27)

- Update constant parameters for flat-field and blaze. [FrancoisBouchy]
- Modification of spirouPLot to Display all orders with correct NBFIB parameter. [FrancoisBouchy]
- Start extraction from order 4th in *cal_ extract_ RAW_ spirou*. [FrancoisBouchy]
- Start extraction from order 4th in *cal_FF_ RAW_ spirou*. [FrancoisBouchy]
- Merge pull request #259 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.837 0.2.011 (2018-04-27)

- Manually adding francois changes. [njcuk9999]
- Manually adding francois changes. [njcuk9999]
- Merge pull request #258 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #256 from njcuk9999/revert-254-francois. [Neil Cook]
  Revert "Francois"
- Revert "Francois" [Neil Cook]
- Merge pull request #255 from njcuk9999/revert-254-francois. [Neil Cook]
  Revert "Francois"
- Revert "Francois" [Neil Cook]
- Merge pull request #254 from njcuk9999/francois. [Neil Cook]
  update accepted.
- Update config.py. [Neil Cook]
- Update *visu_ RAW_ spirou.py*. [Neil Cook]
  call to plt should come via sPlt i.e.: instead of: python import matplotlib.pyplot as plt
  use
  python from SpirouDRS.spirouCore import sPlt plt = sPlt.plt
  This avoids all errors with matplotlib backends.
- Change. [njcuk9999]
- Change. [njcuk9999]
- Update vcs.xml. [Neil Cook]
- Cleaning up files. [njcuk9999]
- Removed cached files. [njcuk9999]
- Reset to master. [njcuk9999]

5.3.1.838 0.2.008 (2018-04-26)

- Reset paths to defaults (shouldn't have overwritten) [Neil Cook]
- Merge pull request #249 from njcuk9999/francois. [Neil Cook]
  Francois
- Merge branch 'dev' into francois. [Neil Cook]
- Merge pull request #248 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #247 from njcuk9999/neil. [Neil Cook]
  Neil
- Add files via upload. [Neil Cook]
  Added francois files manually (via direct upload)
- Add files via upload. [Neil Cook]
  Added francois files via direct upload

5.3.1.839 0.2.007 (2018-04-25)

- Fix to *cal_badpix* to allow use with H2RG (required bool mask for *bad_pixel_mask2)* [Neil Cook]
- Merge pull request #246 from njcuk9999/melissa. [Neil Cook]
  Melissa

5.3.1.840 0.2.0097 (2018-04-25)

- *Cal_DARK*: increased decimals shown *constants_SPIROU_H4RG*: adjusted dark cut limit *spirou_PLOT*: added labels and titles to figures; changed histograms to normalised frequency *spirou_IMAGE.measure_dark*: changed histograms to density histograms, increased decimals. [melissa-hobson]
- Merge pull request #245 from njcuk9999/master. [melissa-hobson]
  update
- Merge pull request #244 from njcuk9999/neil. [Neil Cook]
  Neil
- Updated order of *cal_BADPIX_spirou* in the unit test functions. [Neil Cook]
- Fix for Issue #229 - added alias to *spirouImage.locate_bad_pixels_full* (LocateFullBadPixels) [Neil Cook]
- Code to un-resize and un-flip the image (for back processing files created by the DRS) [Neil Cook]
- Fix for Issue #229 - full flat detector image from engineering data (required for badpix fit) [Neil Cook]
- Fix for Issue #229 - wrote *locate_bad_pixel_full* to workout threshold from full flat engineering data. [Neil Cook]
- Fix for Issue #229 - added parameters to *constants_spirou* file. [Neil Cook]
- Fix for Issue #229 - added parameters to *constants_spirou* file. [Neil Cook]
- Fix to Issue #193 - try statement to import matplotlib and error output via WLOG (does not fix but catches exceptions) [Neil Cook]
- Fix for Issue #229 - added call to spirouImage.LocateFullBadPixels, plotted graph, added resizing and flipping the image to match other recipes. [Neil Cook]
- Merge pull request #243 from njcuk9999/master. [melissa-hobson]
  update branch
- Merge pull request #242 from njcuk9999/neil. [Neil Cook]
  Neil
- Re-built pdfs. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Updated version in readme. [Neil Cook]
- Added alias to *load_other_config_file* (LoadOtherConfig) - used in tools. [Neil Cook]
- Fixed bug in __all__ statement. [Neil Cook]
- Update to style. [Neil Cook]
- New tool - drs documentation - doc functions useful for keeping the docs up-to-date. [Neil Cook]
- Added % comments to doc (in variables) - needed to know which are missing. [Neil Cook]
- Fix to suggestion in Issue #229 - changed argument order around to avoid confusion. [Neil Cook]

- Merge pull request #241 from njcuk9999/neil. [Neil Cook]
  Neil
- Changed plot colour to *"gist_gray"* and linetype to "red" to help ID fits better (pink on rainbow was bad) [Neil Cook]
- Updated preporecess for use with H2RG. [Neil Cook]
- Fix for issue #220 - added alias to InterpolateBadRegions (call to *spirouImage.interp_bad_regions)* [Neil Cook]
- Fix for issue #220 - added *interp_bad_regions* function and added doc strings for other new functions. [Neil Cook]
- Fix for issue #220 - added *bad_region* constants. [Neil Cook]
- Fix for issue #220 - added call to spirouImage.InterpolateBadRegions. [Neil Cook]
- Merge pull request #238 from njcuk9999/master. [Neil Cook]
  update to master

5.3.1.841 0.2.006 (2018-04-23)

- Corrected order of inputs in *cal_BADPIX* main definition. [melissa- hobson]
- Merge pull request #240 from njcuk9999/master. [melissa-hobson]
  Update branch
- Merge pull request #239 from njcuk9999/dev. [Neil Cook]
  Merge pull request #237 from njcuk9999/master
- Merge pull request #237 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #236 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #234 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #233 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #217 from njcuk9999/master. [melissa-hobson]
  Update branch melissa from master
- Merge pull request #216 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #213 from njcuk9999/master. [melissa-hobson]
  Update branch from master
- Merge pull request #211 from njcuk9999/dev. [Neil Cook]
  Merge pull request #207 from njcuk9999/master
- Merge pull request #207 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #210 from njcuk9999/melissa. [Neil Cook]
  Merge pull request #206 from njcuk9999/master
- Merge pull request #206 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #209 from njcuk9999/neil. [Neil Cook]
  Neil

5.3.1.842 0.2.005 (2018-04-20)

Fix

- Exit script should only ask to close graphs if we have plots (see *"has_plots"* keyword) [Neil Cook]

Other

- Fix for issue #235 - added TODO to remove from *cal_DARK* eventually. [Neil Cook]
- Fix for issue #235 changed BADPIX to *BADPIX_OLD* for calibDB key. [Neil Cook]
- Added the *has_plots=False* to exit script. [Neil Cook]
- Fix to issue #176 (unfinished) - avoids the importing of *cal_HC* in unit tests running the code (currently doesn't have .main() for ease of debugging) [Neil Cook]
- Fix to issue #212 - *night_name* now is allowed a backslash at the end and now gives error if incorrectly defined (before wasn't checked specifically) fix to issue regarding type of custom argument (was incorrect - big bug fixed - customarg recipes will now be able to run again) [Neil Cook]
- Updated date and versions. [Neil Cook]
- Fix for issue #218 - threshold in *find_order_centers* should be in constnats file - also updated documentation with new constant. [Neil Cook]
- Issue #219 - Added PP function aliases to spirouImage (called in *cal_preprocess_spirou)* [Neil Cook]
- Issue #219 - pre-processing add Etienne's code to recipe- added functions *"ref_top_bottom"*, *"median_filter_dark_amp"*, *"median_one_over_f_noise"* [Neil Cook]
- Issue #219 - pre-processing add Etienne's code to recipe. [Neil Cook]
- Issue #219 - Add Etiennes pre-processing code to recipe. [Neil Cook]

5.3.1.843 0.2.004 (2018-04-19)

- Fix to handling of custom arguments to accept only a list of filenames. [Neil Cook]
- New way to handle files (with wildcards built in) [Neil Cook]
- Dealing with Issue #219 - pre-processing - unfinished. [Neil Cook]

5.3.1.844 0.2.003 (2018-04-18)

- Fix to Issue #215 - spirouImage.WriteImage do not use dtype='float64' [Neil Cook]
- Fix to Issue #215 - spirouImage.WriteImage do not use dtype='float64' [Neil Cook]

5.3.1.845 0.2.001 (2018-04-17)

- Continuation of Issue #176 - writing *cal_HC* - very stuck on replacing fitgaus.fitgaus. [Neil Cook]
- Fix for Issue #183 - now checks module and version. [Neil Cook]
- Merge pull request #208 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #205 from njcuk9999/neil. [Neil Cook]
  Neil
- Change to doc logo size. [Neil Cook]
- Change to doc logo size. [Neil Cook]
- Edit - test version needed main. [Neil Cook]
- Merge pull request #204 from njcuk9999/dev. [Neil Cook]
  Merge pull request #201 from njcuk9999/master
- Merge pull request #201 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #203 from njcuk9999/melissa. [Neil Cook]
  Merge pull request #202 from njcuk9999/master
- Merge pull request #202 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #200 from njcuk9999/neil. [Neil Cook]
  Neil
- Updated documentation and added example custom configs to config folder. [Neil Cook]
- Issue # 193 - matplotlib dependency. [Neil Cook]
- Merge pull request #199 from njcuk9999/master. [Neil Cook]
  merge

- Merge pull request #197 from njcuk9999/neil. [Neil Cook]
  Neil
- Issue # 194 - Fix to python version string parsing failing if format isn't as expected. [Neil Cook]
- Merge pull request #196 from njcuk9999/import-fixes. [Neil Cook]
  Import fixes
- Update spirouPlot.py. [Neil Cook]
  added _ _ *test_ smoothed_ boxmean_ image* temporarily to spirouPlot.py
- Update spirouLOCOR.py. [Neil Cook]
  remove _ _ *test_ smoothed_ boxmean_ image* from here (isn't needed)
- Update spirouPlot.py. [Neil Cook]

5.3.1.846 0.2.002 (2018-04-17)

- Copied the matplotlib backend fix into spirouLOCOR.py. [Chris Usher]
- Only import IPython when it will be used. [Chris Usher]
- Prevent failed import for missing matplotlib backends. [Chris Usher]
- Merge pull request #192 from njcuk9999/revert-191-melissa. [Neil Cook]
  Revert "Melissa"
- Revert "Melissa" [Neil Cook]
- Merge pull request #191 from njcuk9999/melissa. [Neil Cook]
  Melissa - updated to master
- Merge branch 'master' into melissa. [Neil Cook]
- Merge pull request #190 from njcuk9999/isabelle. [Neil Cook]
  Merge pull request #188 from njcuk9999/master
- Merge pull request #188 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #189 from njcuk9999/francois. [Neil Cook]
  Merge pull request #187 from njcuk9999/master
- Merge pull request #187 from njcuk9999/master. [Neil Cook]
  update to master
- Merge pull request #182 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #181 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #180 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #179 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #178 from njcuk9999/neil. [Neil Cook]
  Merge pull request #177 from njcuk9999/master
- Preprocessing script (currently does rotation only) [melissa-hobson]

5.3.1.847 0.1.037 (2018-04-16)

- Spirou tools addition - compare two files (plot images and diff in a user-friendly manner) [Neil Cook]
- Issue #176 - continued development of *find_lines*. [Neil Cook]
- Issue #176 - Added FirstGuessSolution alias to init. [Neil Cook]
- Issue #176 - continued to build *cal_ HC_ E2DS*. [Neil Cook]
- Fix for bug introduced in last build - *night_ name* now set in *arg_ file_ names*. [Neil Cook]
- Merge from Melissa - H4RG *constants_ SPIROU* file (values set from Melissa) [Neil Cook]
- Merge from Melissa - update *constants_ SPIROU_ H2RG* with pep8 styling. [Neil Cook]
- Merge from Melissa - switch between constants in H2RG and H4RG now *constants_ SPIROU.py* is different for both. [Neil Cook]
- Merge from Melissa - pre-processing script for H4RG images (currently only rotation) [Neil Cook]

5.3.1.848 0.1.036 (2018-04-13)

- Issue #176 - Added catalogue line lists to SpirouDRS data folder. [Neil Cook]
- Issue 176 - continued update of *first_guess_solution* (unfinished), added *find_lines* function (unfinished), added *fit_emi_line* (unfinished) [Neil Cook]
- Fit gaussian moved to spirouCore.spirouMath. [Neil Cook]
- Read table modified to display numbe rof columns on error. [Neil Cook]
- Issue #176 - read line list function modified. [Neil Cook]
- Added overwrite to hdu.writeto function in spirouFits.writeimage function. [Neil Cook]
- Issue #176 - alias for ReadLineList. [Neil Cook]
- Moved fit gaussian to spirouMath. [Neil Cook]
- Issue #185 and #186 - *kw_ACQTIME_KEY* and *kw_ACQTIME_KEY_UNIX* are different between H2RG and H4RG. [Neil Cook]
- Issue #185 and #186 - *DATE_FMT_HEADER* now requires p to function. [Neil Cook]
- Issue #185 and #186 - *DATE_FMT_HEADER* now requires p to function. [Neil Cook]
- Issue #186 - added *"ic_image_type"*, Issue #176 - modified *ic_lamp* types. [Neil Cook]
- Issue #186 - modified *DRS_UCONFIG* for H2RG/H4RG configs. [Neil Cook]
- Issue #176 - modified to allow running without function (temporarily) [Neil Cook]

5.3.1.849 0.1.035 (2018-04-12)

- Issue #176 - added *get_lamp_parameters*, *fiirst_guess_at_wave_soltuion* (unfinished), and *decide_on_lamp_type* functions. [Neil Cook]
- Issue #176 - added GetLampParams alias. [Neil Cook]
- Issue #176 - renamed *cdata_folder*. [Neil Cook]
- Issue #176 - created a *read_line_list* function (unfinished) [Neil Cook]
- Issue #176 - modified GetFile call (with required key) [Neil Cook]
- Issue #176 - added *correct_flat* function. [Neil Cook]
- Issue #176 - added CorrectFlat. [Neil Cook]
- Issue #176 - renamed cdata folder - make it more clear it is a relative path. [Neil Cook]
- Issue #176 - modifications to *get_file_name*. [Neil Cook]
- Issue #176 - added some *cal_HC* params. [Neil Cook]
- Issue #176 - added fiber getting, application of flat and start of first guess at solution. [Neil Cook]
- Update to version ready for new alpha release 0.1.035. [Neil Cook]
- Update to version ready for new alpha release 0.1.035. [Neil Cook]
- Update to version ready for new alpha release 0.1.035. [Neil Cook]
- Update to version ready for new alpha release 0.1.035. [Neil Cook]
- Update to version ready for new alpha release 0.1.035. [Neil Cook]

5.3.1.850 0.1.0349 (2018-04-11)

- Added unit test for *cal_HC_E2DS_spirou*. [Neil Cook]
- Added hcone extraction to unit test. [Neil Cook]
- Replacement of rawfile with *p['ARG_FILE_DIR']* [Neil Cook]
- Replacement of rawfile with *p['ARG_FILE_DIR']* [Neil Cook]
- Place holder function for flat correction. [Neil Cook]
- Replacement of rawfile with *p['ARG_FILE_DIR']* [Neil Cook]
- Replacement of rawfile with *p['ARG_FILE_DIR']* [Neil Cook]
- Fix to issue #176 - in progress - updating *cal_HC_E2DS*. [Neil Cook]

5.3.1.851 0.1.0348 (2018-04-09)

- Fix to issue #152 - User/Custom *config.py* file - rebuilt pdfs. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - rebuilt pdfs. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file - updated documentation. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Fix to issue #152 - User/Custom *config.py* file. [Neil Cook]
- Merge pull request #177 from njcuk9999/master. [Neil Cook]
  merge with master
- Merge pull request #175 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #172 from njcuk9999/neil. [Neil Cook]
  Neil
- Merge pull request #153 from njcuk9999/francois. [Neil Cook]
  Merge pull request #151 from njcuk9999/dev
- Merge pull request #151 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #150 from njcuk9999/dev. [Neil Cook]
  same?
- Merge pull request #149 from njcuk9999/dev. [Neil Cook]
  removed new constant (test)

5.3.1.852 0.1.0346 (2018-04-06)

- Fix to issue #173 - Need a versioned text file. [Neil Cook]
- Fix to issue #174 - License required. [Neil Cook]
- Fixed call to python (was python3 now python) [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #170 - PYTHONPATH in installation - what happens if not defined? [Neil Cook]
- Fix issue #165 - *cal_extract* plotting issue with bounding edges. [Neil Cook]
- Fix issue #163 - *cal_ff* plot fit edges error. [Neil Cook]
- Fix issue #161 - *cal_SLIT* plot wrong offse - offset is now corrected. [Neil Cook]
- Fixed plots closing automatically in an interactive session –> now user is asked. [Neil Cook]
- Fix to issue #159 - updated fix giving several allowed backends. [Neil Cook]
- Fix to issue #159 - matplotlib plots freeze on macOSX. [Neil Cook]

5.3.1.853 0.1.0344 (2018-04-05)

- Fixed typo in call to *deal_with+prefixes* (requires filename if p not defined) and fixed $\_\_NAME\_\_$ [Neil Cook]
- Removed call to calibDB (note needed) [Neil Cook]
- Added quick mention of startswith, contains and endswith method to documentation. [Neil Cook]
- Added contains and endswith methods to ParamDict. [Neil Cook]
- Moved blank recipe to spirouTools. [Neil Cook]
- Wrote some generic tools: list raw/reduced/calib files (with filter), display calibDB (with date filter) [Neil Cook]
- DRS reset moved to spirouTools. [Neil Cook]
- Dependencies corrected and moved to SpirouTools. [Neil Cook]
- Moved tools to separate package. [Neil Cook]
- Updated change log with changes to calibdb. [Neil Cook]
- Added quiet modes for *run_begin* and *load_arguments*. [Neil Cook]
- CalibDB now also contains humantime and unixtime accessible from dictionary call. [Neil Cook]
- Updated module descriptions (based on changes) [Neil Cook]
- Fix of issue #156 - Parameter dictionary source dictionary not case insensitive. [Neil Cook]
- Fix of issue #162 - *cal_SLIT* save TILT to file using Add1Dlist - slight change. [Neil Cook]
- Fix of issue #162 - *cal_SLIT* save TILT to file using Add1Dlist. [Neil Cook]
- Fix of issue #171 - fixed *cal_validate_spirou* -> *cal_validate_spirou.py*. [Neil Cook]
- Fix of issue #168 - Documentation: chapter installation weird <PATH> variable #168. [Neil Cook]
- Fix of issue #166 - *cal_DRIFTPEAK* should accept hc or fp. [Neil Cook]
- Fix of issue #164 - *cal_extract* kind is incorrect. [Neil Cook]
- Fix of issue #160 - too many decimal places in quality control - fixed. [Neil Cook]
- Fix of issue #157 (Unix time doesn't match human time for UT) bug was only in "fake" wave solution files. [Neil Cook]
- Fixed Issue #154 (Installation type update to config.txt and *constants_SPIROU.txt* (now *.py* files) [Neil Cook]
- Same? [Neil Cook]

5.3.1.854 0.1.0342 (2018-03-28)

- Removed new constant (test) [Neil Cook]
- Merge pull request #147 from njcuk9999/dev. [Neil Cook]
  added new constant
- Added new constant. [Neil Cook]
- Merge pull request #146 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #145 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #144 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #143 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #142 from njcuk9999/dev. [Neil Cook]
  Dev

5.3.1.855 0.1.034 (2018-03-25)

- New unit test (not comp full run) [Neil Cook]
- Updated date and version. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added new test full run no compare. [Neil Cook]

5.3.1.856 0.1.033 (2018-03-22)

- New example 7. [Neil Cook]
- New example 6. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated versions and dates. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Moved examples to subfolder. [Neil Cook]
- Spelling check. [Neil Cook]
- Spelling check. [Neil Cook]
- Spelling check. [Neil Cook]
- Spelling check. [Neil Cook]
- Updates to comments. [Neil Cook]
- Spelling check. [Neil Cook]
- Fixed error in call. [Neil Cook]
- Updates to comments. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Update date and versions. [Neil Cook]
- Spell check. [Neil Cook]
- Spell check. [Neil Cook]
- Spell check. [Neil Cook]
- Spell check. [Neil Cook]
- Spell check. [Neil Cook]
- Page split. [Neil Cook]
- Added parameters to record file. [Neil Cook]
- Added *return_filename* for added functionality. [Neil Cook]
- Improvements to telluric file - added header keys. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated edit date and versions. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]

5.3.1.857　0.1.032 (2018-03-19)

- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Corrected spelling. [Neil Cook]
- Merge pull request #141 from njcuk9999/dev. [Neil Cook]
  Dev
- Examples 5 convert to html. [Neil Cook]
- First commit - common python 3 functions different from old python 2. [Neil Cook]
- Merge pull request #140 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #139 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #138 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #137 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #136 from njcuk9999/dev. [Neil Cook]
  Dev

5.3.1.858　0.1.031 (2018-03-14)

- Updated image size. [Neil Cook]
- Update readme. [Neil Cook]

5.3.1.859　0.1.030 (2018-03-13)

- Conversion to html. [Neil Cook]
- First commit - using custom arguments. [Neil Cook]
- Update date and version. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated docs for GetCustomFromRuntime function. [Neil Cook]
- Added spacer. [Neil Cook]
- Reformatted customargs (to be like *cal_CCF)* for consistency. [Neil Cook]
- Example3 in html format. [Neil Cook]
- First commit - the debugger. [Neil Cook]
- Rerun code. [Neil Cook]

5.3.1.860 0.1.029 (2018-03-07)

- Ipython notebooks converted to html. [Neil Cook]
- First commit: ipython notebook example: "What is a parameter dictionary?" [Neil Cook]
- First commit ipython notebook example1: "Calling recipes from python" [Neil Cook]
- Added blank template file. [Neil Cook]
- Updated date and version. [Neil Cook]
- Modified *read_config_file* to be able to return just filename. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Set *config_file* name so sources are correct. [Neil Cook]
- Updated date and version. [Neil Cook]
- Set debug to 0. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]
- Updated exit message. [Neil Cook]

5.3.1.861 0.1.028 (2018-03-06)

- Added note about using texteidter and smart speechmarks. [Neil Cook]
- Fixed importing issues. [Neil Cook]
- Fixed importing issues. [Neil Cook]
- Fixed importing issues. [Neil Cook]
- Fixed importing issues. [Neil Cook]
- Updated date and version. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated dependencies. [Neil Cook]
- Added a test of text file having bad (illegal) characters (non letters, punctuation, whitespace, digits) as defined by python string module. [Neil Cook]
- Added *.bash_profile* for mac install. [Neil Cook]
- Added *.bash_profile* for mac install. [Neil Cook]
- Test of bad characters. [Neil Cook]
- Added a run time debug option and reformatted logging. [Neil Cook]
- Merge remote-tracking branch 'origin/master' [Neil Cook]
- Merge pull request #135 from njcuk9999/dev. [Neil Cook]
  Merge pull request #134 from njcuk9999/master
- Merge pull request #134 from njcuk9999/master. [Neil Cook]
  sync
- Merge pull request #133 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #132 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #131 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #130 from njcuk9999/dev. [Neil Cook]
  Dev

- Merge pull request #129 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #128 from njcuk9999/dev. [Neil Cook]
  pep8 fixes + suppress known-required exceptions
- Merge pull request #127 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #126 from njcuk9999/dev. [Neil Cook]
  Dev - confirm docs built and code runs
- Merge pull request #125 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #124 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #123 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #122 from njcuk9999/dev. [Neil Cook]
  major changes to code
- Merge pull request #121 from njcuk9999/dev. [Neil Cook]
  Dev
- Updated unit test - py2 error is valueerror not importerror. [Neil Cook]
- Updated unit test - py2 error is valueerror not importerror. [Neil Cook]
- Updated unit test - py2 error is valueerror not importerror. [Neil Cook]
- Updated unit test - py2 error is valueerror not importerror. [Neil Cook]

5.3.1.862 0.1.027 (2018-03-01)

- Rebuilt pdfs. [Neil Cook]
- Updated tabbing in TOC. [Neil Cook]
- Updated versions and dates. [Neil Cook]
- Modified *initial_file_setup* to include a "contains" keyword, to make sure all files *(arg_file_names)* contain this substring if contains is not None. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added description. [Neil Cook]
- Added chagnes to *initial_file_steup*. [Neil Cook]
- Added placeholder sections and added setup and exit sections. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Modified recipe description. [Neil Cook]
- Updated pep8 fixes + added sys info. [Neil Cook]
- Updated *display_title* and *display_system_info* doc strings. [Neil Cook]
- Added DisplayTitle and DisplaySysInfo aliases in _ _ *init*_ _ [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated dependencies with python versions. [Neil Cook]
- Added DisplayTitle and DisplaySysInfo to spirouStartup public functions. [Neil Cook]
- Twaeked import. [Neil Cook]

5.3.1.863 0.1.026 (2018-02-27)

- Changed printing in function + added warning that user will reset all processed files. [Neil Cook]
- Changed printing in function. [Neil Cook]
- Changed *display_title* function. [Neil Cook]
- Modified printlog function and added printcolour function. [Neil Cook]
- Added printlog and printcolour aliases. [Neil Cook]
- Added dependencies and updated latest versions of py modules. [Neil Cook]
- Added printlog and printcolour functions. [Neil Cook]
- Tweaked display title. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Fixed bug: *set_souce -> set_source*. [Neil Cook]
- Updated date and version. [Neil Cook]
- Minor text change. [Neil Cook]
- Corrected *cal_loc* example and call. [Neil Cook]
- Update date and version. [Neil Cook]
- Add *get_folder_name* function and fix file name of comparison results file (name it by input program) [Neil Cook]
- Update test comparison dir. [Neil Cook]
- Update test comparison dir. [Neil Cook]
- Same? [Neil Cook]
- First commit - get dependencies for the drs (and current versions) [Neil Cook]
- Added source to *arg_file_names*, nbframes and fitsfilename. [Neil Cook]
- Corrected BIG bug (NBframes not redefined when *arg_file_names* redefined) [Neil Cook]
- Corrected error statement (format missing) [Neil Cook]
- Support astropy < 2.0.1 bug in astro.io.fits hdu.scale (this fixes it) [Neil Cook]
- Updated plot imshow should not take True and False array (convert to ints) [Neil Cook]
- Removed use of tqdm (unnecessary dependency) [Neil Cook]
- Added new page preak for TOC. [Neil Cook]
- Example - slight change to format. [Neil Cook]

5.3.1.864 0.1.025 (2018-02-26)

- Small fixes to refix pep8 across module/suppressing known and required pep8 exceptions. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes + doc strings. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated date and version. [Neil Cook]
- Added summary of properties and graphs section. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]
- Pep8 fixes. [Neil Cook]

- Pep8 fixes. [Neil Cook]

5.3.1.865 0.1.024 (2018-02-23)

- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Cal ccf figure 3. [Neil Cook]
- Cal ccf figure 2. [Neil Cook]
- Cal ccf figure 1. [Neil Cook]
- First commit of cal ccf recipe doc (unfinished) [Neil Cook]
- Updated reffile to e2ds file. [Neil Cook]
- Updated date and version. [Neil Cook]
- First commit - new faster version of telluric mask generation - using polyderivatives. [Neil Cook]
- Updated telluric 2d mask. [Neil Cook]
- Updated date and version. [Neil Cook]
- Added ccf filenames to variables. [Neil Cook]
- Added calccf recipe to inputs. [Neil Cook]
- Changed reffile to e2dsfile. [Neil Cook]
- Take some things out loop to speed up. [Neil Cook]
- Fixes to tilt above and below central fit (untested) [Neil Cook]
- Moved setting of fitsfilename and *arg_file_names* (when files is not None) to a separate function to deal with run time vs call. [Neil Cook]
- Moved some constants outside a loop. [Neil Cook]
- Added cal driftpeak figure. [Neil Cook]
- Added cal driftpeak figure. [Neil Cook]
- Added cal driftpeak figure. [Neil Cook]
- Added cal driftpeak figure. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated the versions and date. [Neil Cook]
- Updated the versions and date. [Neil Cook]
- Updated examples and interactive mode figures. [Neil Cook]

5.3.1.866 0.1.023 (2018-02-21)

- Cal drift raw plot files for docs. [Neil Cook]
- Cal drift raw plot files for docs. [Neil Cook]
- Cal drift e2ds plot files for docs. [Neil Cook]
- Cal drift e2ds plot files for docs. [Neil Cook]
- First commit - cal drift recipe (unfinished) [Neil Cook]
- Updated quick todo list. [Neil Cook]
- Moved the *arg_file_name/fitsfilename* setting when we have custom args to after we read from runtime. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Added drift filenames. [Neil Cook]
- Updated todo list. [Neil Cook]
- Input the caldrift section. [Neil Cook]
- Fix for loadcalibdb. [Neil Cook]
- Fix for loadcalibdb. [Neil Cook]

5.3.1.867 0.1.022 (2018-02-20)

- Major changes to code. [Neil Cook]

5.3.1.868 0.1.021 (2018-02-19)

- Rebuilt pdfs. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added extract figure. [Neil Cook]
- Added extract figure. [Neil Cook]
- Added extract figure. [Neil Cook]
- First commit of verify recipe section. [Neil Cook]
- First commit of extract recipe section. [Neil Cook]
- Added ReadBlazeFile. [Neil Cook]
- Updated doc strings and minor code fixes (for no header in writeimage) [Neil Cook]
- Updated date and versions. [Neil Cook]
- Added function to convert waveimage to interpretted spectrum. [Neil Cook]
- Updated date and version. [Neil Cook]
- Added extract file variables. [Neil Cook]
- Changed order + added input for extract and validate. [Neil Cook]
- Changes to example code run. [Neil Cook]
- Changes to example code run. [Neil Cook]
- Fixed cmdbox typo. [Neil Cook]
- Changed some doc strings. [Neil Cook]
- Changed comment. [Neil Cook]

5.3.1.869 0.1.020 (2018-02-16)

- Update README.md. [Neil Cook]
- Merge pull request #120 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed tested and all run
- Rebuilt pdfs. [Neil Cook]
- Added current default files (for reset) [Neil Cook]
- First commit - a reset switch - setting DRS back to default. [Neil Cook]
- Added mainfitsdir for when we are using custom arguments, resorted functions, added *get_custom_arg_files_fitsfilename* to deal with setting *arg_file_names* and fitsfilename with custom arguments. [Neil Cook]
- Fixed problem with plot *(wave_ll* only for CCF - so use x instead) normally want "wave" [Neil Cook]
- Moved *log_file_name* getting to constants file. [Neil Cook]
- Added *log_file_name* to constants. [Neil Cook]
- Fixed bug for *arg_file_names* from custom args. [Neil Cook]
- Updated doc string. [Neil Cook]
- Added mainfitsdir for custom loadarguments. [Neil Cook]
- Merge pull request #119 from njcuk9999/dev. [Neil Cook]
  Dev
- Rebuilt pdf. [Neil Cook]
- Readded *cal_slit* plots for interactive sessions (accidentally overwritten) [Neil Cook]
- Readded *cal_FF_raw* plots for interactive sessions. [Neil Cook]
- Added *cal_FF_raw* plots for interactive sessions. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added *cal_FF_raw* file definitions. [Neil Cook]
- Updated *cal_FF_raw* change log. [Neil Cook]
- Fixed errors in default recipe. [Neil Cook]
- Added paths for example files, fixed example run. [Neil Cook]
- Added paths for example files. [Neil Cook]
- Added all sections (previously empty) [Neil Cook]

- Added paths for example files. [Neil Cook]
- Added path for example file. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated date and version. [Neil Cook]
- Replace use of *log_ opt* (not valid in *load_ arguments)* with DPROG (Defaults to sys.argv[0]) [Neil Cook]
- Renamed GetKwValues to GetKeywordValues. [Neil Cook]
- Renamed GetKwValues to GetKeywordValues. [Neil Cook]
- Renamed GetKwValues to GetKeywordValues. [Neil Cook]
- Added blaze to calibDB. [Neil Cook]
- Merge pull request #118 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #117 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #116 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #115 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #114 from njcuk9999/dev. [Neil Cook]

  Dev - confirmed untested
- Merge pull request #113 from njcuk9999/dev. [Neil Cook]

  Dev - confirmed docs only and docs build
- Merge pull request #112 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #111 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #110 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #109 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #108 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #107 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #106 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #105 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #104 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #103 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #102 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #101 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #100 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #99 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #98 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #97 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #96 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #95 from njcuk9999/dev. [Neil Cook]

  Dev
- Merge pull request #94 from njcuk9999/dev. [Neil Cook]

added test data link
- Merge pull request #93 from njcuk9999/dev. [Neil Cook]
  link to logo change

5.3.1.870 0.1.019 (2018-02-15)

- Corrected need for mainfitsfile to define *arg_file_names* and fitsfilename. [Neil Cook]
- Corrected doc string typo. [Neil Cook]
- Added *return_header/return_shape* options to readdata function, corrected readrawdata function. [Neil Cook]
- First commit of telluric mask file (currently a pseudo-recipe) [Neil Cook]
- Updated doc strings. [Neil Cook]
- Changed typo and updated some doc strings. [Neil Cook]
- Fixed needing mainfitsfile for custom files. [Neil Cook]
- Fixed needing mainfitsfile for custom files. [Neil Cook]
- Updated edit date and version. [Neil Cook]
- Updated edit date and version. [Neil Cook]
- Added calff. [Neil Cook]
- First commit - blank *cal_ff* recipe. [Neil Cook]
- Added package descriptions (from CTAN) [Neil Cook]
- Updated keys (missed *order_profile)* [Neil Cook]

5.3.1.871 0.1.018 (2018-02-14)

- *Cal_slit* graphs. [Neil Cook]
- *Cal_slit* graphs. [Neil Cook]
- *Cal_slit* graphs. [Neil Cook]
- First commit - recipe for *cal_slit_spirou*. [Neil Cook]
- Added labels to slit plot (were missed before) [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and version info. [Neil Cook]
- Updated date and version info. [Neil Cook]
- Commented TOC separator (may use later to clean up) [Neil Cook]
- Removed TOC separator. [Neil Cook]
- Removed use of caption in favour of capt-of (screwdriver vs hammer) [Neil Cook]
- Added some named labels, fixed typo namdlabels –> namedlabels. [Neil Cook]
- Added calslit include. [Neil Cook]
- Added labels to sections. [Neil Cook]
- Corrected errors in windows sections (ref links) [Neil Cook]
- Addede Interactive mode section. [Neil Cook]
- Fixed program call typo and ref to calDARK. [Neil Cook]
- Fixed subsection title and some paths. [Neil Cook]

5.3.1.872 0.1.017 (2018-02-13)

- Cal loc figures. [Neil Cook]
- Windows environment figures. [Neil Cook]
- Display system info, moved header bar to a constant. [Neil Cook]
- Modified logger to accept printonly and logonly inputs. [Neil Cook]
- Updated version and date. [Neil Cook]
- Changed the windows installation section. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Modified end of code section to reflect changes. [Neil Cook]
- Modified doc string for logger. [Neil Cook]

- Updated shebang, added *exit_script* dealing with interactive sessions in _ _ *main* _ _ call. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]
- Updated shebang and _ _ *main* _ _ exiting. [Neil Cook]

5.3.1.873 0.1.016 (2018-02-12)

- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Updated date and versions. [Neil Cook]
- Fix for only one file name in *readimage_and_combine*. [Neil Cook]
- Changed rawfits to orderpfile (name change) [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Change back to doc class comment. [Neil Cook]
- Change to doc class? [Neil Cook]
- Made cmdboxprintspecial breakable. [Neil Cook]
- Added some named labels and some new file names. [Neil Cook]
- Input calloc. [Neil Cook]
- Edited receipe. [Neil Cook]
- Edited receipe. [Neil Cook]
- Edited receipe. [Neil Cook]
- Edited receipe. [Neil Cook]

5.3.1.874 0.1.015 (2018-02-09)

- Rebuilt pdfs. [Neil Cook]
- Moved calibration database loading to separate function (for custom arg recipes), tweaked functions accordingly, added getting of multi arguments (as last param) + wrapper around *get_file (get_files)* [Neil Cook]
- Added new aliases. [Neil Cook]
- Tweaked *readimage_and_combine* and *math_controller* to be more generic. [Neil Cook]
- Removed Config Error from messages (shouldn't be an error unless error=error) [Neil Cook]
- Added to custom arg section + added setup summary. [Neil Cook]
- Added/edited section. [Neil Cook]
- Rewrote section. [Neil Cook]
- Edited/updated doc strings. [Neil Cook]
- Edited/updated doc strings. [Neil Cook]
- Designed basic layout (setup + sections) [Neil Cook]
- Updated ghost template. [Neil Cook]
- Added loading of calibDB. [Neil Cook]
- Update date and version numbers. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated TILT and WAVE fixes (with todo) [Neil Cook]
- Updated todolist. [Neil Cook]
- Added indents to minipages, added alias/internal function definition. [Neil Cook]
- Added titles to some code boxes. [Neil Cook]
- Added titles to some code boxes. [Neil Cook]
- Added titels to some code boxes, changes paths for print outputs. [Neil Cook]
- Added some new packages to dependencies, added that custom args can be added to code boxes. [Neil Cook]
- Added recipe and module reference sections and some titles for calibDB text file examples. [Neil Cook]
- Changed a bashbox to a cmdbox. [Neil Cook]
- Added example of addition to calibration database. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]
- Updated indentation of minipages. [Neil Cook]

5.3.1.875 0.1.014 (2018-02-07)

- First commit - move recipe to individual file. [Neil Cook]
- First commit - move recipe to individual file. [Neil Cook]
- First commit - move recipe to individual file. [Neil Cook]
- First commit - move recipe to individual file. [Neil Cook]
- First commit - move recipe to individual file. [Neil Cook]
- Updated date and version. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated the highlight parameters for doc string. [Neil Cook]
- Moved individual recipes to indivudal files. [Neil Cook]

5.3.1.876 0.1.013 (2018-02-06)

- First commit module description for thorca. [Neil Cook]
- First commit module description for startup. [Neil Cook]
- Updated doc strings with p and loc descriptions. [Neil Cook]
- Updated doc strings with p and loc descriptions. [Neil Cook]
- Updated doc strings with p and loc descriptions. [Neil Cook]
- Updated wave to *wave_ll*. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Added startup and THORCA. [Neil Cook]
- Added doc strings to RV tex file. [Neil Cook]
- Changed wave to *wave_ll* in loc. [Neil Cook]

5.3.1.877 0.1.012 (2018-02-05)

- Added spirouRV and spirouTHORCA imports to init. [Neil Cook]
- Started updating doc strings (p and loc) [unfinished] [Neil Cook]
- Started updating doc strings (p and loc) [unfinished] [Neil Cook]
- Updated date and version. [Neil Cook]
- Started module writing (incomplete) [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Added inputs. [Neil Cook]
- Updated imports. [Neil Cook]
- Removed unneeded comment for alias. [Neil Cook]
- Modified some doc strings. [Neil Cook]
- Refactored "imageLocSuperimp" –> "ImageLocSuperimp" [Neil Cook]
- Modified comments for several functions (more concise) [Neil Cook]
- Modified *doc_string* for writeimage. [Neil Cook]
- Modified *doc_string* for warninglogger. [Neil Cook]
- Added to *__all__* [Neil Cook]
- Modified *get_keywords doc_string*. [Neil Cook]
- Added doc strings for ConfigError methods. [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- First commit - added doc strings + sub-module func descriptions (based on spirouBLANK.tex) [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Changed subsection and section size in nav bar menu. [Neil Cook]
- Added spirouCore and spirouFLAT to constants , modified paths for WLOG, ParamDict and ConfigError (to module file) [Neil Cook]
- Added blue to the special cmd colours. [Neil Cook]
- Added introduction. [Neil Cook]
- Added doc strings. [Neil Cook]
- Changed default module tex file template. [Neil Cook]
- Refactor imageLocSuperimp –> ImageLocSuperimp. [Neil Cook]

5.3.1.878 0.1.011 (2018-02-02)

- First commit - module tex file. [Neil Cook]
- First commit - module tex file. [Neil Cook]
- First commit - module tex file. [Neil Cook]
- First commit - module tex file. [Neil Cook]
- Edited doc string. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Changed size of subsubsection. [Neil Cook]
- Added new package. [Neil Cook]
- Added docstring tcbox. [Neil Cook]
- Changing format input module tex files. [Neil Cook]
- Updated doc strings with parameter dictionary descriptions. [Neil Cook]
- Updated doc strings with parameter dictionary descriptions. [Neil Cook]
- Updated date and version. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Updated latest edit and version. [Neil Cook]
- Updated some constants descriptions. [Neil Cook]

5.3.1.879 0.1.010 (2018-02-01)

- Updated doc strings with parameter dictionary descriptions. [Neil Cook]
- Updated doc strings with parameter dictionary descriptions. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated date and version. [Neil Cook]
- Add res to loc (for *debug_locplot_fit_residual)* [Neil Cook]
- Update doc string (p and loc) [Neil Cook]
- Update doc string (p and loc) [Neil Cook]
- Update doc string (p and loc) [Neil Cook]
- Updated doc strings. [Neil Cook]
- Update doc string (p and loc) [Neil Cook]

5.3.1.880 0.1.009 (2018-01-31)

- Updated doc strings. [Neil Cook]
- Updated doc strings. [Neil Cook]
- Updated doc strings. [Neil Cook]
- Removed doc strings + added _ _ *all_ _* functions. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Removed doc strings. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Updated date and version. [Neil Cook]
- Updated todo list. [Neil Cook]

- Cosmetic change to comment. [Neil Cook]

5.3.1.881 0.1.008 (2018-01-30)

- Added spacing. [Neil Cook]
- Edit of doc string (unfinished) [Neil Cook]
- Create *DEFAULT_ LOG_ OPT()* from sys.argv[0] [Neil Cook]
- Replace sys.argv[0] in logs with *spirouConfig.Constant.DEFAULT_ LOG_ OPT()* [Neil Cook]
- Added doc strings, moved gaussian function and added some error handling. [Neil Cook]
- Moved gaussian function here. [Neil Cook]
- Added doc strings. [Neil Cook]
- Added doc strings. [Neil Cook]
- Corrected error *"mean_ background"* –> *"mean_ backgrd"* [Neil Cook]
- Updated back to my data folder. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Updated version. [Neil Cook]
- Updated *doc_ strings* and error handling. [Neil Cook]
- Updated *doc_ strings* and error handling. [Neil Cook]
- Updated *doc_ strings*. [Neil Cook]
- Updated version and date. [Neil Cook]
- Updated version and date. [Neil Cook]
- Added *badpix_ norm_ percentile* constant constant. [Neil Cook]
- Added *badpix_ norm_ percentile* constant constant. [Neil Cook]

5.3.1.882 0.1.007 (2018-01-29)

- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Updated versions + dates. [Neil Cook]
- Updated versions + dates. [Neil Cook]
- Updated versions + dates. [Neil Cook]
- Doc strings and error handling (unfinished) [Neil Cook]
- Doc strings and error handling (unfinished) [Neil Cook]
- Doc strings and error handling. [Neil Cook]
- Updated doc strings [unfinished] [Neil Cook]

5.3.1.883 0.1.006 (2018-01-26)

- Added test help file - for *cal_ DARK_ spirou*. [Neil Cook]
- Updated todo list with help files that are needed. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc string. [Neil Cook]
- Update doc strings + help file management. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc strings, remove _ _ *main*_ _ [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc strings. [Neil Cook]
- Update doc. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Update todo list with man files need writing. [Neil Cook]
- Modified MANUAL FILE (corrected) [Neil Cook]
- Updated date and version. [Neil Cook]

- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Updated the date and version numbers. [Neil Cook]
- Added/corrected some cal drift variables. [Neil Cook]
- Added descriptions. [Neil Cook]
- Added doc string for sPlt. [Neil Cook]
- Added constant for drift peak. [Neil Cook]
- Fixed plotting function calls. [Neil Cook]
- Updated descriptions (UNFINISHED) [Neil Cook]
- Updated descriptions and unix/string time getting. [Neil Cook]
- Updated descriptions and unix/string time getting. [Neil Cook]
- Added doc strings + math time functions. [Neil Cook]
- Added more formats (defaults + log), removed main code. [Neil Cook]
- Updated config error. [Neil Cook]
- Updated descriptions and unix/string time getting. [Neil Cook]

5.3.1.884 0.1.005 (2018-01-24)

- Update versions + date. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Version + date update. [Neil Cook]
- Updated _ _ *all* _ _ [Neil Cook]
- Added to warninglogger (funcname), changed end card colour. [Neil Cook]
- Added warnlog alias. [Neil Cook]
- Better error handling + reporting. [Neil Cook]
- Better error handling + reporting. [Neil Cook]
- Better error handling + reporting. [Neil Cook]
- Better error handling + reporting. [Neil Cook]
- Better error handling. [Neil Cook]
- Doc strings added. [Neil Cook]
- Doc strings added. [Neil Cook]
- Warnings added, better error handling. [Neil Cook]
- Update of code. [Neil Cook]
- Config param change (debug mode active) [Neil Cook]
- Submodule clean up and doc string writing. [Neil Cook]
- First commit of quick install guide. [Neil Cook]
- Added *DARK_CUTLIMIT* to keyword used variables, added a hack to avoid not having config file *ICDP_NAME* (will complain elsewhere) [Neil Cook]
- Added *DARK_CUTLIMIT* to keyword used variables, added a hack to avoid not having config file *ICDP_NAME*. [Neil Cook]
- Added logic for quick install guide (false) [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Fixed installDIR. [Neil Cook]
- Sorted out environment paths. [Neil Cook]
- Sorted out environment paths. [Neil Cook]
- Fixed debug mode. [Neil Cook]
- Fixed comment. [Neil Cook]
- Fixed init _ _ *all* _ _ call. [Neil Cook]
- Editted log to print message even if we cannot log to file. [Neil Cook]
- Updated version and latest edit date. [Neil Cook]
- Added additional way to read config file (slow using python open) or give good error message if cannot open. [Neil Cook]
- Allowed ConfigError "message" to take list as input. [Neil Cook]
- Streamlined config strings. [Neil Cook]
- Streamlined config strings. [Neil Cook]
- Fixed error with *DRS_NAME*, *DRS_VERSION*. [Neil Cook]

5.3.1.885 0.1.004 (2018-01-22)

- Added test data link. [Neil Cook]
- Link to logo change. [Neil Cook]
- Merge pull request #92 from njcuk9999/dev. [Neil Cook]
  Merge pull request #91 from njcuk9999/master
- Merge pull request #91 from njcuk9999/master. [Neil Cook]
  merge
- Merge remote-tracking branch 'origin/master' [Neil Cook]
- Merge pull request #90 from njcuk9999/dev. [Neil Cook]
  Merge pull request #89 from njcuk9999/master
- Merge pull request #89 from njcuk9999/master. [Neil Cook]
  master to dev
- Rebuilt pdfs. [Neil Cook]
- Updated version. [Neil Cook]
- Added spacing to constants. [Neil Cook]
- Changed the cmd code boxes. [Neil Cook]
- Added a general section. [Neil Cook]
- Removed definevariablecmd variables. [Neil Cook]
- Added some namedlabels. [Neil Cook]
- Fixed typo in log message. [Neil Cook]
- Updated readme. [Neil Cook]
- Updated date and rebuilt. [Neil Cook]
- Added quick install chapter. [Neil Cook]
- Updated date + version. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Updated version. [Neil Cook]
- Unchanged. [Neil Cook]
- Updated dirs. [Neil Cook]
- Fixed errors. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated log colourring. [Neil Cook]
- Updated paths. [Neil Cook]
- Added readme files. [Neil Cook]
- Added example data readme files. [Neil Cook]
- Added calibDB minimum files. [Neil Cook]
- Restructure of drs file. [Neil Cook]
- Merge pull request #88 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #87 from njcuk9999/dev. [Neil Cook]
  Merge pull request #86 from njcuk9999/master
- Rebuilt pdfs. [Neil Cook]
- Updated version. [Neil Cook]
- Added spacing to constants. [Neil Cook]
- Changed the cmd code boxes. [Neil Cook]
- Added a general section. [Neil Cook]
- Removed definevariablecmd variables. [Neil Cook]
- Added some namedlabels. [Neil Cook]
- Fixed typo in log message. [Neil Cook]
- Updated readme. [Neil Cook]
- Updated date and rebuilt. [Neil Cook]
- Added quick install chapter. [Neil Cook]
- Updated date + version. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Updated version. [Neil Cook]
- Unchanged. [Neil Cook]
- Updated dirs. [Neil Cook]
- Fixed errors. [Neil Cook]

- Rebuilt pdf. [Neil Cook]
- Updated log colourring. [Neil Cook]
- Updated paths. [Neil Cook]
- Added readme files. [Neil Cook]
- Added example data readme files. [Neil Cook]
- Added calibDB minimum files. [Neil Cook]
- Restructure of drs file. [Neil Cook]
- Updated version and date. [Neil Cook]
- Updated version and date. [Neil Cook]
- Merge pull request #86 from njcuk9999/master. [Neil Cook]
  merge

5.3.1.886 0.1.003 (2018-01-16)

- Update README.md. [Neil Cook]
- Merge pull request #85 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed update
- Updated to alpha 0.1. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated to alpha 0.1. [Neil Cook]
- Merge pull request #84 from njcuk9999/dev. [Neil Cook]
  rotated speed table + rebuild pdf
- Rotated speed table + rebuild pdf. [Neil Cook]
- Merge pull request #83 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed doc + version updates
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated python module versions. [Neil Cook]
- Updated readme (quick manual out of date and useless - use pdfs) [Neil Cook]
- Updated dates and version. [Neil Cook]
- Updates architecture. [Neil Cook]
- Merge pull request #82 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed testing and doc
- *Cal_ccf* fitting difference graph. [Neil Cook]
- *Cal_dark* graph 3. [Neil Cook]
- *Cal_dark* graph 2. [Neil Cook]
- *Cal_dark* graph 1. [Neil Cook]
- Changed reporting of errors to "differences" [Neil Cook]
- First commit unit test including all current recipes (with comparison) + *cal_drift_raw* and *cal_driftpeak_e2ds*. [Neil Cook]
- Updated name of unit test 3. [Neil Cook]
- Updated name of unit test 2. [Neil Cook]
- Added new and old methods for calulating badpix normalisation constant (for testing purposes) [Neil Cook]
- Changed location of TOC page break. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Commented conflicting text (do not use memoir captions) [Neil Cook]
- Added new packages. [Neil Cook]
- Added new constants. [Neil Cook]
- Added named labels to some constants. [Neil Cook]
- Added calibdb section (unfinished) [Neil Cook]
- Updated todo list. [Neil Cook]
- Added caldark to recipes. [Neil Cook]
- Updated versions. [Neil Cook]
- Updated change log and moved around sections. [Neil Cook]
- Updated imports in placeholder file. [Neil Cook]
- Updated imports in placeholder file. [Neil Cook]

- Added reffilename to paramdict. [Neil Cook]
- Added to log printing in qc. [Neil Cook]
- Allowed norm median flat to be old or new method. [Neil Cook]
- Merge pull request #81 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #80 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed run and tested
- Merge pull request #79 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed doc changes
- Merge pull request #78 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed - *cal_ccf* now runs
- Merge pull request #77 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed changes
- Merge pull request #76 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed tested
- Merge pull request #75 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed run
- Merge pull request #74 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed untested
- Merge pull request #73 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed *cal_ccf* completed but not tested
- Merge pull request #72 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed *cal_CCF* stuff
- Merge pull request #71 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed unfinished and untested
- Merge pull request #70 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #69 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #68 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #67 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #66 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #65 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #64 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #63 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #62 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed checked for consistency and that codes run
- Merge pull request #61 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed *cal_drift_e2ds* not working
- Merge pull request #60 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed untested *cal_badpix*
- Merge pull request #59 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed pdf build
- Merge pull request #58 from njcuk9999/dev. [Neil Cook]
  Dev - documentation edits: confirm pdf builds
- Merge pull request #57 from njcuk9999/dev. [Neil Cook]
  readme link update
- Merge pull request #56 from njcuk9999/dev. [Neil Cook]
  doc change - pdfs build correctly
- Merge pull request #55 from njcuk9999/dev. [Neil Cook]
  image change
- Merge pull request #54 from njcuk9999/dev. [Neil Cook]

Dev
- Merge pull request #53 from njcuk9999/dev. [Neil Cook]
  added pdf manuals to readme
- Merge pull request #52 from njcuk9999/dev. [Neil Cook]
  added pdf manuals to readme
- Merge pull request #51 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed documentation and cosmetic changes only
- Merge pull request #50 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #49 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #48 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #47 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #46 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #45 from njcuk9999/dev. [Neil Cook]
  Added latex gitignore
- Merge pull request #44 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #43 from njcuk9999/dev. [Neil Cook]
  updated links in table of contents
- Merge pull request #42 from njcuk9999/dev. [Neil Cook]
  Dev
- Delete fits2ramp.py. [eartigau]
- Add files via upload. [eartigau]
  latest version of fits2ramp
- Merge pull request #41 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #40 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #39 from njcuk9999/dev. [Neil Cook]
  Dev - confirm run
- Merge pull request #38 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed cosmetic only
- Merge pull request #37 from njcuk9999/dev. [Neil Cook]
  Dev - confirm runs
- Merge pull request #36 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #35 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #34 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed checked runs and consistency
- Merge pull request #33 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed codes run + bug fixes are correct
- Merge pull request #32 from njcuk9999/dev. [Neil Cook]
  Dev - confirmed cosmetic nature - extract still not working (unfinished)
- Merge pull request #31 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #30 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #29 from njcuk9999/dev. [Neil Cook]
  readme update - confirmed
- Merge pull request #28 from njcuk9999/dev. [Neil Cook]
  confirmed consitency
- Merge pull request #27 from njcuk9999/dev. [Neil Cook]
  Confirm check of consistency

- Merge pull request #26 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #25 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #24 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #23 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #22 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #21 from njcuk9999/dev. [Neil Cook]
  added to general section, *cal_ dark* section and *cal_ loc* section
- Merge pull request #20 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #19 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #18 from njcuk9999/dev. [Neil Cook]
  confirmed runs and consistent
- Merge pull request #17 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #16 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #15 from njcuk9999/dev. [Neil Cook]
  cosmetic changes only - confirmed running
- Merge pull request #14 from njcuk9999/dev. [Neil Cook]
  Check runs and consistent (visually)
- Merge pull request #13 from njcuk9999/dev. [Neil Cook]
  checked they still run
- Merge pull request #12 from njcuk9999/dev. [Neil Cook]
  Tested consistency
- Merge pull request #11 from njcuk9999/dev. [Neil Cook]
  Confirmed still runs and same output
- Merge pull request #10 from njcuk9999/dev. [Neil Cook]
  Confirmed agrees with original code
- Merge pull request #9 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #8 from njcuk9999/dev. [Neil Cook]
  Tested and verified as consistent
- Merge pull request #7 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #6 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #5 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #4 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #3 from njcuk9999/dev. [Neil Cook]
  Dev
- Merge pull request #2 from njcuk9999/dev. [Neil Cook]
  push to master
- Merge pull request #1 from njcuk9999/dev. [Neil Cook]
  Commit to Master

5.3.1.887 0.1.002 (2018-01-12)

- Updated progress. [Neil Cook]
- Rebuilt pdf file. [Neil Cook]
- Updated todo list. [Neil Cook]
- Added fortran python conversion (for test purposes only) [Neil Cook]
- Unignore fitgaus.so. [Neil Cook]
- Added fitgaus.f (for test purposes only) [Neil Cook]
- Added comparison + tests + nanstats in order to pass or fail found errors. [Neil Cook]
- Set a threshold for order of magnitude difference (in comparison) [Neil Cook]
- Added a *test_fit_ccf* to compare "fortran fit" with "python fit" [Neil Cook]
- Cosmetic comment fix. [Neil Cook]
- Added writeimage dtype fix. [Neil Cook]
- Added *kw_drs_QC* keyword. [Neil Cook]
- Cosmetic fixes. [Neil Cook]
- Moved qc and fixed header bugs. [Neil Cook]
- Fixed badpixelfits error. [Neil Cook]
- Added logs. [Neil Cook]
- Fixed header error. [Neil Cook]

5.3.1.888 0.1.001 (2018-01-11)

- Updated progress. [Neil Cook]
- Fixed list not appending. [Neil Cook]
- First commit - comparison functions for old vs new test. [Neil Cook]
- Added ability to test outputs. [Neil Cook]
- Added aliases to utc. [Neil Cook]
- Added fiber definition to fiber loop. [Neil Cook]
- First commit *unit_Test3* - testing the outputs. [Neil Cook]
- Added output assignment to all unit tests. [Neil Cook]
- Added output filename functions, reordered functions for better clarity. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Removed output filenaming to spirouConfig.spirouConst. [Neil Cook]
- Added a question re fiber type for wave file. [Neil Cook]
- Updated version. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Modified date and version. [Neil Cook]
- Added *cdata_folder* constant. [Neil Cook]
- Added spirouTHORCA placeholder section. [Neil Cook]
- Added *cal_CCF* section. [Neil Cook]

5.3.1.889 0.1.000 (2018-01-10)

- Readded *cal_CCF* to unit test 2. [Neil Cook]
- Moved UrNe.mas to data folder. [Neil Cook]
- Added a *locate_mask* function - to local file if filename is not a valid path and found by os.path.exists, make *ic_debug drs_debug==2*. [Neil Cook]
- Make *ic_debug drs_debug==2*. [Neil Cook]
- Corrected typo in debug plot. [Neil Cook]
- Added *CDATA_FOLDER* constant. [Neil Cook]
- Added *get_relative_folder* function. [Neil Cook]
- Added aliases to init. [Neil Cook]
- Added removal of lockfile in generated error. [Neil Cook]

- Make *ic_ debug drs_ debug==2.* [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Added spaces to some commands. [Neil Cook]
- Added listing style and tcolorbox to print out cmd prompt in colours red/yellow/green. [Neil Cook]
- Added to variables. [Neil Cook]
- Added to todo. [Neil Cook]
- Added coloured log section. [Neil Cook]
- Change log updated (ccf update needs doing) [Neil Cook]
- Debug mode explained in comments. [Neil Cook]
- Moved file. [Neil Cook]
- Make *ic_ debug drs_ debug==2.* [Neil Cook]
- Remove template logging (moved into spirouRv.GetCCFMask function. [Neil Cook]
- Removed *ic_ debug* and replaced with *drs_ debug.* [Neil Cook]
- Removed *ic_ debug* (replaced with *drs_ debug)* [Neil Cook]
- Added an option in *debug_ start* to allow no coloured text. [Neil Cook]
- Changed order to allow reading of config file (to access certain parameters without running recipe) [Neil Cook]
- First commit - config file reading (base level no drs imports allowed) [Neil Cook]
- Moved config file reading to new code. [Neil Cook]
- Removed *ic_ debug* (now *drs_ debug)* [Neil Cook]
- Added input keyword chapter for user. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Removed devguide if statements. [Neil Cook]
- Created named label command (to allow linking to individual text via phantom sections) [Neil Cook]
- Changed label to namedlabel. [Neil Cook]
- Changed label to namedlabel. [Neil Cook]
- Removed typo. [Neil Cook]
- Changed label to namedlabel. [Neil Cook]
- Changed label to named label. [Neil Cook]
- Made links to modules only for dev guide. [Neil Cook]
- Modified variables. [Neil Cook]
- Made most of input keywords section devguide only. [Neil Cook]
- Removed *ic_ debug* constant. [Neil Cook]
- Added *drs_ debug* and *coloured_ log* constants. [Neil Cook]
- Removed *ic_ debug* and replaced with *drs_ debug.* [Neil Cook]
- Removed *ic_ debug* and replaced with *drs_ debug.* [Neil Cook]

5.3.1.890 0.0.048 (2018-01-09)

- Fixed import and removed *cal_ CCF* (problem with code) from unit tests. [Neil Cook]
- Fixed import. [Neil Cook]
- Reformatted multi-line error message. [Neil Cook]
- Fixed comments. [Neil Cook]
- Better dealing with calibDB file. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
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- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]

- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Overlhaul of define variable function. [Neil Cook]
- Readded *qc_max_signal*, added *calib_db_match* constant. [Neil Cook]
- Placeholder for *cal_WAVE*. [Neil Cook]
- Placeholder for *cal_HC*. [Neil Cook]
- Moved wave into fiber loop (now needs fiber) [Neil Cook]
- Added calibdb prefix (from update to V48) [Neil Cook]

5.3.1.891 0.0.046 (2018-01-08)

- Updated text for conversion from .txt to *.py* config files. [Neil Cook]
- Added *return_locals* for debugging purposes. [Neil Cook]
- Added aliases for *unit_test_functions*. [Neil Cook]
- Added/modified renamed functions for setup, changed errors that span multiple lines to list argument for logger. [Neil Cook]
- Added/modified renamed functions for setup. [Neil Cook]
- Removed call to unused constant (update to V48) [Neil Cook]
- Corrected change for update to V48. [Neil Cook]
- Updated text for config files from .txt to *.py* conversion. [Neil Cook]
- Allow list log messages, coloured log messages, and launch debugger in DEBUG mode on error. [Neil Cook]
- Updated text for change of .txt config to .py. [Neil Cook]
- Added colour levels and debug pseudo constants. [Neil Cook]
- Fixed error with getting dictionaries from config files. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Added qc constants. [Neil Cook]
- Converts to py file (but still read as text file) + added some qc constants. [Neil Cook]
- Converts to py file (but still read as text file) [Neil Cook]
- Moved exit function to top, changed startup alias. [Neil Cook]
- Updated for V48 of old code. [Neil Cook]
- Updated for V48 of old code. [Neil Cook]
- Updated for V48 of old code. [Neil Cook]
- Modified startup functions. [Neil Cook]
- Modified startup functions. [Neil Cook]
- Modified startup functions. [Neil Cook]
- Modified startup functions. [Neil Cook]
- Added date and release type to codes for modules. [Neil Cook]
- Added date and release type to codes for recipes. [Neil Cook]
- Rebuilt pdfs after variables changes. [Neil Cook]
- Unit test 2 now uses *unit_test_functions*. [Neil Cook]
- Unit test 1 now uses *unit_test_functions*. [Neil Cook]
- Moved argument definitions of unit tests to functions file (can call from multiple files without having to update all) [Neil Cook]
- Modified *create_drift_file* (V48 update) [Neil Cook]
- Added fiber to 'WAVE' calib key (V48 update) [Neil Cook]
- Added *drift_peak_plot_llpeak_amps* function (V48 update) [Neil Cook]
- Added *calib_prefix* const function. [Neil Cook]
- Updated descriptions of *drift_peak* variables. [Neil Cook]
- Added and updated *drift_peak* constants. [Neil Cook]
- Added 'ALL' fiber type option and error if *fiber_type* is not understood. [Neil Cook]
- Updated to version 48 (untested) [Neil Cook]
- Updated to version 48 (untested) [Neil Cook]

5.3.1.892 0.0.045 (2017-12-21)

- Added coravelation and sub functions, added ccf fit functions and misc functions. [Neil Cook]
- Added aliases for coravelation and fitccf. [Neil Cook]
- Added ccf plots. [Neil Cook]
- Added ccf keywords. [Neil Cook]
- Added ccf table and fits pseudo constants. [Neil Cook]
- Added ccf constants. [Neil Cook]
- Unchanged. [Neil Cook]
- Unchanged. [Neil Cook]
- Unchanged. [Neil Cook]
- Added correlation sections - code finished but untested. [Neil Cook]
- What. [Neil Cook]

5.3.1.893 0.0.044 (2017-12-20)

- Temporarily put mask in bin folder (where does it go?) [Neil Cook]
- Corrected mistakes in *get_e2ds_ll.* [Neil Cook]
- Added aliases for getll and getdll. [Neil Cook]
- Added to coravelation function (not finished), added *calculate_ccf* function (not finished), added *raw_correlbin* function, added correlbin function (not finished) [Neil Cook]
- Added to coravelation function (not finished), added *calculate_ccf* function (not finished), added *raw_correlbin* function, added correlbin function (not finished) [Neil Cook]
- Fixed error in *read_table* (with colnames != None) [Neil Cook]
- Added keyword. [Neil Cook]
- Updated configerror error message. [Neil Cook]
- Added constants. [Neil Cook]
- Added data to loc. [Neil Cook]

5.3.1.894 0.0.043 (2017-12-19)

- Need to finish code. [Neil Cook]
- Redefined wave getting (GetE2DSll) and added a micron mask checking section. Code unfinished. [Neil Cook]
- First commit added *get_e2ds_ll*, *get_ll_from_coeffiecients*, and *get_dll_from_coefficients* functions. [Neil Cook]
- First commit added GetE2DSll alias. [Neil Cook]
- Need to finish coravelation function. [Neil Cook]
- Added *get_ccf_mask* function, added coravelation function (not finished) [Neil Cook]
- Added to *write_table*, added *read_table* function, added *update_docs* function and call to function at end. [Neil Cook]
- Modified *read_wave_file.* [Neil Cook]
- Added ReadTable alias. [Neil Cook]
- Added keywords to use list. [Neil Cook]
- Added *cal_CCF* keywords (input from *WAVE_AB)* [Neil Cook]
- Added GetKwValues alias to *get_keyword_values_from_header.* [Neil Cook]
- Cosmetic changes to comments. [Neil Cook]

5.3.1.895 0.0.042 (2017-12-18)

- First commit (similar to *cal_ drift_ e2ds)* – currently unfinished. [Neil Cook]
- Modified *get_ custom_ from_ run_ time_ Args* function (Added for function arguments) to allow more functionality, commented old function. [Neil Cook]
- Added start of *get_ ccf_ mask* function (not finished) [Neil Cook]
- Added alias to *get_ ccf_ mask* (GetCCFMask) [Neil Cook]
- Added ability to define x and y in *drift_ plot_ Selected_ wave_ ref.* [Neil Cook]
- Added two *cal_ CCF* constants. [Neil Cook]
- Added dividers between sections 2.7 - 2.10. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Updated progress. [Neil Cook]

5.3.1.896 0.0.041 (2017-12-14)

- Rebuilt pdf. [Neil Cook]
- Updated *drift_ peak_ exp_ width* function calls. [Neil Cook]
- Changed hardcoded width to width from constant in *get_ drift()* [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Added TOC page divider. [Neil Cook]
- Added caldriftpeak command. [Neil Cook]
- Added drift peak section and constants. [Neil Cook]
- Updated constants. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Deep copy on speref in *create_ drift_ file* function, other modifications to correct errors. [Neil Cook]
- Corrected errors in *drift_ peak_ plot_ dtime_ against_ drift.* [Neil Cook]
- Added to change log. [Neil Cook]
- Added drift-peak constants. [Neil Cook]
- Fixes to *cal_ drift-peak* - now works in gaussfit and non-gaussfit mode. [Neil Cook]

5.3.1.897 0.0.040 (2017-12-13)

- Rebuild pdf. [Neil Cook]
- Updated todo list. [Neil Cook]
- Updated progress in readme. [Neil Cook]
- Added drift-peak plot to documentation figures. [Neil Cook]
- Added RV aliases. [Neil Cook]
- Corrected some code, added warning catch, added *sigma_ clip* function, added *drift_ per_ order* and *drift_ all_ orders* functions. [Neil Cook]
- Added *drift_ peak* plot, *drift_ plot_ correlation_ comp* and working function. [Neil Cook]
- Added *drift_ peak* constants. [Neil Cook]
- Cosmetic change to logging. [Neil Cook]
- Cosmetic change to logging. [Neil Cook]
- Added many sections (code finished - untested) [Neil Cook]

5.3.1.898 0.0.039 (2017-12-12)

- Corrected *cal_drift_e2ds* test (file was wrong) [Neil Cook]
- First commit - copy of *cal_drift_e2ds* - in process of modifying - not tested. [Neil Cook]
- Added global c constant, added *create_drift_file*, *gauss_function*, *remove_wide_peaks*, *remove_zero_peaks*, *get_drift*, *pearson_rtest* functions (not tested) [Neil Cook]
- Rearranged function aliases, added *drift_peak* function aliases. [Neil Cook]
- Change MeasureMinMax function name. [Neil Cook]
- Added *append_source*, *append_sources*, *append_all* methods to ParamDict. [Neil Cook]
- Changed doc string of *measure_box_min_max.* [Neil Cook]
- Added drift constants. [Neil Cook]
- Change MeasureMinMax function name. [Neil Cook]
- Change MeasureMinMax function name. [Neil Cook]
- Cosmetic changes. [Neil Cook]
- Cosmetic changes. [Neil Cook]

5.3.1.899 0.0.038 (2017-12-11)

- Updated readme progress. [Neil Cook]
- First commit unit test 2. [Neil Cook]
- Updated latest edit date. [Neil Cook]
- Updated todo list. [Neil Cook]
- Removed unneeded comment. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]
- Checked against old versions and updated edit date, added badpix key. [Neil Cook]
- Checked against old versions and updated edit date. [Neil Cook]

5.3.1.900 0.0.037 (2017-12-08)

- Rebuild pdfs. [Neil Cook]
- Updated readme. [Neil Cook]
- Updated readme. [Neil Cook]
- Added description of some variables. [Neil Cook]
- Added to changelog. [Neil Cook]
- Fixed fibertype function (now got from constants) [Neil Cook]
- Fixed bug with *LOC_FILE* not being used. [Neil Cook]
- Added root to copy root keys - now works as supposed to (only copies keys with root not all keys) [Neil Cook]
- Moved ww calc to function and calculating for all unique combinations (up to 4) of ww0 and ww1 (caused by rounding) [Neil Cook]
- Added closeall funciton, modified ext and drift functions. [Neil Cook]
- Changed *root_drs* keywords (now used in code) [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Updated date. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Added DRIFT-E2DS and changed rootdrs keywords. [Neil Cook]
- Updated todo list. [Neil Cook]
- Removed duplicate sections (i.e. drifts should all be in one section etc), renamed placeholder sections. [Neil Cook]
- Added new extract and drift constants, added spacing. [Neil Cook]

- Added new extract and drift keywords. [Neil Cook]
- Added *fiber_types*, reworked extract and drift constants. [Neil Cook]
- Added return locals. [Neil Cook]
- Added return locals. [Neil Cook]
- Added return locals. [Neil Cook]
- Added return locals. [Neil Cook]
- Added return locals, added extra input to make like old extractrawC. [Neil Cook]
- Added return locals, added extra input to make like old extractrawAB. [Neil Cook]
- Added return locals, fixed changes from old to new. [Neil Cook]
- Added return locals, fixed minor differences. [Neil Cook]
- Added return locals, fixed minor differences between old and new code. [Neil Cook]
- Added return locals. [Neil Cook]
- Returned locals. [Neil Cook]

5.3.1.901 0.0.036 (2017-12-07)

- Added *get_fiber_type* function. [Neil Cook]
- Added Get Fiber type function. [Neil Cook]
- Modified *get_all_similar_files*. [Neil Cook]
- Added readdata function and modified readimage, added *read_flat_file* function. [Neil Cook]
- Added MakeTable and WriteTable to init. [Neil Cook]
- Made sure we dont get filename unless we need it in *get_acquision_time*. [Neil Cook]
- Added extra drift constants. [Neil Cook]
- Updated. [Neil Cook]
- First commit (no working) [Neil Cook]
- Changed *__main__* to main() in sources. [Neil Cook]
- Updated readme with badpix section. [Neil Cook]
- Corrected typo in wmed - in *normalise_median_flat* function *(flat_median_width* to *badpix_flat_med_wid)* [Neil Cook]
- Corrected type (comma) in *USE_KEYS*. [Neil Cook]
- Rebuild pdfs. [Neil Cook]
- Added numbered pdf bookmarks + contents to bookmarks. [Neil Cook]
- Added TOC commands to change spacing in TOC. [Neil Cook]
- Added tocloft package. [Neil Cook]
- Added calbadpix constant. [Neil Cook]
- Added badpix section. [Neil Cook]
- Updated todo section. [Neil Cook]
- Added badpix section. [Neil Cook]
- Added badpix section. [Neil Cook]
- Added badpix constants. [Neil Cook]
- Fixed badpixelfits construction. [Neil Cook]

5.3.1.902 0.0.035 (2017-12-06)

- Moved *unit_Test1* to unit test module. [Neil Cook]
- First commit if unit test init file. [Neil Cook]
- Modified *run_time_custom_args* (now works and tested), added *get_custom_from_run_time_args* and *get_file* functions, modified *display_custom_args* function. [Neil Cook]
- Added GetCustomFromRuntime and GetFile aliases. [Neil Cook]
- Added *normalise_median_flux* and *locate_bad_pixel* functions. [Neil Cook]
- Added functionality to readimage. [Neil Cook]
- Added LocateBadPixels and NormMedianFlat aliases. [Neil Cook]
- Added badpix keywords. [Neil Cook]
- Added startswith function to ParamDict. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Cosmetic changes to commenting. [Neil Cook]
- Commented packages. [Neil Cook]

- Updated to-do list. [Neil Cook]
- Added placeholder module sections. [Neil Cook]
- Added badpix constants. [Neil Cook]
- Fixed Addkey not assigning to hdict. [Neil Cook]
- First commit *cal_BADPIX*. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Added to question. [Neil Cook]
- First commit to do list chapter. [Neil Cook]
- First commit documentation chapter. [Neil Cook]
- Added todolist and documentation chapters to main tex. [Neil Cook]
- Added package ulem (For strikethrough) removed duplicate packages. [Neil Cook]
- Removed visibility level from pseudoparamentry. [Neil Cook]
- Added latexbox (and latexbox1) [Neil Cook]
- Removed visibility level for pseudo code (should be all private) [Neil Cook]
- Added new code sections. [Neil Cook]
- Added latex code example. [Neil Cook]

5.3.1.903 0.0.034 (2017-12-05)

- First commit of *output_keywords* chapter (filled and completed) [Neil Cook]
- Added *output_keywords* chapter. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Added keyword aliases. [Neil Cook]
- Added keywordentry command (similar to parmeterentry) [Neil Cook]
- Added escaping to inline python text. [Neil Cook]
- Added text. [Neil Cook]
- Readme link update. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuild pdf. [Neil Cook]
- Cosmetic change. [Neil Cook]
- Added *EXIT_LEVELS* definition. [Neil Cook]
- Changed exit vairable to *log_exit_type*. [Neil Cook]
- Added main init paramdict commands and move mac command. [Neil Cook]
- Changed title size to tiny. [Neil Cook]
- Changed title size to tiny. [Neil Cook]
- Modified sections. [Neil Cook]
- Added section. [Neil Cook]
- Removed sections added intro paragraph. [Neil Cook]

5.3.1.904 0.0.033 (2017-12-04)

- Image change. [Neil Cook]
- Image change. [Neil Cook]
- Added pdf manuals to readme. [Neil Cook]
- Added pdf manuals to readme. [Neil Cook]
- Added pdf manuals to readme. [Neil Cook]
- Added pdf manuals to readme. [Neil Cook]
- Cosmetic changes only. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Removed *.py* from recipe command added more hskips for module commands. [Neil Cook]
- Added psuedoparamentry command. [Neil Cook]
- Added blank pythonbox tcblisting. [Neil Cook]
- Added sections. [Neil Cook]
- Changed note to dev note. [Neil Cook]
- Wrote section (from readme) [Neil Cook]

5.3.1.905 0.0.032 (2017-12-01)

- Rebuilt pdf. [Neil Cook]
- Corrected syntax errors and line breaking. [Neil Cook]
- Rebuilt pdf files. [Neil Cook]
- Changed coi to *os_fac* and called from *ic_tilt_coi*. [Neil Cook]
- Added getting *DRS_NAME* and *DRS_VERSION* from spirouConfig.Constants. [Neil Cook]
- Moved the internal hyperlink setup out of preamble. [Neil Cook]
- Moved the internal hyperlink setup out of preamble. [Neil Cook]
- Added module aliases, added hslip 0pt for long variable names (so they can split on line break) [Neil Cook]
- Moved colour definitions to commands, modified ParameterEntry to add called from form (for devguide only) [Neil Cook]
- Moved colour definitions to commands. [Neil Cook]
- Reformated ParameterEntry (added call from for devguide), added many new variables (still not complete) [Neil Cook]
- Added error if calibDB file does not exist (and proper exception + log/print message) [Neil Cook]
- Corrected typo. [Neil Cook]
- Added sources for some constants, renamed coi to *ic_tilt_coi*. [Neil Cook]
- Added source for *fib_type*. [Neil Cook]

5.3.1.906 0.0.031 (2017-11-30)

- Cosmetic change to spacing. [Neil Cook]
- Added placeholder sections. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Changed the user manual from yellow to red (and updated the margin label) [Neil Cook]
- Changed the level of green on the dev margin. [Neil Cook]
- Added new constants. [Neil Cook]
- Modified ParameterEntry command. [Neil Cook]
- Added a python inline style. [Neil Cook]
- Added variable file locations section, image variable section, fiber variable section, dark calibration section. [Neil Cook]
- Minor spelling changes to comments. [Neil Cook]
- Rebuilt pdfs. [Neil Cook]
- Now getting *DRS_NAME* and *DRS_VERSION* from spirouConfig.Consants. [Neil Cook]
- Added a NAME function constant. [Neil Cook]
- Added spirouCONSt and spirouKeywords constants. [Neil Cook]
- Added minipage to parameter definition (to force items on one page) [Neil Cook]
- Modified *drs_name* and *drs_version* - only in dev version. [Neil Cook]
- Removed *drs_name* and *drs_version* from config.txt (now in spirouConst) [Neil Cook]

5.3.1.907 0.0.030 (2017-11-29)

- Rebuilt pdf files. [Neil Cook]
- Renamed preample to preamble. [Neil Cook]
- First commit of preamble file. [Neil Cook]
- First commit of packages file. [Neil Cook]
- First commit of merged variables file. [Neil Cook]
- First commit of merged recipes file. [Neil Cook]
- First commit of merged intro file. [Neil Cook]
- Updated folder path for figures in readme. [Neil Cook]
- Rebuilt pdf files. [Neil Cook]
- Moved bulk of same code to packages file and preample file, added ifdevguide (to distinguish between dev and user) added coloured border, moved chapters around after merges. [Neil Cook]
- Added masterclibddbfile, configtxtfile, acqtimekey, folderdateformat constants. [Neil Cook]
- Added paraeter command and devnote devsection (all dependent on devguide or userguide) [Neil Cook]
- Attempted breakable tcolorbox. [Neil Cook]

- First full commit - wrote section. [Neil Cook]
- Corrected spelling and added command in place of filename. [Neil Cook]
- Added from old manual. [Neil Cook]
- Added more sections. [Neil Cook]
- Deleted (not used) [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]
- Deleted and merged dev and user. [Neil Cook]

5.3.1.908 0.0.029 (2017-11-28)

- First commit of user version of *data_architecture* (not to be kept - use if statements?) [Neil Cook]
- First commit of dev version of *data_architecture* (not to be kept - use if statements?) [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Rebuilt pdf. [Neil Cook]
- Added packages, modified abstract (noindent) [Neil Cook]
- Added packages, modified abstract (noindent) [Neil Cook]
- Ignored .listing files. [Neil Cook]
- Added recipe constants. [Neil Cook]
- Added a definevariablecmd function (cyan instead of blue for definevariable) [Neil Cook]
- Complete redo of code formatting (using newtcblistings) [Neil Cook]
- Updated label for chapter. [Neil Cook]
- Updated label for chapter. [Neil Cook]
- Updated label for chapter. [Neil Cook]
- Added code blocks section. [Neil Cook]
- Added code block sections. [Neil Cook]
- Updated notes to environment, code to code environments. [Neil Cook]
- Added folder layout section, installation root dir section, bin dir section, spirou module directory section. [Neil Cook]
- Renamed *cal_validate_drs* to *cal_validate_spirou*. [Neil Cook]

5.3.1.909 0.0.028 (2017-11-27)

- Added latex gitignore. [Neil Cook]
- Memoir chapter styles (for pdf building) [Neil Cook]
- First commit dev guide. [Neil Cook]
- First commit user guide. [Neil Cook]
- Added logo to figures. [Neil Cook]
- Added constants first commit. [Neil Cook]
- Added commands (from old manual) [Neil Cook]
- Added coding formats (using new styles) [Neil Cook]
- Added installation process (first commit) for linux+mac and windows. [Neil Cook]
- What. [Neil Cook]
- Added placeholder first commit tex files (empty other than title) [Neil Cook]
- Updated progress in readme (with documentation needs) [Neil Cook]
- Added a function to check write level, corrected bug in logging (was *print_level* needed to be *log_level)* [Neil Cook]
- Added logo to documentation files. [Neil Cook]
- Edited comments. [Neil Cook]
- Added validation code (to test imports and display user setup) [Neil Cook]
- Updated links in table of contents. [Neil Cook]

5.3.1.910 0.0.027 (2017-11-24)

- Updated section naming in readme. [Neil Cook]
- Added installation process to readme. [Neil Cook]
- Added *ic_ext_all* constant. [Neil Cook]
- Added timing to debug run. [Neil Cook]
- Added posibility to save all extraction types to file (simple, tilt, tiltweight, weight) [Neil Cook]
- Added timed unit tests sections. [Neil Cook]
- Corrected unit test. [Neil Cook]

5.3.1.911 0.0.026 (2017-11-23)

- Made unit test compatible with python 2 (ordered dict) [Neil Cook]
- Updated progress in readme. [Neil Cook]
- Added to table of contents, added section 2.3 (to be filled out like section 2.2) [Neil Cook]
- Imported division from _ _*future* (to make sure all division is float division not int), cleaned up code, applied pep8 convensions. [Neil Cook]
- Removed debug timing stuff. [Neil Cook]
- Update readme with *cal_extract* and *cal_drift* sections, added unit test timing section. [Neil Cook]
- Renamed *run_inital_startup* to *run_initial_startup*. [Neil Cook]
- Wrapper around *cal_extract_RAW_spirou* to allow *fiber_type* defined as 'C' [Neil Cook]
- Wrapper around *cal_extract_RAW_spirou* to define AB as the fiber type. [Neil Cook]
- First commit - unit test for all tested files (with timings) [Neil Cook]
- Modified *run_inital_startup* function to allow *night_name* and files arguments to be passed from main function calls. [Neil Cook]
- Moved *measure_dark* function here from *cal_DARK_spirou*, added 'human'/'unix' time to *get_acqtime*. [Neil Cook]
- Added alias to MeasureDark function. [Neil Cook]
- Cosmetic change to _ _ *all* _ _ [Neil Cook]
- Added *drift_plot_dtime_Against_mdrift* function. [Neil Cook]
- Added *kw_ACQTIME_KEY_UNIX*. [Neil Cook]
- Modified *ARG_FILE_NAMES* and *ARG_NIGHT_NAME* to accept value already in p (from function call over command line arguments) [Neil Cook]
- Added human/unix acqtime getting. [Neil Cook]
- Added *ic_drift_n_order_max* parameter, cosmetic changes (spaces between sections increased) [Neil Cook]
- Moved _ _ *main* _ _ code to main function. [Neil Cook]
- Moved _ _ *main* _ _ code to main function. [Neil Cook]
- Moved _ _ *main* _ _ code to main function. [Neil Cook]
- Moved _ _ *main* _ _ code to main function. [Neil Cook]
- Moved _ _ *main* _ _ code to main function, added rv properties section, added plot section, added save drift values to file section. [Neil Cook]
- Moved _ _ *main* _ _ code to main function. [Neil Cook]

5.3.1.912 0.0.025 (2017-11-22)

- Cosmetic changes to layout. [Neil Cook]
- Fixed some bugs, added compute cosmic+renorm section, added calculate RV drift section. [Neil Cook]
- Changed mask1 and mask to flag in *delta_v_rms_2d*, added *renormalise_cosmic2d* and *calculate_RV_drifts_2D* functions. [Neil Cook]
- Added aliases for ReNormCosmic2D and CalcRVdrift2D. [Neil Cook]
- Fixed error in *get_all_similar_files* (filelist not returned) [Neil Cook]
- Fixed error in *drift_plot_photon_uncertainty ('number_orders'* in loc not p) [Neil Cook]
- Added *ic_drift_cut*, renamed *ic_dv_maxflux* and *ic_dv_boxsize*. [Neil Cook]

5.3.1.913 0.0.024 (2017-11-21)

- Modified readme with change in plot function. [Neil Cook]
- Added imports, added startup section, read ref image section, get basic ref props section, resize ref image section, get loc/tilt/wave sections, merge coeffs section, extract ref section, computer dvrms section, plot ref section, get all files section, started all file loop (not finished) [Neil Cook]
- First commit, added *delta_v_rms_2d* function. [Neil Cook]
- Added *get_all_similar_files* function, modified *correct_for_dark* function (now can return dark for use later), modified *get_exptime*, *get_gain*, *get_sigdet*, *get_param*, added *get_acqtime*. [Neil Cook]
- Redefined readimage (no combining) and added *readimage_and_combine* (to do reading and combining), updated readimage functions throughout. [Neil Cook]
- Updated _ _all_ _ [Neil Cook]
- Added GetAllSimilarFiles, GetAcqTime, ReadImage and ReadImageAndCombine functions. [Neil Cook]
- Modified extract functions to have and look for keywords in function calls before using defaults (allows customisation) [Neil Cook]
- Renamed plots for clarity, added *drift_plot_selected_wave_ref*, *drift_plot_photo_uncertainty*. [Neil Cook]
- Added filename arg to *get_acquisaion_time* and code to deal with it. [Neil Cook]
- Added *ic_ext_d_range_fpall*, *ic_drift_noise*, *ic_dv_maxflux*, *ic_dv_boxsize*, *drift_nlarge*, *drift_file_skip*, modified *ic_ext_range_fpall*. [Neil Cook]
- Renamed ReadImage to ReadImageAndCombine for clarity and renamed plotting functions (for clarity) [Neil Cook]
- Renamed ReadImage to ReadImageAndCombine for clarity and renamed plotting functions (for clarity) [Neil Cook]
- Renamed ReadImage to ReadImageAndCombine for clarity, changed fiber to p['fiber'], and renamed plotting functions (for clarity) [Neil Cook]
- Renamed ReadImage to ReadImageAndCombine for clarity. [Neil Cook]
- Renamed ReadImage to ReadImageAndCombine for clarity. [Neil Cook]

5.3.1.914 0.0.023 (2017-11-20)

- Updated progress section. [Neil Cook]
- Added function *copy_root_keys* function, modified *read_header* function. [Neil Cook]
- Added alias for CopyRootKeys to init and _ _all_ _ [Neil Cook]
- Modified *extract_AB_order*, *extract_order*, *extract_tilt_order*, *extract_tilt_weight_order*, *extract_tilt_weight_order2*, *extract_weight_order*, *extract_const_range*, *extract_const_range_fortran*, *extract_const_range_wrong* and *extract_wrapper* added code for *extract_tilt*, *extract_weight*, *extract_tilt_weight2*, *extract_tilt_weight*, extract, *check_for_none*, *get_tilt_matrix*. [Neil Cook]
- Updated _ _all_ _ [Neil Cook]
- Added alias to ExtractTiltWeightOrder2. [Neil Cook]
- Added *cal_extract* plot functions. [Neil Cook]
- Moved EXIT definition to constants. [Neil Cook]
- Added *kw_LOCO_FILE* keyword. [Neil Cook]
- Added EXIT function (to return exit statement based on *log_exit_type()* [Neil Cook]
- Added *ic_ext_range_fpall*, modified *ic_ff_plot_all_orders*, added *ic_extmeanzone* constants. [Neil Cook]
- Renamed extracttiltweightorder function to extracttiltweightorder2. [Neil Cook]
- Added timing to extraction comparison, corrected noise calculation, added plot section, added saving e2ds to file. [Neil Cook]

5.3.1.915 0.0.021 (2017-11-17)

- Added p to spiouCDB.GetDatabase (for *max_time* constants) [Neil Cook]
- Added p to spiouCDB.GetDatabase (for *max_time* constants), added read out of *max_time* in error (helps to identify why error was caused) [Neil Cook]
- Fixed call to spirouEXTOR.ExtractABOrder, added p to spiouCDB.GetDatabase (for *max_time* constants) [Neil Cook]
- Fixed error in *add_key_2d_list*. [Neil Cook]
- Fixed *selected_order_fit_and_edges*, added function *all_order_fit_and_edges*. [Neil Cook]
- Added stringtime2unixtime and unixtime2stringtime functions (fixed from spirouCDB) [Neil Cook]
- Added *DATE_FMT_HEADER* and *DATE_FMT_CALIBDB* constants. [Neil Cook]
- Added *ic_ff_plot_all_orders* constant, fixed *loc_file_fpall* and *orderp_file_fpall*. [Neil Cook]
- Fixed acqtime key error, fixed time getting error (inconsistent times), made check that times are consistent, added *max_time_human* and *max_time_unix* to p. [Neil Cook]
- Added due test mode. [Neil Cook]
- Added due test mode, added plot all orders (instead of just selected) - slower, added flat to calibDB. [Neil Cook]
- Modified imports, added version/author from constants. [Neil Cook]
- Modified imports, added version/author from constants, and added _ _ all _ _ function. [Neil Cook]
- Modified imports, added version/author from constants, changed lloc to loc, added functions for *extract_order*, *extract_order_0*, *extract_tilt_order*, *extract_weight_order* (None currently working) - will need to edit *extract_wrapper* to make work. [Neil Cook]
- Modified imports, added version/author from constants and interactive plot constant. [Neil Cook]
- Modified imports, added version/author from constants, added *TRIG_KEY*, *WRITE_LEVEL*, EXIT and WARN from constants, added *CONFIG_KEY_ERROR* warning. [Neil Cook]
- Added constants PACKAGE(), VERSION(), AUTHORS(), *LATEST_EDIT()*, CONFIGFOLDER(), CONFIGFILE(), *INTERACTIVE_PLOT_ENABLED()*, *LOG_TRIG_KEYS()*, *WRITE_LEVEL()*, *LOG_EXIT_TYPE()*, *LOG_CAUGHT_WARNINGS()*, *CONFIG_KEY_ERROR*, add set version and author from constants. [Neil Cook]
- Modified imports, added version/author from constants, added package *config_file*, configfolder and trig key from Constants. [Neil Cook]
- Modified imports, added version/author from constants. [Neil Cook]
- Modified imports, added version/author from constants. [Neil Cook]
- Modified imports, added version/author from constants. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases, added printing of sub-package names. [Neil Cook]
- First commit, modified imports, added version/author from constants, added _ _ all _ _ aliases, moved RunInitialStartup and RunStartup here (from SpirouCore) [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases, added aliases for different extraction types. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases, moved RunInitialStartup and RunStartup to spirouStartup module. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases. [Neil Cook]
- Modified imports, added version/author from constants, added _ _ all_ _ aliases. [Neil Cook]
- Editted comments for *ic_extopt*. [Neil Cook]
- Modified imports, moved spirouStartup to own module, added calls to extract functions. [Neil Cook]
- Modified imports, moved spirouStartup to seperate module. [Neil Cook]
- Modified *get_loc_coefficients* to look for keyword *'LOC_FILE'* [Neil Cook]
- Added key to arguments of *read_tilt_file* function, added *read_wave_file* function, modified *read_order_profile_superposition* to look for keyword *'ORDERP_FILE'* [Neil Cook]
- Added ReadWaveFile alias. [Neil Cook]
- Added A and B to fiber type parameters, added *loc_fil* and *orderp_file* parameters. [Neil Cook]
- Moved dprtype from header getting section, added fiber A B and AB replacement for AB (in merging coefficients) [Neil Cook]
- Added read image section, added basic image properties section, added correction of dark, added resize image, added the logging of dead pixels, added minmax *max_signal* section, added background computation section,

added tilt reading section, added wave solution reading section, added localaization coefficient getting section, added order profile getting section, added order loop, added noise/flux/SNR calculation, added saturation warning section, added quality control section. [Neil Cook]

5.3.1.916 0.0.020 (2017-11-16)

- Add calibDB to p in startup if calibdb required (should be faster than reloading it each time) [Neil Cook]
- Corrected *cal_ff* extractiltweightorder spelling mistake. [Neil Cook]
- Added check for calibDB in p. [Neil Cook]
- Added check for 'calibDB' in p. [Neil Cook]
- Moved *forbidden_copy_keys* to constants, added *get_type_from_header* function, added *read_raw_header* function. [Neil Cook]
- Added GetTypeFromHeader alias to init. [Neil Cook]
- Added dealing with customargs and added *run_time_custom_args + display_custom_args* functions. [Neil Cook]
- Added *kw_DPRTYPE*. [Neil Cook]
- Added *FORBIDDEN_COPY_KEYS* constant. [Neil Cook]
- Added tests for calibDB in p. [Neil Cook]
- Reformatted comments on variables. [Neil Cook]
- Added dprtype find from header, modified test code. [Neil Cook]
- Added dprtype find from header, modified test code. [Neil Cook]
- Added dprtype find from header, modified test code. [Neil Cook]
- Added dprtype find from header, added test code, added *__NAME__*, added setup section. [Neil Cook]
- Added dprtype find from header, added test code. [Neil Cook]

5.3.1.917 0.0.019 (2017-11-15)

- Added *cal_FF_RAW* summary of changes section, updated progress. [Neil Cook]
- Added *add_key_1d_list* function, updated *add_key_2d_list* to be more generic (with header comment) [Neil Cook]
- Added AddKey1DList alias to init. [Neil Cook]
- Added *selected_order_fit_and_edges*, *selected_order_tilt_adjusted_e2ds_blaze* and *selected_order_flat* plot functions. [Neil Cook]
- Added *kw_EXTRA_SN* and *kw_FLAT_RMS*. [Neil Cook]
- Added *ic_ff_order_plot* constant. [Neil Cook]
- Cosmetic change. [Neil Cook]
- Added plot section, added saving blaze and flat field section. [Neil Cook]

5.3.1.918 0.0.018 (2017-11-14)

- Added *convert_to_adu* function, fixed *get_gain/get_sigdet/get_param* functions. [Neil Cook]
- Removed reducedfolder call and fixed *order_profile* key. [Neil Cook]
- Added ConvertToADU alias to init. [Neil Cook]
- First commit *spirouFLAT.py* added *measure_blaze_for_order* function. [Neil Cook]
- First commit spirouFLAT init (added MeasureBlazeForOrder alias) [Neil Cook]
- Modified *extract_tilt_weight_order* and *extract_wrapper* functions, added *extract_tilt_weight* function and *extract_tilt_weight_old* function. [Neil Cook]
- Fixed error in gain/exptime keyword. [Neil Cook]
- Fixed hard coded key in *get_file_name* function. [Neil Cook]
- Cosmetic change. [Neil Cook]
- Added *ic_ff_sigdet*, *ic_extfblaz*, *ic_blaze_fitn* constants. [Neil Cook]
- Added storage set up for extraction, added extract with tilt+weight loop, added skip for *max_signal* QC. [Neil Cook]

5.3.1.919 0.0.017 (2017-11-13)

- First commit, added some well used constants (constants but need input and functions so not formed from basic string/int/float/list) [Neil Cook]
- Reworked *fiber_params* to get dictionaries of constants with particular suffix, added more logging to *get_loc_coefficients*, added *merge_coefficients* function. [Neil Cook]
- Added mergecoefficients alias. [Neil Cook]
- Added masterfile constant, added *get_gain*, *get_sigdet*, *get_param* functions. [Neil Cook]
- Moved bulk of getting file name from calibDB to spirouCDB, added *read_order_profile_superposition* function. [Neil Cook]
- Added GetSigdet, GetExptime, GetGain and ReadOrderProfile aliases to init. [Neil Cook]
- Added *extract_tilt_weight_order* function (not finished), added *extract_tilt_weight* skeleton code, changed *extraction_wrapper* to fit changes of other functions. [Neil Cook]
- Added ExtractTiltWeightOrder alias to init file. [Neil Cook]
- Added reduced folder constant, fixed *calibd_dir* path on line 150 (now 149) [Neil Cook]
- Fixed logging to file (date wasn't working) [Neil Cook]
- Added sigdet, exptime and gain keywords, moved acqtime to "required header keys" section. [Neil Cook]
- Added *extract_dict_params* function. [Neil Cook]
- Added ExtractDictParam to init. [Neil Cook]
- Added raw and reduced dir constants, added new function *get_file_name*, added *lock_file* and master file constants. [Neil Cook]
- Added GetFile command to init. [Neil Cook]
- Chagned fiber param variables to dictionaries. [Neil Cook]
- Changed getting sigdet, exptime and gain to functions, added reduced folder constant, added new fiber params command. [Neil Cook]
- Changed getting sigdet, exptime and gain to functions, added reduced folder constant. [Neil Cook]
- Changed getting sigdet, exptime and gain to functions, added reduced folder constant, added read tilt slit angle, added start of fiber extract loop (not finished) [Neil Cook]
- Changed getting sigdet, exptime and gain to functions, added reduced folder constant. [Neil Cook]
- Added pep8 cosmetic corrections. [Neil Cook]
- Added pep8 cosmetic corrections. [Neil Cook]
- Added filename option to readimage function, added *read_tilt_file* function. [Neil Cook]
- Added ReadTiltFile to init. [Neil Cook]
- Added image to doc string for *extract_AB_order*. [Neil Cook]
- Added *ic_tilt_nbo* constant. [Neil Cook]
- Added space between comma. [Neil Cook]
- Added read tilt slit angle section. [Neil Cook]

5.3.1.920 0.0.016 (2017-11-10)

- Added *fib_type* to fiber types constants, added *cal_ff* params, added a qc param. [Neil Cook]
- Moved *measure_box_min_max* and *measure_background_and_get_central_pixels* to spirouBACK. [Neil Cook]
- Added *measure_background_and_get_central_pixels*, *measure_box_min_max* to spirouBACK *measure_background_flatfield* (not finished) to init. [Neil Cook]
- Moved *measure_background_and_get_central_pixels*, *measure_box_min_max* to spirouBACK, added *measure_background_flatfield* (not finished) [Neil Cook]
- Moved *measure_background_and_get_central_pixels*, *measure_box_min_max* to spirouBACK. [Neil Cook]
- Moved MeasureBkgrdGetCentPixs to spirouBACK. [Neil Cook]
- Added setup section, added read image section, added correction of dark section, added resize image section, , added *max_signal* section. [Neil Cook]
- Chnaged ccdsigdet to sigdet, added test (no need to specific files) [Neil Cook]

5.3.1.921 0.0.015 (2017-11-09)

- Added *cal_slit* section. [Neil Cook]
- Stricked done progress. [Neil Cook]
- Added hlines. [Neil Cook]
- Edit table of contents, added back to top, added future sections. [Neil Cook]
- Added table of contents. [Neil Cook]
- Section numbering. [Neil Cook]
- Added WLOG update. [Neil Cook]
- Added WLOG update, and configError update. [Neil Cook]
- Added jpg py3 logo. [Neil Cook]
- Added picture as jpg. [Neil Cook]
- Changed path for plot. [Neil Cook]
- Correlation with a box test plot. [Neil Cook]
- Change test function for *smoothed_boxmean_image*. [Neil Cook]
- Added to general section, *cal_dark* section and *cal_loc* section. [Neil Cook]
- Moved *kw_TILT* to own section. [Neil Cook]
- Edited description of slit param. [Neil Cook]

5.3.1.922 0.0.014 (2017-11-08)

- Added doc string for extract and added ExtractABorder alias to init. [Neil Cook]
- Added FitTilt and GetTilt to init. [Neil Cook]
- Moved *extract_AB_order* here (from *cal_SLIT_spirou)* [Neil Cook]
- Removed *get_tilt* and *fit_filt* functions (to spirouImage) [Neil Cook]
- Moved *get_tilt* and *fit_filt* functions here. [Neil Cook]
- Added doc strings for slit plotting functions. [Neil Cook]
- Updated *USE_KEYS* list formatting. [Neil Cook]
- Updated readme. [Neil Cook]
- Reworked *get_tilt* function, added extract AB order function and fit filt function, added plotting section, added tilt calculation section, added todo quality control section, added update calibDB section. [Neil Cook]
- Added coi *ic_tilt_fit* and *ic_slit_order_plot* constants. [Neil Cook]
- Added *kw_TILT* keyword. [Neil Cook]
- Added slit plotting functions: *selected_order_plot* and *slit_tilt_angle_and_fit_plot*. [Neil Cook]
- Added doc string for *extract_wrapper*, *extract_const_range*, added test functions *extract_const_range_fortran* and moved *extract_const_range* to *extract_const_range_wrong* (updates former) [Neil Cook]
- Changed plt.ion to sPlt controller function. [Neil Cook]

5.3.1.923 0.0.013 (2017-11-07)

- Added doc for *get_loc_coefficients*, *initial_order_fit*, *sigmaclip_oder_fit* and *image_localization_superposition* added *calcualte_location_fits* function. [Neil Cook]
- First commit - added extract wrapper alias. [Neil Cook]
- First commit - added extract wrapper and first attempt at extract code. [Neil Cook]
- First commit - added fast polyval function. [Neil Cook]
- Added doc string comments for all functions. [Neil Cook]
- Edited *kw_loco_ctr_coeff* and *kw_loco_fwhm_coeff*. [Neil Cook]
- Allowed *max_time* to be None and get *max_time* from p['fitsfilename'] [Neil Cook]
- Added some slit parameters. [Neil Cook]
- Added extract function. [Neil Cook]
- Added test via sys.argv. [Neil Cook]
- Added *get_loc_coefficients* function. [Neil Cook]
- Added GetCoeffs to init. [Neil Cook]
- Called GetAcqTime in *correct_for_dark* function. [Neil Cook]
- Added *read_header*, *read_key* and *read_key_2d_list* functions. [Neil Cook]
- Added ReadHeader, ReadKey, Read2Dkey to init. [Neil Cook]

- Added CopyCDBfiles call to *run_ startup* function. [Neil Cook]
- Added *get_ acquision_ time* and *copy_ files* function. [Neil Cook]
- Added CopyCDB and GetAcqTime to init. [Neil Cook]
- Updates *cal_ SLIT* with *_ _ NAME_ _* and new functions, updated startup section, added read image section, correction of dark section, resize image section, get coefficients section. [Neil Cook]
- Removed unused cocde from *cal_ loc_ RAW*. [Neil Cook]

5.3.1.924 0.0.012 (2017-11-03)

- Updated comments in *constants_ SPIROU*. [Neil Cook]
- Added a label to *locplot_ order*. [Neil Cook]
- Changed splt to sPlt. [Neil Cook]

5.3.1.925 0.0.011 (2017-11-02)

- Added timer, moved plots to spirouPlots, moved functions to spirouLOCOR, updated AddNewKey −> AddKey, added quality control section and add to calibDB section. [Neil Cook]
- Added timer, moved plots to spirouPlots, updated AddNewKey−> Addkey, [Neil Cook]
- Added *_ _ getitem_ _ _*, *_ _ contains*, *_ _ delitem_ _* functions, forced all keys to uppercase (now ParamDict is case-insensitive), added *source_ keys*, *_ _ capitalise_ keys_ _*, *_ _ capitalise_ _ key_ _* functions, added list to set of evaluate allowed types. [Neil Cook]
- Reloaded keywords *USE_KEYS*, added ParamDict call, added *kw_ LOC_* keys, added source to overwritten warning. [Neil Cook]
- Renamed AddNewKey to AddKey. [Neil Cook]
- Added wrapper function for *add_ new_ key (add_ new_ keys)*, [Neil Cook]
- Renamed *image_ localazation_ superposition* to *image_ localization_ superposition*. [Neil Cook]
- Added functions from *cal_ loc* −> spirouLOCOR, added *image_ localazation_ superposition* function. [Neil Cook]
- Added functions from *cal_ loc* −> spirouLOCOR to init. [Neil Cook]
- Moved fiber variables to own section, added qc for *cal_ loc*. [Neil Cook]
- Changed keys as now param dict all uppercase. [Neil Cook]
- First commit - all plotting functions moved here. [Neil Cook]

5.3.1.926 0.0.010 (2017-11-01)

- *Set_ source* for param dicts. [Neil Cook]
- *Set_ source* for param dicts. [Neil Cook]
- Renamed *set_ source* function to *set_ source_ for_ defaulting_ statements* (to avoid confusion) [Neil Cook]
- Added *set_ source*. [Neil Cook]
- Added documentation to ConfigException, added new class ParamDict (custom dictionary), added *set_ source* to param dicts and a *set_ source* function for dealing with default values from *check_ params()* [Neil Cook]
- Added ParamDict to init. [Neil Cook]
- Added set source + *c_ Database* −> ParamDict. [Neil Cook]
- Added set source + fparam −> ParamDict. [Neil Cook]
- Added set source + updated keywords to match spirouKeywords. [Neil Cook]

5.3.1.927 0.0.009 (2017-10-31)

- Modified *measure_background_and_get_central_pixels* to accept and return loc made a copy of data2 (data2o) for localisation with 0 on fit data dump added code for "Save and record of image of localization with order center and keywords" section added code for "Save and record of image of sigma" section placeholder code for "Save and Record of image of localization" section. [Neil Cook]
- Added empty holder for *image_localazation_super* function (not finished) [Neil Cook]
- Updated call for *ACQTIME_KEY* to *kw_ACQTIME_KEY*. [Neil Cook]
- Moved functions into sections added function *"add_new_key"* and *"add_key_2d_list"* [Neil Cook]
- Updated init file. [Neil Cook]
- Updated call to spirouConfig moved *check_params* moved *load_other_config_file* (kept wrapper function for logging) [Neil Cook]
- Removed log constants (to spirouConfig) [Neil Cook]
- Updated spirouCore init. [Neil Cook]
- First commit moved from config/keywords. [Neil Cook]
- Moved some constants to here *(TRIG_KEY*, *WRITE_LEVEL*, EXIT) added config exception class added config error class moved *load_config_from_file* from startup functions to spirouConfig added doc for *check_config* moved *check_params* from startup to spirouConfig created *get_default_config_file* function. [Neil Cook]
- First commit for spirouConfig ini - moved config and keyword function calls to here. [Neil Cook]
- Added *ic_locfitp*, *ic_loc_delta_width*, *ic_locopt1* to config file. [Neil Cook]
- Added *SPECIAL_NAME* back to config. [Neil Cook]
- Updated function calls. [Neil Cook]
- Updated function calls. [Neil Cook]
- Added call to AddNewKey. [Neil Cook]

5.3.1.928 0.0.008 (2017-10-30)

- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
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- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- Tmp file for keyword args? - sort this out. [Neil Cook]
- File migration and new imports plot order num against rms. [Neil Cook]
- File migration and new imports. [Neil Cook]
- File migration and new imports. [Neil Cook]
- Reordered files. [Neil Cook]

5.3.1.929 0.0.007 (2017-10-27)

- Reworked fit order into "initial order fit" and *"sigmaclip_order_fit"* added and tested order fitting sections. [Neil Cook]
- Added some more location parameters. [Neil Cook]
- Updated locate center order position into two functions. [Neil Cook]
- Return header from last "added" fits and set fitsfilename to last file (as in original code) - not sure it this is wanted but it is how it is. [Neil Cook]
- Changed *locate_center_order_positions* to two functions one for center finding one for center + width of individual (subtle differences) [Neil Cook]

5.3.1.930 0.0.006 (2017-10-26)

- Revert "added example of BoxSmoothedImage with mode 'convolve' vs 'manual'" This reverts commit f7637bf. [Neil Cook]
- Changed the logged to exit via sys.exit. [Neil Cook]
- Added a minimum width requirement and return widths in *"locate_center_order_position"* functions. [Neil Cook]
- Closed the hdu and added a header extension argument (default = 0) [Neil Cook]
- Changed name of *locate_central_position* alias. [Neil Cook]
- Added constants from *cal_loc_RAW_spirou*. [Neil Cook]
- Added to position and width finding (incomplete + untested) [Neil Cook]
- Fixed formatting. [Neil Cook]
- Reformatted BoxSmoothedimage and LocateCentralPosition descriptions in change log. [Neil Cook]
- Wrapped for *locate_order_positions* to go between manual and convolve versions. [Neil Cook]
- Added more documentation for *smoothed_boxmean_image*. [Neil Cook]
- Added BoxSmoothedImage 'convolve' vs 'manual' change to change log. [Neil Cook]
- Added BoxSmoothedImage with mode 'convolve' vs 'manual' [Neil Cook]

5.3.1.931 0.0.005 (2017-10-25)

- Added *locate_central_positions* function. [Neil Cook]
- Added some code for locating central positions. [Neil Cook]
- Removed sys.exit (now in WLOG for key='error') add a warning that parameter dictionary key is duplicated and overwrite when loading other config file. [Neil Cook]
- Added keys argument to *write_file_to_master* added log statement to log updated calibDB. [Neil Cook]
- Moved *smoothed_boxmean_image* function to spirouLOCOR added function *measure_box_min_max*. [Neil Cook]
- Moved *smoothed_boxmean_image* function to spirouLOCOR. [Neil Cook]
- Corrected typo 'Adding' –> 'ADD' [Neil Cook]
- Updates init with boxsmoothedminmax moved boxsmoothed image to spirouLOCOR. [Neil Cook]
- Added config readme at top added some *cal_loc* variables added -[code] tag to comments to show where constant is used (currently) [Neil Cook]
- Added measure background function and *plot_y_miny_maxy* and *plot_min_ycc_loc_threshold* updated data2 to be a copy of *order_profile*. [Neil Cook]
- Changed updatemaster key to variable instead of hardcoded string. [Neil Cook]
- Added *cal_loc_RAW_spirou* section to changelog. [Neil Cook]
- First commit of spirouLOCOR (empty) [Neil Cook]
- Added *flip_image*, *convert_to_e*, and *smoothed_boxmean_image* functions. [Neil Cook]
- Added 'BoxSmoothedImage, ConvertToE and FlipImage functions. [Neil Cook]
- Added *loc_box_size* constant and localisation parameters section. [Neil Cook]
- Added construct image *order_profile* section and write *order_profile* to file/calibDB sections. [Neil Cook]
- Updated comment with spelling correction. [Neil Cook]

5.3.1.932 0.0.004 (2017-10-24)

- Set out plan for code. [Neil Cook]
- Move config file. [Neil Cook]
- Add warning logger and remove sys.exit from all but logger. [Neil Cook]

5.3.1.933 0.0.003 (2017-10-16)

- Added nbframes as a parameter to get in *run_startup* function. [Neil Cook]
- Changed *ACQTIME_KEY* to getting from config file added checks for *ACQTIME_KEY*. [Neil Cook]
- Allow *math_controller* arg "framemath" to be None –> pass straight through. [Neil Cook]
- Added *correct_for_dark* function changed raise value errors to WLOG + sys.exit(1) [Neil Cook]
- Added CorrectForDark to init. [Neil Cook]
- Added *ACQTIME_KEY* constant. [Neil Cook]
- Added read image file section added call to CorrectForDark function added resize image section. [Neil Cook]
- Added rotation and conversion to e- (commented out currently) [Neil Cook]
- Added *fiber_params* function added startup.RunInitialStartup call added custom startup.RunStartup call (with parameters to add for each prefix case) [Neil Cook]
- Added a requirement that calibdb is defined in *run_startup* function. [Neil Cook]
- Updated the README with summary of changes to *cal_DARK_spirou.py*. [Neil Cook]

5.3.1.934 0.0.002 (2017-10-13)

- Added check for reduced directory (and make if needed) added check from calib directory (and make if needed) [Neil Cook]
- First commit added *update_datebase* and *put_file* functions added *get_check_lock_file*, *write_files_to_master*, and time2unixtime functions. [Neil Cook]
- Added PutFile and UpdateMaster functions. [Neil Cook]
- Added writeimage and *copy_original_keys* functions. [Neil Cook]
- Added readimage and writeimage function to init. [Neil Cook]
- Added dark quality control parameters added calibDB parameters. [Neil Cook]
- Added short name to *measure_dark* function added *dadead_{0}* to parameter dictionary (p) added comments dictionary from ReadImage added quality control section added save dark to fits section added save bad pixel mask added calibDB update. [Neil Cook]
- Added more TODO's regarding user defined config file. [Neil Cook]
- Added *DRS_PLOT* variable. [Neil Cook]
- Added image region plot added datacut plot added histogram plot. [Neil Cook]
- Added dark histogram variables. [Neil Cook]
- Added measure dark function changed pp –> p added dark measurement section added identification of bad pixels section. [Neil Cook]

5.3.1.935 0.0.001 (2017-10-12)

- Added evaluate value function to try to interpret the value in a config file (i.e. set to float/int/bool before setting to a string) [Neil Cook]
- Added line separator. [Neil Cook]
- Added *__version__* [Neil Cook]
- Added keyslookup function added numpy import. [Neil Cook]
- First commit added resize function. [Neil Cook]
- Added GetKeys + ResizeImage function to init added *__version__* [Neil Cook]
- Added *ic_cc(x/y)_(blue/red)_(low/high)* variables added *qc_dark_Time* variable. [Neil Cook]
- Added read image and resize iamge sections. [Neil Cook]
- Modified *run_startup* to deal with no fitfilename file. [Neil Cook]
- Updated *DRS_ROOT* path. [Neil Cook]
- Added *readimage+read_raw_Data* documentation and *keylookup+math_controller* function. [Neil Cook]
- Added ReadImage and GetKey to init. [Neil Cook]

- Added ReadImage functions and got keys from header. [Neil Cook]
- Added initial files, added readimage and *read_raw_data* functions. [Neil Cook]
- Added initial files. [Neil Cook]
- Updated title of readme. [Neil Cook]

Some radii options for box corners used; they were ignored as pict2e was not found