S-Cubes python package

creating IFS-like cubes with S-PLUS data

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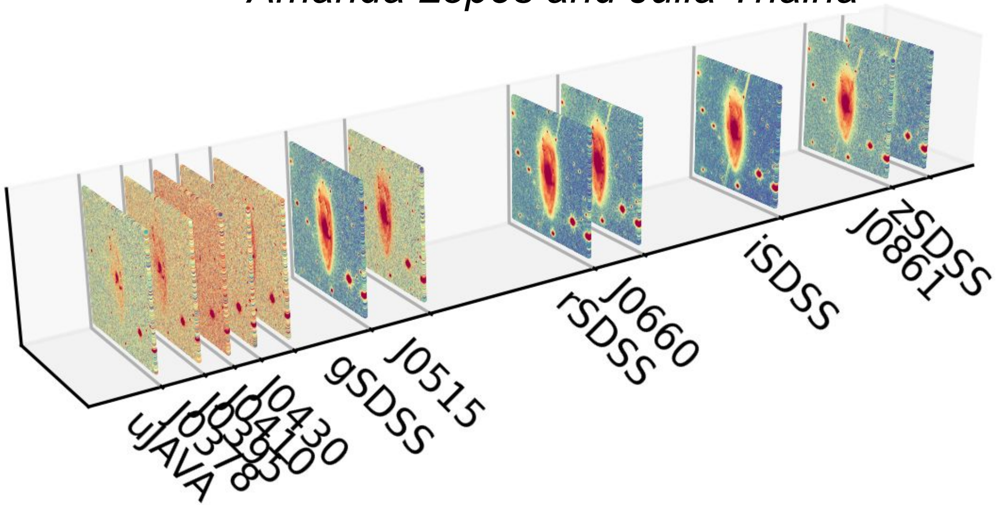
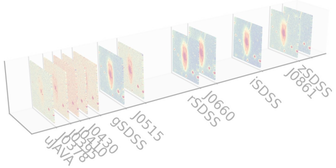
coding: *Fábio Herpich, Gustavo Schwarz*

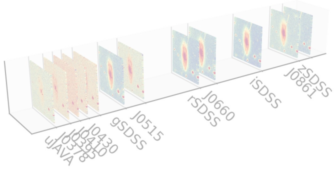
testing: *Roberto Cid Fernandes, Maiara Sampaio Carvalho, Victor Hugo Sasse, Amanda Lopes and Júlia Thainá*





S-Cubes package presentation

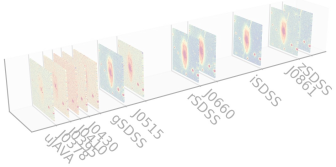
The software is a modern version of ***make_scubes_v02.py***, a script written by Fábio Herpich. **S-Cubes** has been completely remodeled and rewritten taking advantage of a new paradigm of coding, new python tools, and the recent release of the **splusdata** package.



S-Cubes package presentation

The package includes:

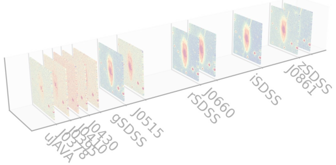
- **console scripts** create cubes, detection images and mask stars
- **modules** to access output data
- **modules** to access online S-PLUS data
- S-PLUS DR4 Calibration **data**
- S-PLUS filters **data**
- **online documentation** with running examples



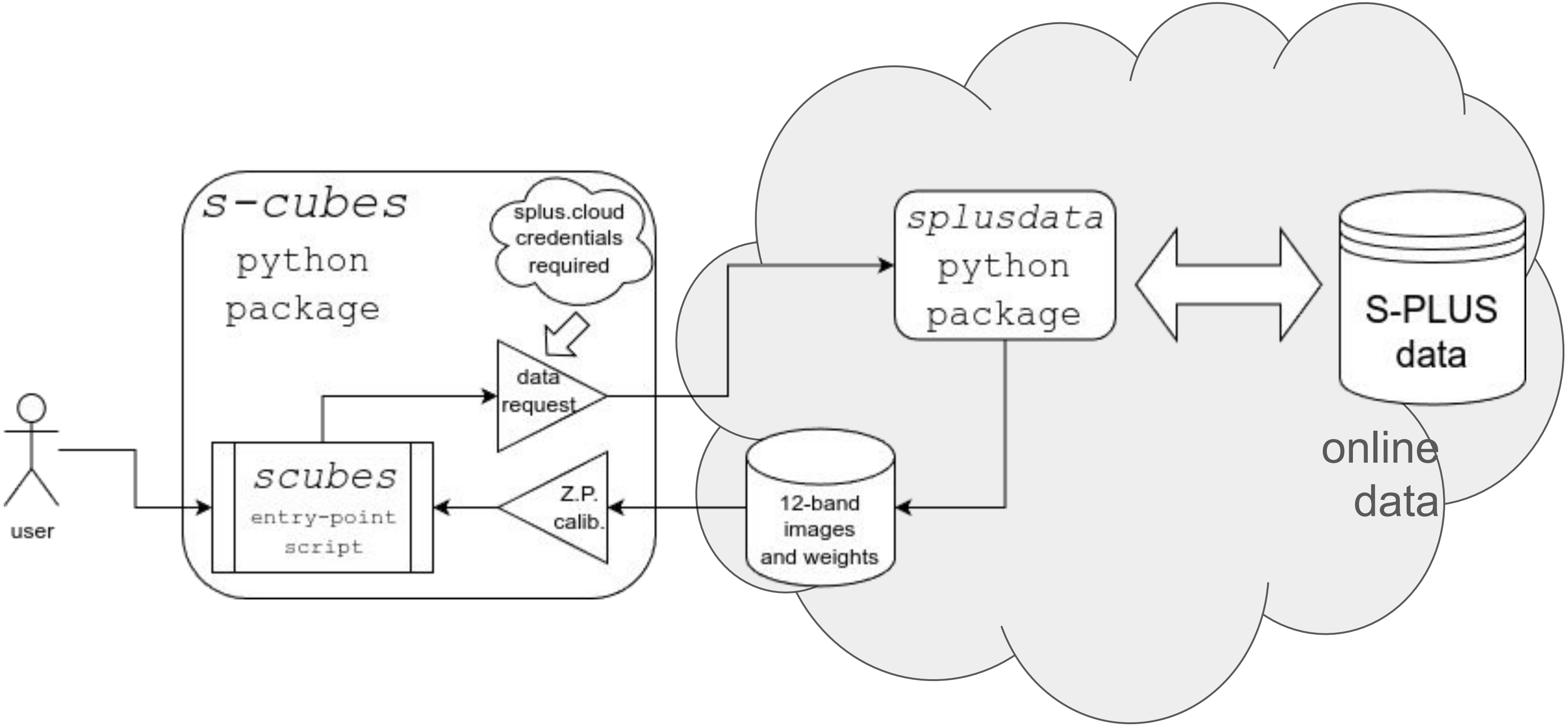
S-Cubes package main console scripts

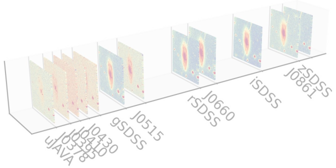
- *scubes and scubesml:* the main script of **S-Cubes**. Download 12-band images cropped from S-PLUS observed tiles. The images are zero-point calibrated and the fluxes and uncertainties are calculated. At the end, generates a FITS file with the cube and some metadata. The “*ml*” version operates with an input ***masterlist*** of objects.

- *sex_mask_stars:* uses **SExtractor** in order to create a spatial mask of stars, attempting to remove the areas enclosed by the brightest ones along the FOV.

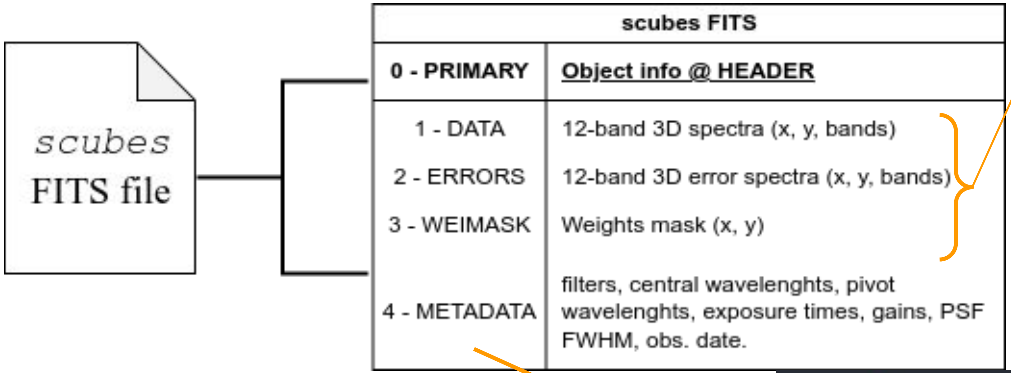


S-Cubes: scubes entry-point console script



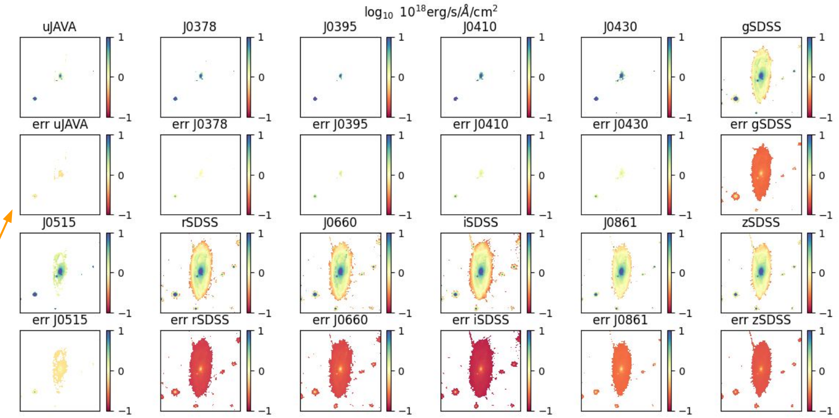


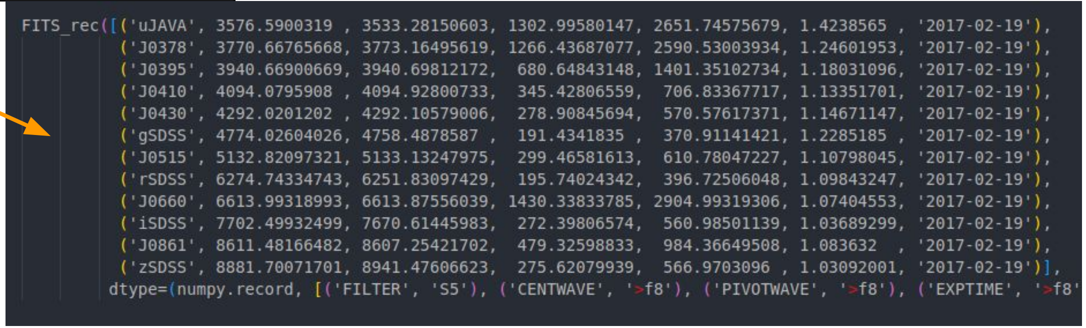
S-Cubes: SCUBE - the output cube



scubes FITS

0 - PRIMARY	Object info @ HEADER
1 - DATA	12-band 3D spectra (x, y, bands)
2 - ERRORS	12-band 3D error spectra (x, y, bands)
3 - WEIMASK	Weights mask (x, y)
4 - METADATA	filters, central wavelenghts, pivot wavelenghts, exposure times, gains, PSF FWHM, obs. date.





```
FITS_rec([('uJAVA', 3576.5900319 , 3533.28150603, 1302.99580147, 2651.74575679, 1.4238565 , '2017-02-19'),
          ('J0378', 3770.66765668, 3773.16495619, 1266.43687077, 2590.53003934, 1.24601953, '2017-02-19'),
          ('J0395', 3940.66900669, 3940.69812172,  680.64843148, 1401.35102734, 1.18031096, '2017-02-19'),
          ('J0410', 4094.0795908 , 4094.92800733,  345.42806559,  706.83367717, 1.13351701, '2017-02-19'),
          ('J0430', 4292.0201202 , 4292.10579006,  278.90845694,  570.57617371, 1.14671147, '2017-02-19'),
          ('gSDSS', 4774.02604026, 4758.4878587 ,  191.4341835 ,  370.91141421, 1.2285185 , '2017-02-19'),
          ('J0515', 5132.82097321, 5133.13247975,  299.46581613,  610.78047227, 1.10798045, '2017-02-19'),
          ('rSDSS', 6274.74334743, 6251.83097429,  195.74024342,  396.72506048, 1.09843247, '2017-02-19'),
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          ('iSDSS', 7702.49932499, 7670.61445983,  272.39806574,  560.98501139, 1.03689299, '2017-02-19'),
          ('J0861', 8611.48166482, 8607.25421702,  479.32598833,  984.36649508, 1.083632  , '2017-02-19'),
          ('zSDSS', 8881.70071701, 8941.47606623,  275.62079939,  566.9703096 , 1.03092001, '2017-02-19')],
         dtype=(numpy.record, [('FILTER', 'S5'), ('CENTWAVE', '>f8'), ('PIVOTWAVE', '>f8'), ('EXPTIME', '>f8'
```
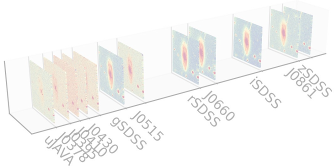
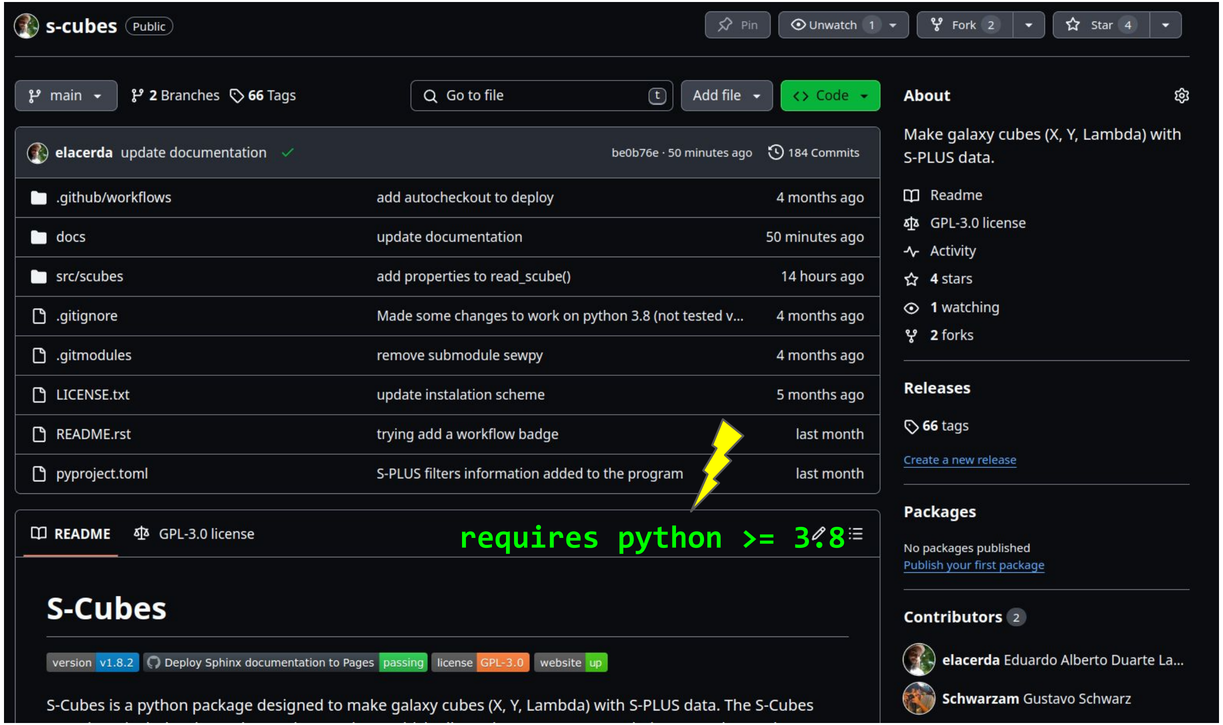



S-Cubes package source and online documentation

- GitHub page: https://github.com/elacerda/s-cubes *(v1.8.2)*



elacerda update documentation ✓ be0b76e · 50 minutes ago 184 Commits

.github/workflows	add autocheckout to deploy	4 months ago
docs	update documentation	50 minutes ago
src/scubes	add properties to read_scube()	14 hours ago
.gitignore	Made some changes to work on python 3.8 (not tested v...	4 months ago
.gitmodules	remove submodule sewpy	4 months ago
LICENSE.txt	update instalation scheme	5 months ago
README.rst	trying add a workflow badge	last month
pyproject.toml	S-PLUS filters information added to the program	last month

requires python >= 3.8

S-Cubes

S-Cubes is a python package designed to make galaxy cubes (X, Y, Lambda) with S-PLUS data. The S-Cubes

About

Make galaxy cubes (X, Y, Lambda) with S-PLUS data.

Readme
GPL-3.0 license
Activity
4 stars
1 watching
2 forks

Releases

66 tags
Create a new release

Packages

No packages published
Publish your first package

Contributors 2

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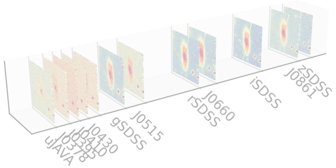
Schwarzam Gustavo Schwarz



S-Cubes package source and online documentation

- Webpage: https://elacerda.github.io/s-cubes/

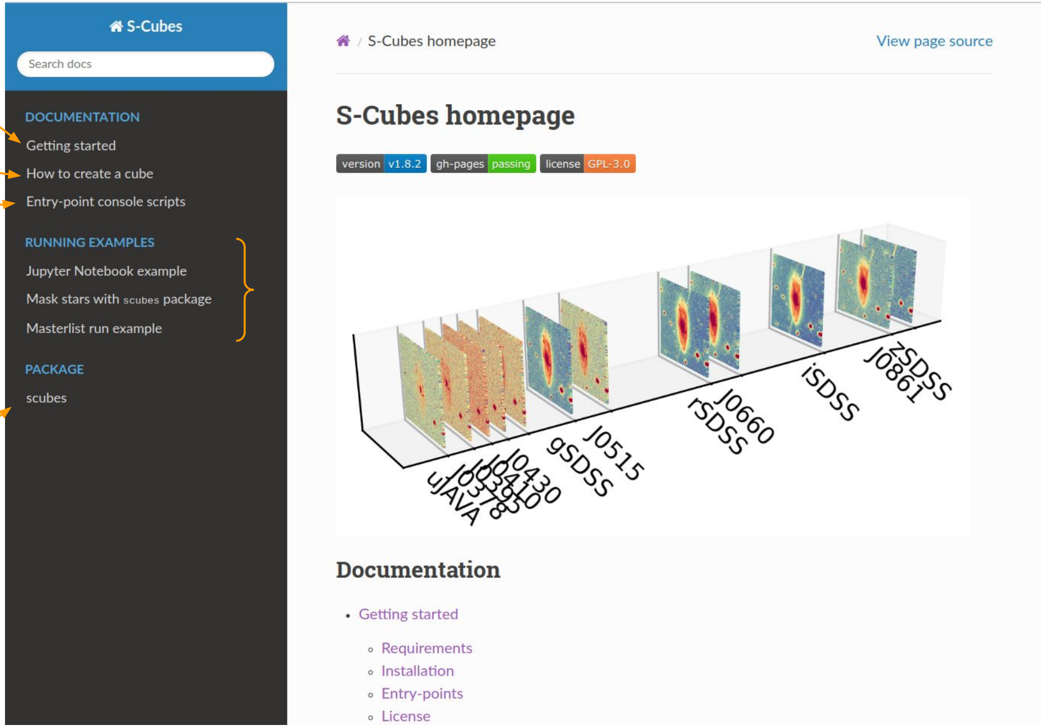
requirements and installation guide

quick scubes example

scripts documentation

Three example notebooks with running scripts, output files reading and metadata explanation and usage.

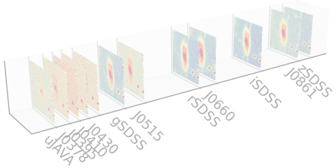
source code documentation



S-Cubes homepage

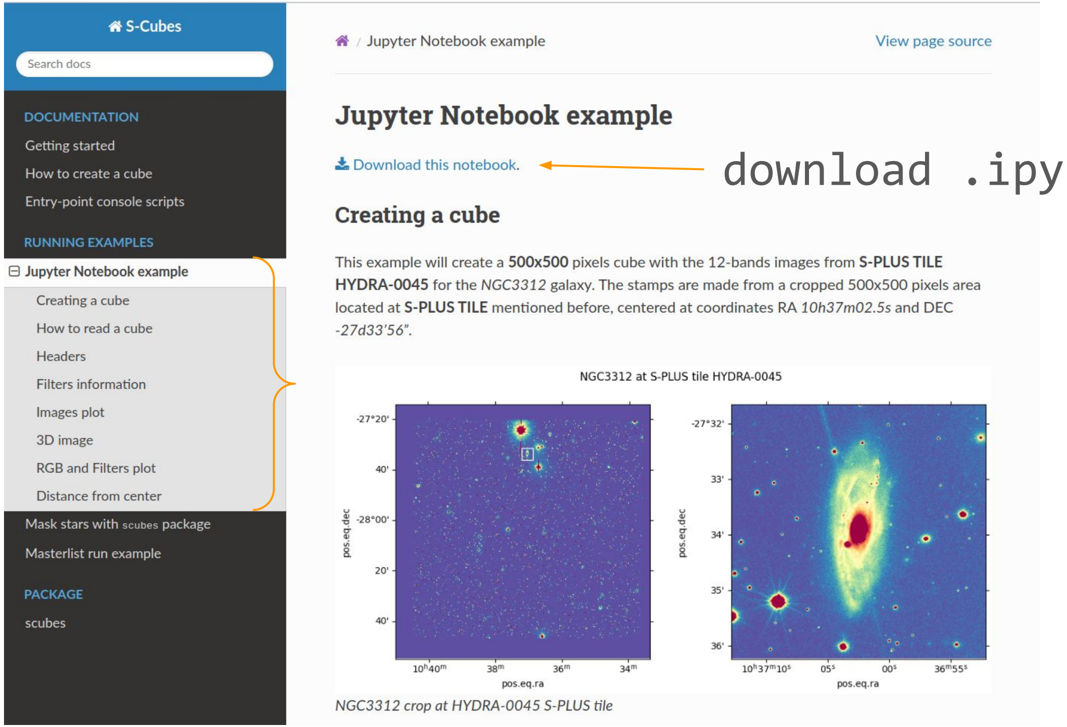
Documentation

- Getting started
  - Requirements
  - Installation
  - Entry-points
  - License



S-Cubes package source and online documentation

- Webpage: https://elacerda.github.io/s-cubes/nb_example.html



Jupyter Notebook example

Download this notebook.

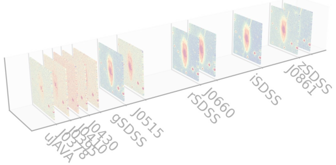
Creating a cube

This example will create a **500x500** pixels cube with the 12-bands images from **S-PLUS TILE HYDRA-0045** for the *NGC3312* galaxy. The stamps are made from a cropped 500x500 pixels area located at **S-PLUS TILE** mentioned before, centered at coordinates RA *10h37m02.5s* and DEC *-27d33'56"*.

NGC3312 crop at HYDRA-0045 S-PLUS tile

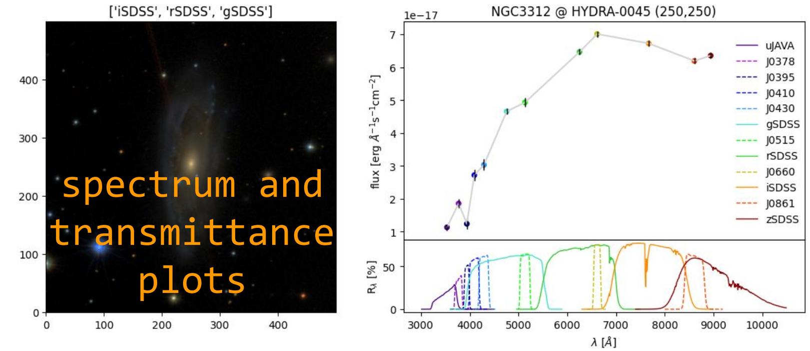
download .ipynb file

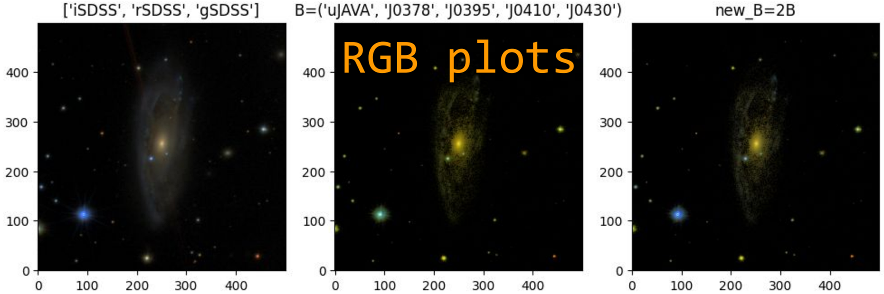
interactive scubes package usage with plots

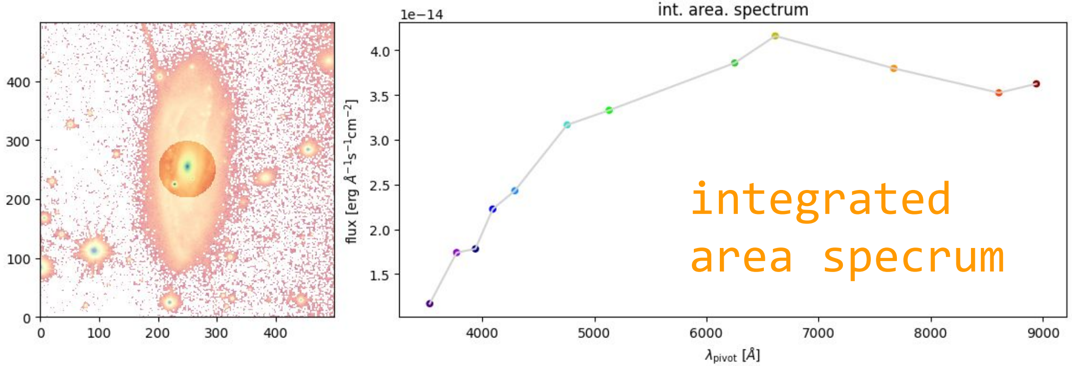


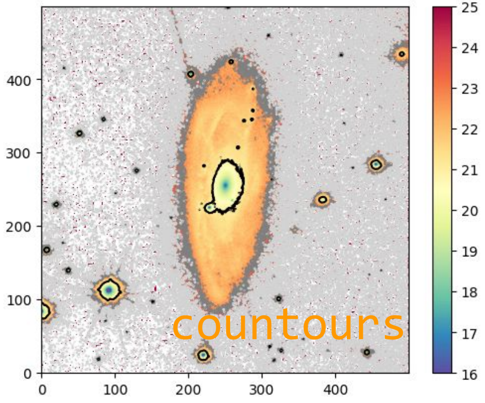
S-Cubes package source and online documentation

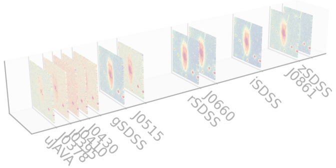
- Webpage: https://elacerda.github.io/s-cubes/nb_example.html


spectrum and transmittance plots


RGB plots


integrated area specrum

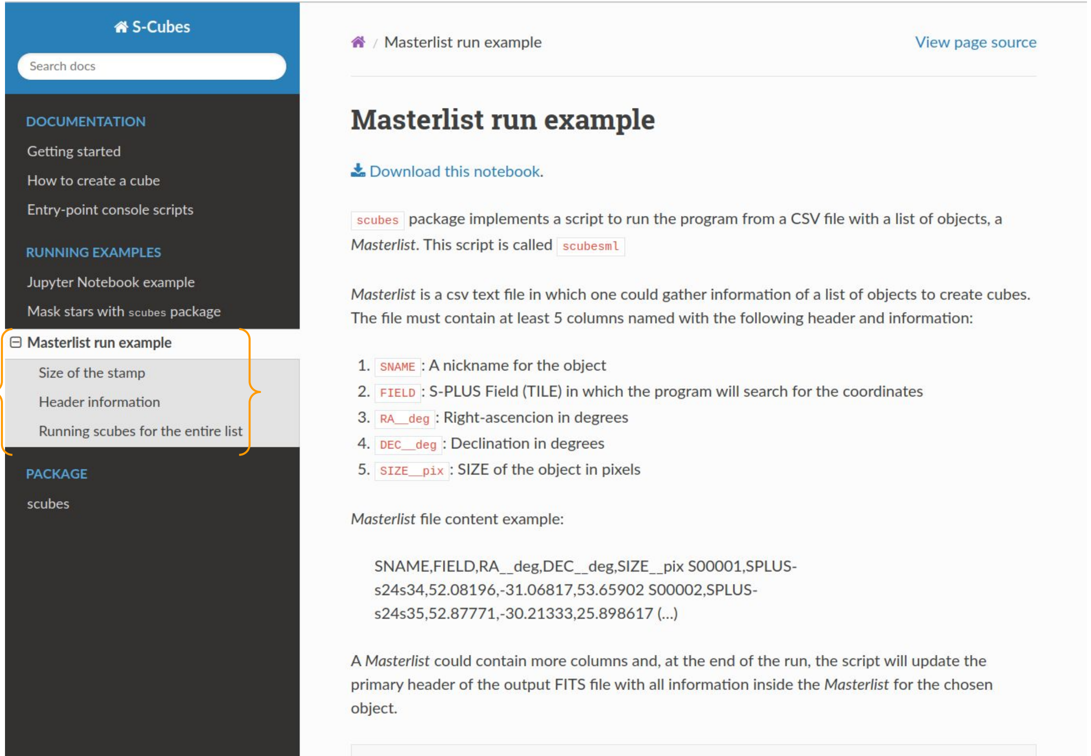

countours



S-Cubes package source and online documentation

- Webpage: https://elacerda.github.io/s-cubes/masterlist_example.html

How to run scubes using a list of objects



Masterlist run example

Download this notebook.

`scubes` package implements a script to run the program from a CSV file with a list of objects, a *Masterlist*. This script is called `scubesml`

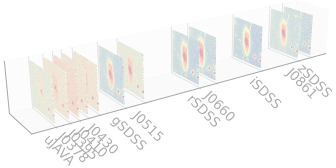
Masterlist is a csv text file in which one could gather information of a list of objects to create cubes. The file must contain at least 5 columns named with the following header and information:

1. `SNAME` : A nickname for the object
2. `FIELD` : S-PLUS Field (TILE) in which the program will search for the coordinates
3. `RA__deg` : Right-ascencion in degrees
4. `DEC__deg` : Declination in degrees
5. `SIZE__pix` : SIZE of the object in pixels

Masterlist file content example:

> SNAME,FIELD,RA__deg,DEC__deg,SIZE__pix S00001,SPLUS-s24s34,52.08196,-31.06817,53.65902 S00002,SPLUS-s24s35,52.87771,-30.21333,25.898617 (...)

A *Masterlist* could contain more columns and, at the end of the run, the script will update the primary header of the output FITS file with all information inside the *Masterlist* for the chosen object.

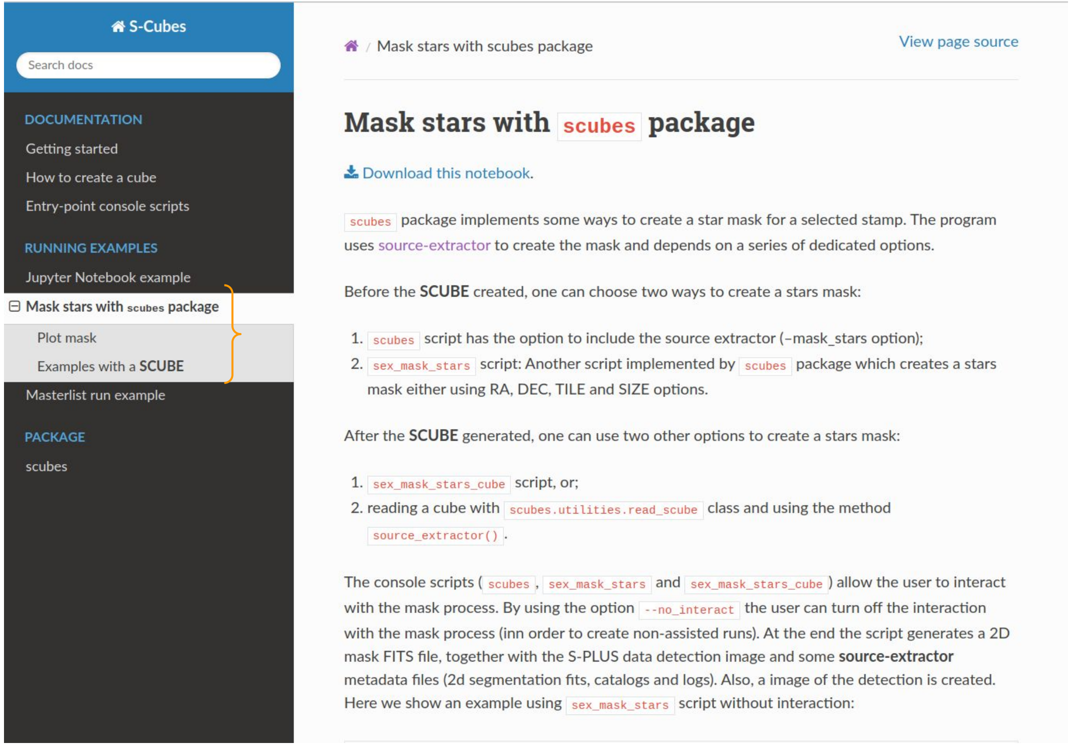


S-Cubes package source and online documentation

- Webpage: https://elacerda.github.io/s-cubes/mask_stars_example.html

Using scubes package to create a mask of stars in the FOV

SExtractor (source-extractor) required



Mask stars with `scubes` package

Download this notebook.

`scubes` package implements some ways to create a star mask for a selected stamp. The program uses source-extractor to create the mask and depends on a series of dedicated options.

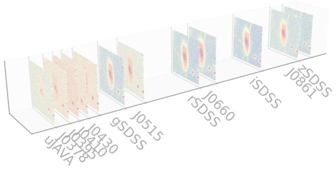
Before the **SCUBE** created, one can choose two ways to create a stars mask:

1. `scubes` script has the option to include the source extractor (–mask_stars option);
2. `sex_mask_stars` script: Another script implemented by `scubes` package which creates a stars mask either using RA, DEC, TILE and SIZE options.

After the **SCUBE** generated, one can use two other options to create a stars mask:

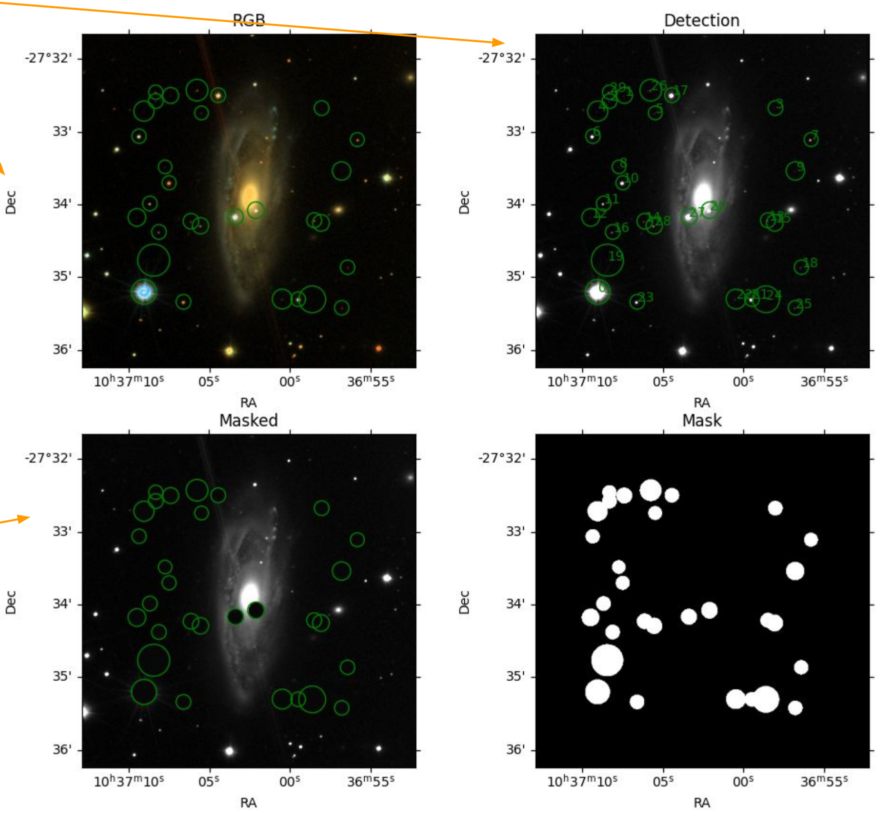
1. `sex_mask_stars_cube` script, or;
2. reading a cube with `scubes.utilities.read_scube` class and using the method `source_extractor()`.

The console scripts (`scubes` , `sex_mask_stars` and `sex_mask_stars_cube`) allow the user to interact with the mask process. By using the option `--no_interact` the user can turn off the interaction with the mask process (inn order to create non-assisted runs). At the end the script generates a 2D mask FITS file, together with the S-PLUS data detection image and some **source-extractor** metadata files (2d segmentation fits, catalogs and logs). Also, a image of the detection is created. Here we show an example using `sex_mask_stars` script without interaction:



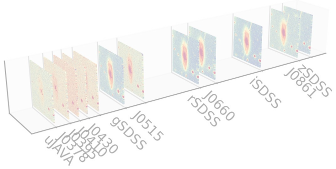
S-Cubes package mask stars output example

DETECTIONS



MASK

MASKED IMAGE



S-Cubes package: what's next?

- finish code documentation
- add an option to run with input IMAGES
- update for the new reduction (MAR)
- move entire source-code and online documentation to splus-collab github
- make available other stars mask processes
- splus.cloud integration
- get in touch with S-PLUS different science groups to search for usage adaptations
- bugs? e-mail: dhubax@gmail.com