

L1A : Process RAW to L1A

Raw binary to HDF5 and filter data on SZA.

Processing Parameters and metadata:

HyperInSPACE version: 1.0.9

The stuff that dreams are made of.

/version=R0

/investigators=Sam_Spade

/affiliations=Sam_Spade_Detective_Agency

/contact=supersleuth@noir.com

/experiment=sample

/cruise=Sample1

/documents=LogSheet.xls,ProcessReport.xls

/instrument_manufacturer=Satlantic

/instrument_model=HyperSAS

/calibration_date=

/calibration_files=HSE488B.cal,HSL386B.cal,HLD386B.cal,HED488B.cal,SATTHS0045A.tdf,HLD385B.cal,HSL385B.cal,SATNAV0001A.tdf,GPRMC_NMEA0183v3.01.tdf

/data_type=above_water

/data_status=preliminary

/measurement_depth=0

Process log:

Process Single Level

ProcessL1a.processL1a: 01-Nov-2021 14:49:56

L1A file produced:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1A/SAMPLE_HYPERSAS_SOLARTRACKER_L1A.hdf

Process Single Level:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1A/SAMPLE_HYPERSAS_SOLARTRACKER_L1A.hdf -
SUCCESSFUL

L1B : Process L1A to L1B

Apply factory calibrations.

Processing Parameters: None

Process log:

Process Single Level

ProcessL1b.processL1b: 01-Nov-2021 14:50:48

Applying factory calibrations.

Group: GPRMC_NMEA0183v3.01.tdf

File: \$GPRMC

Group: HED488B.cal

File: SATHED0488

Group: HLD385B.cal

File: SATHLD0385

Group: HLD386B.cal

File: SATHLD0386

Group: HSE488B.cal

File: SATHSE0488

Group: HSL385B.cal

File: SATHSL0385

Group: HSL386B.cal

File: SATHSL0386

Group: SATNAV0001A.tdf

File: SATNAV0001

L1B file produced:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1B/SAMPLE_HYPERSAS_SOLARTRACKER_L1B.hdf

Process	Single	Level:
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/Users/daurin/GitRepos/HyperInSPACE/Data/L1B/SAMPLE_HYPERSAS_SOLARTRACKER_L1B.hdf	-	
SUCCESSFUL		

L1C : Process L1B to L1C

Filter data on pitch, roll, yaw, and azimuth angles.

Processing Parameters:

Rotator Home Angle: 0.0

Rotator Delay: 60.0

Pitch/Roll Filter: 5.0

Rel Azimuth Min: 90.0

Rel Azimuth Max: 135.0

Process log:

Process Single Level

Found data: station

Found data: lat

Found data: lon

Found data: wind

Found data: wt

Found data: sal

Found data: speed_f_w

ProcessL1c:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1B/SAMPLE_HYPERSAS_SOLARTRACKER_L1B.hdf

ProcessL1c.processL1c: 01-Nov-2021 14:50:53

Bad Datetag or Timetag2 found. Eliminating record. 1776 : 3158326.0 : 758134061.0

Filtering file for high pitch and roll

Percentage of data out of Pitch/Roll bounds: 0 %

Filtering file for bad Absolute Rotator Angle

Percentage of SolarTracker data out of Absolute Rotator bounds: 0 %

Filtering file for bad Relative Solar Azimuth

Percentage of data out of Relative Solar Azimuth bounds: 3 %

Flag data from TT2: 2016-05-20 07:58:17.566000+00:00 to 2016-05-20 07:59:48.483000+00:00
(HHMMSSMSS)

Eliminate combined filtered data from datasets.*****

Remove ES_DARK Data

Length of dataset prior to removal 1033 long

Length of records removed from dataset: 8

Data end 1025 long, a loss of 1 %

Remove ES_LIGHT Data

Length of dataset prior to removal 3579 long

Length of records removed from dataset: 23

Data end 3556 long, a loss of 1 %

Remove GPS Data

Length of dataset prior to removal 1777 long

Length of records removed from dataset: 45

Data end 1732 long, a loss of 3 %

Remove LI_DARK Data

Length of dataset prior to removal 1027 long

Length of records removed from dataset: 8

Data end 1019 long, a loss of 1 %

Remove LI_LIGHT Data

Length of dataset prior to removal 4753 long

Length of records removed from dataset: 37

Data end 4716 long, a loss of 1 %

Remove LT_DARK Data

Length of dataset prior to removal 245 long

Length of records removed from dataset: 2

Data end 243 long, a loss of 1 %

Remove LT_LIGHT Data

Length of dataset prior to removal 1243 long

Length of records removed from dataset: 9

Data end 1234 long, a loss of 1 %

Remove SOLARTRACKER Data

Length of dataset prior to removal 1776 long

Length of records removed from dataset: 46

Data end 1730 long, a loss of 3 %

Remove ANCILLARY_METADATA Data

Length of dataset prior to removal 59 long

Length of records removed from dataset: 1

Data end 58 long, a loss of 2 %

L1C file produced:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1C/SAMPLE_HYPERSAS_SOLARTRACKER_L1C.hdf

Process Single Level:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1C/SAMPLE_HYPERSAS_SOLARTRACKER_L1C.hdf -

SUCCESSFUL

L1D : Process L1C to L1D

Deglitch data and apply shutter dark corrections.

Processing Parameters:

ES Dark Window: 11
ES Light Window: 9
ES Dark Sigma: 3.2
ES Light Sigma: 2.4
LT Dark Window: 9
LT Light Window: 9
LT Dark Sigma: 3.2
LT Light Sigma: 2.3
LI Dark Window: 11
LI Light Window: 9
LI Dark Sigma: 3.5
LI Light Sigma: 2.4
ES Light Thresh. Band: None
ES Light Min.: None
ES Light Max.: None
ES Dark Thresh. Band: None
ES Dark Min.: None
ES LDark Max.: None
LI Light Thresh. Band: 421.63
LI Light Min.: None
LI Light Max.: None
LI Dark Thresh. Band: None
LI Dark Min.: None
LI LDark Max.: None
LT Light Thresh. Band: None
LT Light Min.: None
LT Light Max.: None
LT Dark Thresh. Band: None
LT Dark Min.: None
LT Dark Max.: None

Process log:

Process Single Level

Deglitching anomaly file found for this L1C. Using these parameters.

ProcessL1d:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1C/SAMPLE_HYPERSAS_SOLARTRACKER_L1C.hdf

ProcessL1d.processL1d: 01-Nov-2021 14:50:55

Screening ANCILLARY_METADATA for clean timestamps.

Screening ES_DARK for clean timestamps.

Screening ES_LIGHT for clean timestamps.

Screening GPS for clean timestamps.

Screening LI_DARK for clean timestamps.

Screening LI_LIGHT for clean timestamps.

Screening LT_DARK for clean timestamps.

Screening LT_LIGHT for clean timestamps.

Screening SOLARTRACKER for clean timestamps.

ES

Deglitching dark

Data reduced by 422 (41%)

Deglitching light

Data reduced by 550 (15%)

LI

Deglitching dark

Data reduced by 73 (7%)

Deglitching light

Data reduced by 1745 (37%)

LT

Deglitching dark

Data reduced by 50 (21%)

Deglitching light

Data reduced by 219 (18%)

Dark Correction: ES

Dark Correction: LI

Dark Correction: LT

L1D file produced:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1D/SAMPLE_HYPERSAS_SOLARTRACKER_L1D.hdf

Process Single Level:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1D/SAMPLE_HYPERSAS_SOLARTRACKER_L1D.hdf -

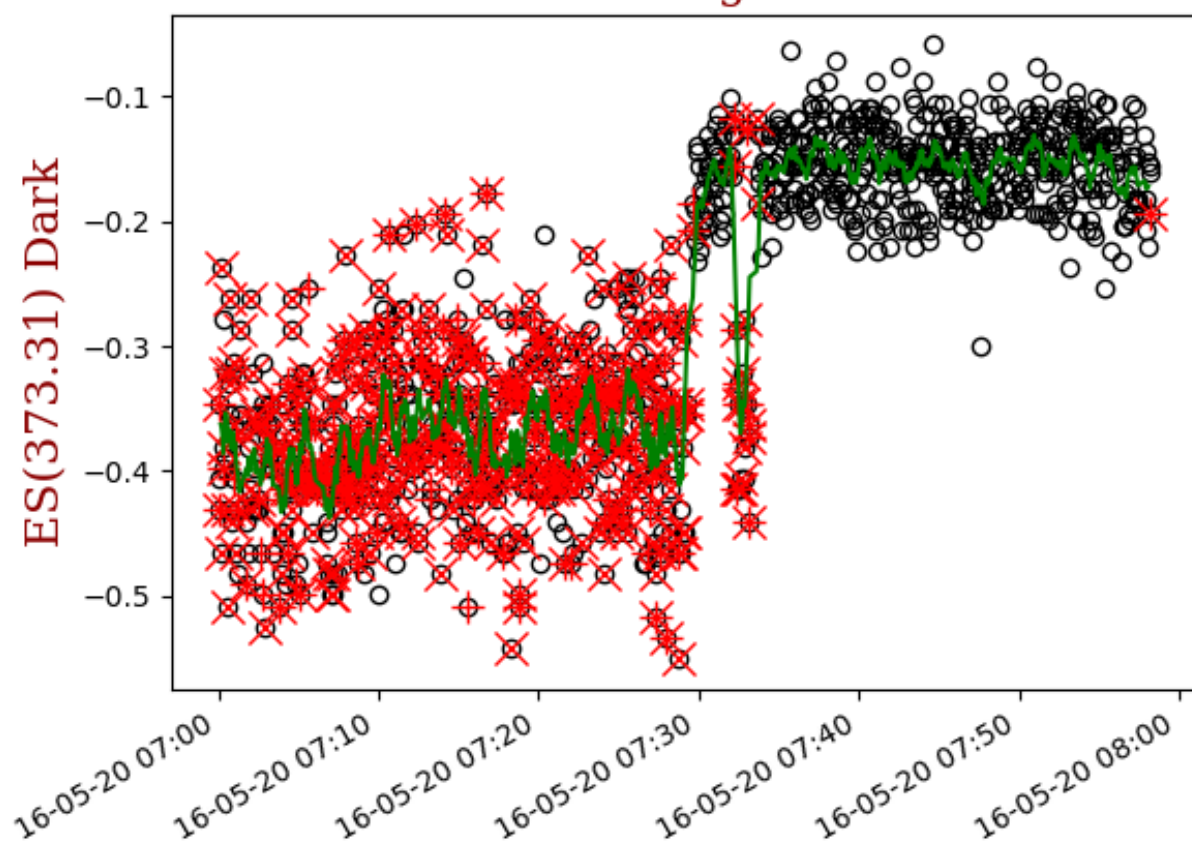
SUCCESSFUL

Example Deglitching

Randomized. Complete plots of hyperspectral deglitching from anomaly analysis can be found in [output_directory]/Plots/L1C_Anoms.

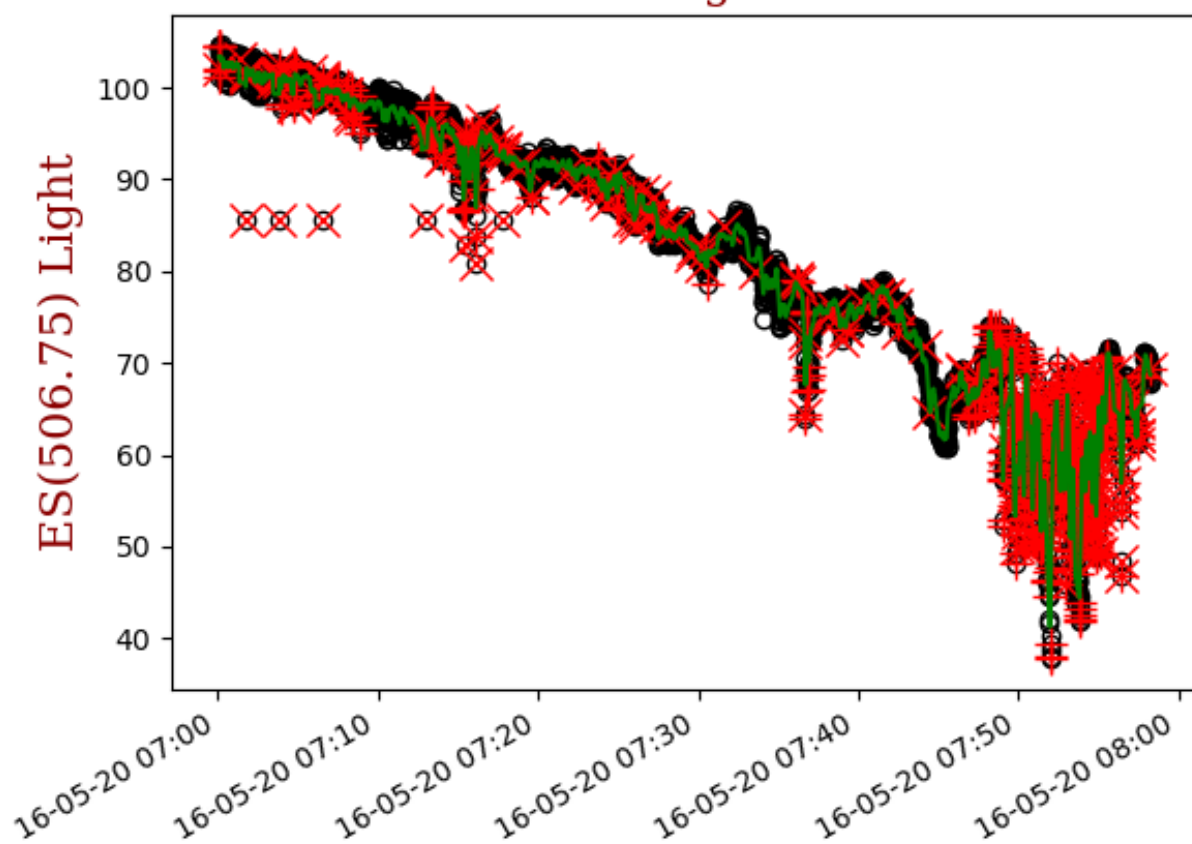
Marked for exclusions in ALL bands

WindowSize = 11 Sigma Factor = 3.2



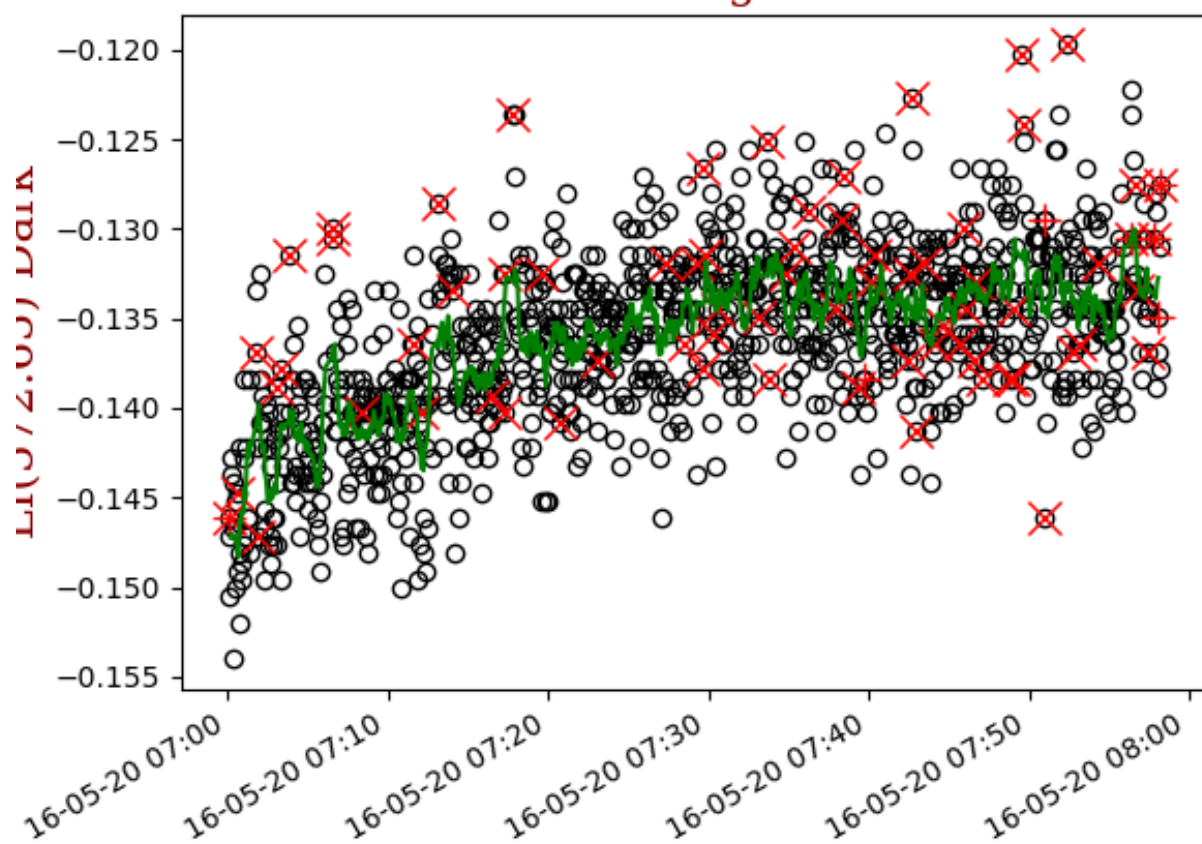
Marked for exclusions in ALL bands

WindowSize = 9 Sigma Factor = 2.4



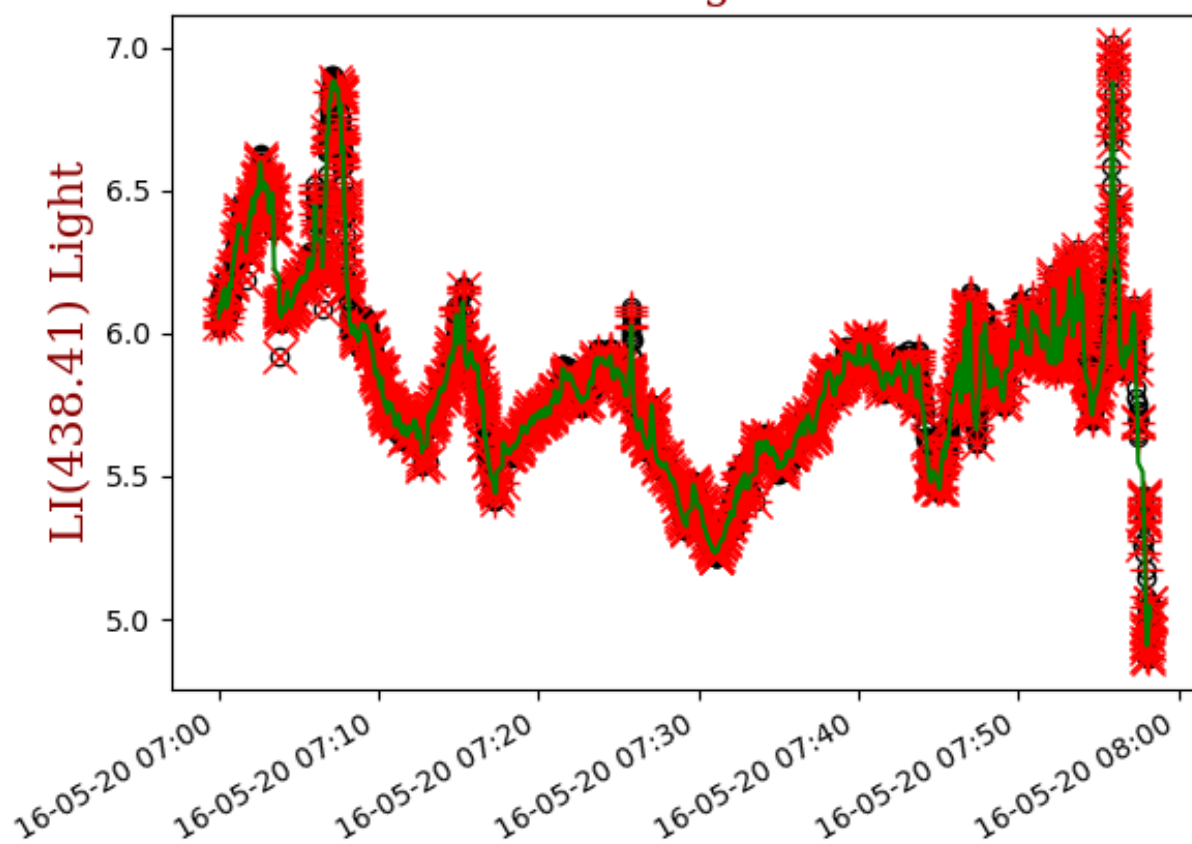
Marked for exclusions in ALL bands

WindowSize = 11 Sigma Factor = 3.5



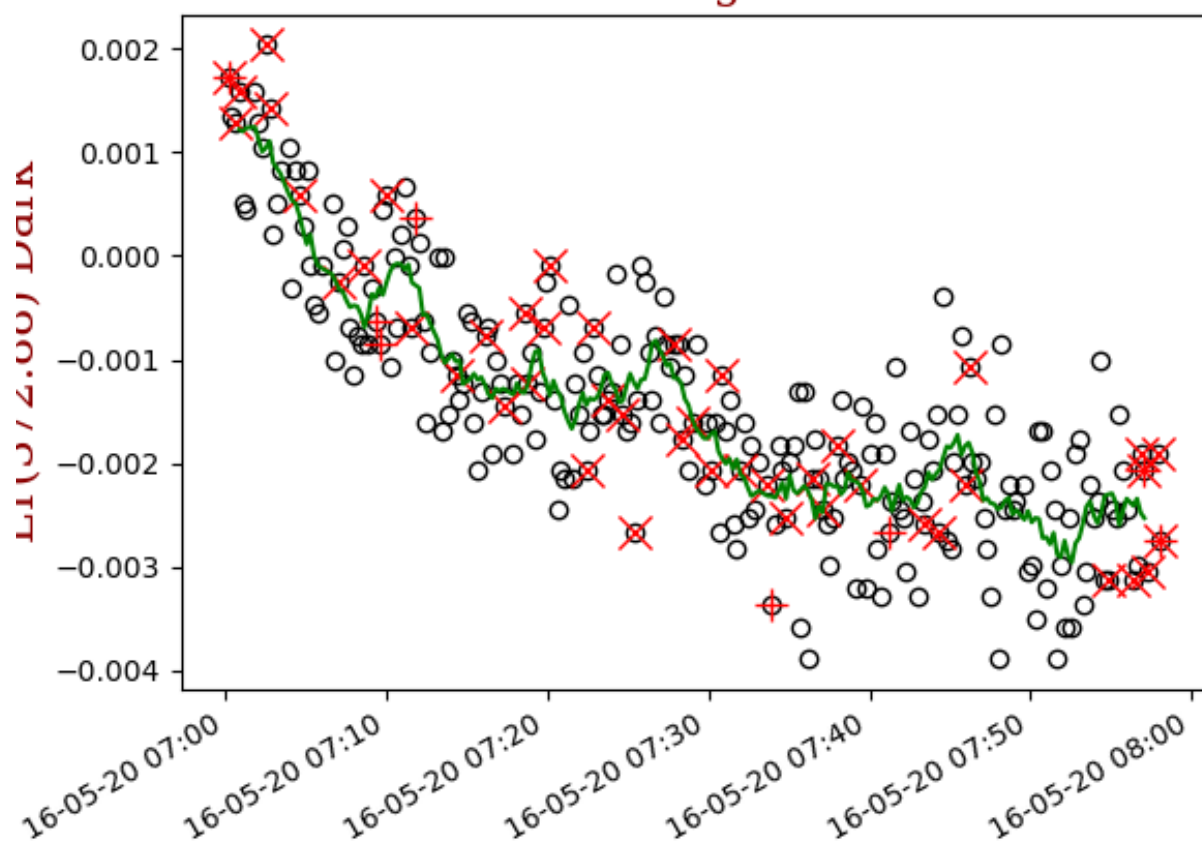
Marked for exclusions in ALL bands

WindowSize = 9 Sigma Factor = 2.4



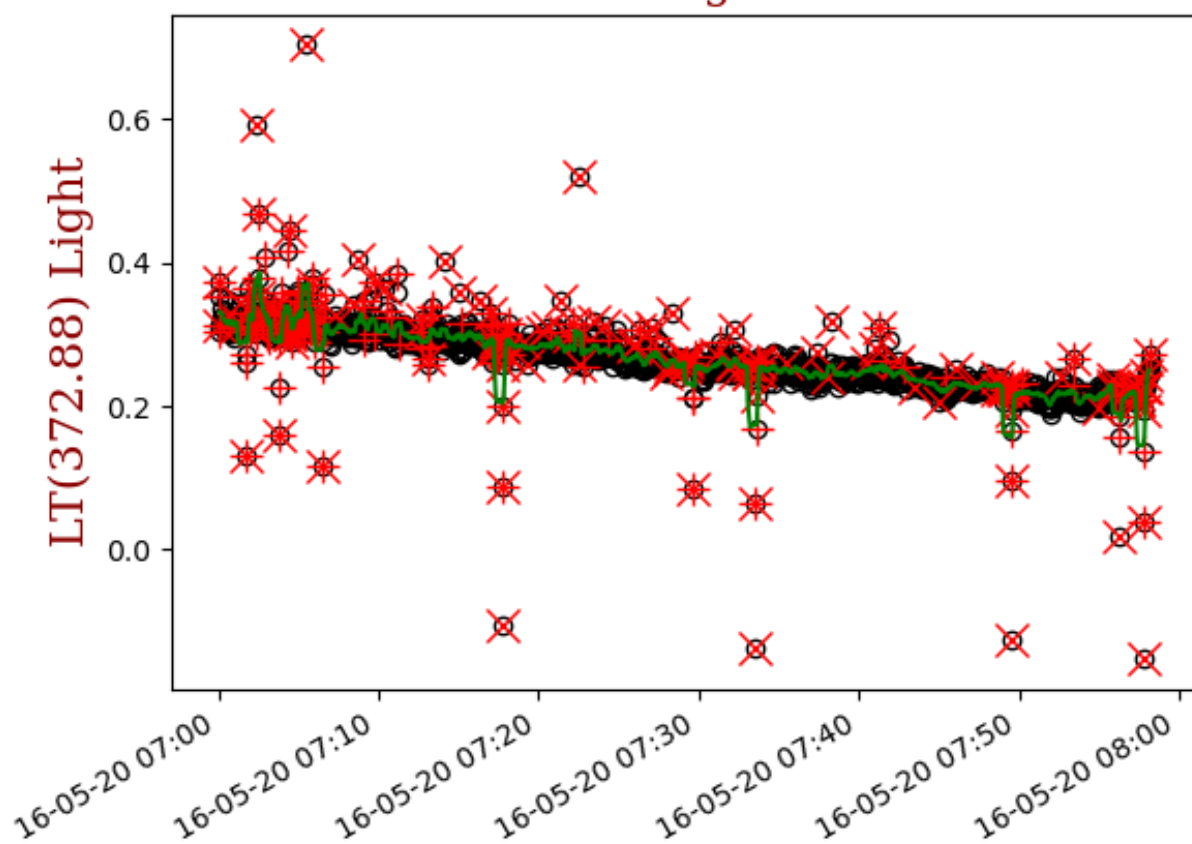
Marked for exclusions in ALL bands

WindowSize = 9 Sigma Factor = 3.2



Marked for exclusions in ALL bands

WindowSize = 9 Sigma Factor = 2.3



L1E : Process L1D to L1E

Interpolate data to common timestamps and wavebands.

Processing Parameters:

Wavelength Interp Int: 3.3 nm

Process log:

Process Single Level

ProcessL1e.processL1e: 01-Nov-2021 14:52:14

LT has fewest records (as expected) - interpolating to LT; 1015 records

Interpolate Data ES

Interpolate Data LI

Interpolate Data LT

Skip. Other instruments are being interpolated to this one.

Interpolate Data LATITUDE

Interpolate Data LONGITUDE

Interpolate Data COURSE

Interpolate Data SOG

Interpolate Data REL_AZ

Interpolate Data ELEVATION

Interpolate Data AZIMUTH

Interpolate Data POINTING

Interpolate Data HUMIDITY

Interpolate Data PITCH

Interpolate Data ROLL

Interpolate Data HEADING

Interpolate Data REL_AZ

Interpolate Data SZA

Interpolate Data STATION

Interpolate Data LATITUDE

Interpolate Data LONGITUDE

Interpolate Data SALINITY

Interpolate Data SOLAR_AZ

Interpolate Data SST

Interpolate Data WINDSPEED

Interpolate Data SPEED_F_W

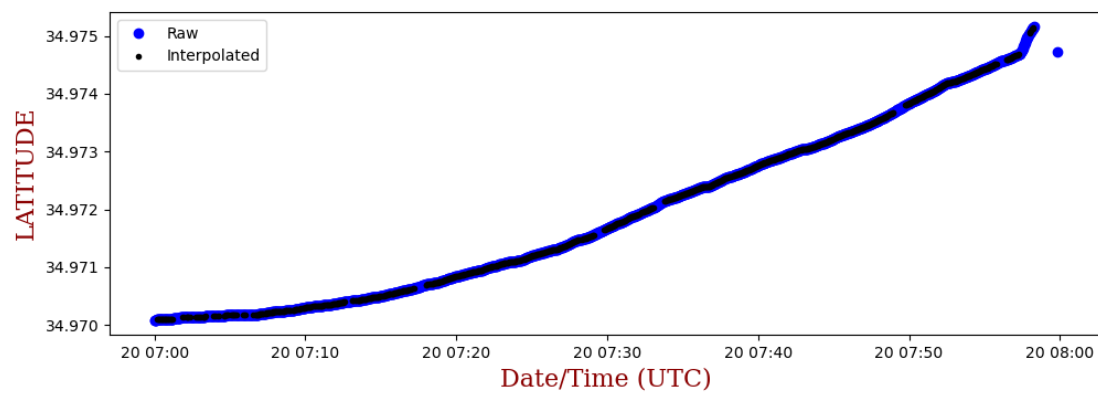
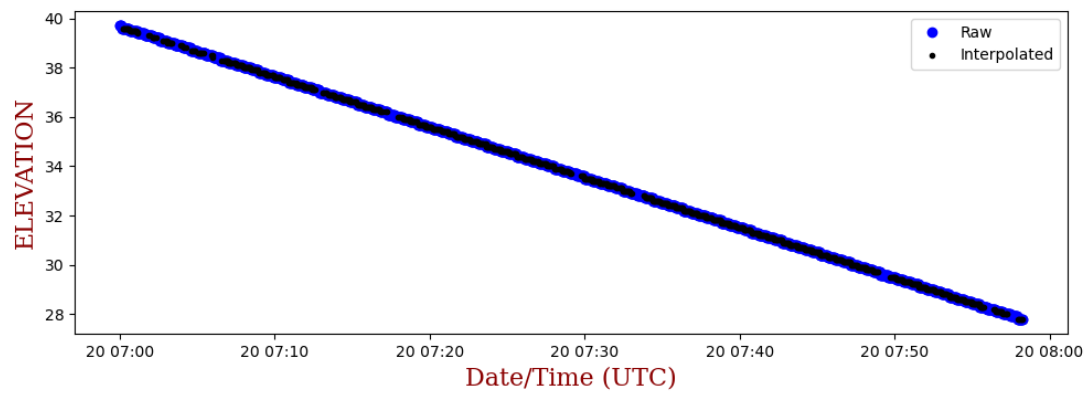
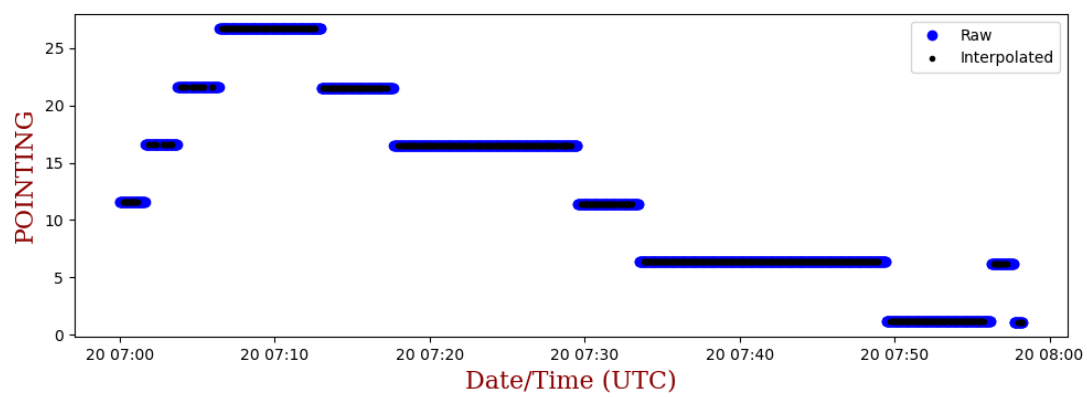
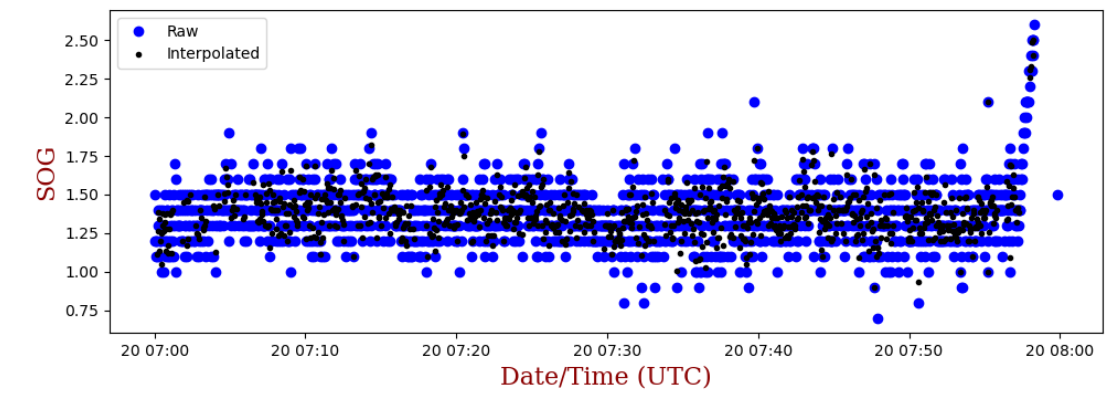
L1E file produced:

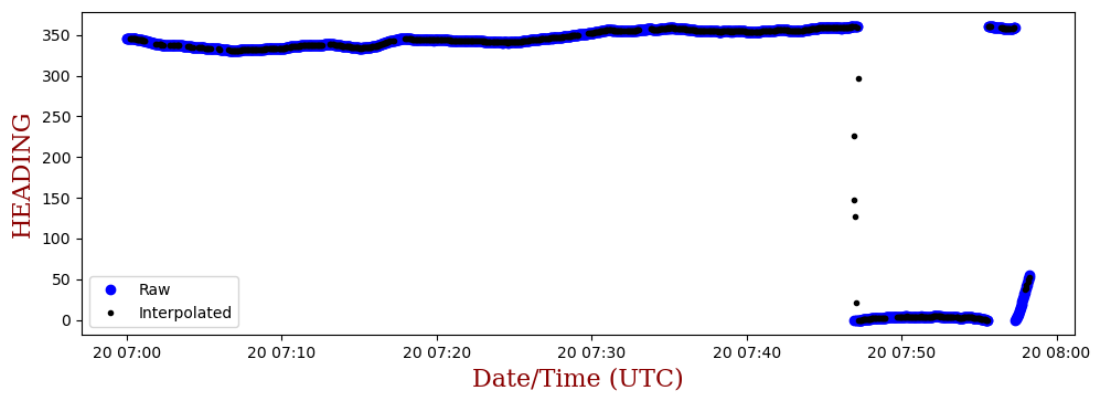
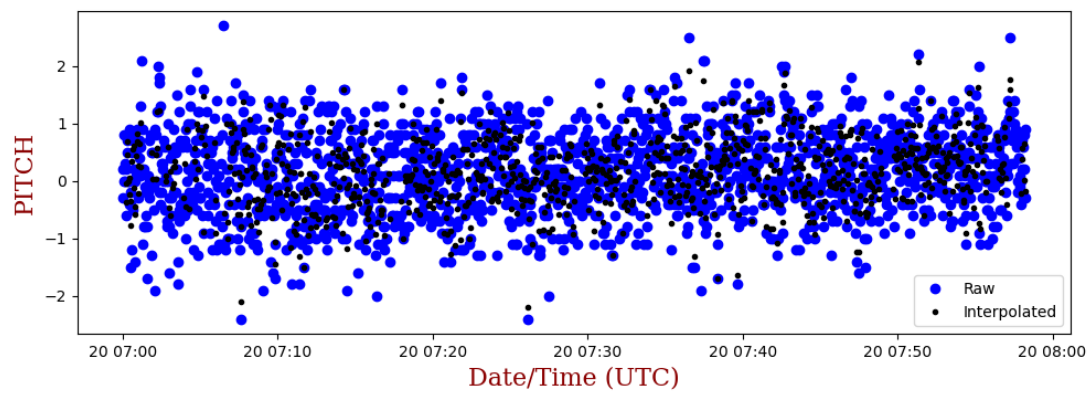
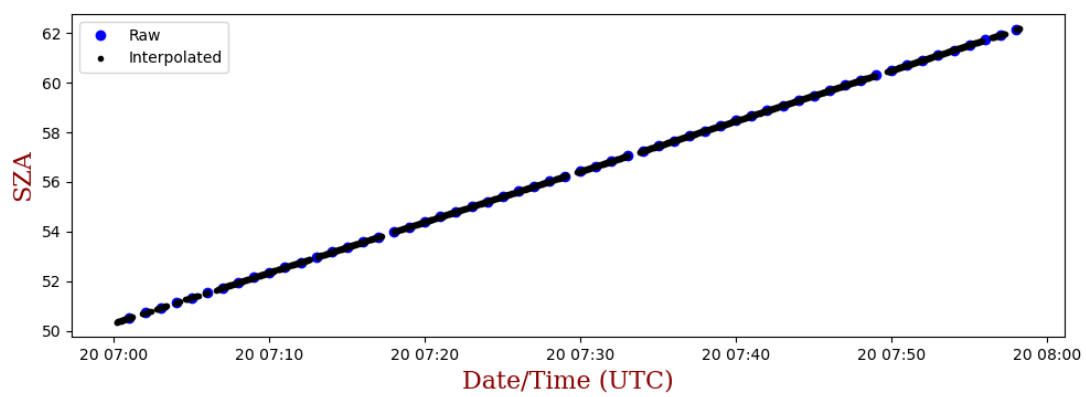
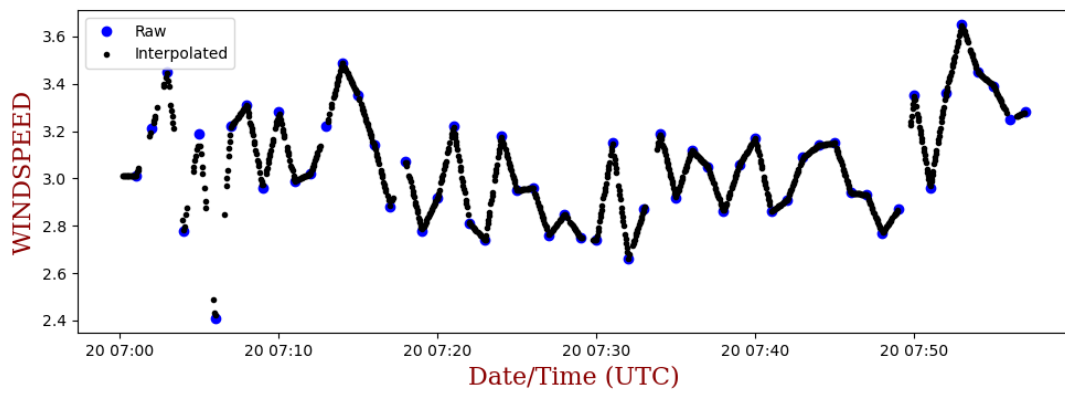
/Users/daurin/GitRepos/HyperInSPACE/Data/L1E/SAMPLE_HYPERSAS_SOLARTRACKER_L1E.hdf

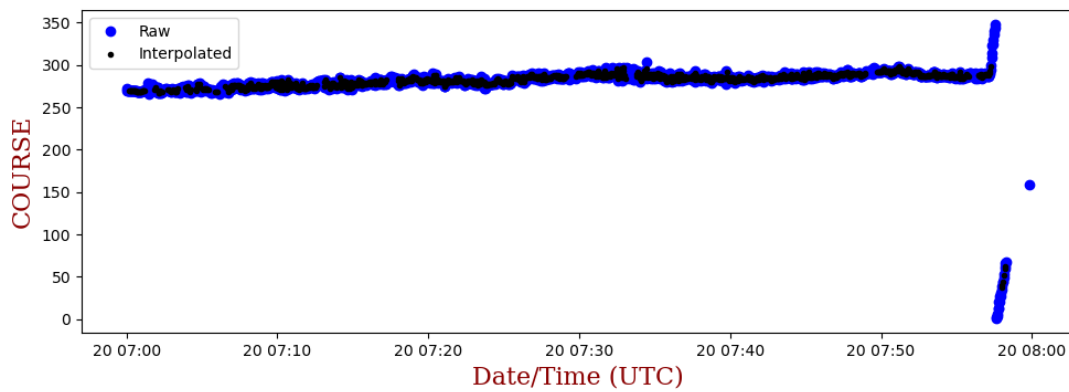
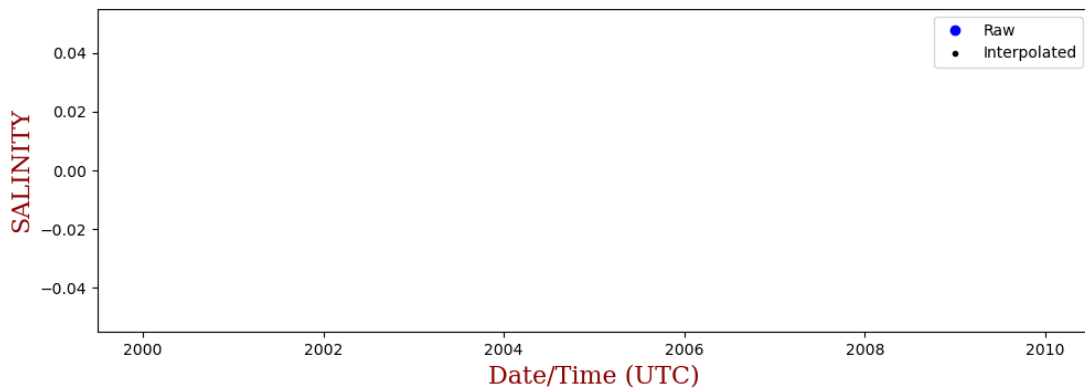
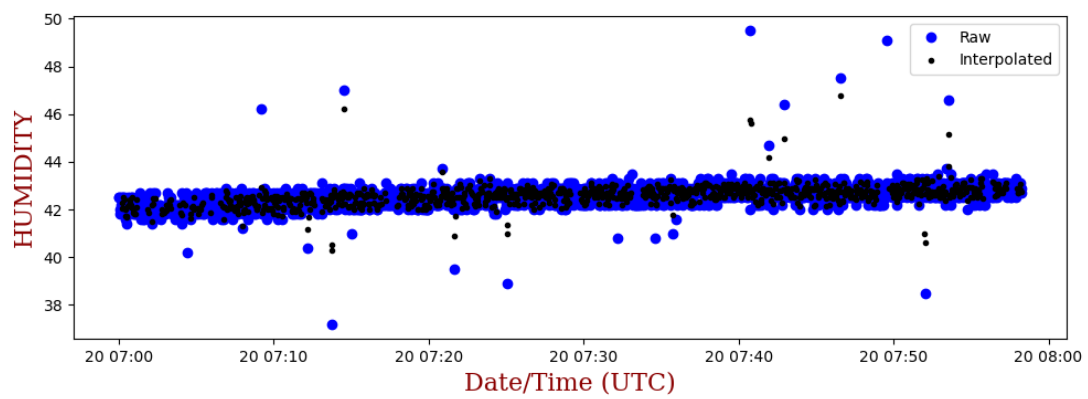
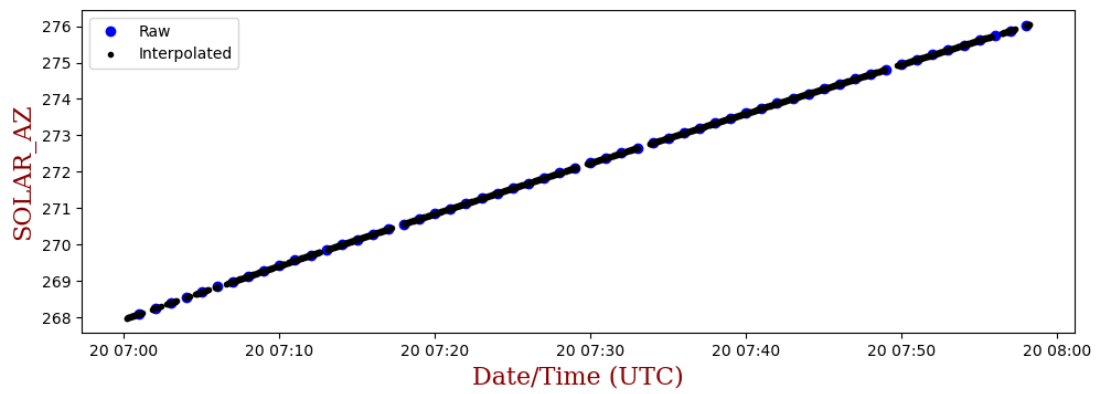
Output SeaBASS for HDF: Es, Li, Lt files

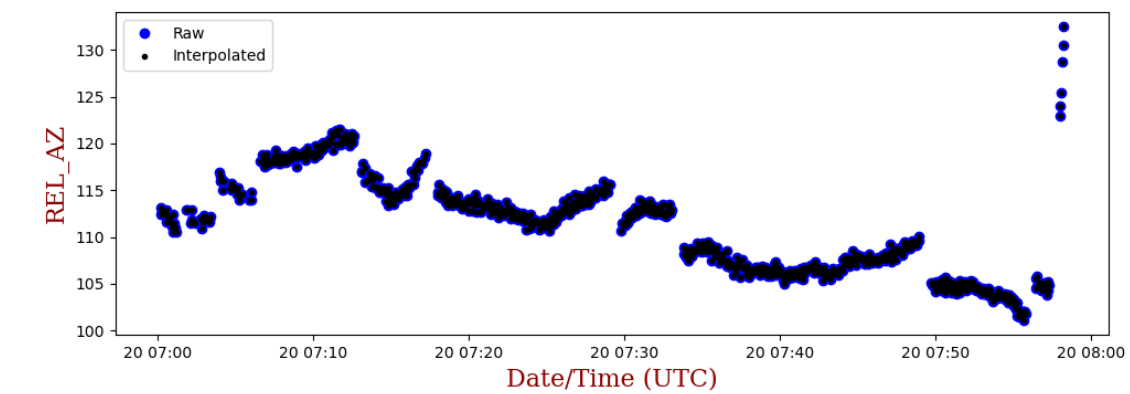
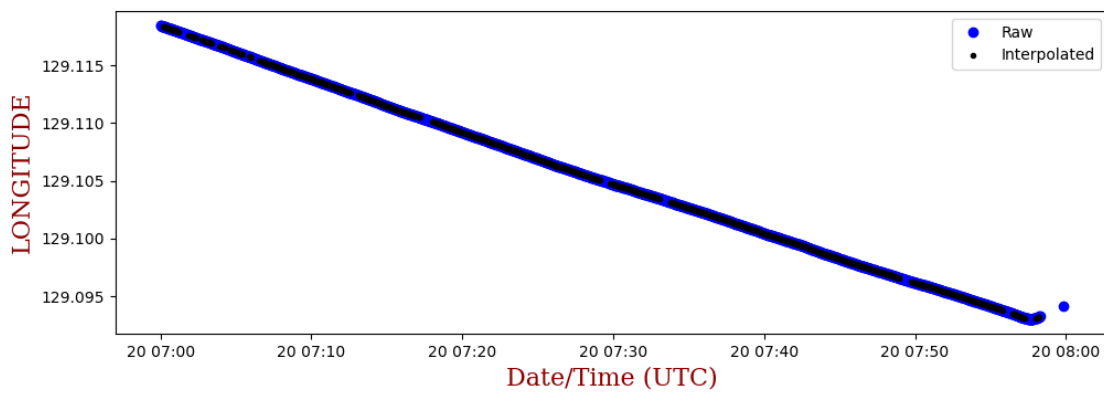
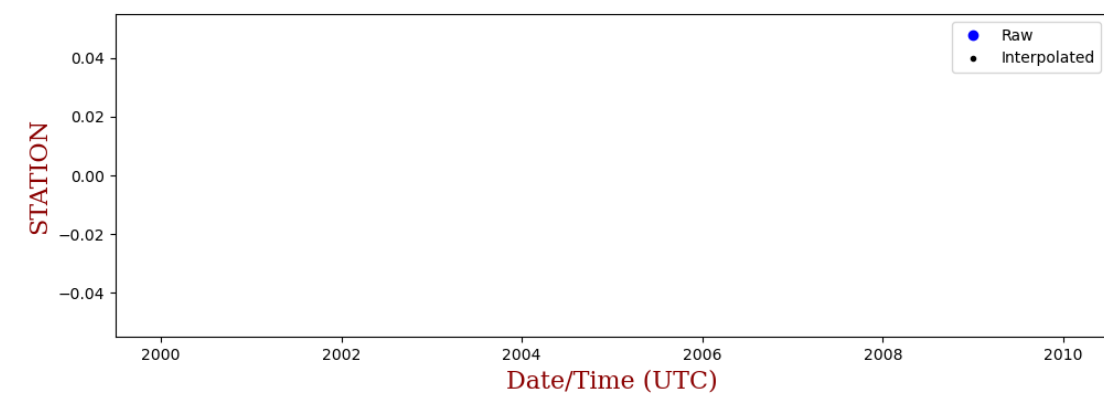
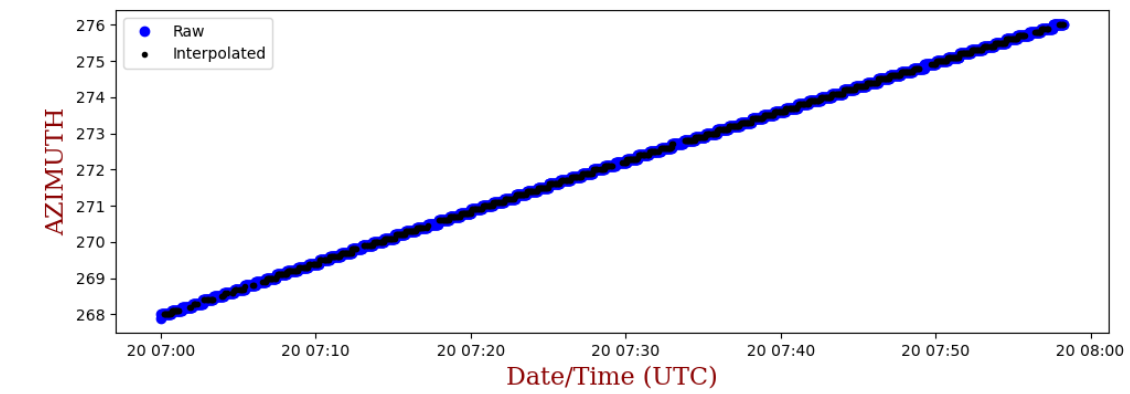
Example Temporal Interpolations

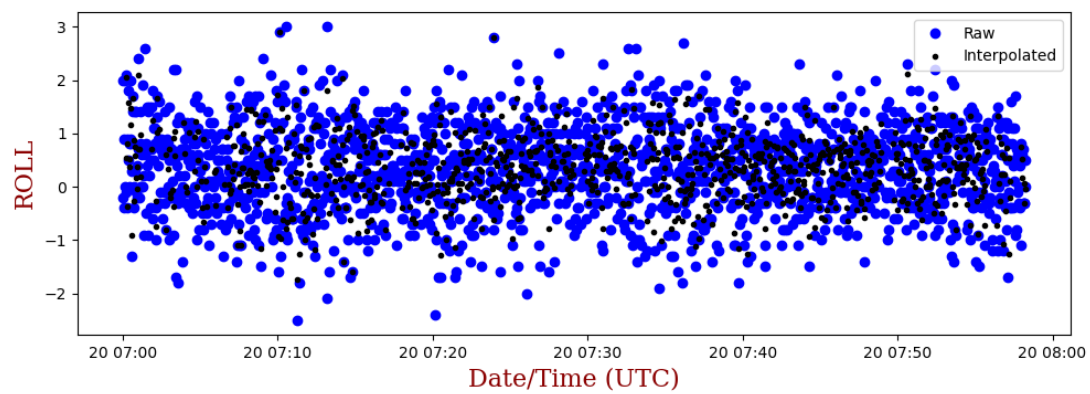
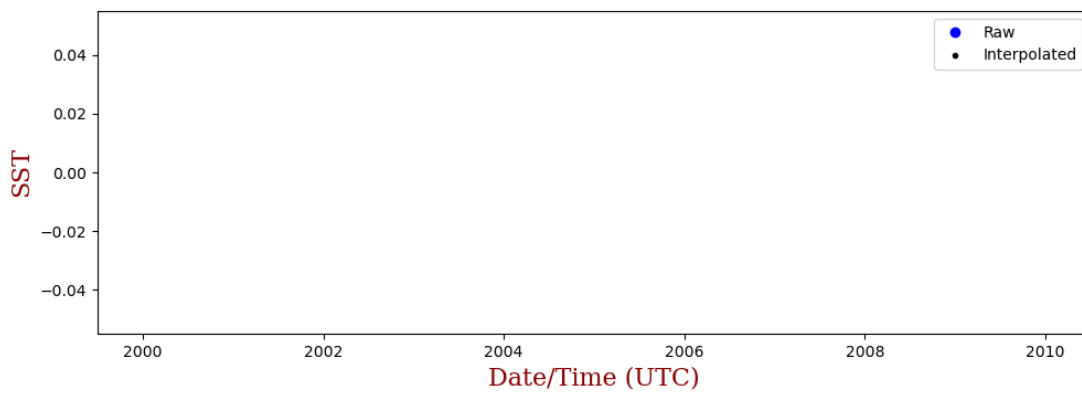
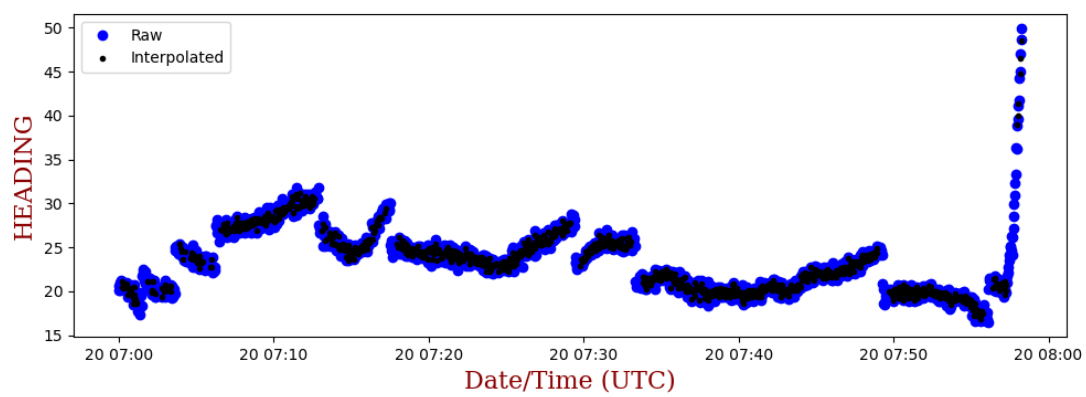
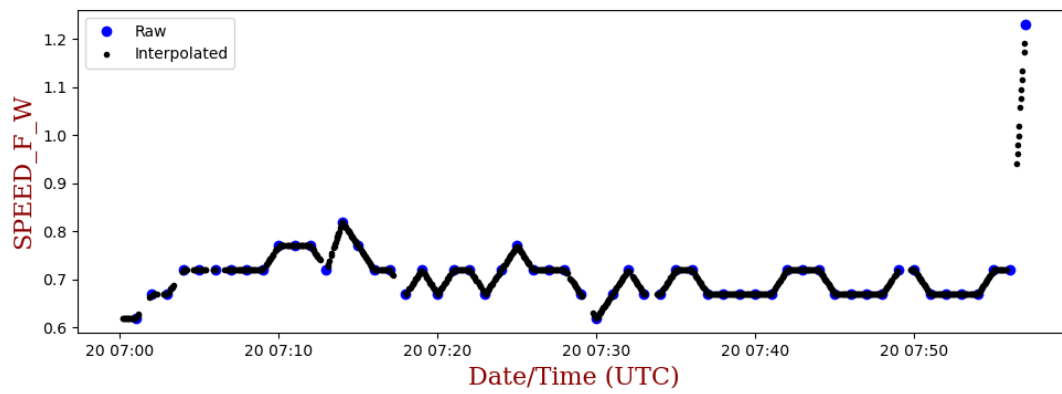
Randomized. Complete plots of hyperspectral interpolations can be found in [output_directory]/Plots/L1E.

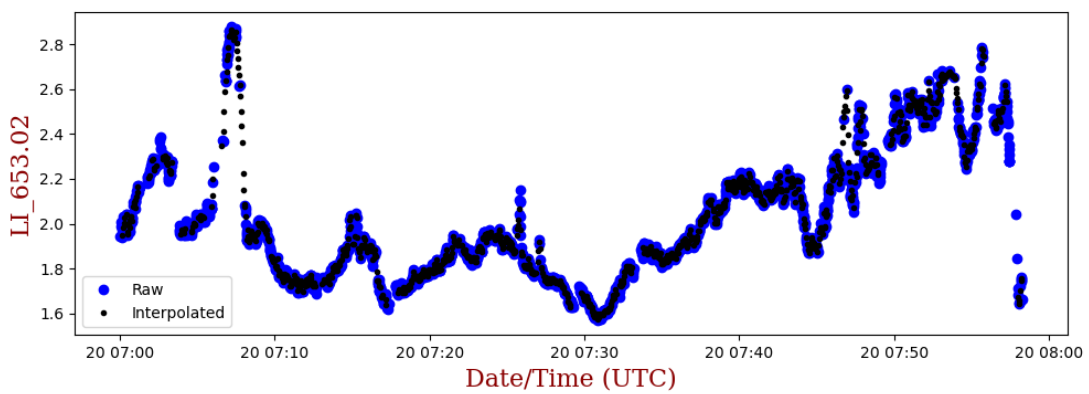
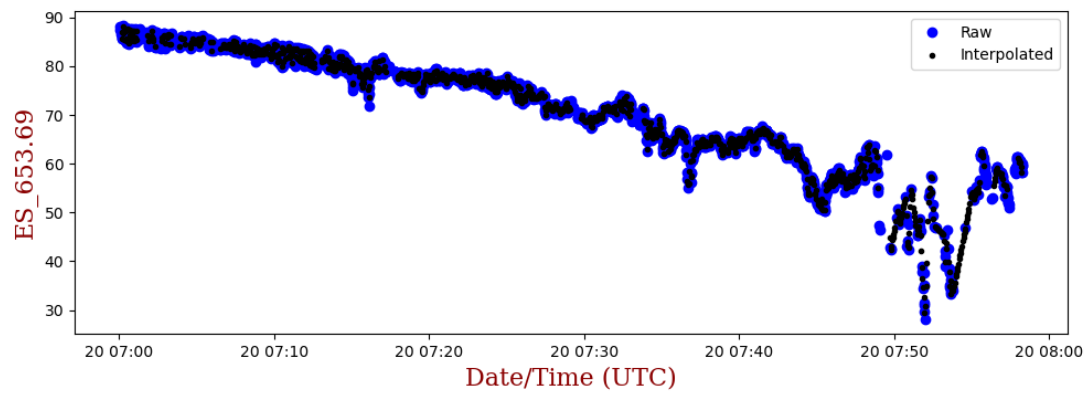
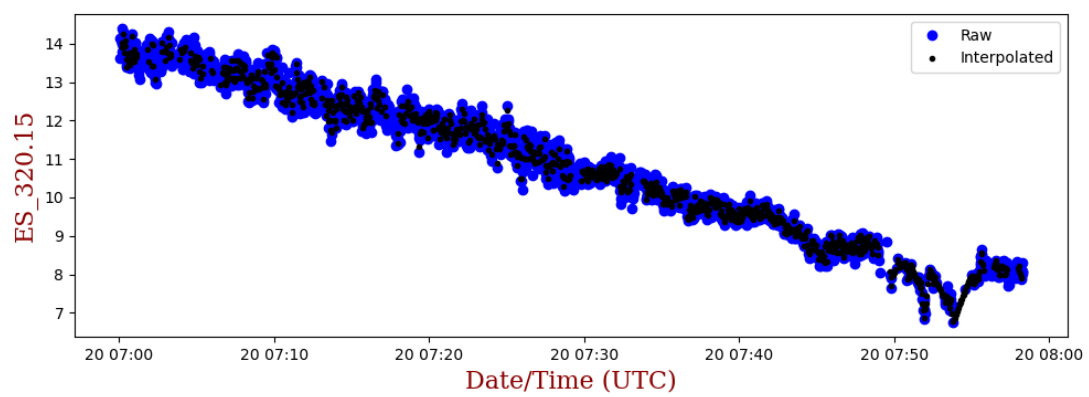
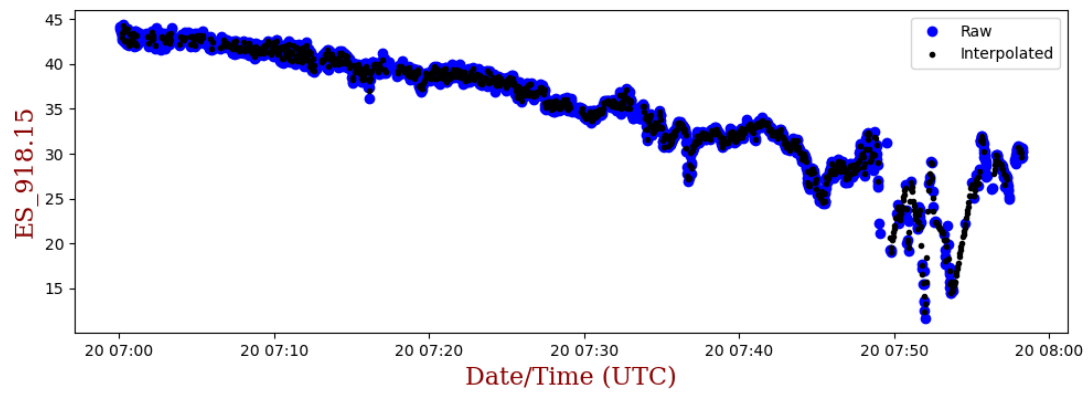


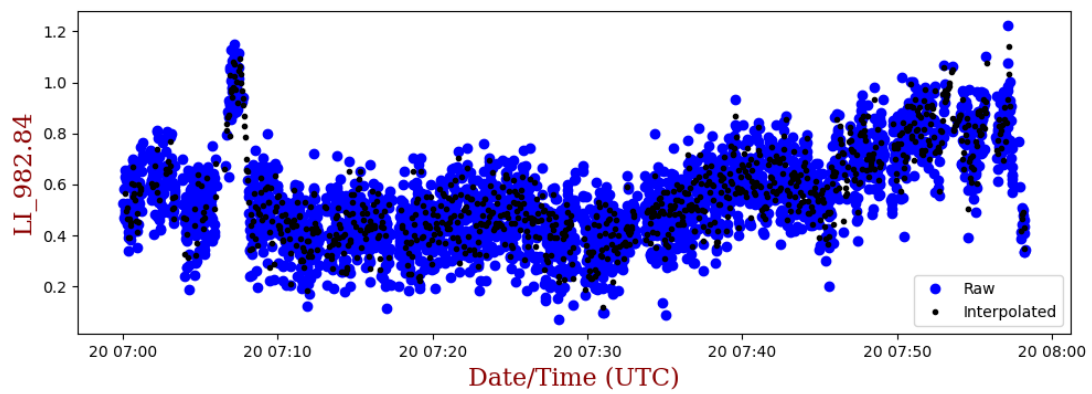
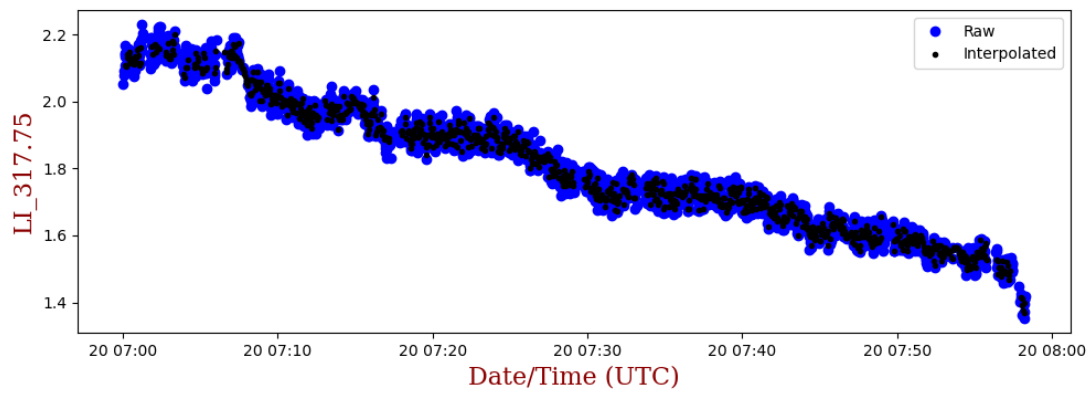




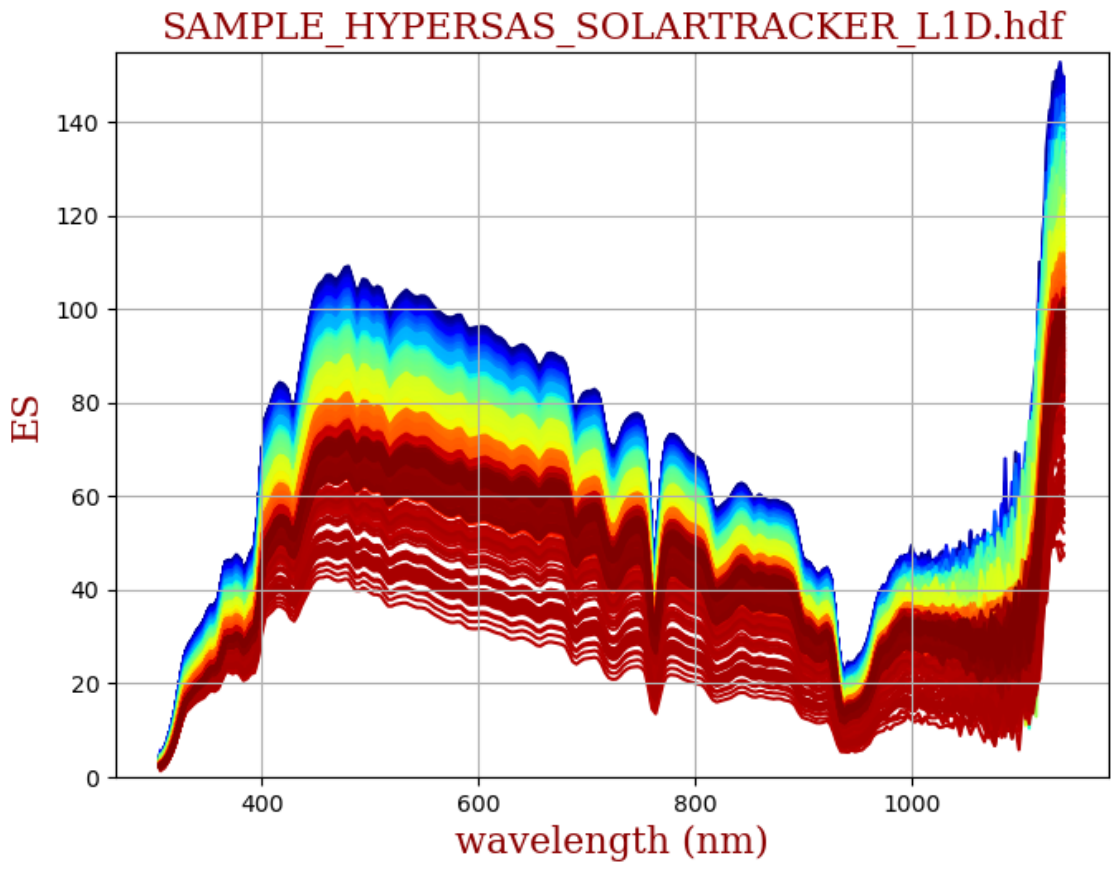


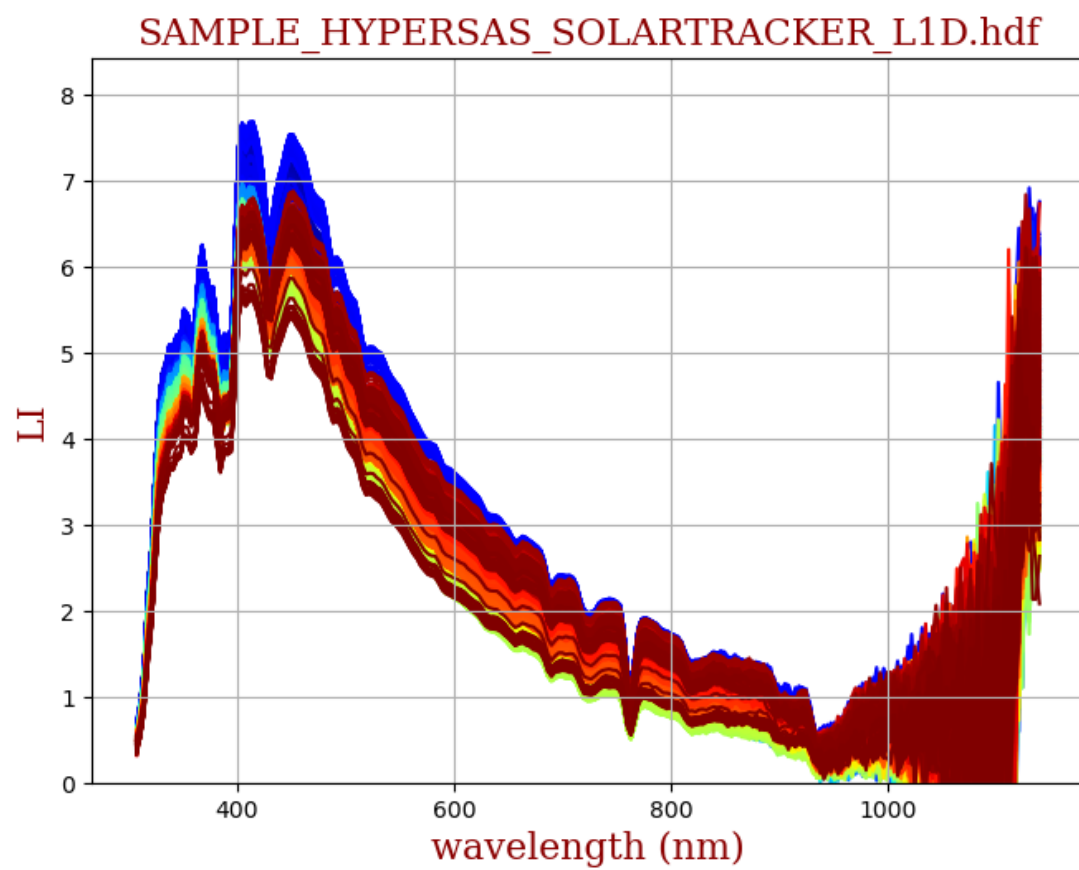


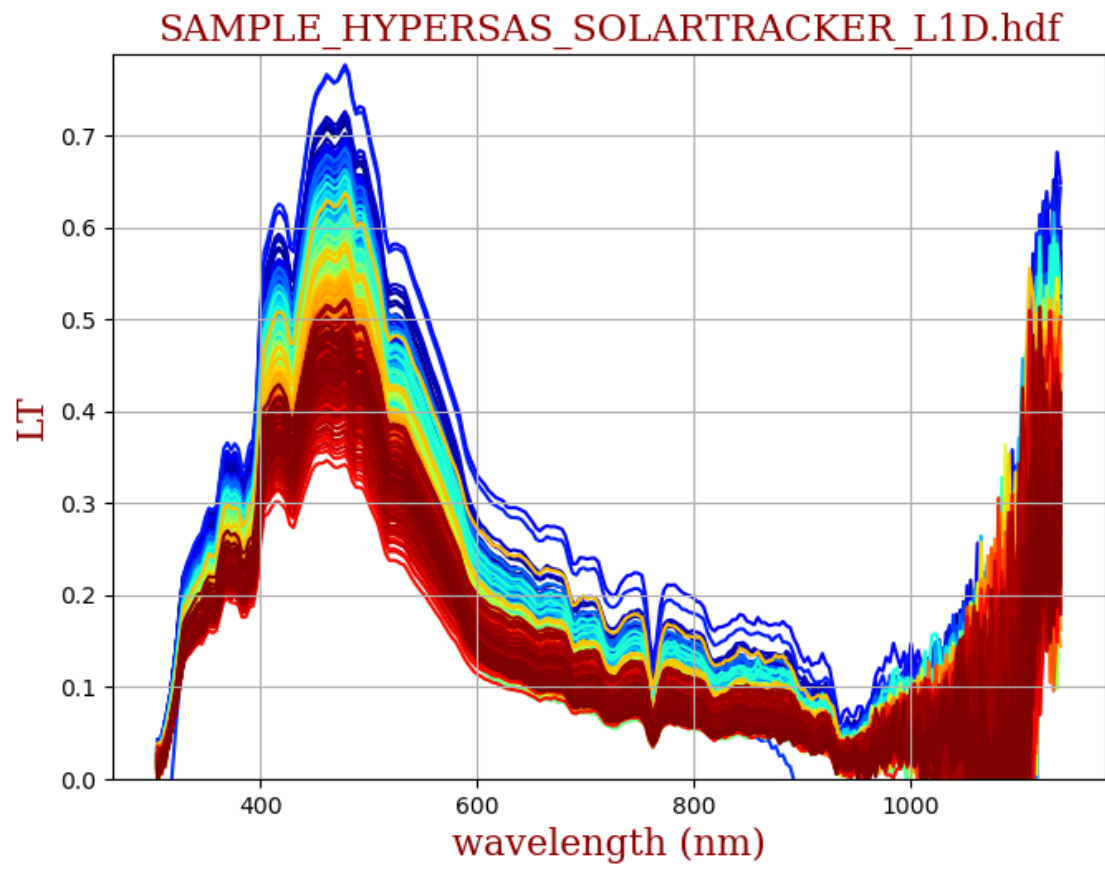




Complete spectral plots







L2 : Process L1E to L2

Apply more quality control filters, temporal binning, station selection, glint correction, NIR corrections, reflectance calculation and OC product calculation.

Processing Parameters:

Max Wind: 10.0

Min SZA: 20.0

Max SZA: 60.0

Filter Sigma Es: 5.0

Filter Sigma Li: 8.0

Filter Sigma Lt: 3.0

Cloud Filter: 1.0

Es Filter: 2.0

Dawn/Dusk Filter: 1.0

Rain/Humidity Filter: 1.095

Ensemble Duration: 300 sec

Percent Lt Filter: 10.0

Glint_Correction: Mobley 1999

NIR Correction: Mueller and Austin 1995

Remove Negatives: ON

Process log:

Process Single Level

ProcessL2:

/Users/daurin/GitRepos/HyperInSPACE/Data/L1E/SAMPLE_HYPERSAS_SOLARTRACKER_L1E.hdf

Model data for Wind and AOD may be used to replace blank values. Reading in model data...

Ancillary file found locally: N201614107_MERRA2_1h.nc

Ancillary file found locally: N201614107_AER_MERRA2_1h.nc

Filling in field data with model data where needed.

Filling in ancillary data with default values where still needed.

Applying $Lt(NIR) > Lt(UV)$ quality filtering to eliminate spectra.

0.0% of spectra flagged

Low SZA. SZA: 60

Percentage of data out of SZA and Wind limits: 18 %

Flag data from TT2: 2016-05-20 07:47:29.030000+00:00 to 2016-05-20 07:58:13.339000+00:00

Remove IRRADIANCE Data

Length of dataset prior to removal 1015 long

Length of dataset after removal 831 long: 18% removed

Remove RADIANCE Data

Length of dataset prior to removal 1015 long

Length of dataset after removal 831 long: 18% removed

Remove ANCILLARY Data

Length of dataset prior to removal 1015 long

Length of dataset after removal 831 long: 18% removed

Applying spectral filtering to eliminate noisy spectra.

1.2% of Es data flagged

0.5% of Li data flagged

5.4% of Lt data flagged

Remove IRRADIANCE Data

Length of dataset prior to removal 831 long

Length of dataset after removal 777 long: 6% removed

Remove RADIANCE Data

Length of dataset prior to removal 831 long

Length of dataset after removal 777 long: 6% removed

Remove ANCILLARY Data

Length of dataset prior to removal 831 long

Length of dataset after removal 777 long: 6% removed

Applying meteorological filtering to eliminate spectra.

0.0% of spectra flagged

Binning datasets to ensemble time interval.

53 spectra in slice (ensemble).

5 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

74 spectra in slice (ensemble).

7 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

85 spectra in slice (ensemble).

8 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

80 spectra in slice (ensemble).

8 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

97 spectra in slice (ensemble).

10 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

83 spectra in slice (ensemble).

8 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

88 spectra in slice (ensemble).

9 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

97 spectra in slice (ensemble).

10 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

84 spectra in slice (ensemble).

8 spectra remaining in slice to average after filtering to lowest 10.0%.

Calculating M99 glint correction with complete LUT

Perform simple residual NIR subtraction.

Filtering reflectance spectra for negative values.

0.0% of Rrs_HYPER spectra flagged

0.0% of nLw_HYPER spectra flagged

Processing chlor_a

Processing avw

Processing CDOM, Sg, DOC

Processing qaa

Processing Wei QA

L2 file produced:

/Users/daurin/GitRepos/HyperInSPACE/Data/L2/SAMPLE_HYPERSAS_SOLARTRACKER_L2.hdf

Output SeaBASS for HDF:

/Users/daurin/GitRepos/HyperInSPACE/Data/L2/SAMPLE_HYPERSAS_SOLARTRACKER_L2.hdf