

# Copernicus FICE 2024

Training on

In situ Ocean Colour Above-Water Radiometry towards Satellite Validation

## Ingesting TriOS data into HyperCP

Dirk Aurin

NASA Goddard Space Flight Center

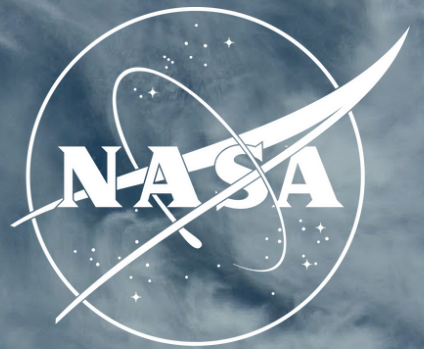
[dirk.a.aurin@nasa.gov](mailto:dirk.a.aurin@nasa.gov)



6-17 May 2024  
Venice, Italy





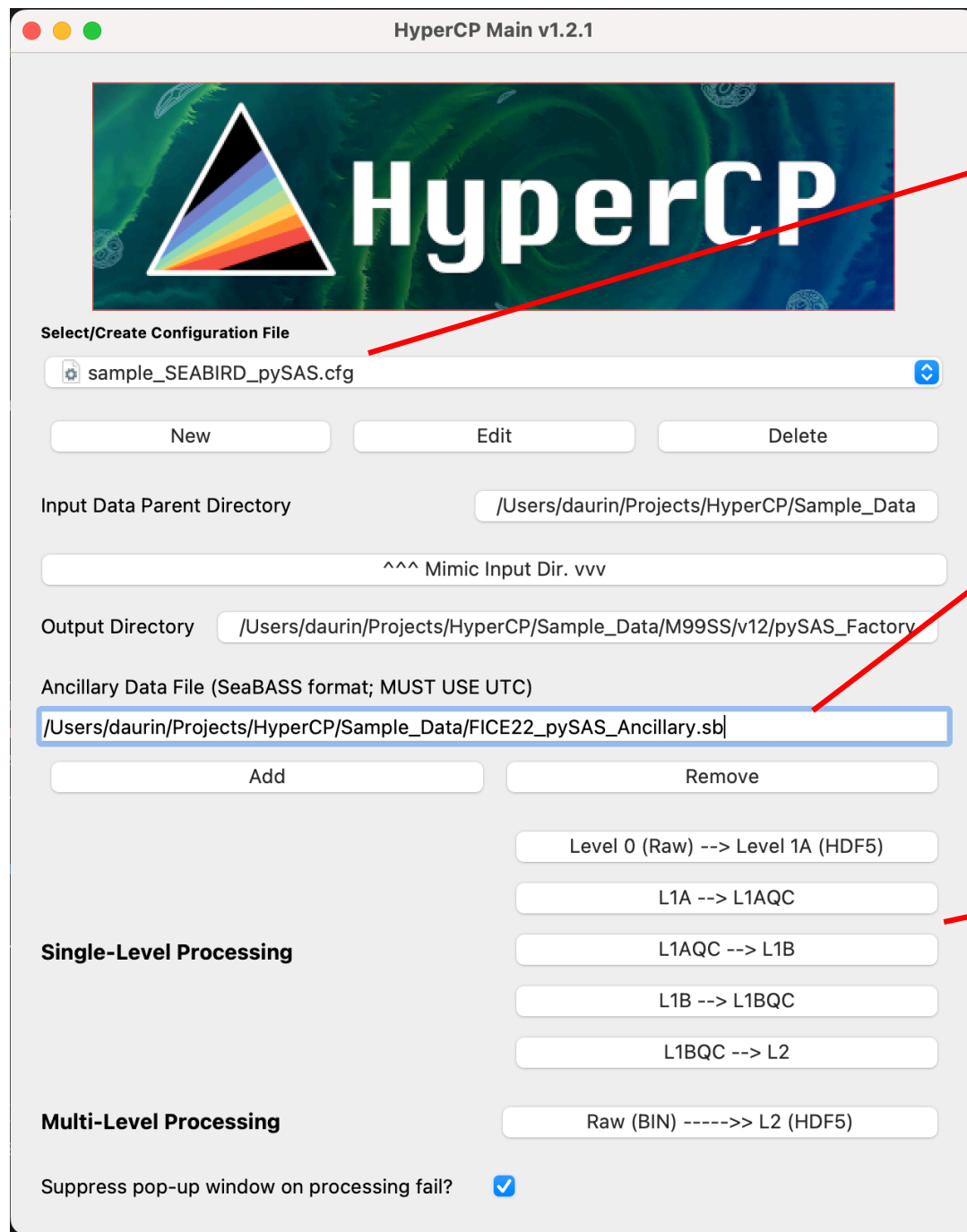
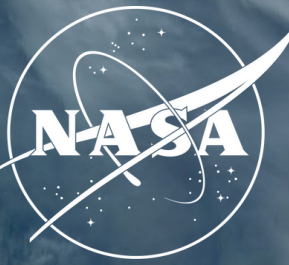


# Ingesting TriOS data into HyperCP

Dirk Aurin  
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Morgan State University



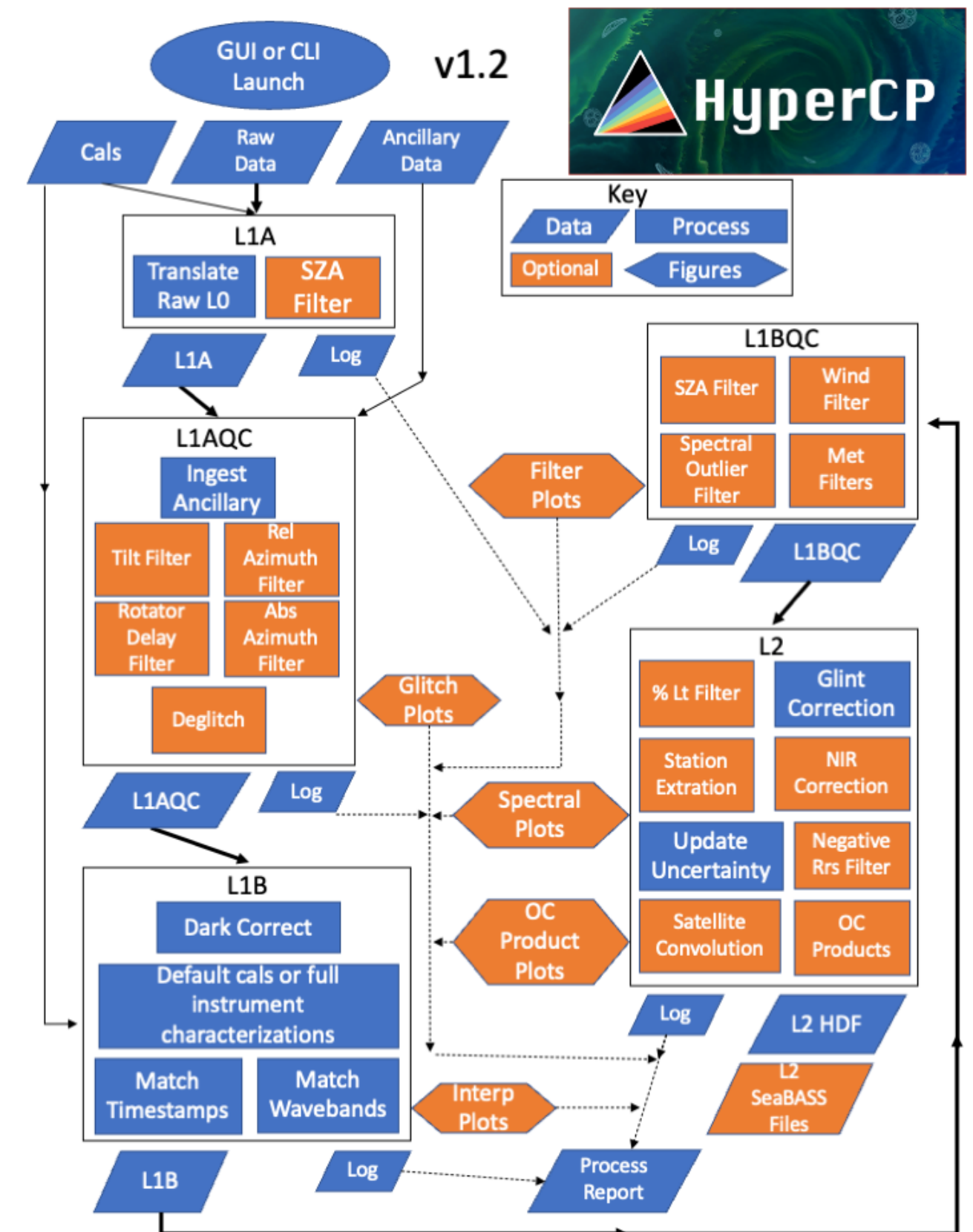
# Overview



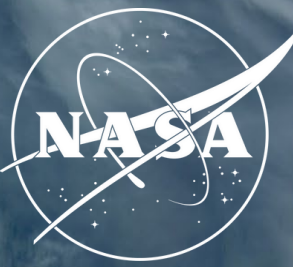
Each instrument deployment or cruise gets a unique configuration

The Ancillary file for the entire deployment/cruise is provided here. (**Not required for quick-look processing if an azimuth robot/sensor is present but required otherwise.**)

Processing can be run on one file or many files together, and can be run on one level or all levels together



# Ancillary Data for Manually Operated TriOS



There will be more in-depth training on the Ancillary file and the SeaBASS format during Days 3-6. Until then, I suggest editing one of the sample Ancillary files to suite your temporary needs.

For each station:

```
FICE2024_TriOS_Ancillary template.sb
/begin_header
/investigators=Your_Name
/affiliations=Your_Lab
/contact=Your@email
/experiment=FICE
/cruise=FICE2024
/station=AAOT
/data_file_name=FICE2024_Ancillary.sb
/documents=NA
/calibration_files=NA
/data_type=pigment
/data_status=final
/start_date=20220714
/end_date=20220721
/start_time=08:45:00 [GMT]
/end_time=09:00:00 [GMT]
/north_latitude=45.314 [DEG]
/south_latitude=45.314 [DEG]
/east_longitude=12.508 [DEG]
/west_longitude=12.508 [DEG]
/water_depth=NA
/measurement_depth=0
/missing=-9999
/delimiter=comma
/fields=year,month,day,hour,minute,second,lat,lon,wind,wdir,Wt,At,sal,RelAz
/units=yyyy,mo,dd,hh,mn,ss,degrees,degrees,m/s,degrees,degreesC,degreesC,PSU,degrees
/end_header
2022,7,14,8,45,0,45.314,12.508,0.2,95,25.6,-9999.0000,-9999.0000,135
2022,7,14,9,0,0,45.314,12.508,0.5,111,25.5,-9999.0000,-9999.0000,135
```

Most critical (for quick-look processing) is Relative Azimuth



# HyperCP: Loading Instrument Calibration

TriOS RAMSES triplet

No GPS

Li

Es

Lt

No Tilt-Heading sensor

No Azimuth control robot

Configuration: sample\_TRIOS\_NOTRACKER.cfg

Sensor Type: TriOS

Level 1A Processing

Level 1AQC Processing

Level 1B Processing

Level 1BQC Processing

Level 2 Processing

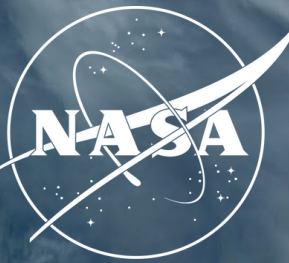
Level 2 Ensembles

L2 Sky/Sunglint Correction ( $\rho$ )

HyperCP

- Back\_SAM\_8166.dat
- Back\_SAM\_8329.dat
- Back\_SAM\_8595.dat
- Cal\_SAM\_8166.dat
- Cal\_SAM\_8329.dat
- Cal\_SAM\_8595.dat
- SAM\_8166.ini
- SAM\_8329.ini
- SAM\_8595.ini

# L1AQC for Manually Operated TriOS



Manually operated instruments with no tilt sensor, GPS, or azimuth robot

Relative azimuth is required.

Configuration: sample\_TRIOS\_NOTRACKER.cfg

Sensor Type: TriOS

Add Cals Remove Cals

SAM\_8166.ini Enabled  
SAM\_8329.ini  
SAM\_8595.ini

LI

**Level 1A Processing**  
Raw binary to HDF5  
Raw UTC Offset [+/-] 0.0  
Solar Zenith Angle Filter  
SAZ Max  70.0

**Level 1AQC Processing**  
Filter on pitch, roll, yaw, and azimuth  
Pitch/Roll Filter (where present)   
Max Pitch/Roll Angle 5.0  
SolarTracker or pySAS   
Rotator Home Angle Offset 0.0  
Rotator Delay (Seconds) 2.0  
Absolute Rotator Angle Filter   
Rotator Angle Min -40.0  
Rotator Angle Max 40.0  
Relative Solar Azimuth Filter   
Rel Angle Min 90.0  
Rel Angle Max 135.0  
Deglitch Data   
Launch Anomaly Analysis

**Level 1B Processing**  
Dark offsets, calibrations and corrections. Interpolate to common timestamps and wavebands.  
Ancillary data are required for Zhang glint correction and can fill in wind for M99 and QC. Select database download:  
 GMAO MERRA2  ECMWF  
(GMAO PROMPTS FOR EARTHDATA LOGIN: [register](#))  
Fallback values when no model available:  
Default Wind Speed (m/s) 5.0  
Default AOD(550) 0.2  
Default Salinity (psu) 38.0  
Default SST (C) 28.0  
Select Calibration/Characterization/Correction Regime:  
 Factory Calibration Only  
 TriOS  SeaBird (Non-FRM Class-based)  
 FRM Class-based (RadCal required)  
Add RadCals: Files found  
 FRM Full Characterization:  
 Local Add Files: Files found  
 FidRadDB  
Interpolation Interval (nm) 3.3  
Generate Interpolation Plots   
Plot Interval (nm) 20.0

**Level 1BQC Processing**  
Data quality control filters.  
Eliminate where Lt(NIR)>Lt(UV)   
Max. Wind Speed (m/s) 10.0  
SAZ Minimum (deg) 20.0  
SAZ Maximum (deg) 60.0

Enable Spectral Outlier Filter   
Generate Plots   
Filter Sigma Es 5.0  
Filter Sigma Li 8.0  
Filter Sigma Lt 3.0  
Enable Meteorological Filters (Experimental)   
Cloud Li(750)/Es(750)> 1.0  
Significant Es(480) (uW cm^-2 nm^-1) 2.0  
Dawn/Dusk Es(470/680)< 1.0  
Rain/Humid. Es(720/370)< 1.095

**Level 2 Processing**  
Temporal binning, glitter reduction, glint correction, residual correction, QC, satellite convolution, OC product generation, SeaBASS file output.

**L2 Ensembles**  
Extract Cruise Stations   
Ensemble Interval (secs; 0=None) 300  
Enable Percent Lt Calculation   
Percent Lt (%) 10.0

**L2 Sky/Sunglint Correction (ρ)**  
 Mobley (1999) ρ  Zhang et al. (2017) ρ  
 Groetsch et al. (2017)  Your Glint (2023) ρ  
NIR Residual Correction   
 Mueller and Austin (1995) (blue water)  
 SimSpec. Ruddick et al. (2006) (turbid)  
 Your NIR Residual (2023) (universal)  
Remove Negative Spectra

BRDF Correction   
Morel R.f/Q  Lee IOP

**L2 Products**  
Convolve to Satellite Bands:  
AQUA \*  Sen-3A  V-NPP   
TERRA  Sen-3B  V-JPSS   
\* Automatic for Derived Products  
Generate Spectral Plots  
Rrs  nLw  Es  Li  Lt   
Derived L2 Ocean Color Products

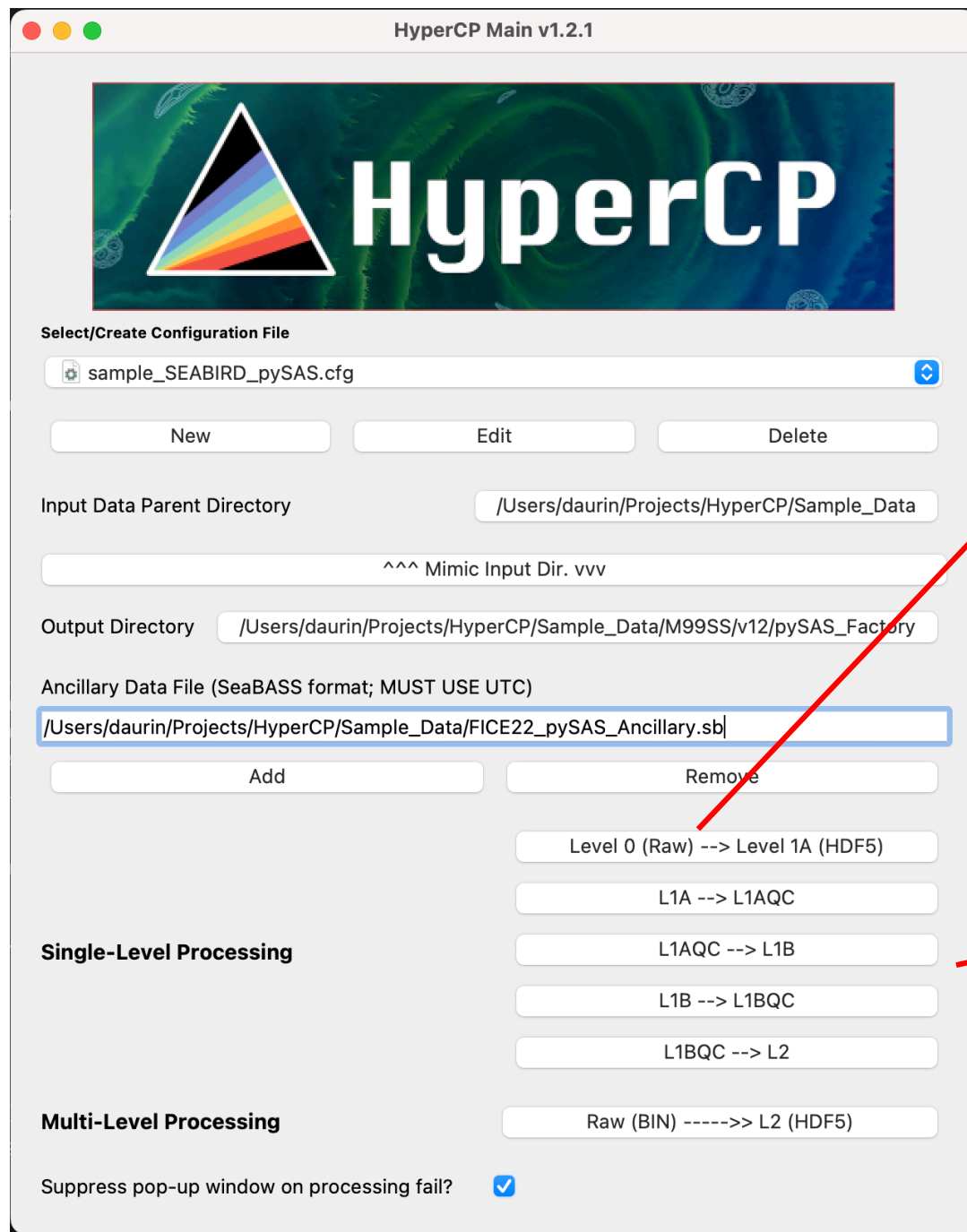
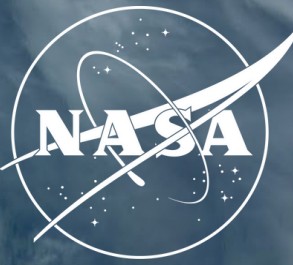
Save SeaBASS Files   
Edit SeaBASS Header  
sample\_TRIOS\_NOTRACKER.hdr  
Write PDF Report

HyperCP

Save/Close Save As Cancel



# Overview



- 📁 SAM\_8166\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_080000.mlb
- 📁 SAM\_8166\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_082000.mlb
- 📁 SAM\_8329\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_080000.mlb
- 📁 SAM\_8329\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_082000.mlb
- 📁 SAM\_8595\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_080000.mlb
- 📁 SAM\_8595\_RAW\_SPECTRUM\_FRM4SOC2\_FICE22\_UT\_20220719\_082000.mlb

For TriOS, raw files will look something like this, with one file for each radiometer at each sample station.

Processing can be run on one file or many files together, and can be run on one level or all levels together.

More extensive training on data processing in HyperCP will be provided during Days 3-6.