Copernicus FICE 2025

Training on

In situ Ocean Colour Above-Water Radiometry towards Satellite Validation

HyperCP Hands-On

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PROGRAMME OF THE EUROPEAN UNION
Copernicus Europe's eyes on Earth
IMPLEMENTED BY EUMETSAT
FRM4SOC Phase-2
fiducial reference measurements for satellite ocean colour

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NASA

HyperCP Hands-On Answer Key

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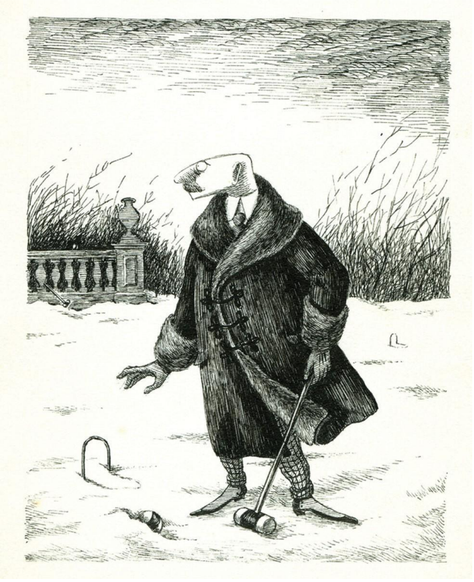
First Wicket (Spritz #1)

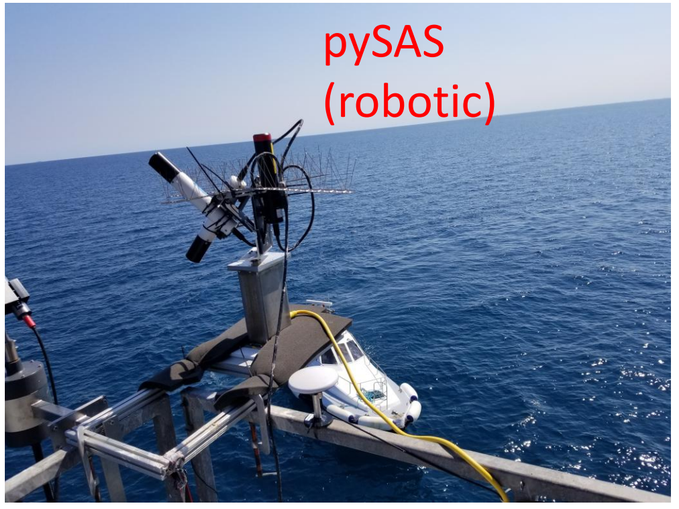
Open existing configurations for sample data provided (TriOS & pySAS)

- (Main) Establish Input/Output paths for the data
- (Main) Provide the appropriate Ancillary data file
- Process the two manually acquired TriOS files from L0 to L2
  - (Configuration):
  - L1B Default (“Factory Only”) mode
  - No station extraction
  - M99 glint correction
  - SimSpec NIR offset
  - No BRDF or convolution
  - No Derived Products



(Artwork by Edward Gorey)

- Process the autonomous pySAS data using the same settings



GODDARD EARTH SCIENCES

Second Wicket

- Locate the processing Reports for the pySAS and TriOS files
  - What percentage of L_t data were removed from each file for the L1BQC spectral filter?
    - pySAS: 10.4%, TriOS: 6.9%,10%
  - In L2, how many spectra remained in each ensemble after the “glitter” correction was performed (retaining only the darkest 10% of L_t measurements)?
    - pySAS: 20,19,20,19,8, TriOS: 3, 3

Your answers may differ if you changed some QC thresholds

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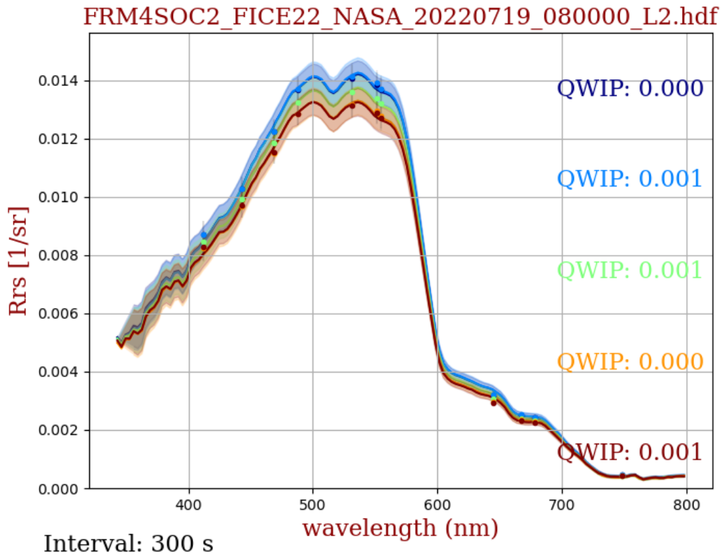
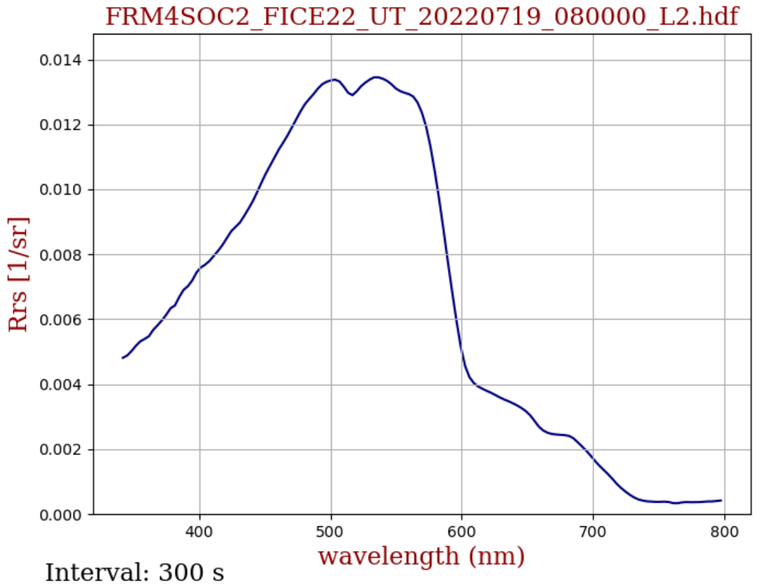
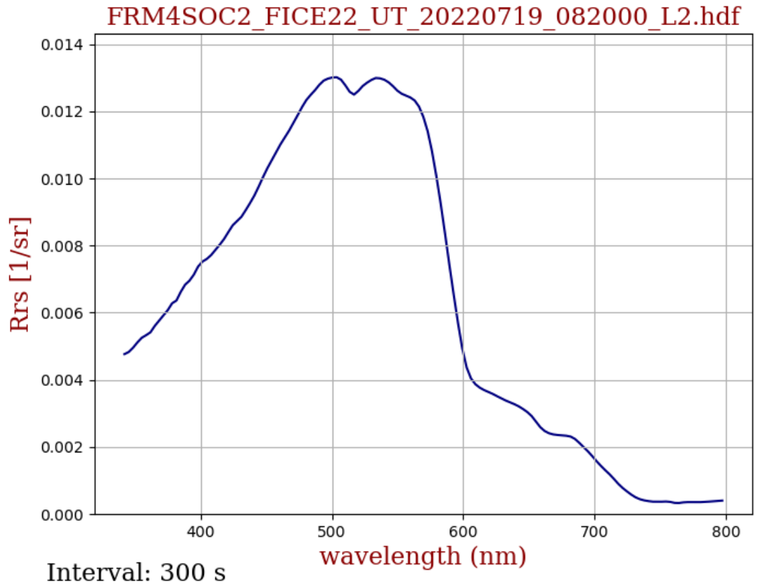
Second Wicket

- Locate the L2 Plots
  - How do R_{rs} and E_s compare between the TriOS and the SeaBird instruments?
  - What is missing from TriOS plots? Why? No uncertainties currently for TriOS Non-FRM Factory regime.







Second Wicket

- Repeat pySAS L1BQC to L2 using station extraction.
  - Based on plots and what you know, which pySAS stations correspond to each TriOS file?

The pySAS file ran from continuously/autonomously from 0800 for about 30 minutes. The TriOS data were collected on station at 0800 and 0820. Therefore, station 32 was at 0800 and station 33 was at 0820.

FICE22_pySAS_Ancillary.sb

```
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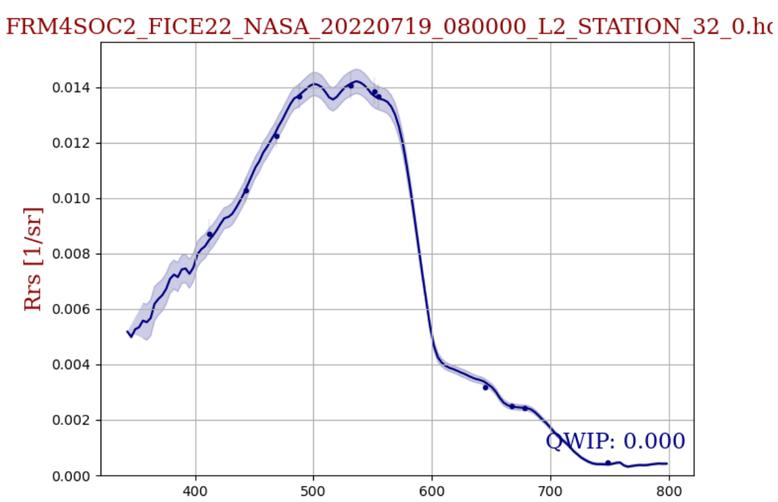
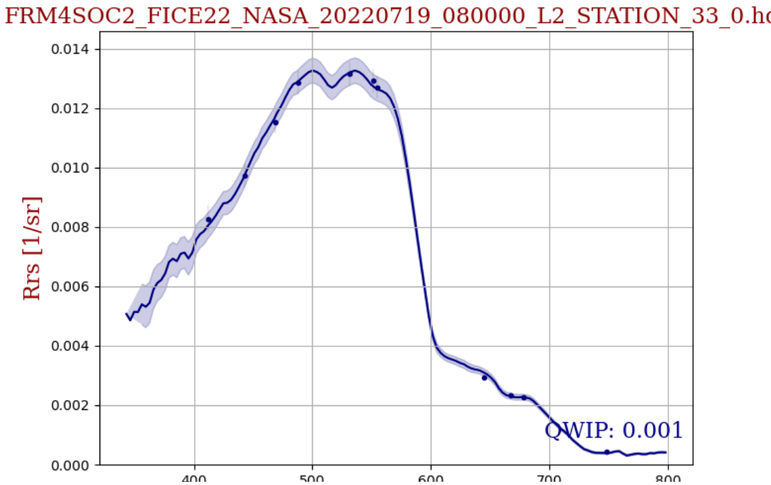
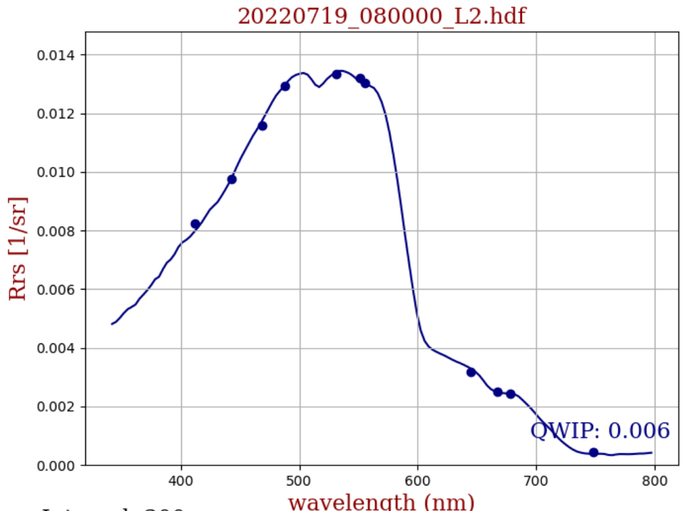
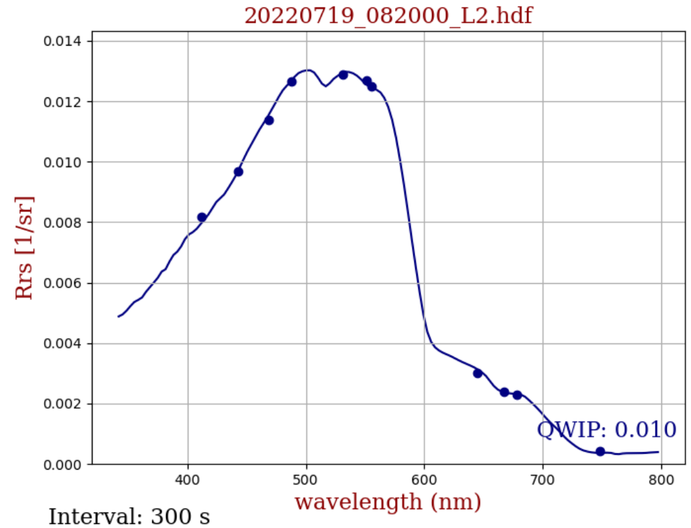




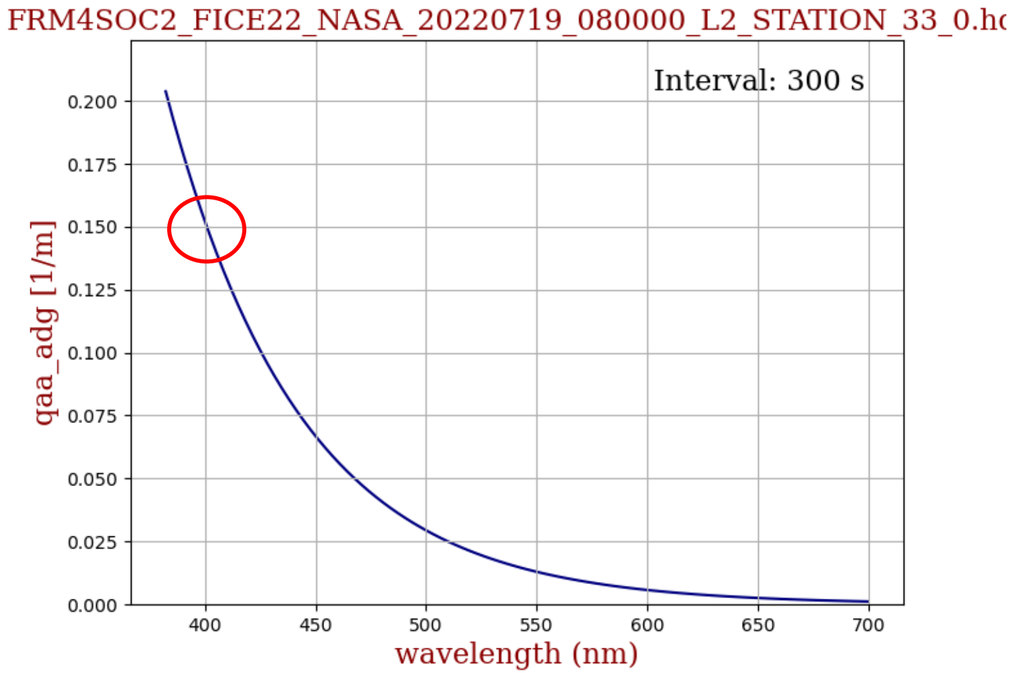




Interval: 300 s

Third Wicket

- Process both datasets L0->L2
  - Include chlor_a, QWIP (requires AVW), and satellite convolution
  - Use NIR, and BRDF appropriate for optically complex waters
  - Set L2 processing to obtain Derived Products for QAA a_{dg} and b_{bp}
  - What was $a_{dg}(400)$ at Station 32?



CHAPTER ONE

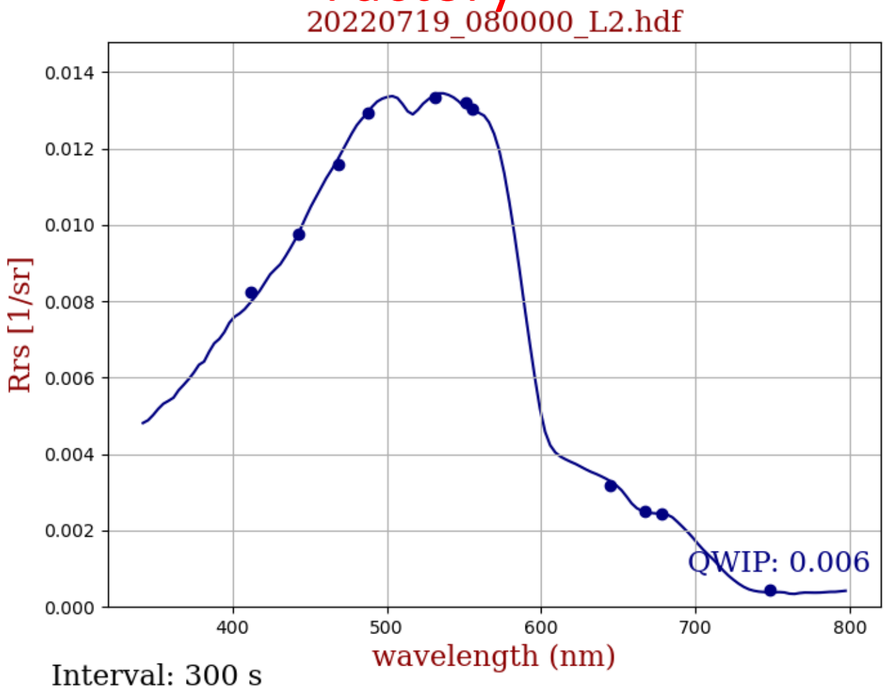
Embley and Yewbert were hitting one another with croquet mallets

Fourth Wicket

(H

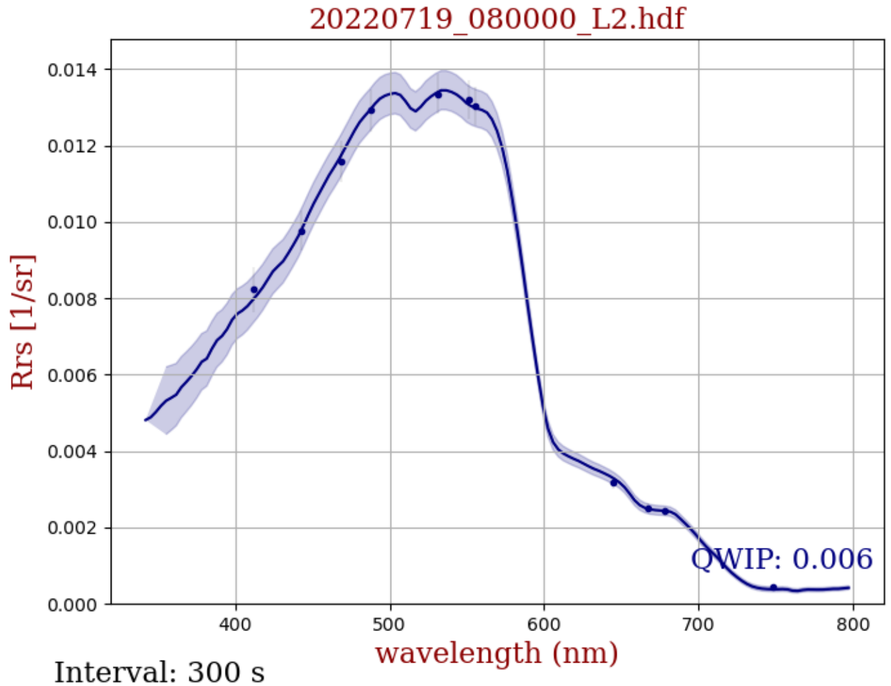
- Reprocess TriOS sample data (either modify the sample configuration provided or the one you developed) to use the Class-based pathway/mode
  - How did your L2 results (E_s, L_i, L_t, L_w, R_{rs}) change compared to running in Default/Factory mode? Same magnitude, but uncertainties provided.

Factory



Interval: 300 s

Class

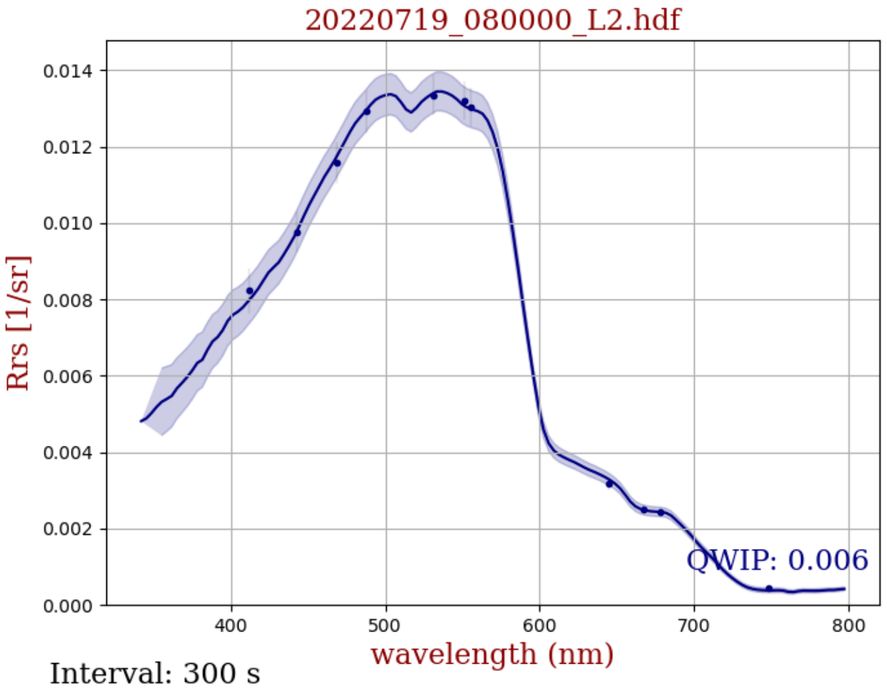


Interval: 300 s

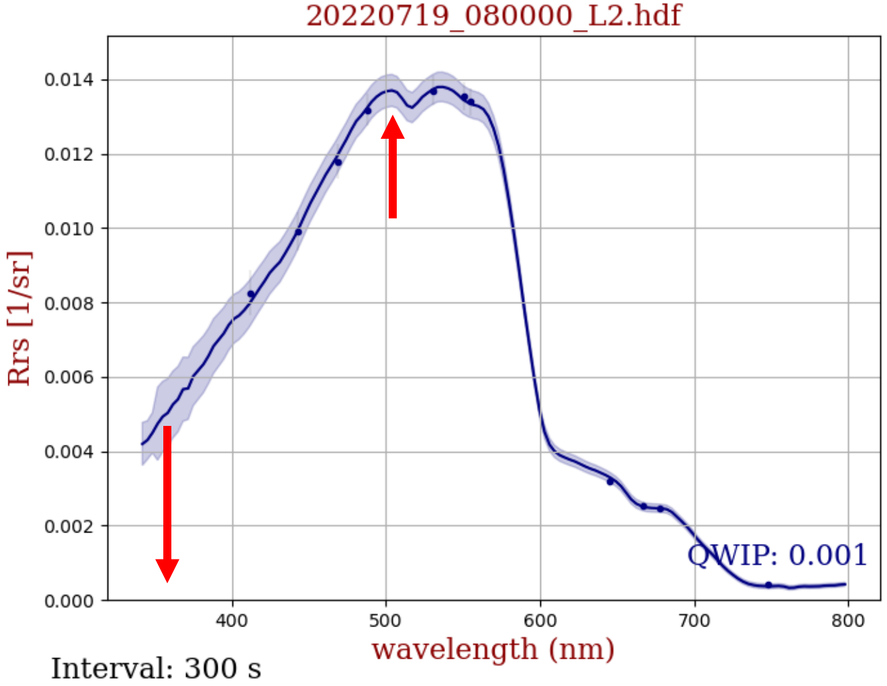
Fourth Wicket

(Happenstance Theater

Class

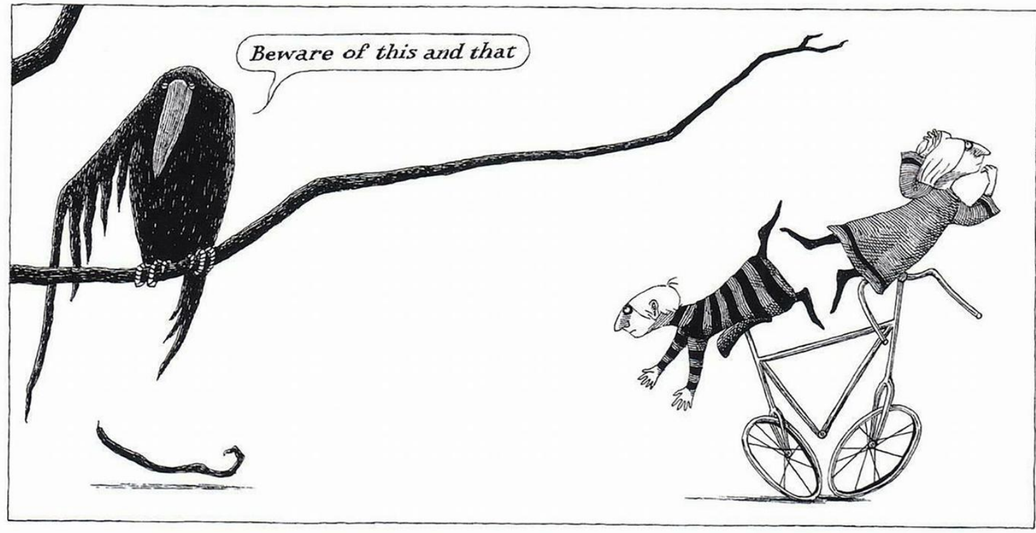


Full



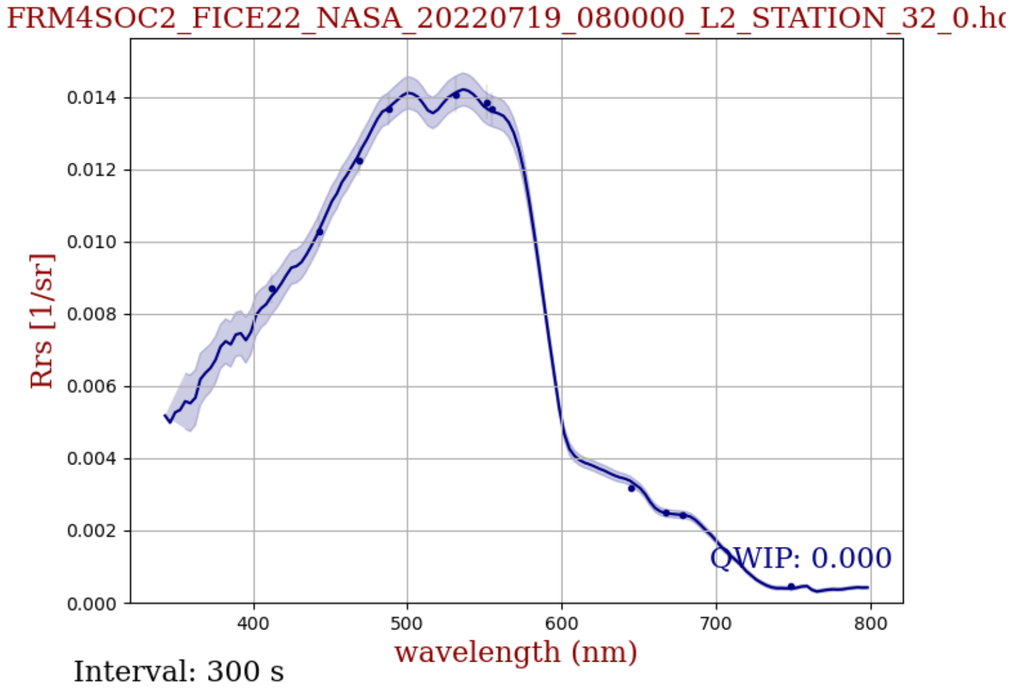
- Now change to Full-FRM
  - How did the component spectra (E_s, L_i, L_t, L_w, R_{rs}) change compared to Default and Class-based pathways?

Fifth Wicket

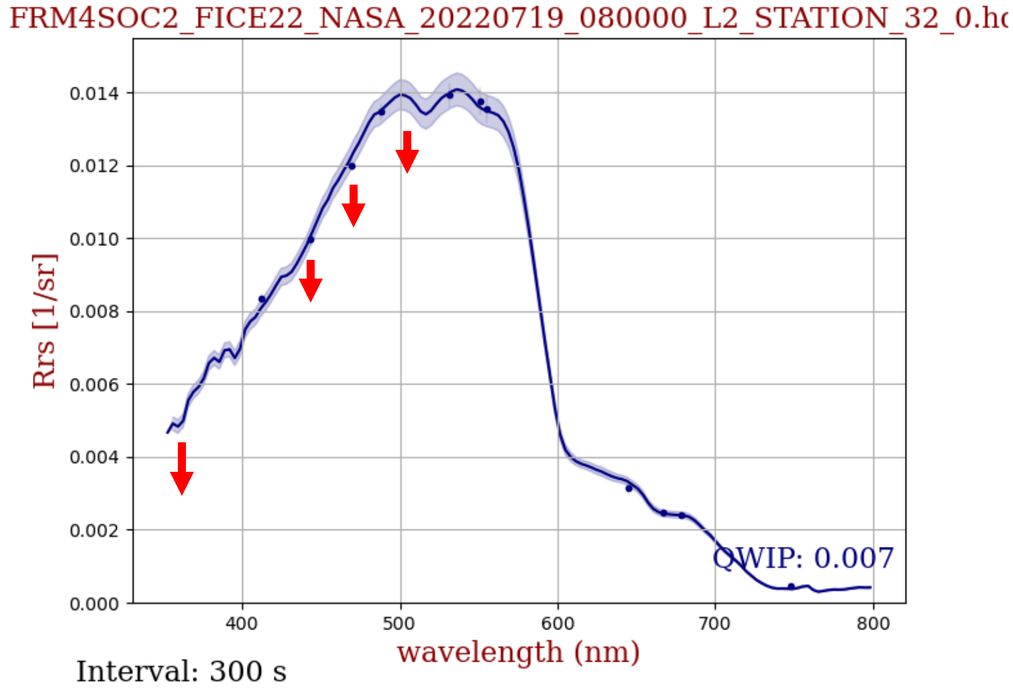


- Reprocess pySAS sample data in Class-based mode with both M99 and Z17 glint corrections
  - *When changing only the L2 settings, you can re-process L1BQC -> L2 for speed*
  - How does the resulting R_{rs} compare between glint corrections?

Class M99 SimSpec



Class Z17 SimSpec

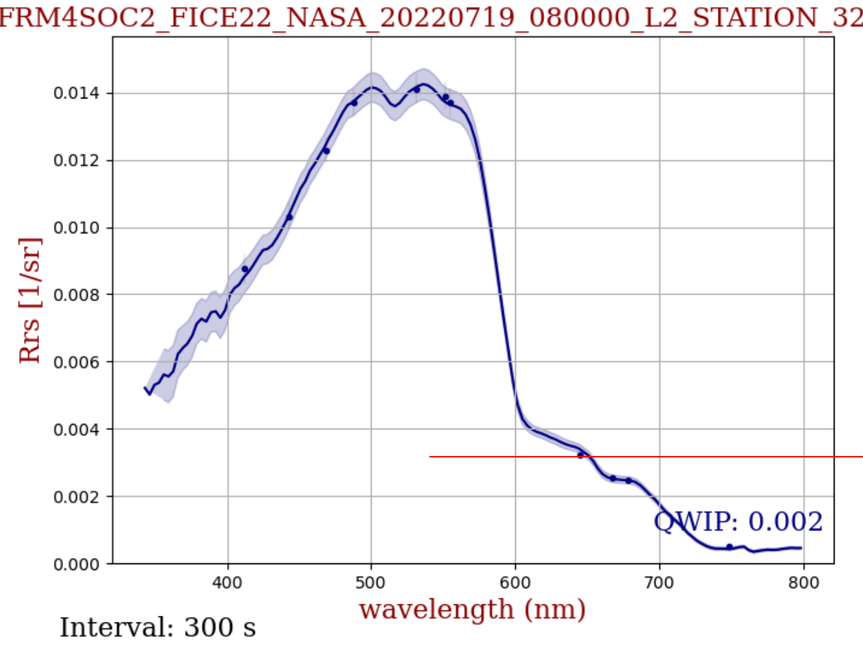


Fifth Wicket

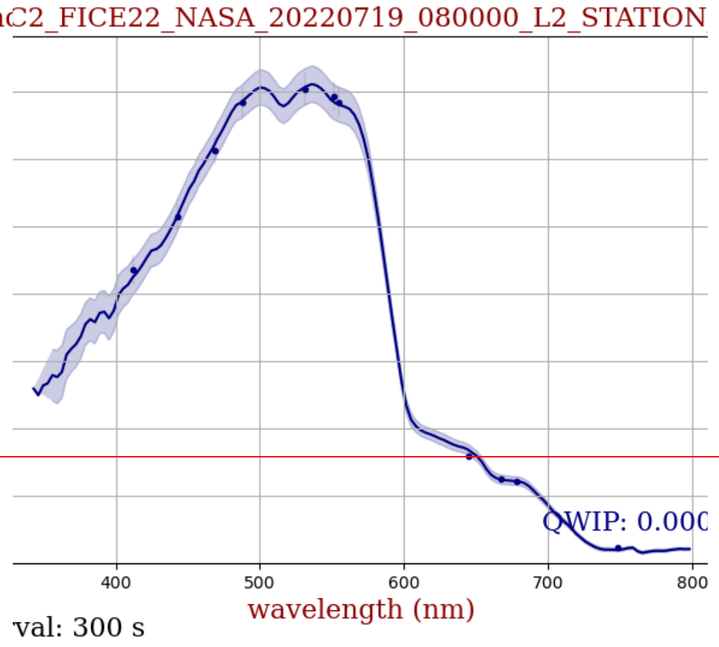
- Reprocess pySAS sample data in Class-based mode in Z17 without no NIR correction and compare against processing with NIR correction (SimSpec)
  - How does the resulting R_{rs} compare between NIR offsets?

(M99 for speed…)

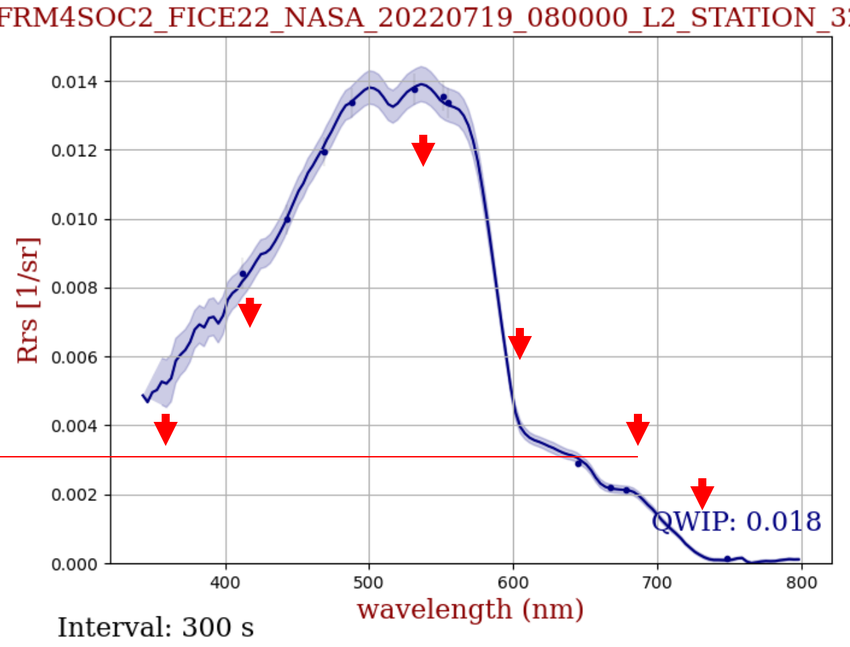
Class M99 No NIR

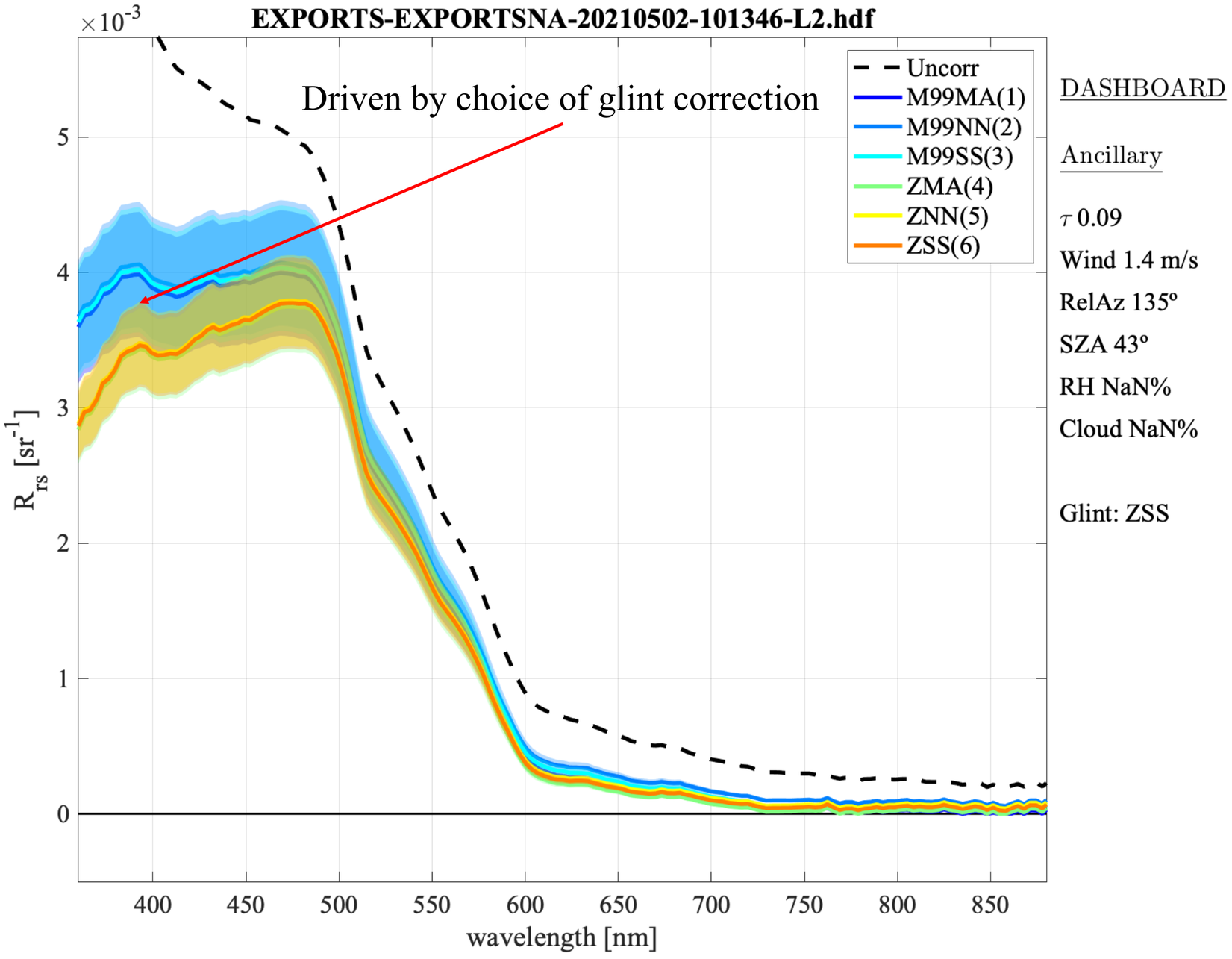


Class M99 SimSpec



Class M99 MA (flat)





HyperCP

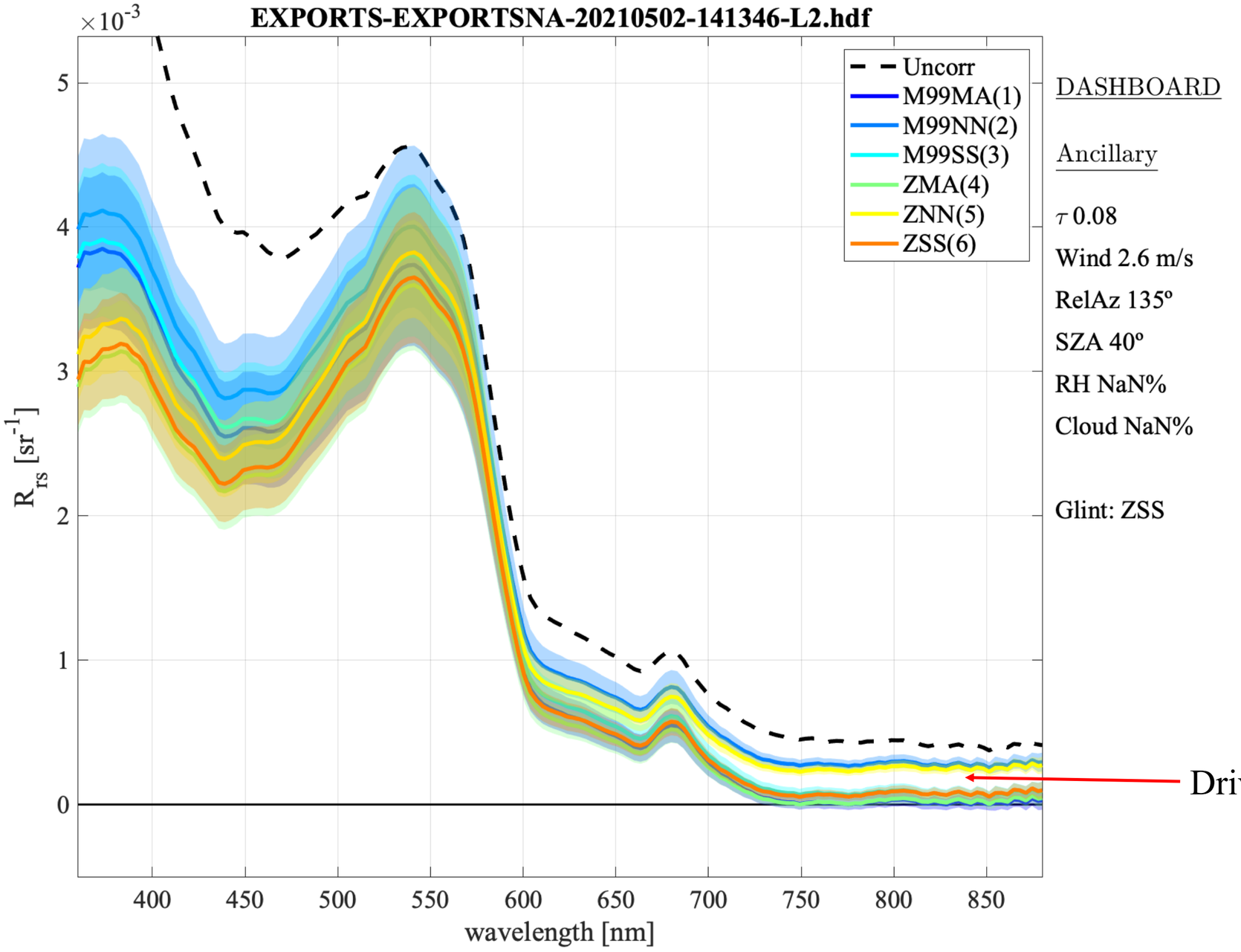
Comparison between various glint and NIR residual corrections of the same L2 ensemble reflectance spectrum where

Glint Correction:

- **M99**: Mobley 1999
- **Z**: Zhang et al. 2017

NIR Residual Glint Correction:

- **NN**: No NIR correction
- **MA**: Mueller and Austin 1995
- **SS**: SimSpec (Ruddick et al. 2006)



DASHBOARD

Ancillary

τ 0.08

Wind 2.6 m/s

RelAz 135°

SZA 40°

RH NaN%

Cloud NaN%

Glint: ZSS

HyperCP

Comparison between various glint and NIR residual corrections of the same L2 ensemble reflectance spectrum where

Glint Correction:

- **M99**: Mobley 1999
- **Z**: Zhang et al. 2017

NIR Residual Glint Correction:

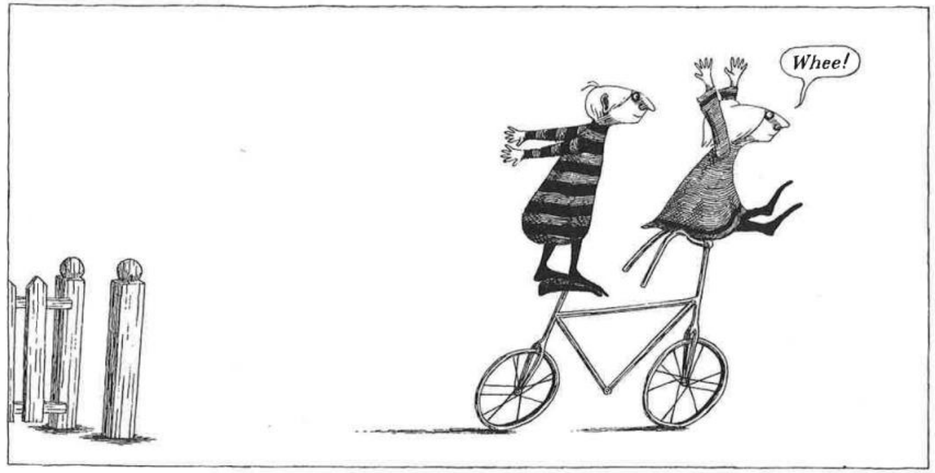
- **NN**: No NIR correction
- **MA**: Mueller and Austin 1995
- **SS**: SimSpec (Ruddick et al. 2006)

Driven by choice of NIR correction

Sixth Wicket (Bonus)

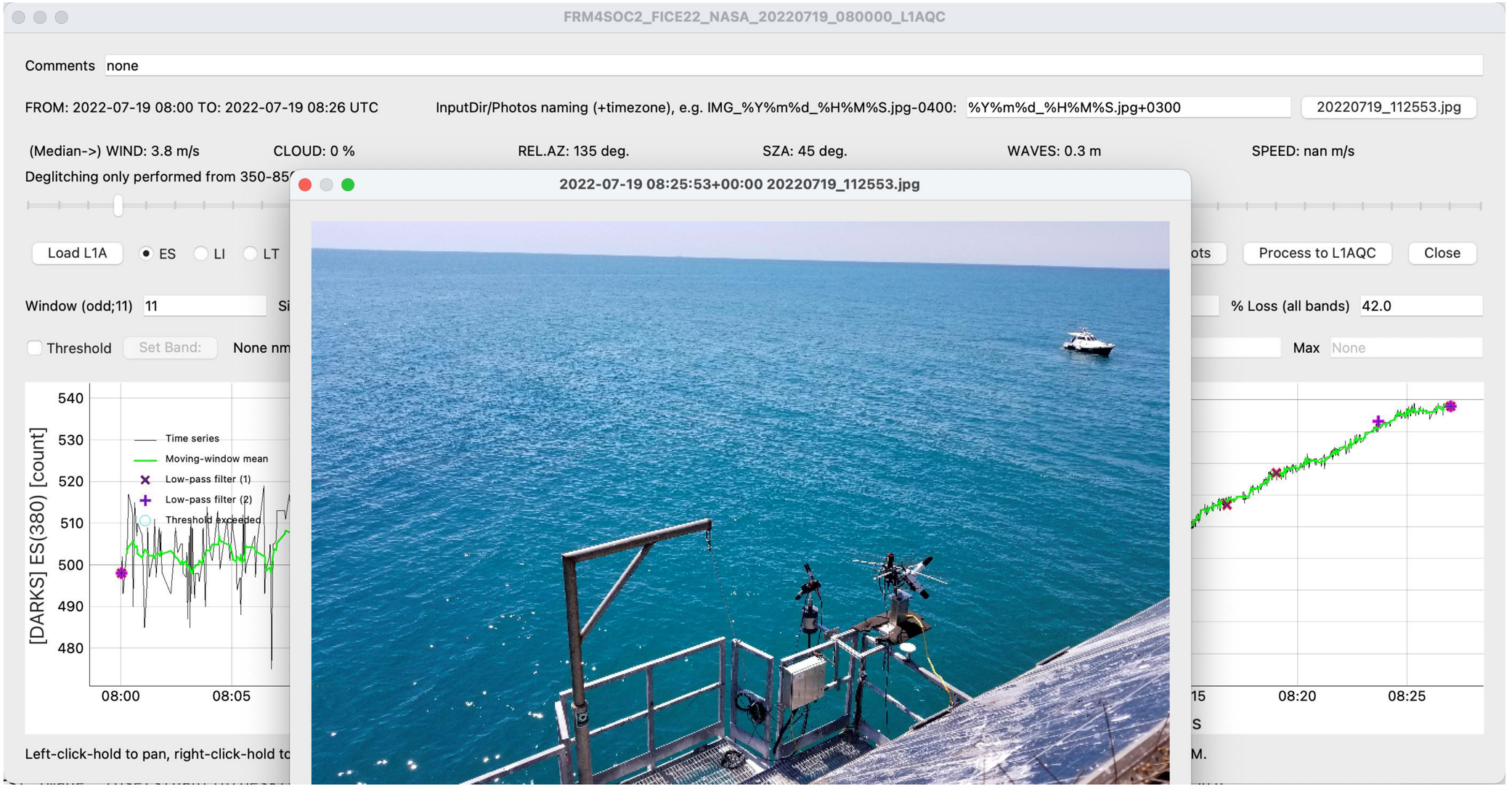
- Launch the L1AQC Anomaly Analysis tool for the autonomous pySAS dataset
  - How long is the time series? ~28 mins
  - Photos taken during this period are provided but named with UTC+3 hours timestamps. Adjust the format string properly to view the photos.
  - What is the median Solar Zenith Angle for this file? 45 degress
  - Move the waveband slider to 480 nm and update the figures. With the default sigma and window settings for the *irradiance* sensor, what percentage of the shutter-open spectra in all bands are retained after low-pass filtering? 58% Why are there so few points shown as filtered when the percentage is shown to be so high? Outliers in one band lead to removing the entire spectrum in all bands

- Change to the skylight radiance and eliminate the noisy shutter-dark measurements using the threshold tool.
- Change to the total water-leaving radiance and adjust the window and sigma to retain 87.5% of light values.
- Leave a sensible comment, save params, and inspect the resulting CSV file.



so Embley had to sit on the handlebars as they flew out the gate.

Sixth Wicket



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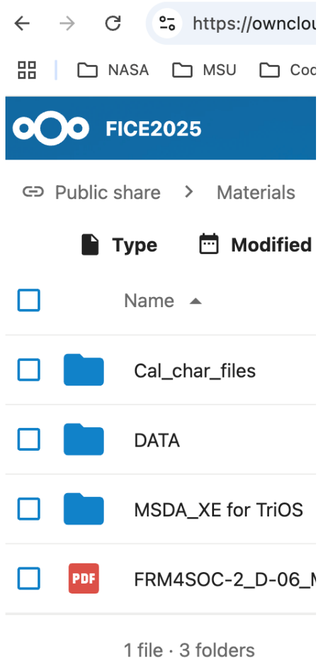
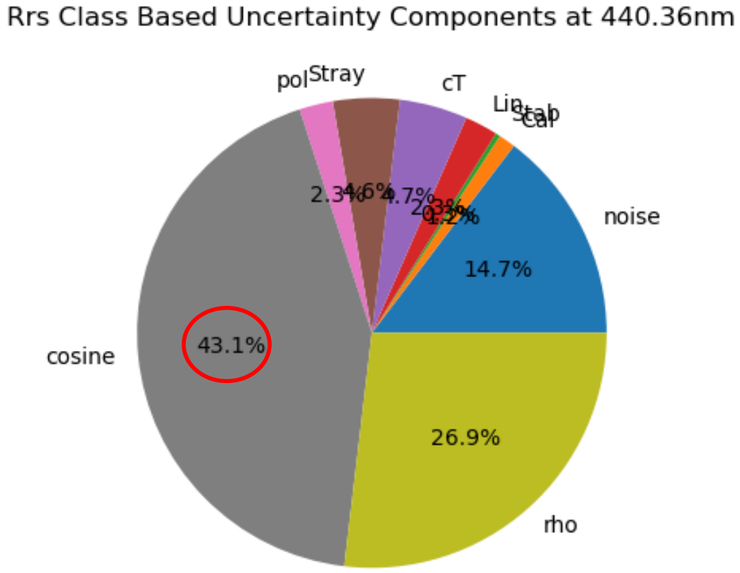
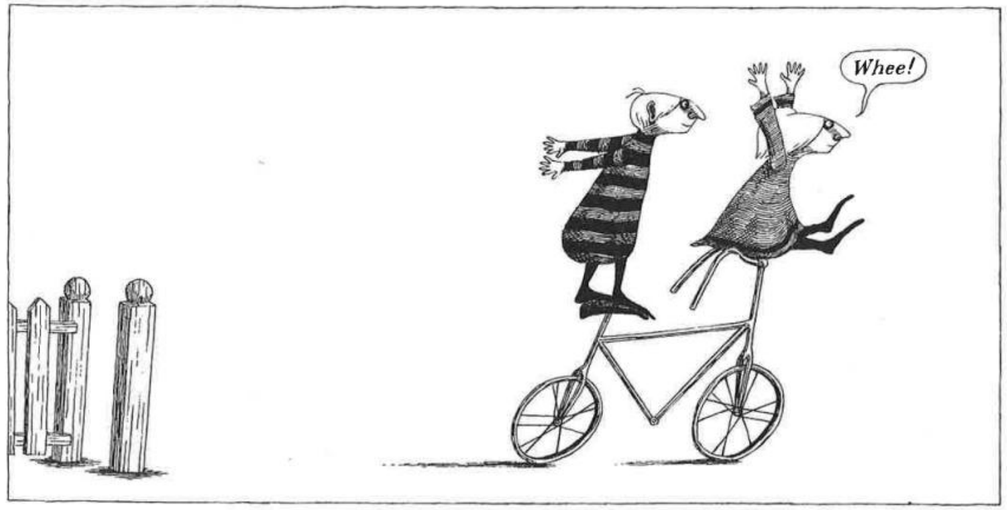
Seventh Wicket

- San Servolo demonstration data
  - Build a new Configuration in HyperCP for processing the 6 stations collected at the dock last Wednesday
  - Process these using the caps-on darks approach for Stns 1&2 (when darks were collected), and using air temp for Stns 3-6 (no caps-on darks collected)
  - Set L1B to use FRM Class-based regime, and turn on uncertainty breakdown plots in L2
  - What proportion of the Rrs(440) uncertainty at Stn 0301 is driven by the angular response of irradiance?







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