

HyperInSPACE

(HYPER SPECTRAL *IN SITU* SUPPORT FOR PACE)

A community processor for in situ radiometry

IOCCG COMMITTEE MEETING
MAY 2021

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Ocean Ecology Lab
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1. We need more high-quality *in situ* radiometry matchups to satellite imagery and *in situ* optical/biogeochemical data

Rigorous: quality-controlled

Transparent: open-source

Reproducible: public

Protocol-driven: documented

Flexible: innovative, adaptive, modular

2. HyperInSPACE is a step in that direction

3. For it to thrive, it needs participation from the community



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Satellite Validation

Algorithm Development



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Building on past work

NASA/TM-2003-21621/Rev-Vol III

*James L. Mueller, Giulietta S. Fargion and Charles R. McClain, Editors
J. L. Mueller, Andre Morel, Robert Frouin, Curtiss Davis, Robert Arnone, Kendall Carder, Z.P. Lee, R.G. Steward, Stanford Hooker, Curtis D. Mobley, Scott McLean, Brent Holben, Mark Miller, Christophe Pietras, Kirk D. Knobelspiess, Giulietta S. Fargion, John Porter and Ken Voss, Authors.*



Review

**Ocean Optics I A Review of Protocols for Fiducial Reference
Val Measurements of Downwelling Irradiance for the
Radiometric N Validation of Satellite Remote Sensing Data
over Water**



Kevin G. Ruddick ^{1,*}
Alexandre Castagna ²
B. Carol Johnson ³, Jo
and Riho Vendt ¹⁰

Review

**A Review of Protocols for Fiducial Reference
Measurements of Water-Leaving Radiance for
Validation of Satellite Remote-Sensing Data
over Water**

Kevin G. Ruddick ^{1,*},
Alex Gilerson ⁵, Marti
Michael Ondrusek ¹¹,



IOCCG Protocol Series

**Ocean Optics & Biogeochemistry Protocols for
Satellite Ocean Colour Sensor Validation**

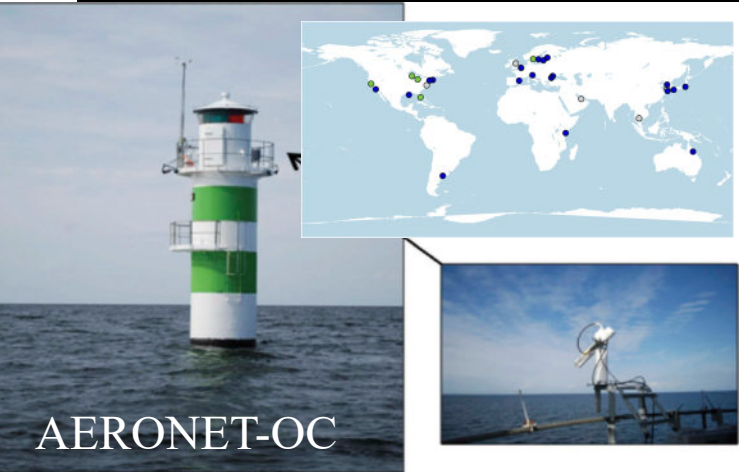
**Volume 3: Protocols for Satellite Ocean Colour Data
Validation: In Situ Optical Radiometry (v3.0)**

Authors
Giuseppe Zibordi, Kenneth J. Voss, B. Carol Johnson and James L. Mueller

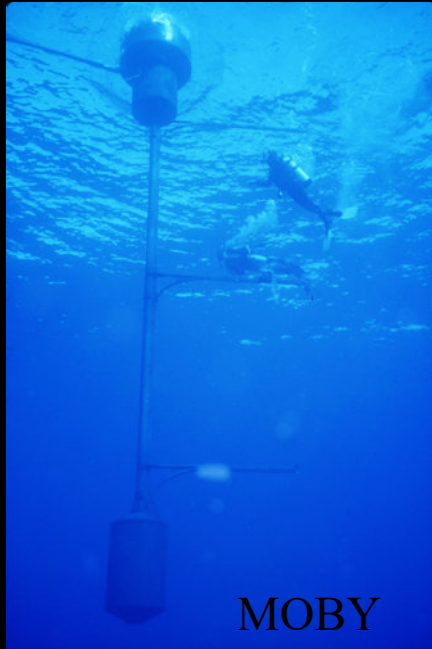




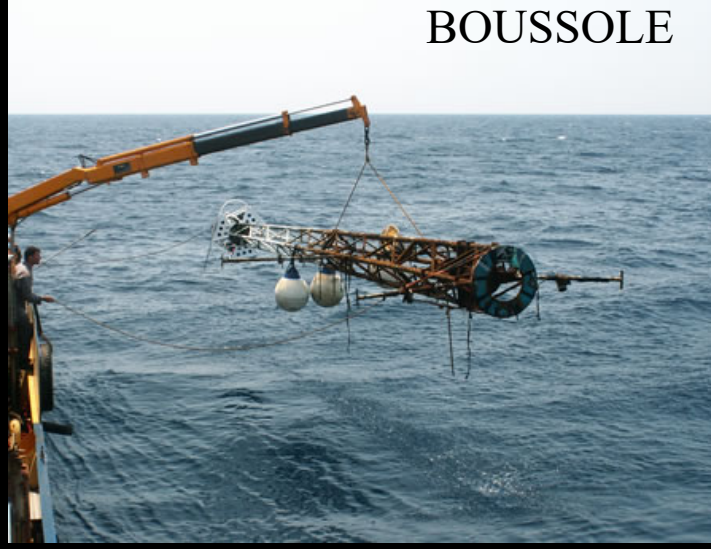
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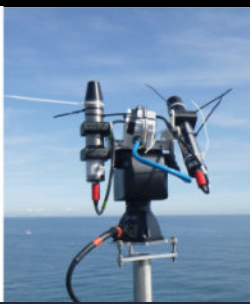
AERONET-OC



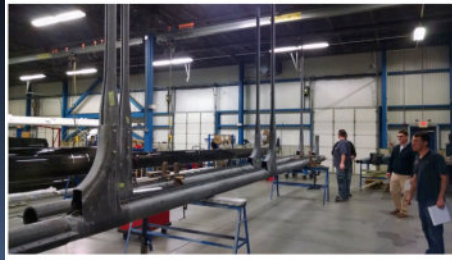
MOBY



BOUSSOLE



MarONet
MOBY-Net structure has been designed and built:



Above, main Spar with arms fitted in place.



SEA-BIRD SCIENTIFIC
HyperNav
Hyperspectral Radiometer Development

NASA THE UNIVERSITY OF MAINE

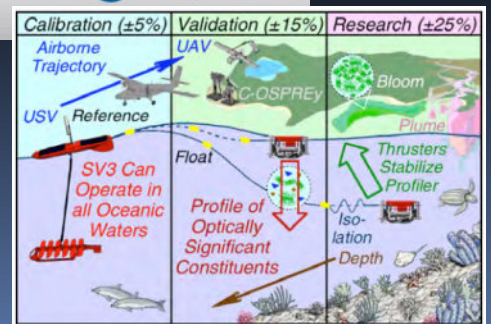
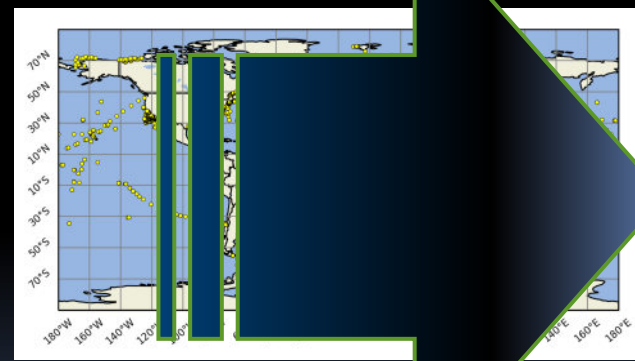
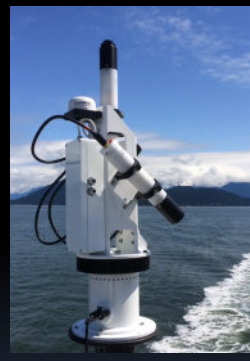
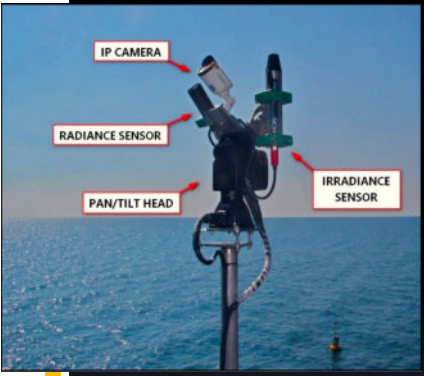
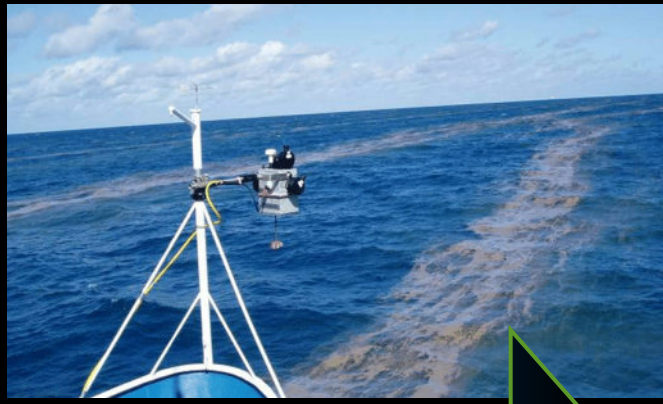


Fig. 71. The HARPOONS CVR paradigm wherein au-



Worldview DESIS Planet SeaHawk GLIMR etc.

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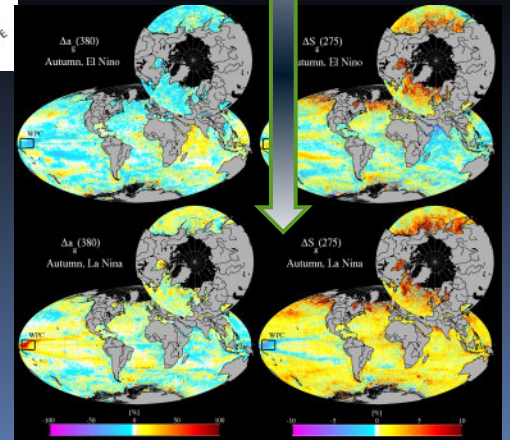
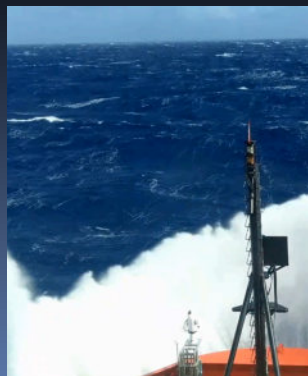
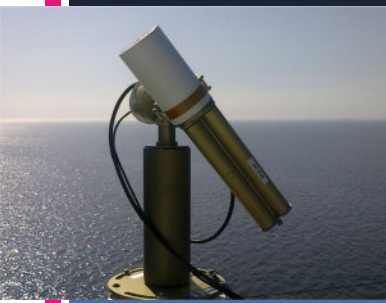
SeaBASS

Home About SeaBASS Contribute Data Wiki

Welcome to the SeaWiFS Bio-optical Archive and Storage System (SeaBASS), the public Ocean Biology Processing Group (OBPG) information on how to search for data, please refer to "Contribute Data."

Data Shortcuts

File Search	Investigators
Validation Search	Experiments
Time Series Tool	Cruises
SST Search	Fields
NOMAD Dataset	FRM4SOC





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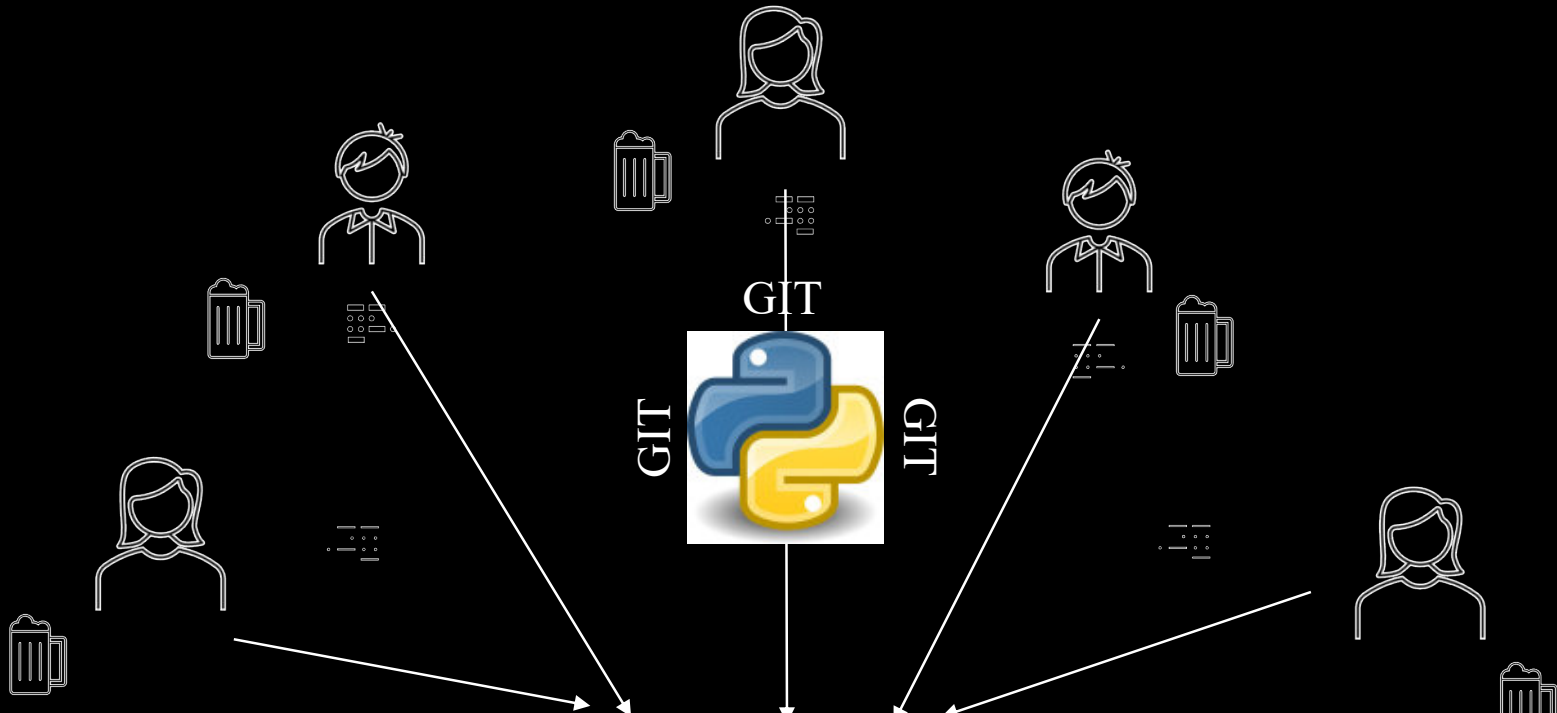
Data Shortcuts	Lists
File Search	Investigators
Validation Search	Experiments
Time Series Tool	Cruises
SST Search	Fields
NOMAD Dataset	



=Black box (proprietary, compiled, and/or inaccessible)



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SeaBASS

Home About SeaBASS Get Data Contribute Data Wiki

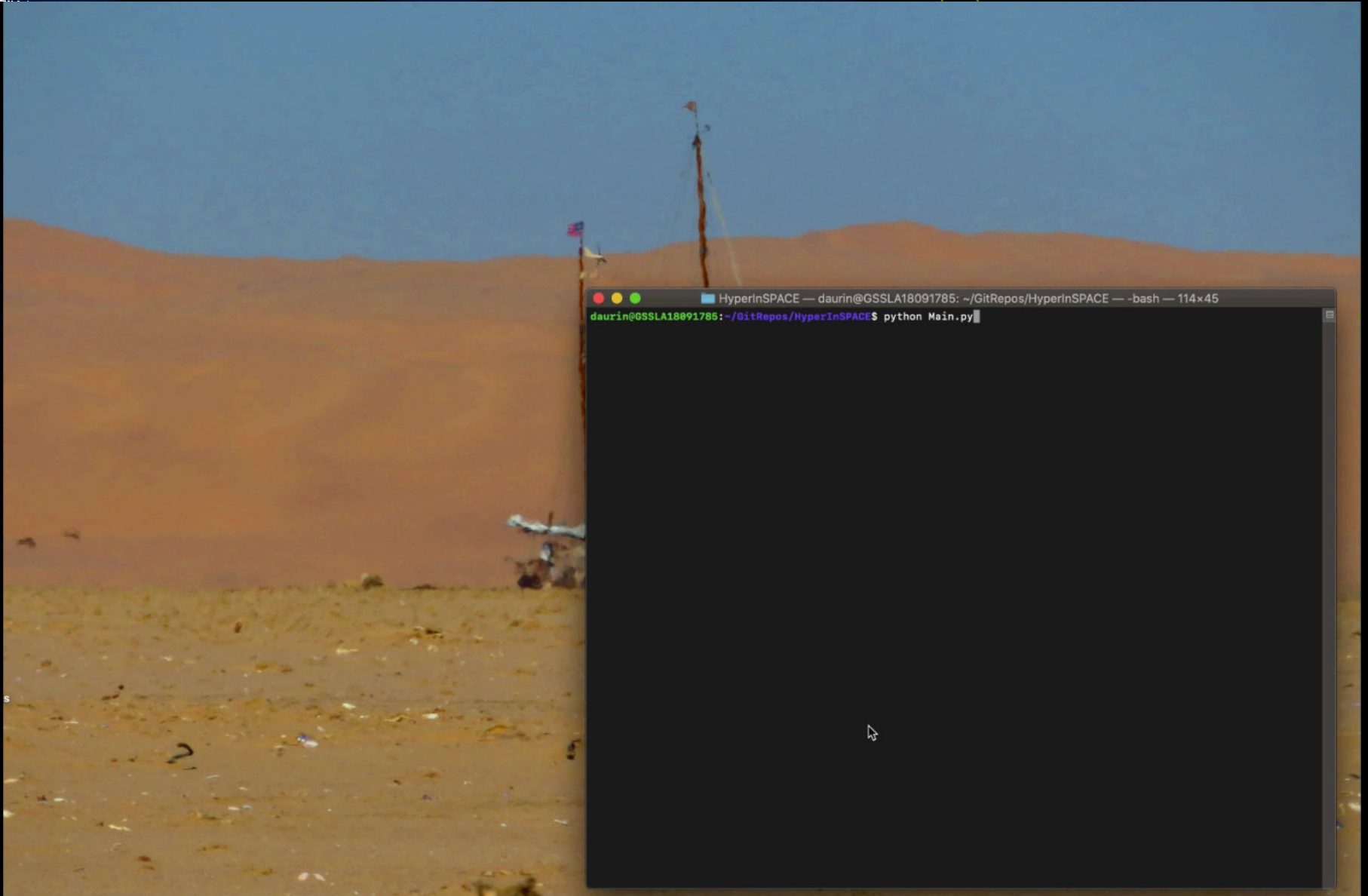
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Data Shortcuts	Lists
File Search	Investigators
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Time Series Tool	Cruises
SST Search	Fields
NOMAD Dataset	





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Tuned

L1D : Process L1C to L1D

Deglight data and apply shutter dark corrections.

Processing Parameters:

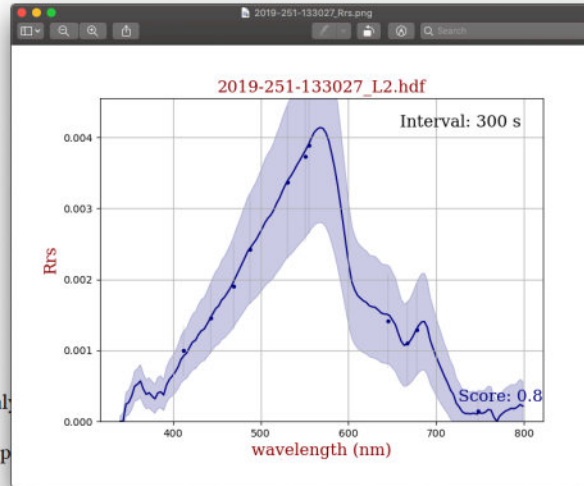
- ES Dark Window: 9
- ES Light Window: 5
- ES Dark Sigma: 3.0
- ES Light Sigma: 3.7
- LT Dark Window: 11
- LT Light Window: 3
- LT Dark Sigma: 3.2
- LT Light Sigma: 2.2
- LI Dark Window: 11
- LI Light Window: 5
- LI Dark Sigma: 2.7
- LI Light Sigma: 2.7

Process log:

Process Single Level from Anomaly Analysis
ProcessL1d:
/Users/daurin/Projects_Supplemental/HyperInSPACE/L1C.hdf

ProcessL1d.processL1d: 09-Apr-2021 17:40:06

Screening ANCHILARY_METADATA for clean timestamps



Deglight data and apply shutter dark corrections.

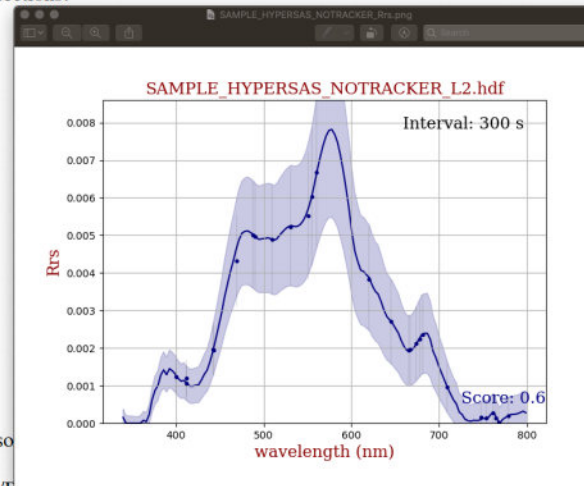
Processing Parameters:

- 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

Process log:

Process Single Level
No deglighting parameter file found. Resolving
ProcessL1d:
/Users/daurin/GitRepos/HyperInSPACE/Data/L1C/SAMPLE_HYPERSAS_NOTRACKER_L1C.hdf

ProcessL1d.processL1d: 09-Apr-2021 16:16:33

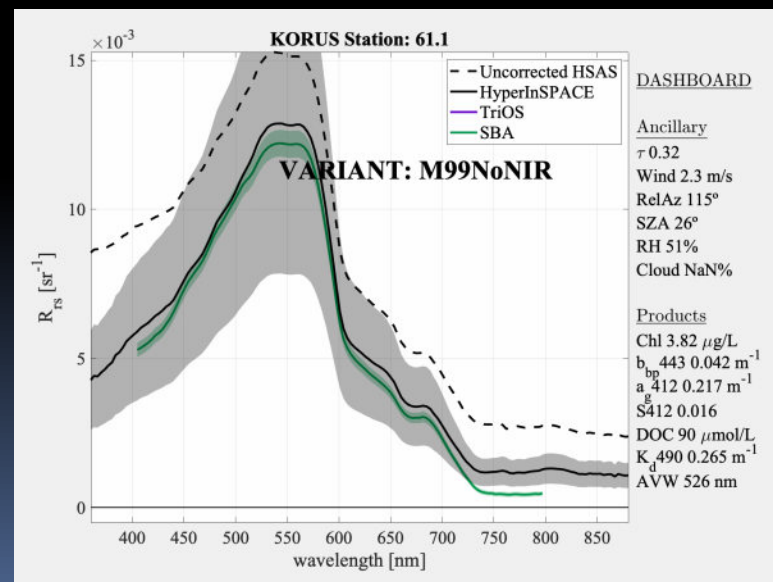
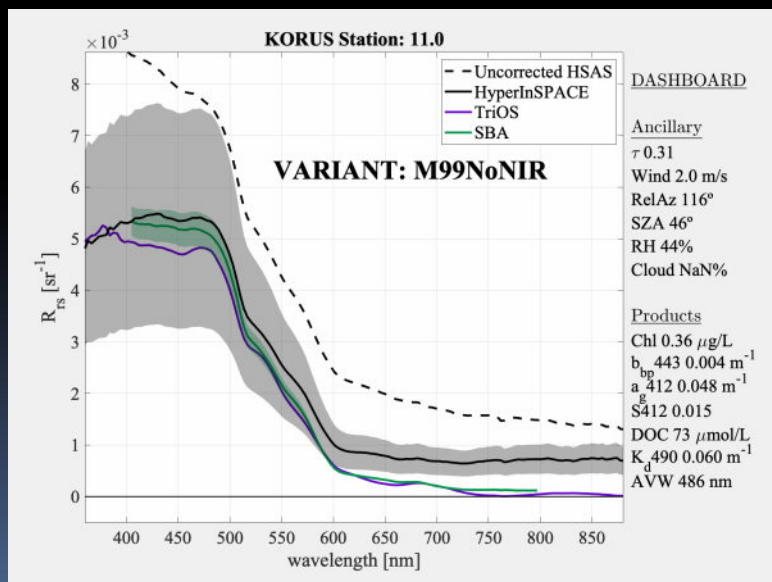
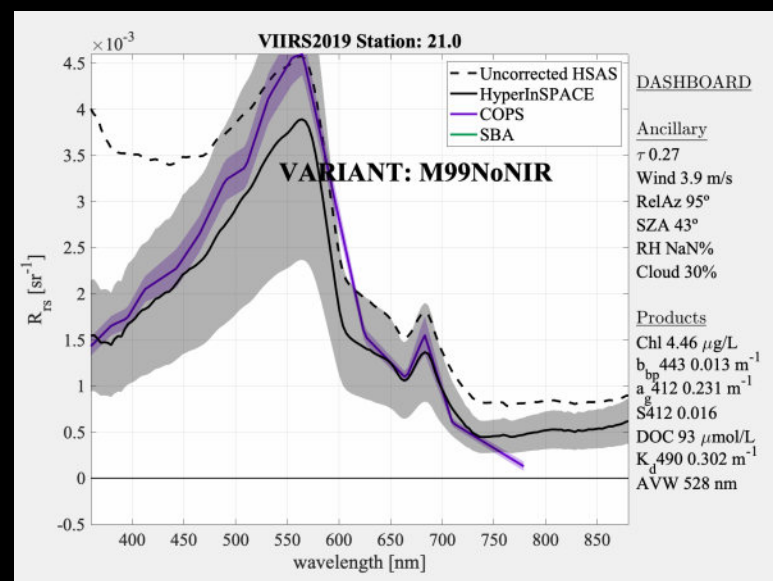
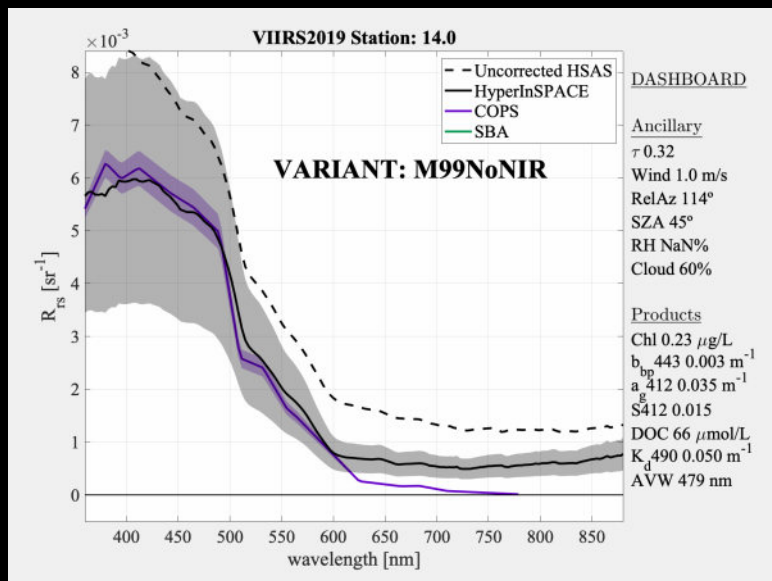


Default
(based on a
different
cruise)

Hyperspectral Matchups

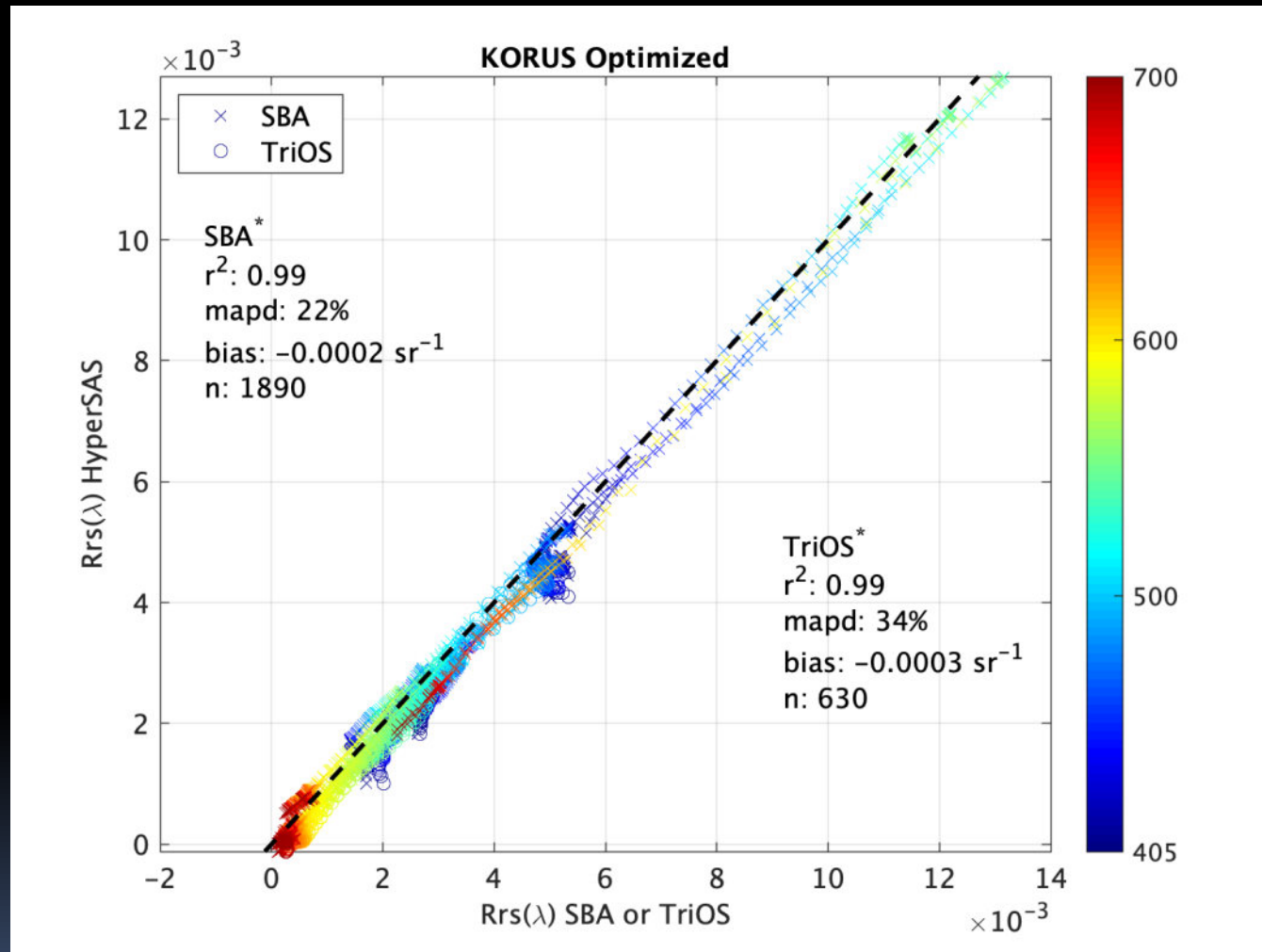
Bluer Waters

Greener Waters

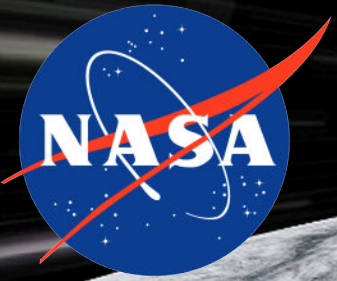


Thanks to KIOST (W. Kim, Y-J Park) for TriOS KORUS data, NOAA STAR (J. Wei) for SBA KORUS and VIIRS2019

Hyperspectral Matchups



24 Stations matched to TRiOS and/or SBA
Cruise: KORUS-OC (2016)



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(HYPERPECTRAL *IN SITU* SUPPORT FOR PACE)

Official release March 2021
<https://github.com/nasa/HyperInSPACE>

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master 12 branches 0 tags Go to file Add file Code

oceancolorcoder	Clean up plot paths in Controller an...	8a7ad87	4 days ago	346 commits
Config	Restore ignore extra Data directories		5 days ago	
Data	Clean up plot paths in Controller and Utilities		4 days ago	
Source	Clean up plot paths in Controller and Utilities		4 days ago	
.gitignore	Restore ignore extra Data directories		5 days ago	
Changelog.md	Fix names in batch mode. Fix f3.2 waveband in An...		5 days ago	
Changelog.pdf	Update README and Changelog		5 days ago	
LICENSE.txt	Update README for testing		5 days ago	
Main.py	Update README for testing		5 days ago	
NOSA_GSC-18527-1.pdf	Strip extra Data directories out.		5 days ago	
README.md	Strip extra Data directories out.		5 days ago	
README.pdf	Update README and Changelog		5 days ago	

README.md

Hyperspectral In situ Support for PACE



HyperInSPACE is designed to provide hyperspectral in situ support for the **PACE mission** by processing automated, above-water, hyperspectral ocean color radiometry data using state-of-the-art methods and protocols for quality assurance, uncertainty estimation/propagation, sky/sunglint correction, convolution to satellite wavebands, and ocean color product retrieval. Data output are formatted to text files for submission to the SeaBASS database and saved as comprehensive HDF5 records with automated processing reports. The package is designed to facilitate rigorous, flexible, and transparent data processing for the ocean color remote sensing community, particularly Pls funded by NASA to submit such radiometric data to SeaBASS

Python 100.0%



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1. Community requires robust, transparent, reproducible processing of in situ radiometry
2. HyperInSPACE is a promising first step in that direction
3. For it to succeed, HyperInSPACE requires the community

<https://github.com/nasa/HyperInSPACE>

Contact:
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dirk.a.aurin@nasa.gov

Developed in support of PACE Science Data Segment