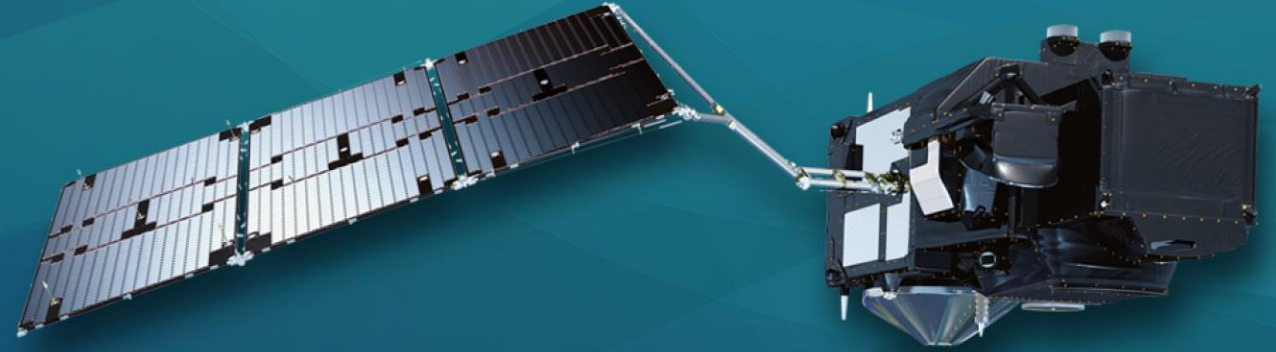




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9th Sentinel-3 Validation Team meeting 2026

30 March–01 April 2026 | ESA–ESRIN | Frascati (Rome), Italy

In-water AOP data requirements, workflows and results for PACE Validation

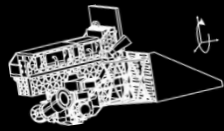
Violeta Sanjuan Calzado^{1,2}, Christopher Proctor^{1,3}, Amir Ibrahim, Inia Soto-Ramos, Michael Maniscalco^{1,3}

¹NASA Goddard Space Flight Centre

²University Maryland Baltimore County

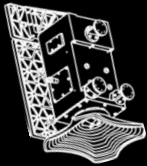
³Science Systems and Applications, Inc.

⁴Morgan State University



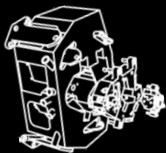
OCI

340-890 nm in 2.5 nm steps
 7 discrete SWIR: 940-2260 nm
 1-2 day coverage; $\pm 20^\circ$ tilt; 1km
 NASA Goddard Space Flight Center



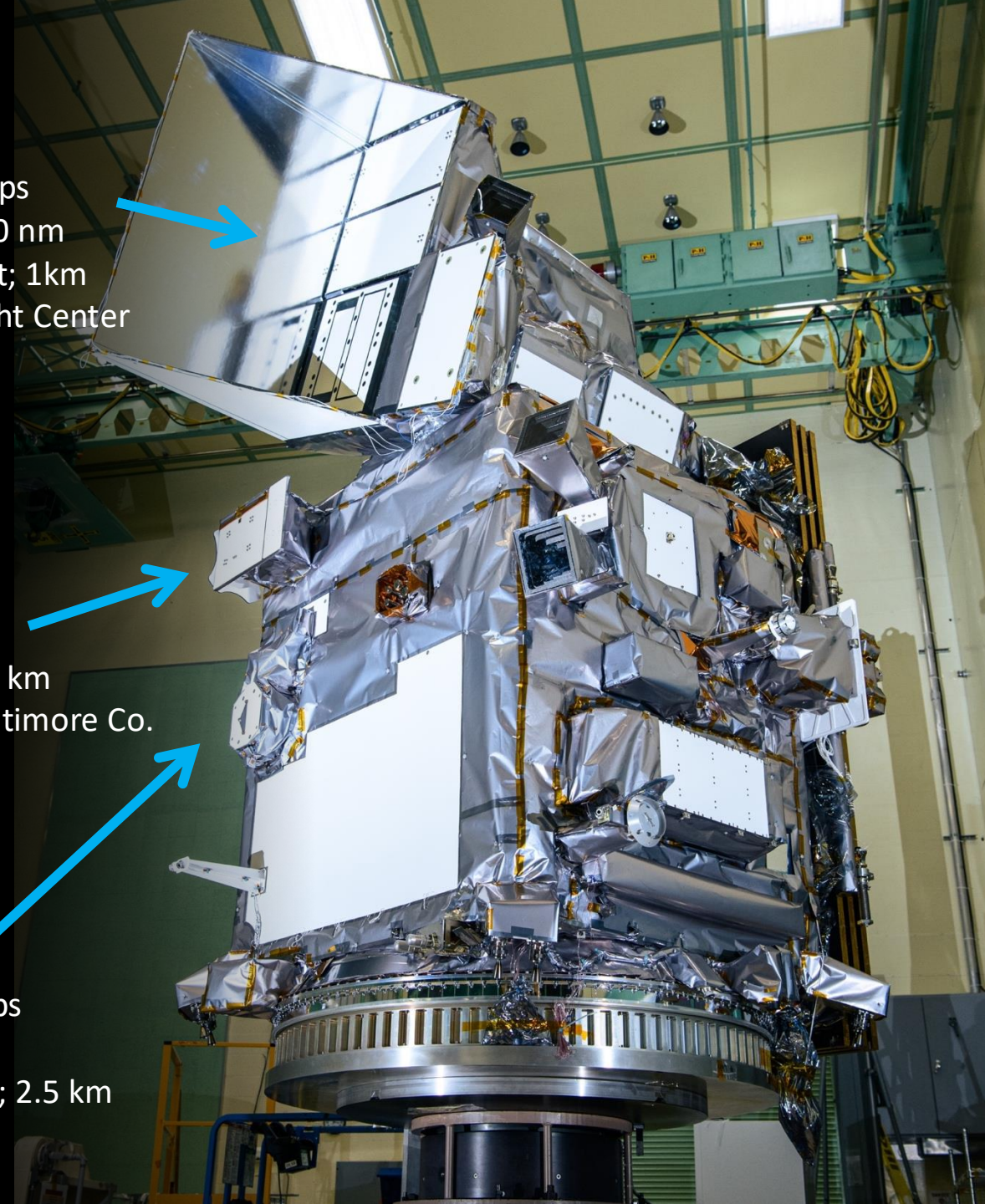
HARP2

440, 550, 670, 870 nm
 10-60 viewing angles
 wide swath polarimeter; 3 km
 University of Maryland Baltimore Co.



SPEXone

380-770 nm in 2-4 nm steps
 5 viewing angles
 narrow swath polarimeter; 2.5 km
 SRON, Airbus NL



PACE (re)processing efforts

Initial data release on 4 Apr 2024

First reprocessing (V2) in Jul 2024

Second repro (V3) in Feb 2025

Second+ repro (V3.1) Sep 2025

- OCI only
- updated SVC
- several atm corr improvements
- Released new products

polar, ascending, 98° inclination
 13:00 local Equatorial crossing time
 676.5 km altitude
 6-9 hrs data latency

PACE Validation Efforts



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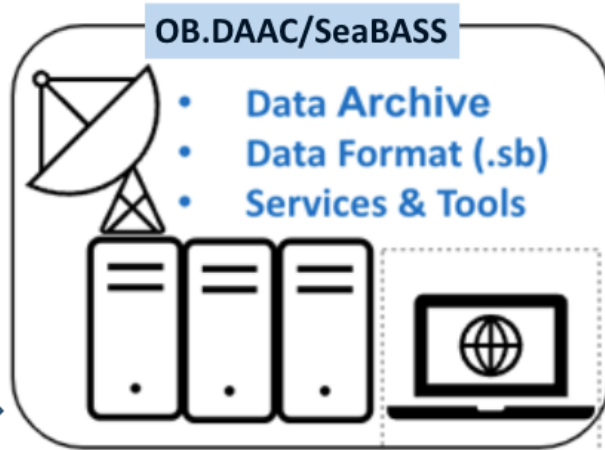
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NASA OB.DAAC - SeaWiFS Bio-optical Archive and Storage System (SeaBASS) is the agency's primary archive for in situ ocean and water optical and oceanographic measurements and it is responsible for curating the data used for ocean color validation.



External validation data sources:
AERONET-OC, AERONET-MAN,
MOBY, WATERHYPERNET



**SeaBASS Data
Publicly Available**

<https://seabass.gsfc.nasa.gov/>

SeaBASS Data Analyst
QA/QC data
Dataset collection and processing should meet the community vetted protocols

Validation Leads
In situ- satellite match-ups
Post-process for validation and algorithm development

NOMAD
Curate & catalog data into stations

PACE Validation Data Sources



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SeaBASS: Main Source for Ocean data

- NASA-funded projects (PVST, others)
- Inter-agency collaboration (e.g., VIIRS-Validation cruises)
- OEL Field Support Group
- Voluntary submissions
- PACE-PAX – Ocean data
- 22 out of 24 Teams under PVST



Atmospheric Science Data Center (ASDC): Atmospheric data (asdc.larc.nasa.gov)

- NASA-funded projects (e.g., PACE-PAX)
- Teams under PVST

Other Data Sources:

- AERONET
- CloudNET
- ARM

Data submissions: In-water AOP



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- Provide full profile data, full spectral resolution
- Additional documents:
 - Calibration files
 - Data processing description in detail
 - Acquisition conditions; currents, shallow water depth, high SZA. Cruise log.
 - Photos of sky conditions during acquisitions

Metadata fields including:

- Wind speed (/wind_speed=)
- Cloud cover (/cloud_percent=) *Required*
- Wave height (/wave_height=)
- Ship heading (/heading=)
- Instrument deployed (COPS, Hyperpro...)
- Tilt, Roll, and/or Pitch, time, depth....
- Uncertainty calculations.

SeaBASS

[Home](#) [About SeaBASS](#) [Get Data](#) [Contribute Data](#) [Wiki](#) [Lists](#) [Login](#)

Data Submission Special Requirements

When preparing a submission, check to see if the data type is in the list **below**. Certain types of SeaBASS data submissions have special requirements. Some submissions require extra "checklist" documents. These requirements and several examples are listed below, sorted by data types. This list is not exhaustive.

Check if your submission type lists any **required extra documents**. These checklists are designed to standardize and preserve critical methods for data users to assess the data quality and to consider them for satellite validation or inclusion in algorithm development datasets. We prefer you to provide these documents in PDF (text and plain text), pick your preference and fill out the necessary sections. Rename the file in a relevant way to make it unique (e.g., add the cruise number and date to the filename). These files are part of your submission.

The **special notes** section for each data type highlights any necessary measurement-specific metadata (e.g., conditionally required headers), file naming conventions, and other important information.

This page also provides **example submission** sections containing model data files and documentation bundles to help you format different types of data. Your files might look a bit different, but hopefully the examples are helpful as a starting place from which to further adapt or improve your submissions.

Table of Contents

1. Absorption and Attenuation Meter (AC-S, AC-9)
 - 1.1. [required extra documents, AC-meter](#)
 - 1.2. [special notes, AC-meter](#)
2. Absorption, Gelbstoff / CDOM (spectrophotometer)
 - 2.1. [required extra documents, ag](#)
 - 2.2. [special notes, ag](#)
 - 2.3. [example submission, ag](#)
3. Absorption, Particulate (spectrophotometer)
 - 3.1. [required extra documents, ap](#)
 - 3.2. [special notes, ap](#)
 - 3.3. [example submission, ap](#)
4. Particulate Organic Carbon and Nitrogen (POC, PON)
 - 4.1. [required extra documents, POC, PON](#)
 - 4.2. [special notes, POC, PON](#)
 - 4.3. [example submission, POC, PON](#)



Visual SeaBASS 3.0



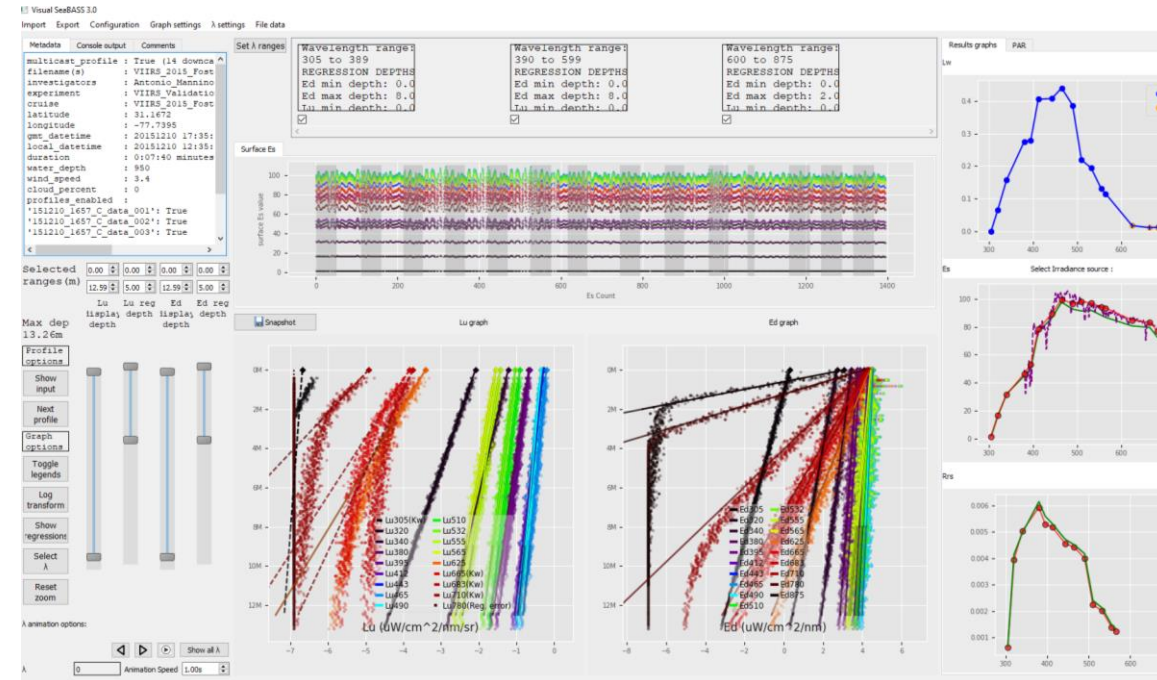
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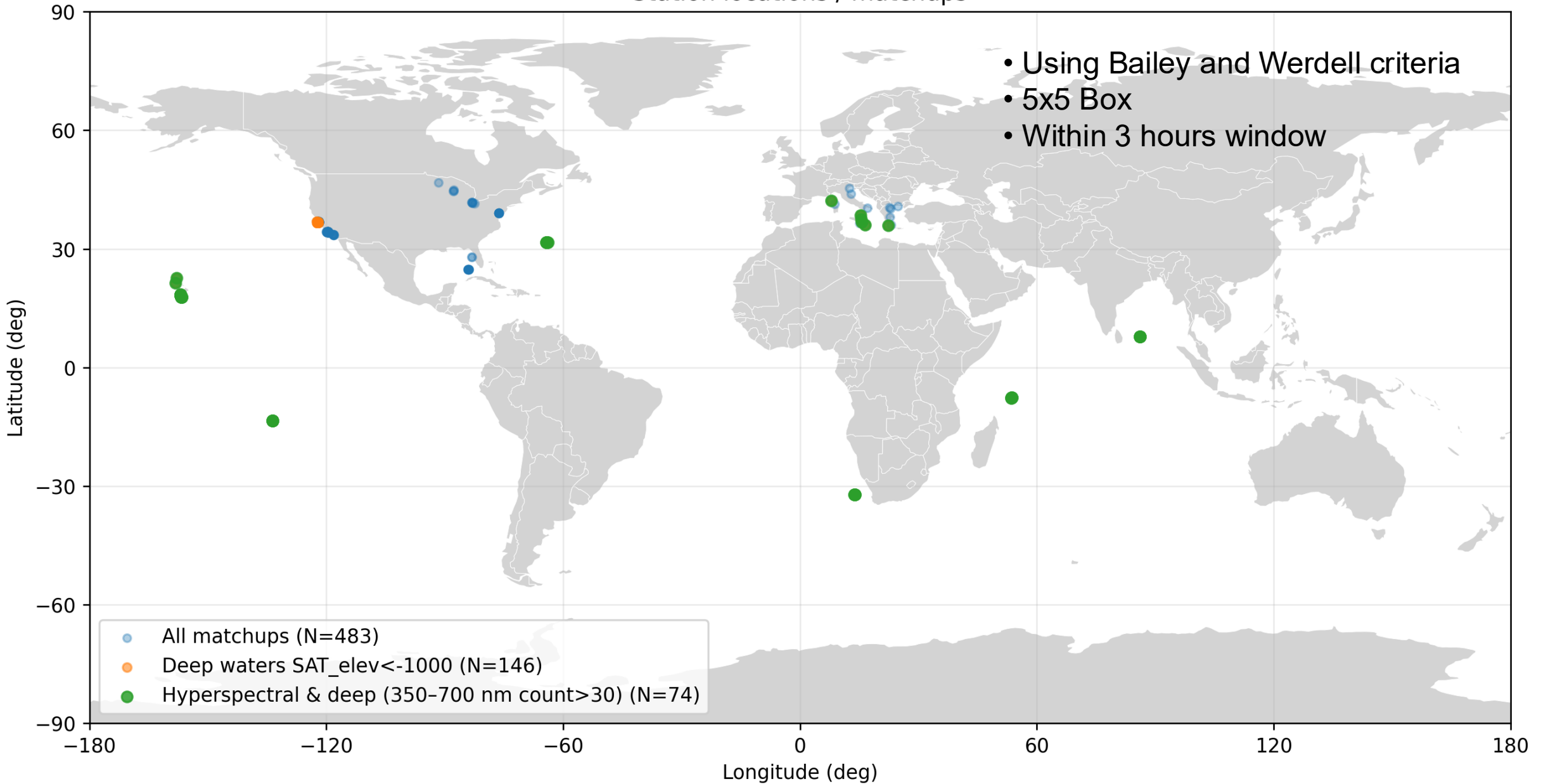


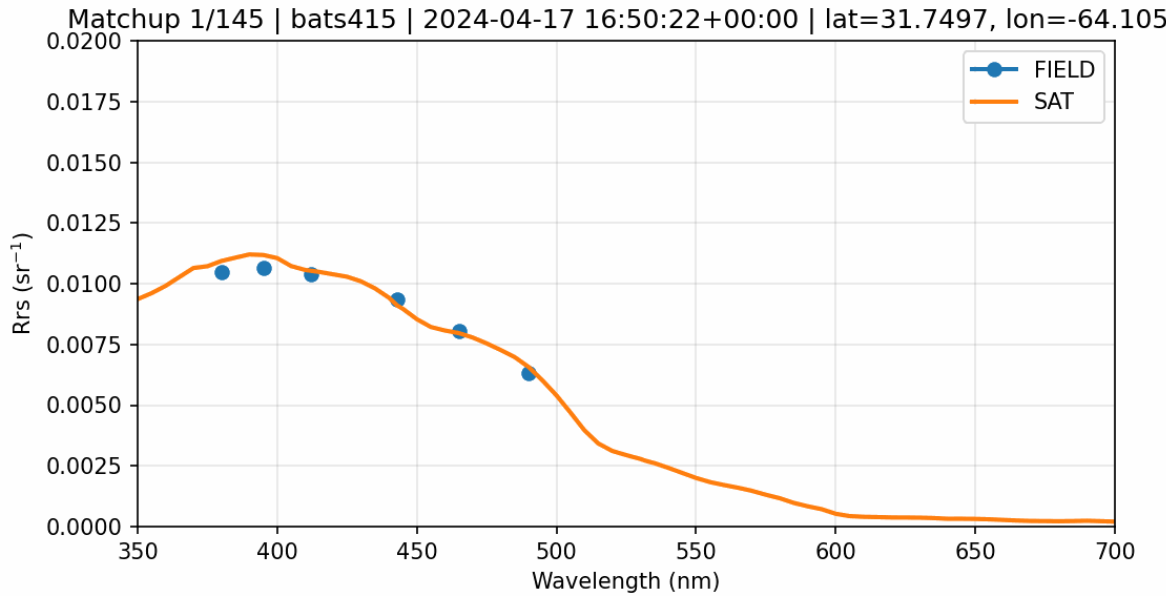
- Open source AOP processor to generate L_w from profile radiometry submitted into SeaBASS data repository following SeaBASS data submission requirements.
- Input data profile AOP (.sb files). SeaBASS data format.
- Displays E_d , L_u profile data together with accessory information data for QA/QC evaluation of radiometric profiles.
- Data analysis on individual/grouped wavelengths for better retrievals.
- First order LR analysis over the selected depth.
- Outputs generated are L_w , E_s (measured and extrapolated), K_d , K_{par} , z_{37} , z_{10} , z_{01}
- Updates to support PACE data requirements as well as updated ocean color community practices, IOCCG In-situ radiometry protocols to process profile radiometry into water leaving radiance.



Matchups analysis

Station locations / matchups





Apparent Optical Properties (AOP)

PACE Data Matchups

Apparent Optical Properties (AOP) measured from the ocean depend on the type and composition of materials in the water (e.g., phytoplankton, colored dissolved organic material, detritus, and bubbles), as well as the environmental lighting conditions (e.g., sun angle, sensor viewing angle, and atmospheric composition). Here, we validate the spectral Remote Sensing Reflectance (Rrs), which is the amount of light leaving the sea surface towards the sensor normalized by the light reaching the sea surface from the entire upward hemisphere. For PACE-OCI, Rrs is derived through a series of quality control and atmospheric correction protocols.

[Read more >](#)

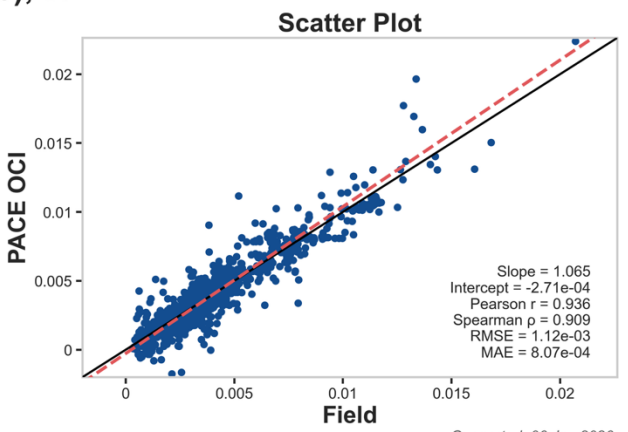
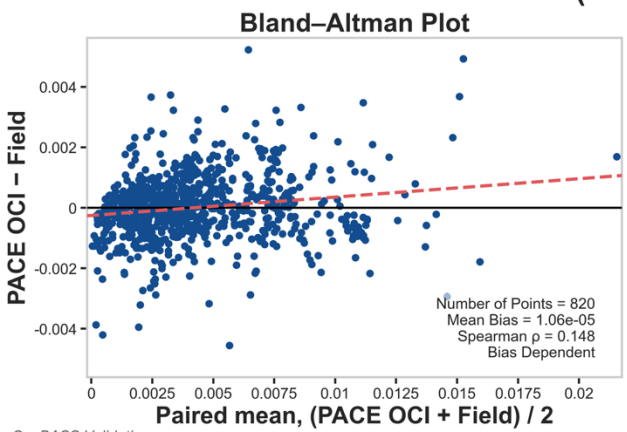
Background on AOP >>

Wavelength	Mean Bias	Limits of Agreement		Linear Slope	Linear Intercept	Linear Correlation	Rank Correlation	RMSE [View plot]	MAE [View plot]	Matchup Plots
		Low	High							
Rrs_400	0.000437	-999	999	1.15	-0.000225	0.898	0.839	0.00181	0.00138	Click here
Rrs_412	-5.76E-06	-999	999	1.1	-0.000445	0.916	0.875	0.00151	0.00108	Click here
Rrs_443	1.06E-05	-999	999	1.06	-0.000271	0.936	0.909	0.00112	0.000807	Click here
Rrs_490	5.57E-05	-999	999	1.09	-0.000349	0.959	0.92	0.000867	0.000606	Click here
Rrs_510	0.000102	-999	999	1.09	-0.000243	0.967	0.874	0.000785	0.000524	Click here
Rrs_560	0.000109	-999	999	1.08	-0.000146	0.981	0.931	0.000705	0.000435	Click here
Rrs_620	-2.04E-05	-999	999	1.02	-3.81E-05	0.974	0.837	0.000458	0.000245	Click here
Rrs_665	-6.77E-05	-0.000891	0.000755	0.955	-3.11E-05	0.963	0.791	0.000425	0.000217	Click here

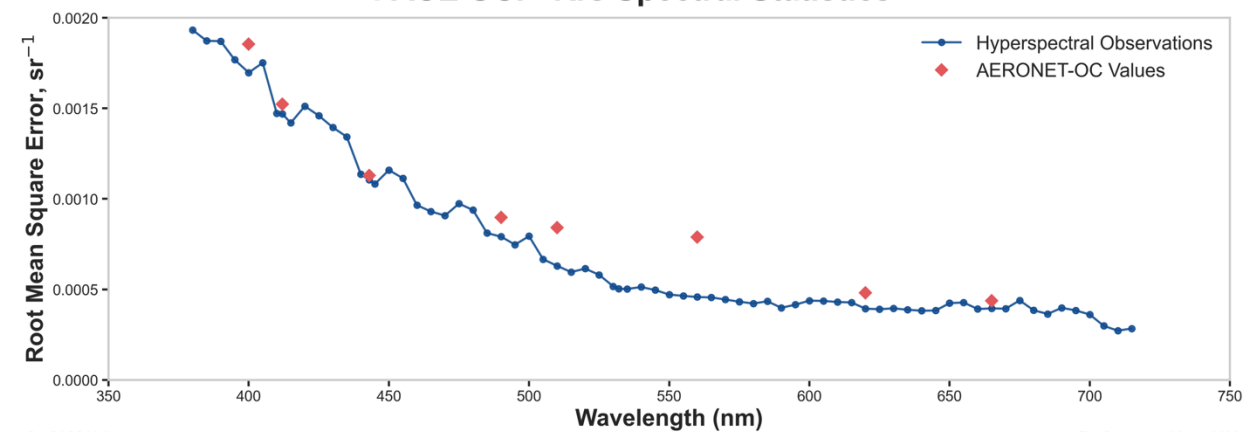
PACE OCI - Rrs Spectral Statistics

https://pace.oceansciences.org/pace_data_matchups.htm

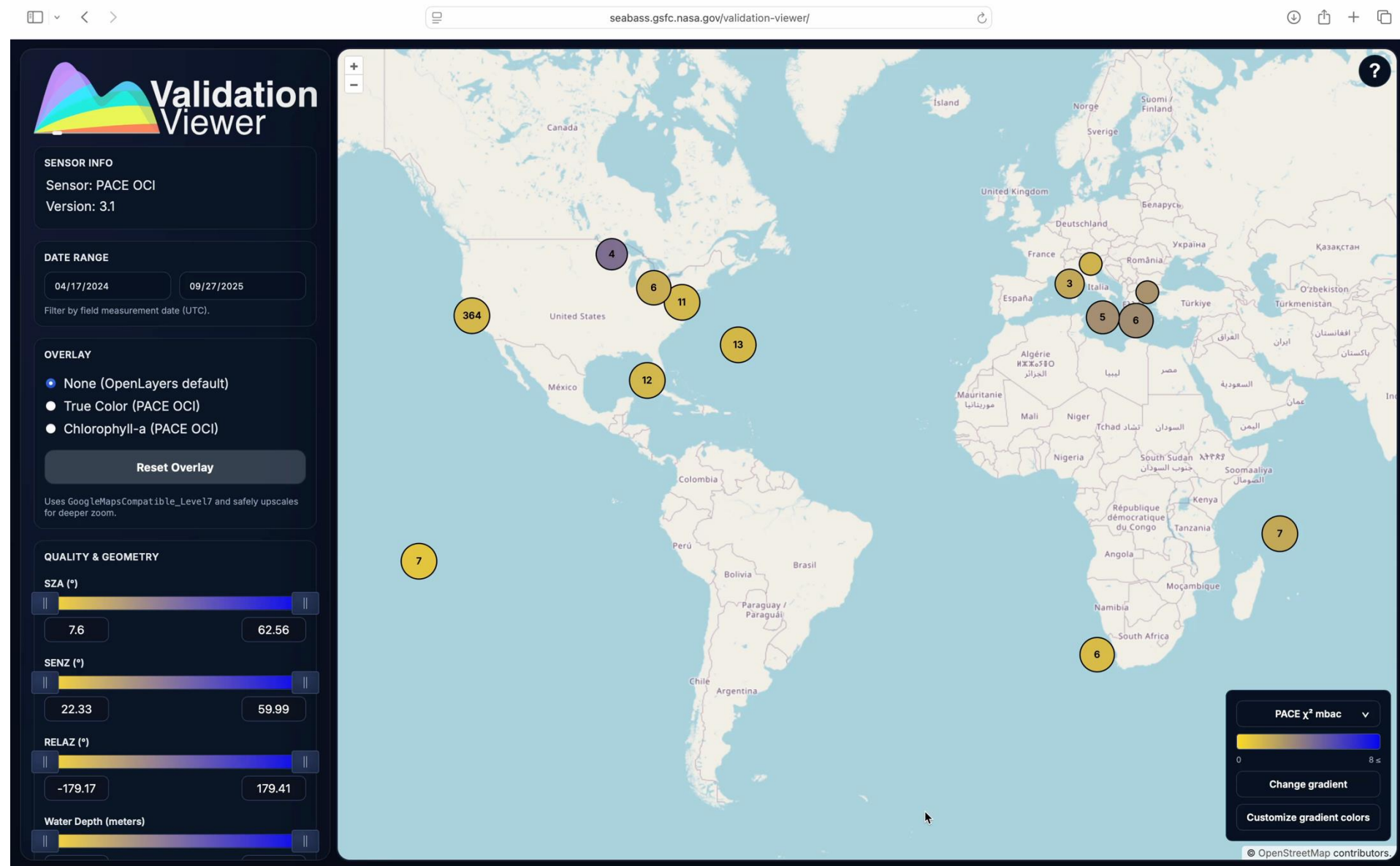
Rrs(443), sr⁻¹



PACE OCI - Rrs Spectral Statistics



- Validation Viewer is an interactive tool for browsing the validation matchups
- Currently supports Rrs
- Additional products coming soon:
 - Surface reflectance
 - BGC and IOP products
 - Time series analysis





HELP HUB Satellite data processing can be difficult.
We're here to help you climb out of that hole!

PACE OCEAN COLOR OS DAAC | OBPC NASA

A banner with a blue and white background. On the left, the text 'HELP HUB' is in large blue letters. To its right, the text 'Satellite data processing can be difficult. We're here to help you climb out of that hole!' is in a smaller font. On the right side, there is a circular QR code with 'HELP HUB' written in the center. At the bottom, there are logos for PACE, OCEAN COLOR OS DAAC | OBPC, and NASA.



LEARN MORE

pace-community-join@lists.nasa.gov

(subject "subscribe")



PACE
Land data Users' Group
Building capacity & community for PACE's advanced terrestrial observations

A banner with a green and white background. On the left, the word 'PACE' is in large white letters with a starburst effect. To its right, the text 'Land data Users' Group' is in a smaller font. Below that, the text 'Building capacity & community for PACE's advanced terrestrial observations' is in a smaller font. On the right side, there is an image of a satellite in orbit over a green landscape.

the best chance we have for mission continuity (extension + new missions) is through your scientific advances – be great and share your results with us!