

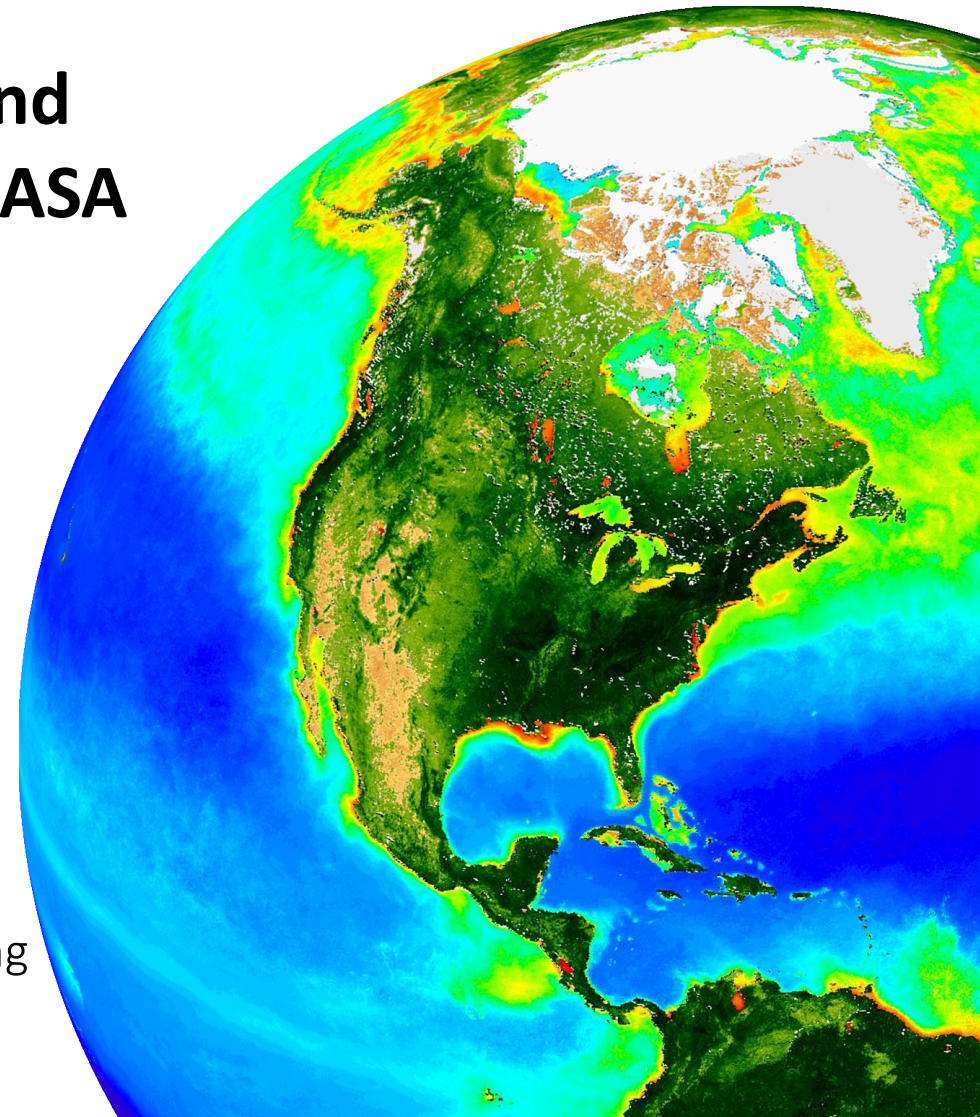
# SeaWiFS Bio-Optical Archive and Storage System (SeaBASS) & NASA Field Support Group Updates

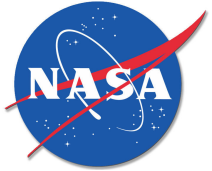
**Joel Scott**

NASA GSFC, Ocean Ecology Laboratory

Contributors: Sean Bailey, P. Jeremy Werdell, Chris Proctor, Antonio Mannino, NASA's Field Support Group

2019 NASA Ocean Color Research Team Meeting  
8 April 2019



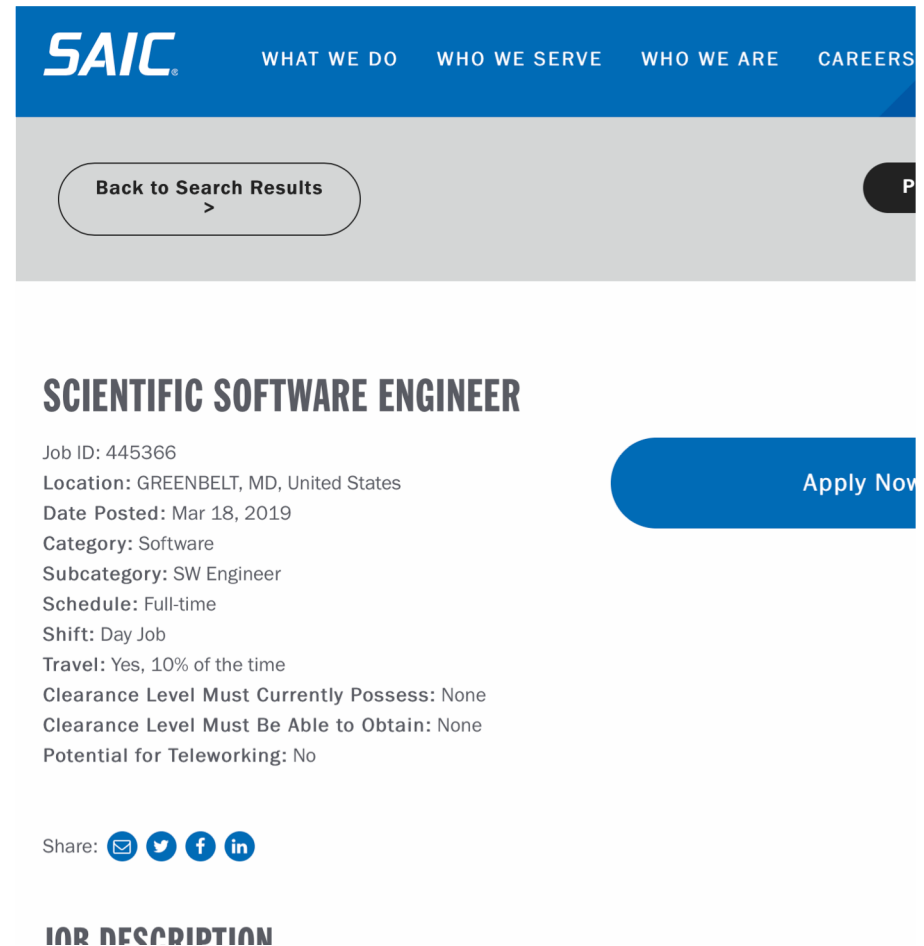


# Major News

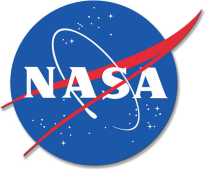
- NASA phased out the use of FTP
  - Data submission process was affected
  - Require individual, authenticated SFTP accounts (requires some setup)  
[https://seabass.gsfc.nasa.gov/wiki/Data\\_Submission](https://seabass.gsfc.nasa.gov/wiki/Data_Submission)
- SeaBASS officially recognized as part of the OB.DAAC
  - SeaBASS data format – official ESDIS format since 2016
  - All SeaBASS data archived in perpetuity, assigned a DOI, & searchable via NASA Earthdata Search (coming soon)

# Come work with us!

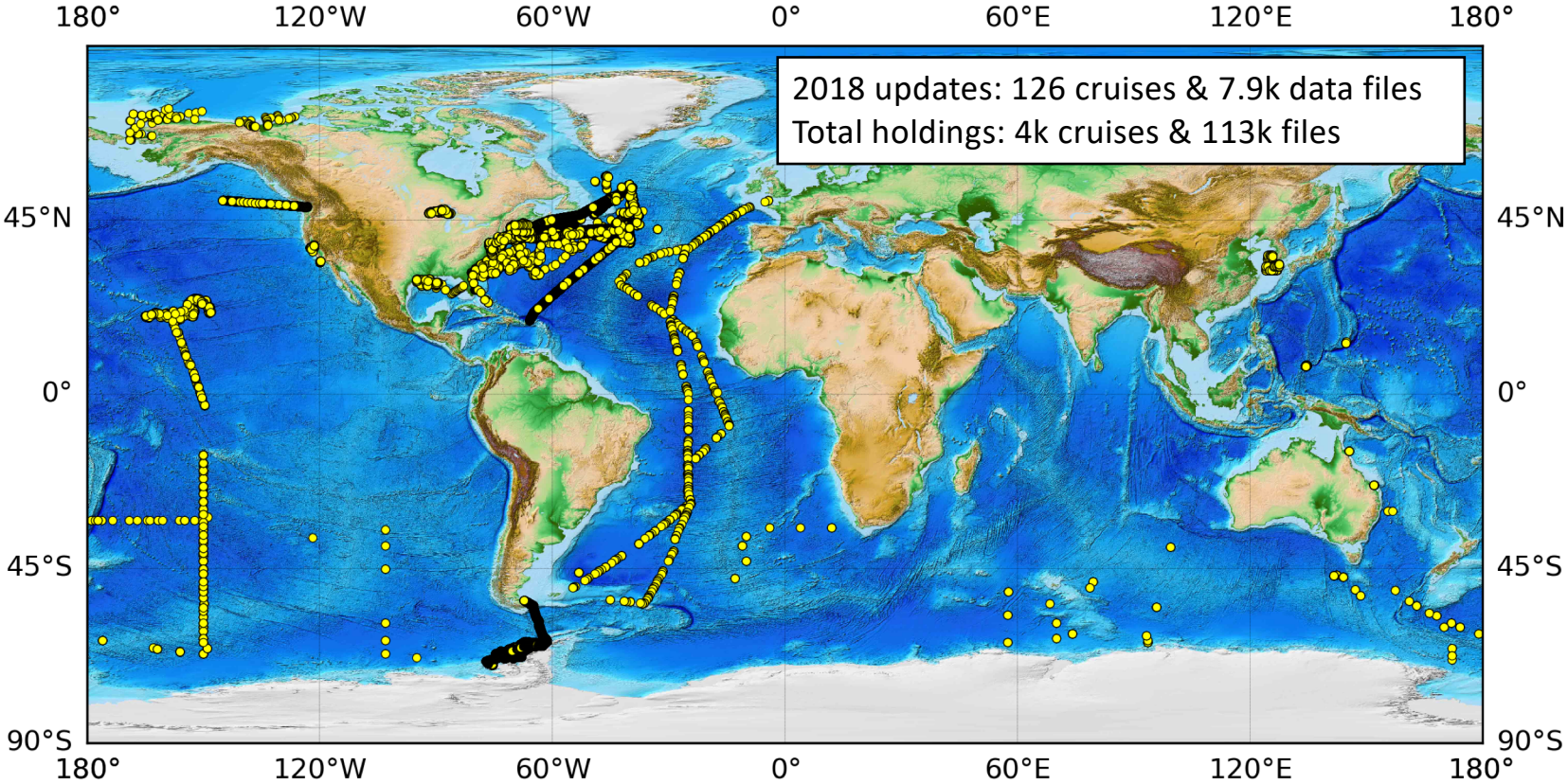
- SeaBASS is hiring a scientific software engineer
- Apply at:
  - <https://jobs.saic.com>
  - Job ID: 445366

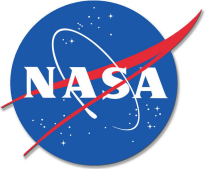


The screenshot shows the top navigation bar of the SAIC website with links for 'WHAT WE DO', 'WHO WE SERVE', 'WHO WE ARE', and 'CAREERS'. Below the navigation is a search bar with a 'Back to Search Results' button. The main content area features the job title 'SCIENTIFIC SOFTWARE ENGINEER' in bold. Below the title, the following details are listed: Job ID: 445366, Location: GREENBELT, MD, United States, Date Posted: Mar 18, 2019, Category: Software, Subcategory: SW Engineer, Schedule: Full-time, Shift: Day Job, Travel: Yes, 10% of the time, Clearance Level Must Currently Possess: None, Clearance Level Must Be Able to Obtain: None, and Potential for Teleworking: No. At the bottom of the job details, there are social sharing icons for email, Twitter, Facebook, and LinkedIn. A blue button labeled 'Apply Now' is positioned to the right of the job details. The section 'JOB DESCRIPTION' is partially visible at the bottom.



# SeaBASS & Recent Data

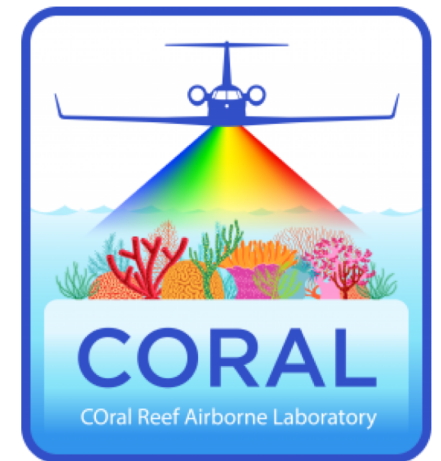


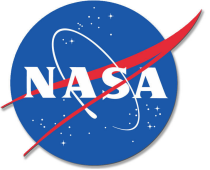


# Major NASA Missions



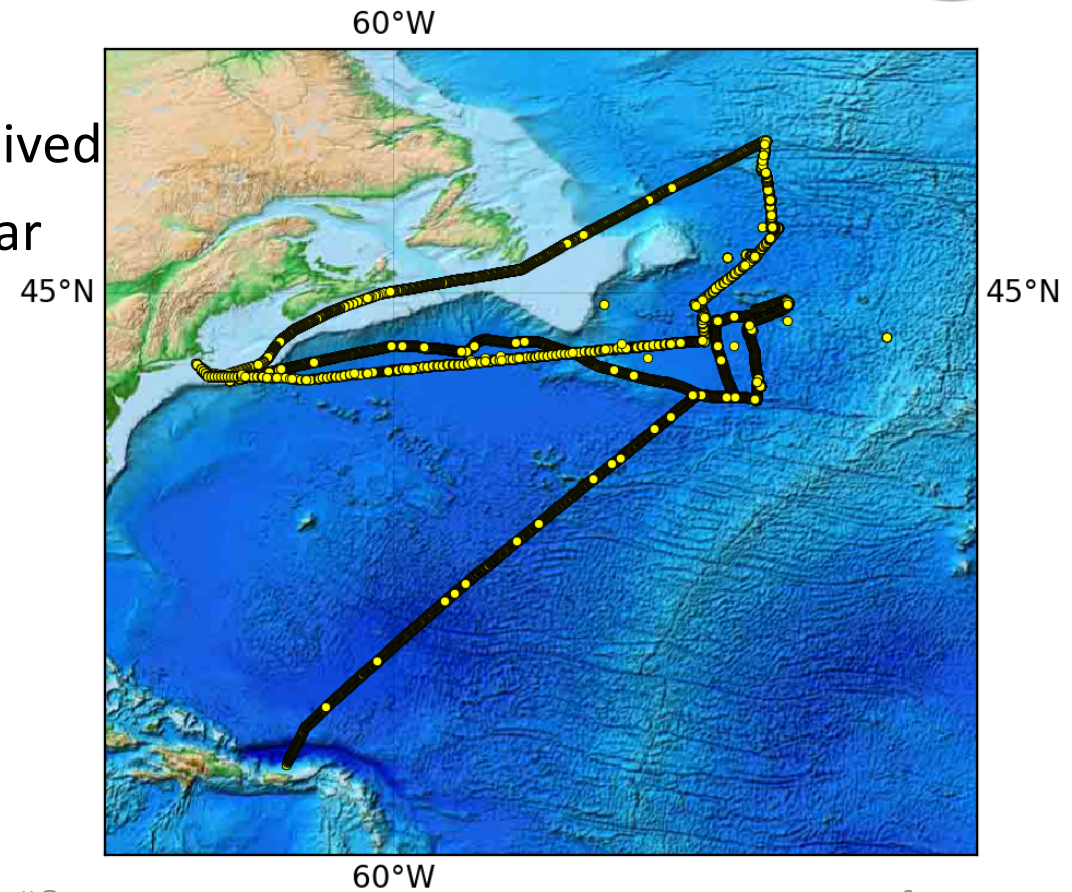
- SeaBASS supports NASA EVS-2 missions
  - NAAMES  
(North Atlantic Aerosols and Marine Ecosystems Study)
  - CORAL  
(COral Reef Airborne Laboratory)
- EXPORTS  
(EXport Processes in the Ocean from Remote Sensing)

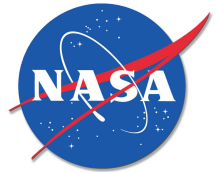




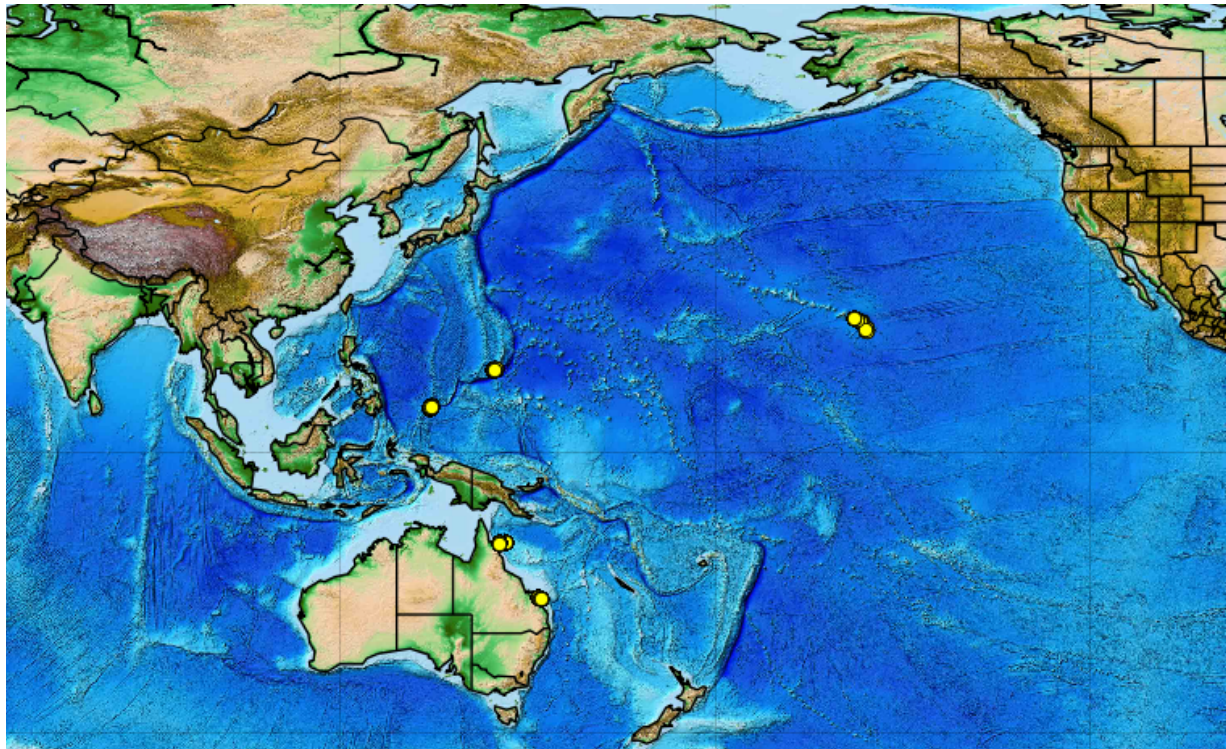
# SeaBASS Updates: NAAMES

- First three NAAMES cruises: archived
- New data holdings within last year
  - NAAMES\_3: 2017 fall
  - NAAMES\_4: 2018 spring (partially archived, due 30 April)





# SeaBASS Updates: CORAL

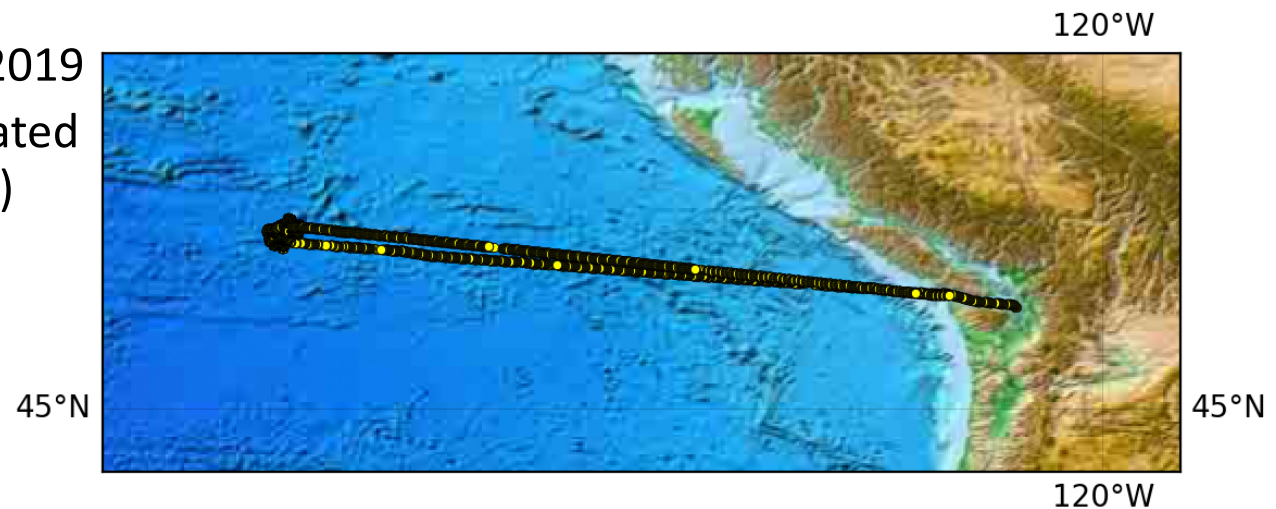


- In-water data from all six deployments: archived
- Paired into bundles for coincident PRISM flight lines, once archived at OB.DAAC (summer 2019)



# SeaBASS Updates: EXPORTS

- EXPORTSNP cruise
  - Aug/Sep 2018 in northeast Pacific Ocean
- Early data archived
  - Deadline late summer 2019
  - New data types anticipated (i.e. - fluxes & rates, etc)







# SeaBASS: Data Citation

- Every data collection gets...
  - DOI (Digital Object Identifier)  
E.g. - [10.5067/SeaBASS/CORAL/DATA001](https://doi.org/10.5067/SeaBASS/CORAL/DATA001)
  - Permanent, summary webpage
- Example citation:  
Hochberg, Eric (2017), CORAL, SeaWiFS Bio-optical Archive and Storage System (SeaBASS), NASA. Accessed: 21 January 2019.  
<http://dx.doi.org/10.5067/SeaBASS/CORAL/DATA001>

## CORAL

Experiment:	CORAL
Pis*:	Carpenter, Robert   Dierssen, Heidi   Hochberg, Eric   Lee, Zhongping
Start Time:	2014-07-21 14:00:00
End Time:	2017-05-13 18:16:22
North:	21.523
South:	-23.472
East:	151.995
West:	-157.838
Data Types:	above_water, cast, diver, mooring
Parameters:	ag ag_sd agp agp_sd ap ap_sd bbb bbb_bp bbo bp_sd bbo_sd benthic_type cgp cgp_sd oxygen oxygen_saturation par ph rrs rrs_sd sal veleast veinorth velup vt

\*Listed alphabetically

## DOI

[10.5067/SeaBASS/CORAL/DATA001](https://doi.org/10.5067/SeaBASS/CORAL/DATA001)

## Description

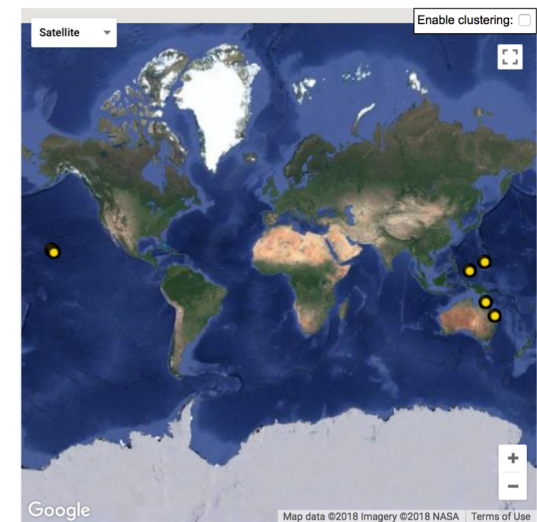
The CORAL experiment is a Earth Venture Suborbital-2 (EVS-2) mission designed to provide an extensive, uniform picture of coral reef composition through the use of the Portable Remote Imaging Spectrometer (PRISM) instrument aboard the Tempus Applied Solutions Gulfstream-IV (G-IV) aircraft combined with a variety of in situ data to identify reef composition and model primary production. The CORAL experiment covers the Mariana Islands, Palau, portions of the Great Barrier Reef, and the Main Hawaiian Islands.

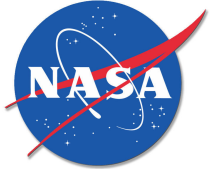
## EXTERNAL LINKS

[BIOS CORAL Page](#)

## URL

<https://coral.jpl.nasa.gov>





# SeaBASS: Nitty-Gritty Updates

- Standard field name updates
  - Chl by method
    - chl\_a: chl via HPLC pigment analysis
    - chl: chl via spectrophotometric or fluorometric analysis (i.e. – “extracted” chl)
    - chl\_lineheight: proxy chl via particulate absorption line height
    - chl\_stimf: chl via a calibrated in situ fluorometer
    - chl\_experiment: chl via experiment or experimental methods
  - Metadata header updates
    - /HPLC\_lab= (e.g. - NASA\_GSFC)
    - /HPLC\_lab\_technician= (e.g. - Crystal\_Thomas)
    - /instrument\_model= (e.g. - PRR-800)
    - /instrument\_manufacturer= (e.g. - Biospherical\_Instruments\_Inc)
    - /calibration\_date= (e.g. - 20190230)



# SeaBASS Updates: Validation

- All validation is current with OBPG satellite versions:

Sensor	Version
VIIRS-SNPP	R2018.0
MODIS-Aqua	R2018.0
MODIS-Terra	R2018.0
MERIS	R2012.1
SeaWiFS	R2018.0
OCTS	R2014.0
CZCS	R2014.0

# SeaBASS: Time Series Validation

## Regional Time Series Tool BETA

### Region

AERONET-OC USC

### Sensors

- MODIS-Aqua R2018.0
- MODIS-Terra R2018.0
- VIIRS-SNPP R2018.0
- SeaWiFS R2018.0

### Products

- a
- a<sub>dg</sub>
- AOT
- a<sub>ph</sub>
- b<sub>bp</sub>
- chl
- K<sub>d\_490</sub>
- PIC
- POC
- R<sub>rs</sub>

### Data Averaging

- Weekly
- Monthly
- Seasonal

### X-Axis (Year Range)

Start: 2012 Stop: 2018

### Y-Axis (Product Range)

- Default
- Dynamic

### Wavelengths (Satellite)

- Plot nearby wavebands together

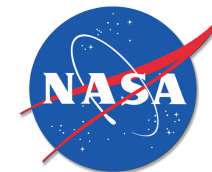
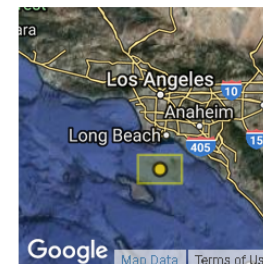
<https://seabass.gsfc.nasa.gov/timeseries/>

[View Full Results](#) [Download Results \(Unaveraged\)](#)

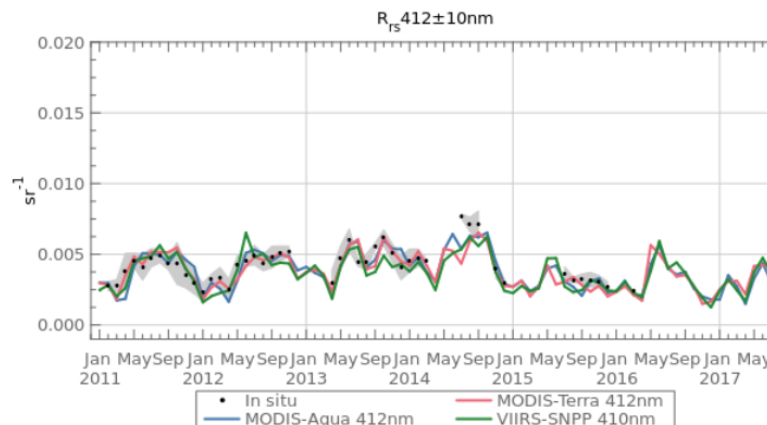
### Region Description

AERONET-OC L2 site off the southern California coast, USC (33.56371N, 118.11782W)

In situ data acquired from the [Aerosol Robotic Network - Ocean Color \(AERONET-OC\)](#) web site. See [Zibordi et al. \(2009\)](#) and SeaBASS's [AERONET-OC readme](#) for details. Additional data usage policies apply.



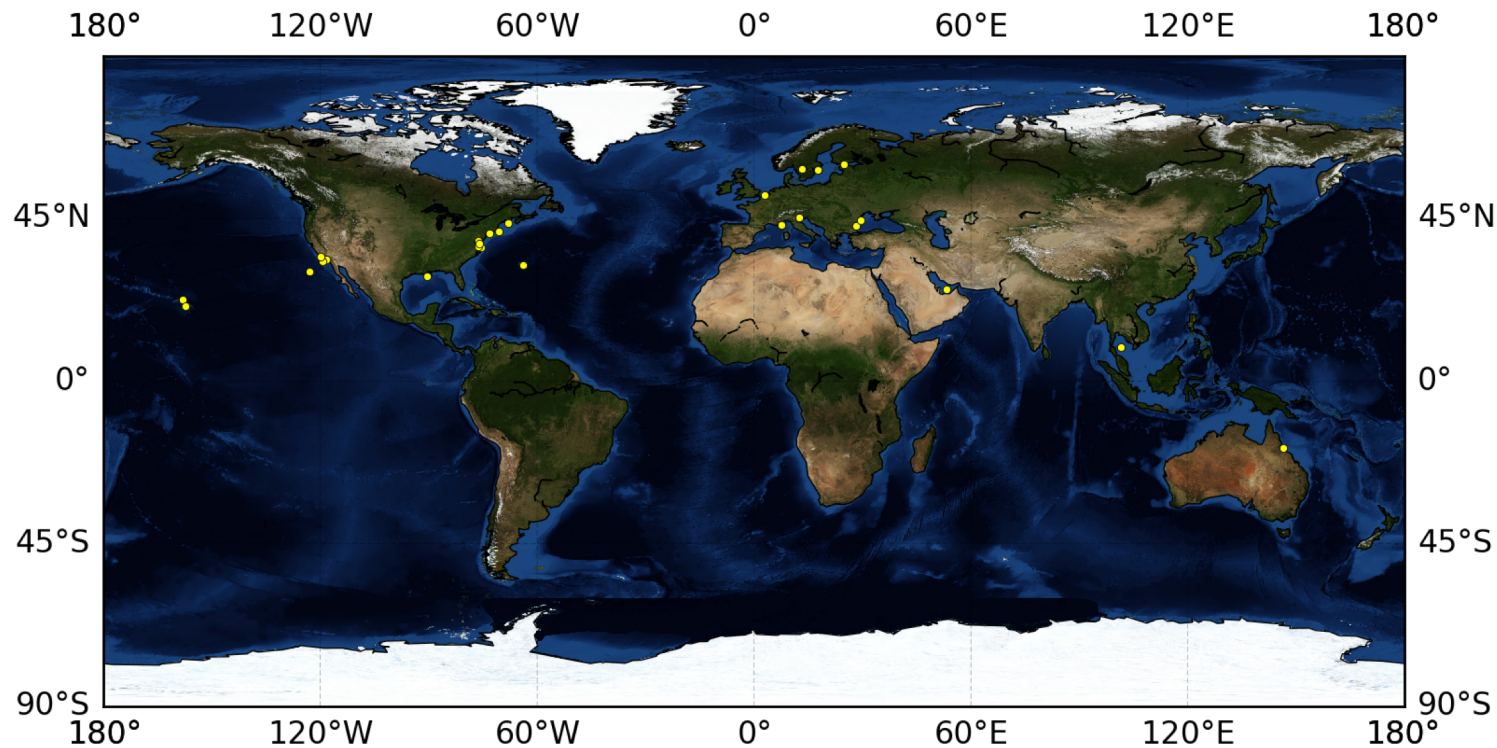
### Results Preview





# 25 multi-year sites

- Regions with recurrent monitoring programs or persistent observations



- BBOP/BATS (Bermuda)
- BOUSSOLE mooring
- CALCOFI Northeast
- CALCOFI Southwest
- Upper Chesapeake Bay
- Lower Chesapeake Bay
- Middle Chesapeake Bay
- Gulf of Maine
- Hawaiian Ocean T/S
- MOBY
- Plumes and Blooms
- AERONET-OC Cove
- AERONET-OC Galata
- AERONET-OC Gloria
- AERONET-OC GOT
- AERONET-OC Gustav
- AERONET-OC Helsinki
- AERONET-OC LISCO
- AERONET-OC Lucinda
- AERONET-OC MVCO
- AERONET-OC Palgrunden
- AERONET-OC USC
- AERONET-OC Venice
- AERONET-OC WAVECIS
- AERONET-OC Zeebrugge



# SeaBASS Updates: Software

([https://seabass.gsfc.nasa.gov/wiki/seabass\\_tools](https://seabass.gsfc.nasa.gov/wiki/seabass_tools))

- SeaBASS file readers/writers

**SeaBASS** SeaBASS Software Tools

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## SeaBASS Software Tools

### Read Tools

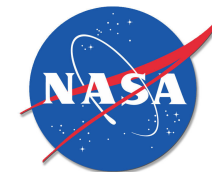
The following tools provide read-functionality to access data stored in SeaBASS formatted-files.

Tool Name	Programming Language
<a href="#">readsb</a>	MATLAB
<a href="#">readSB</a>	Python
<a href="#">SeaBASS-File</a>	Perl

### Write Tools

The following tools provide write-functionality to compose SeaBASS formatted-files.

Tool Name	Programming Language
<a href="#">SeaBASS-File</a>	Perl
<a href="#">readSB.writeSBfile</a>	Python



# SeaBASS Updates: Software

([https://seabass.gsfc.nasa.gov/wiki/seabass\\_tools](https://seabass.gsfc.nasa.gov/wiki/seabass_tools))

- SeaBASS file converters
  - **To** netCDF4 and ICARTT
  - **From** GSFC HPLC pigment analysis spreadsheets (to the SeaBASS format)

**SeaBASS** SeaBASS Software Tools

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## SeaBASS Software Tools

### Conversion Tools

The following tools provide conversion of SeaBASS formatted-files to other data formats (such as [netCDF](#)).

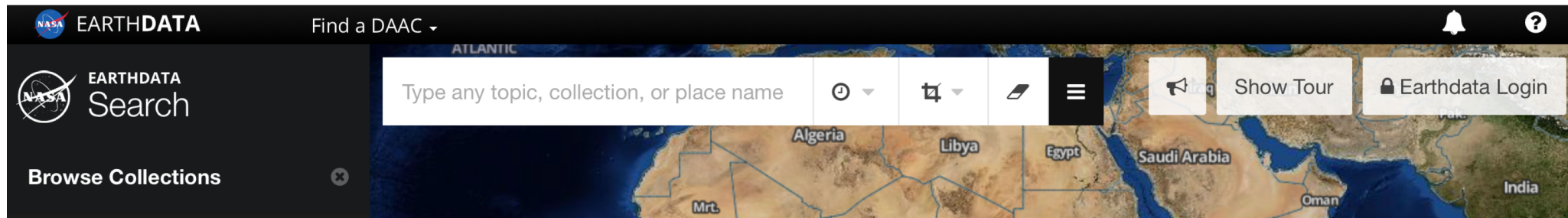
Tool Name	Converts SeaBASS files to...	Programming Language
<a href="#">sb2nc</a>	netCDF	Perl
<a href="#">sb2icartt</a>	ICARTT	Web-based tool
<a href="#">HPLC2sb</a>	Converts GSFC-run HPLC worksheets to SeaBASS file(s)	Web-based tool



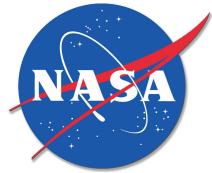
# SeaBASS Updates: Software

([https://seabass.gsfc.nasa.gov/wiki/seabass\\_tools](https://seabass.gsfc.nasa.gov/wiki/seabass_tools))

- Stand-alone Satellite Validation Match-up Tools
  - **fd\_matchup.py**: locate satellite granules via Earthdata Search







# SeaBASS Updates: Software

([https://seabass.gsfc.nasa.gov/wiki/seabass\\_tools](https://seabass.gsfc.nasa.gov/wiki/seabass_tools))

- Stand-alone Satellite Validation Match-up Tools
  - [fd\\_matchup.py](#): locate satellite granules via Earthdata Search
  - [mk\\_matchup.py](#): makes match-ups from OB.DAAC L2 granules, applies exclusion-criteria (Bailey and Werdell, 2006)

SeaBASS

SeaBASS Software Tools

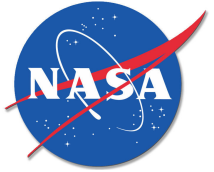
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## SeaBASS Software Tools

### Satellite Validation Match-up Tools

The following tools provide a work flow to create satellite validation match-ups to data contained in SeaBASS formatted-files.

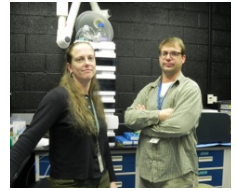
Script Name	Description	Language	Location
<a href="#">fd_matchup.py</a>	find relevant <a href="#">OB.DAAC</a> satellite granules from in situ points or a <a href="#">SeaBASS data file</a>	Python	part of <a href="#">SeaDAS</a> software package
<a href="#">mk_matchup.py</a>	generate coincident satellite validation match-ups for a <a href="#">SeaBASS data file</a>	Python	part of <a href="#">SeaDAS</a> software package



# Field Support Group Updates

# HPLC Updates

Technical manager/contact:  
Crystal Thomas  
[crystal.s.thomas@nasa.gov](mailto:crystal.s.thomas@nasa.gov)  
301-286-7299

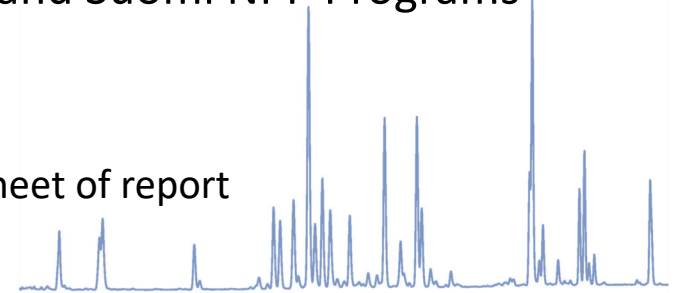


Analyze ~3,000 pigment samples/year for NASA Terra-Aqua and Suomi NPP Programs

- Planned activity/funding extends to 2021

## Updated documentation

- How to report size-fractionated sample data added to 'information' sheet of report
- [Sample analysis request form](#) and [metadata form \(required\)](#)
  - submit BEFORE samples are shipped



## On-going activities

- Public posting of HPLC QA/QC Plan (summer 2019)
- Updating methodology: uHPLC (fall 2019)
- Testing/implementing new analysis techniques: (1) LC-MS & (2) phycobiliproteins (summer/fall 2019)



**From Paula: “your ROSES proposals must budget & account for your HPLC samples” – current cost is \$100/sample**

- These funds are held at NASA HQ for you
- After proposal selection, email Crystal about your proposed HPLC samples

# IOCCG Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

- New series of protocol publications from IOCCG to encourage international adoption of a standard set measurement protocols for satellite validation
  - Building on the NASA Ocean Optics Protocols from 2002 & 2003, expanding to field measurements not previously addressed
  - Intended to be “living documents” (revised as necessary)  
Available on-line as pdf files
  - Prepared by subject matter experts
  - Peer-reviewed by the scientific community
  - Efforts largely supported by NASA  
With GSFC staff coordinating
- Protocols will have DOIs and archived at IODE Ocean Best Practices
  - <https://www.oceanbestpractices.net/>



# Process in IOCCG *in situ* Measurement Protocols Development

## Assemble a Team of Subject Matter Experts

- Procure travel funds to hold workshop(s) to discuss and resolve challenges
- Establish a protocol document draft outline
- Identify lead/contributing authors

## Writing of the protocol document

- Hold public workshops/breakouts
- Encourage lead/contributing authors to present progress at conferences

## Post Protocol on IOCCG website for Comments (60+ days)

- Notify community through IOCCG, TOS, NASA e-mail lists, OCB, etc.
- Comments received by lead authors and/or editors

## Revision of Protocols Based on Public Comments

## Final Peer Review by Associate Editorial Board

- Verify that public comments were adequately addressed

## Final Technical Revisions & Copy Editing/Proofreading

## IOCCG obtains DOI and adds Front/Back cover pages

- “Final” version posted to IOCCG website

# Status of Protocol Activities

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

Volume 1: Inherent Optical Property Measurements and Protocols Absorption Coefficient (v1.0)

**Absorption (particles)  
COMPLETED!!!  
Nov. 2018**

November 2018

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

Volume 2: Beam Transmission and Attenuation Coefficients, Instruments, Characterization, Field Measurements and Data Analysis Protocols (v2.0)

**Beam-c  
available May 2019**

International Ocean Colour Coordinating Group (IOCCG) in collaboration with National Aeronautics and Space Administration (NASA)  
IOCCG, Dartmouth, Canada  
May 2019

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**AOPs  
@  
Associate Editorial  
Board  
coming June 2019**

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**Inline Flow-  
Through IOPs  
@  
Associate Editorial  
Board  
coming June 2019**

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**CDOM Absorption  
@  
Final writing  
Stage  
coming late 2019**

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**POC  
@  
Final Writing  
Stage  
coming late 2019**

See poster #13, J. Chaves

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**Phytoplankton  
Taxonomy WG on  
Data Reporting  
@  
Writing Stage  
coming 2020**

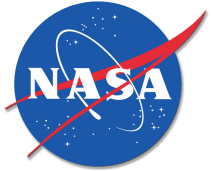
Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**Scattering  
Properties  
@  
Early Writing  
Stage  
coming ~2020**

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

**Primary  
Productivity  
@  
Early Writing  
Stage  
coming ~2021**

See poster #111, R. Vandermeulen



# Thank you!

From the entire SeaBASS team ([seabass@seabass.gsfc.nasa.gov](mailto:seabass@seabass.gsfc.nasa.gov)),  
i.e. – Joel Scott ([joel.scott@nasa.gov](mailto:joel.scott@nasa.gov)) & Chris Proctor ([christopher.proctor@nasa.gov](mailto:christopher.proctor@nasa.gov))