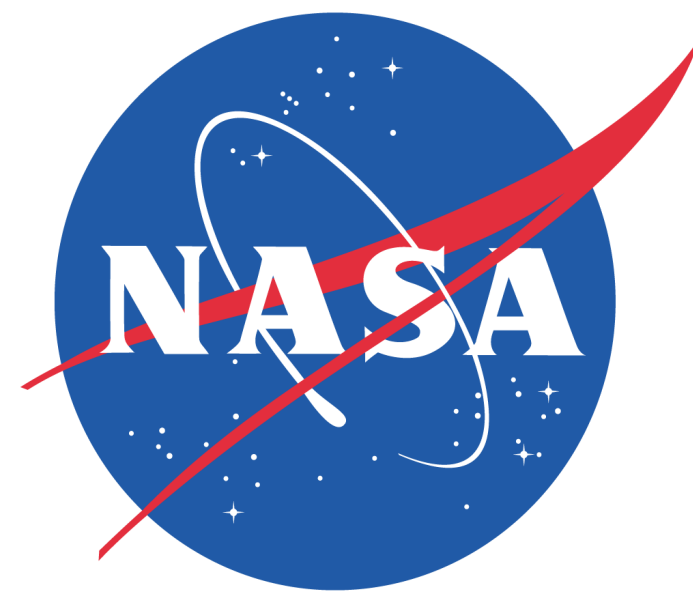


The SeaBASS Archive and Validation System: Data and tools for researchers and ocean color satellite match-ups



Chris Proctor^{1,2}, Joel Scott^{1,3}, Jason Lefler^{1,2}, Sean Bailey¹, P. Jeremy Werdell¹
christopher.proctor@nasa.gov, joel.scott@nasa.gov, jason.lefler@nasa.gov, jeremy.werdell@nasa.gov, sean.w.bailey@nasa.gov

¹NASA Goddard Space Flight Center
²Science Systems and Applications, Inc.
³SAIC

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

Introduction

The SeaWiFS Bio-optical Archive and Storage System (SeaBASS) is NASA's repository for *in situ* oceanographic datasets. In addition to SeaBASS serving datasets publicly through web search engines, its data and services support Ocean Color satellite missions with the ongoing ground-truth comparisons needed for the validation of global geophysical measurements.

Data Types

Data archived in SeaBASS are collected from ships, moorings, autonomous buoys, and other platforms. Measurements come from a variety of instruments, such as profilers, flow-through systems, hand-held sensors, and laboratory analyzers. Diverse data types include:

- apparent and inherent optical properties
- phytoplankton pigments
- carbon stocks
- hydrography
- other biogeochemical and atmospheric measurements

SeaBASS file format

ASCII text, arranged in two sections: a block of metadata information followed by the data matrix

A Digital Object Identifier (DOI) is registered for each archived experiment to assist with citations

Standardized keywords enable automated processing

/fields and /units identify every column in the data block and are also standardized, such as:

Field name	Units	Description
Chl_a	mg/m ³	HPLC Chlorophyll a (MV_Ch1_a plus allomers and epimers)
Date	yyyymmdd	Sample date
POC	mg/m ³	Particulate organic carbon
Rrs	1/sr	Remote sensing reflectance (Lw / Ed)
Wt	degreesC	Water temperature

FCHECK

Automated FCHECK file checking software scans data submissions

Errors and warning messages alert when required metadata are missing, keywords are misspelled, or files are otherwise malformed

Metadata Header Section

/begin_header
/keyword=value
/keyword=value,value,etc
! This is a general comment
/end_header

Data Section

Values separated by delimiters

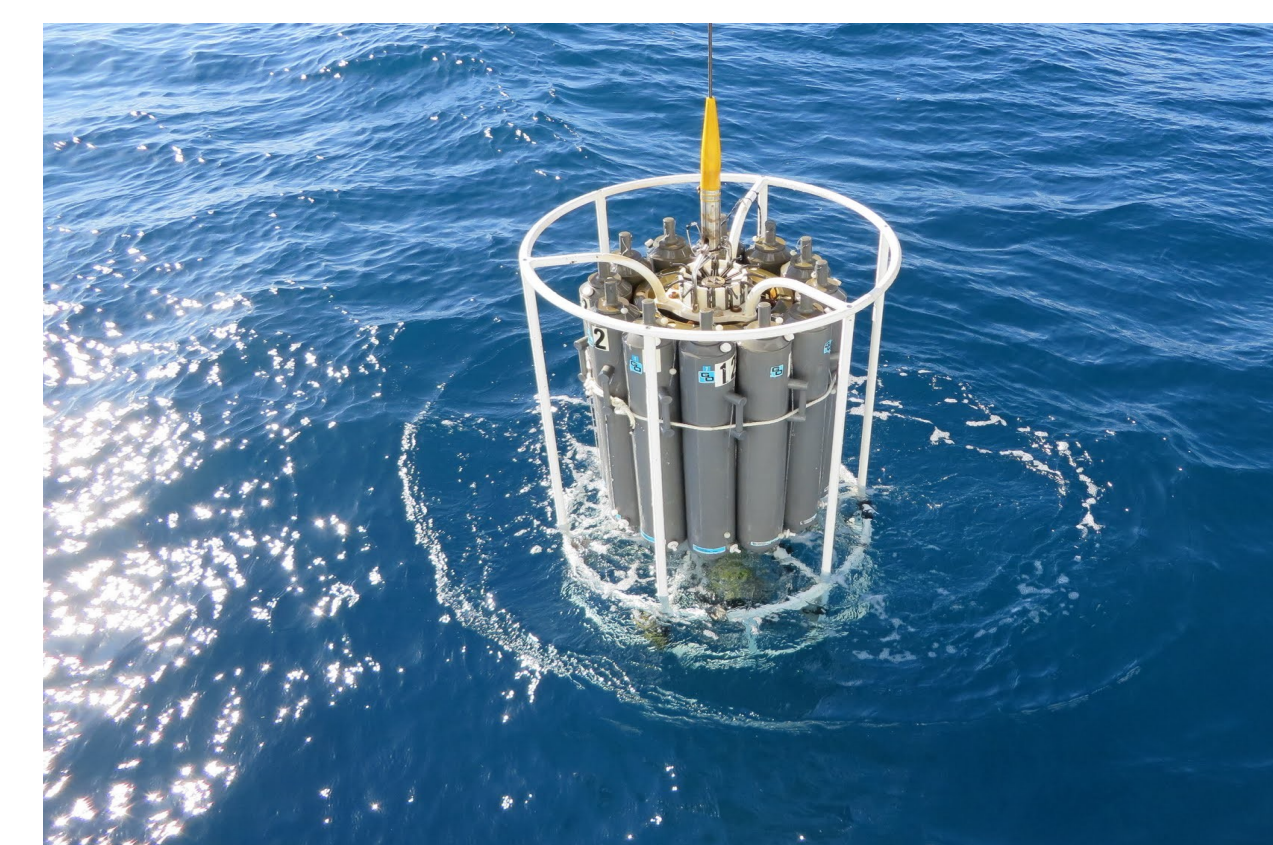
Search for Data

File Search: download bundles of data files. Craft search queries based on metadata date or location ranges, keywords, measurement types, and many other options

Validation Search: search for coincident match-ups between *in situ* values and satellite measurements.

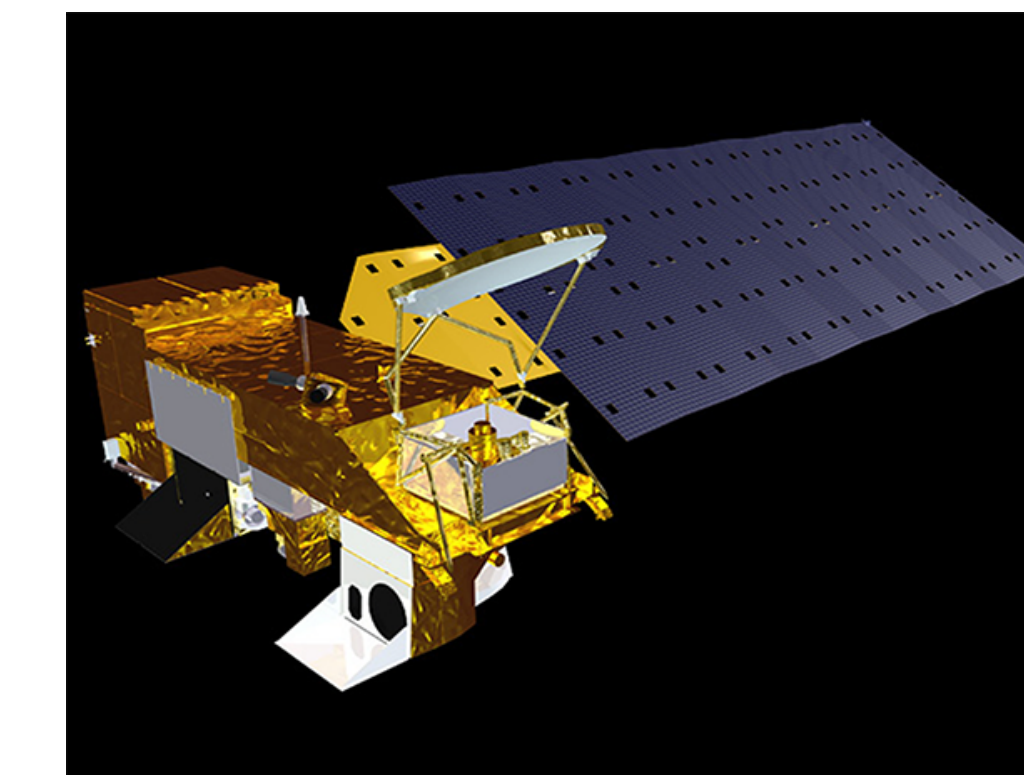
Customize search parameters, from metadata to “exclusion” quality criteria, and download the resulting data, plots and summary statistics

View results from different ocean color satellite sensors including SeaWiFS, MODIS-Aqua, MODIS-Terra, Suomi-NPP VIIRS, MERIS and others



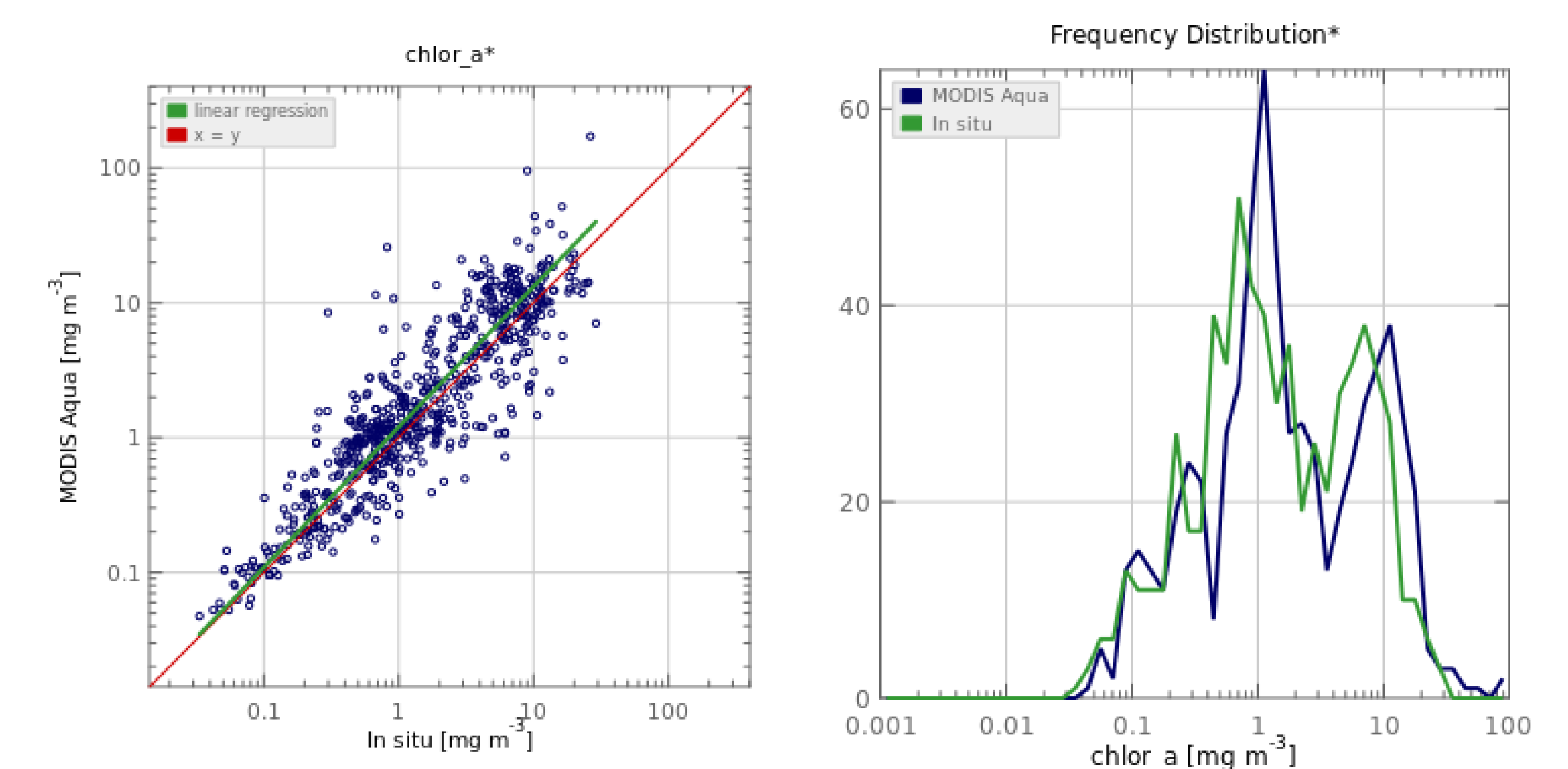
Example SeaBASS file excerpt:

```
/begin_header
/identifier_product_doi=10.5067/SeaBASS/EXAMPLE_A/DATA001
/investigators=John_Smith,Mary_Walker
/affiliations=State_University
/contact=jsmith@state.edu
/experiment=EXAMPLE_A
/cruise=cal0101
/station=93
/data_file_name=pigments_cal0101.dat
/documents=cal0101_readme.txt
/calibration_files=turner_cals_0012.txt
/data_type=pigment
/start_date=20010314
/end_date=20010314
/start_time=16:01:30[GMT]
/end_time=16:30:45[GMT]
/north_latitude=42.135[DEG]
/south_latitude=42.055[DEG]
/east_longitude=-72.375[DEG]
/west_longitude=-72.420[DEG]
/missing=-9999
/below_detection_limit=-8888
/delimiter=tab
/fields=time,depth,CHL,CHL_SD,PHAEO,Tpg
/units=hh:mm:ss,m,mg/m^3,mg/m^3,mg/m^3
/end_header
16:01:30 0 2.355 0.125 0.785 3.140
16:03:45 5 2.180 0.391 1.005 3.185
16:07:53 10 1.510 0.092 0.034 1.544
16:15:11 50 0.157 0.010 -9999 -9999
```



NASA provided images

Product Name	MODIS Aqua Range	In situ Range	#	Best Fit Slope*	Best Fit Intercept*	R ² *	Median Ratio	Abs % Difference	RMSE*
chlora	0.0293, 180.87	0.033, 29.004	657	1.067	0.055	0.816	1.154	40.846	0.3239



Validation of SeaBASS Chl holdings versus MODIS-A Chl R2014.0 using OCI algorithm (OC3E / CI blend), * = log-based statistics

As well as providing public distribution of datasets, SeaBASS data and services support:

- satellite data product validation
- satellite algorithm development
- satellite instrument calibration
- the NOMAD data set
- time series analysis
- support of international workshops

Software tools

In addition to web-based search tools provided on the SeaBASS website, other software is available for download including:

SeaBASS File Readers (e.g., for Python, MATLAB, Perl)

File Converters (e.g., convert SeaBASS files to netCDF or ICARTT format)

Standalone Satellite Match-up Tools for locating coincident ocean color satellite sensor files and then extracting information from those files (available via SeaDAS software)

Acknowledgements

Special thanks to the many investigators who have contributed data to SeaBASS. Deep gratitude is given to NASA for funding Earth Science research, especially ocean color satellites and validation efforts. Thanks to Javier Concha for the ship-based images and NASA for the satellite images.