# NOMAD v3.0: Supporting PACE validation activities


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2021 2030 United Nations Decade of Ocean Science for Sustainable Development

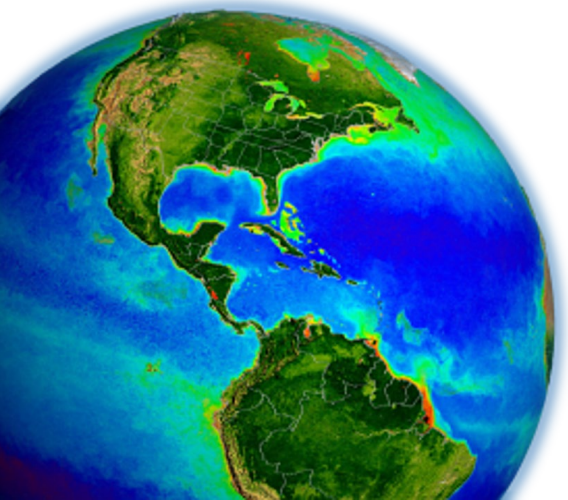
# NASA bio-Optical Marine Algorithm Dataset

NOMAD is a publicly available, global, high quality in situ bio-optical data set for use in ocean color algorithm development and satellite data product validation activities. Data products include coincident observations of water-leaving radiances, chlorophyll a concentrations as well as IOP data, along with relevant metadata, such as the date, time, and coordinates of data collection and binary processing flags.

https://seabass.gsfc.nasa.gov/wiki/NOMAD

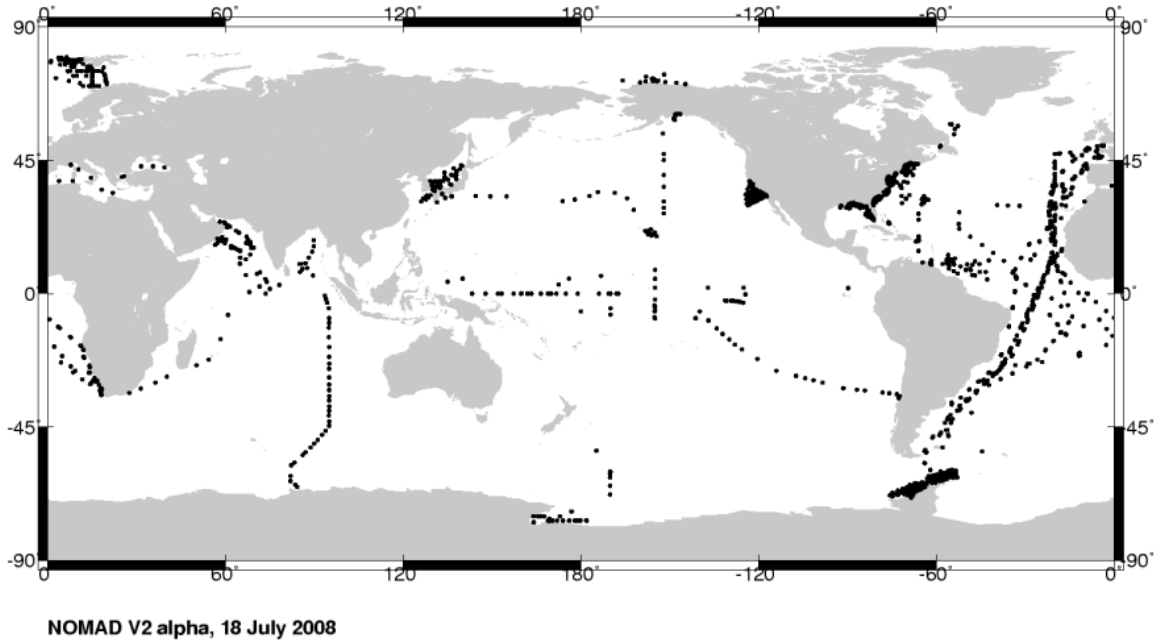
NOMAD is built upon data available on SeaBASS. Data selection requires specific selection criteria available on NOMAD website.

NOMAD comprises a database architecture for regular updates from data repository, data matching, QA/QC and data optical weighting.



# NOMAD v2.0

- Multispectral database with wavelength coverage 400-700 nm
- NOMAD architecture built from radiometry
- AOP's, IOP's and pigments products
- Station within 1 hour and 0.1º, with exceptions on special locations
- Last version update 2008




NOMAD was compiled within the NASA SIMBIOS program (Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies) supporting SeaWifs and MODIS activities

# PACE specific mission requirements

The Plankton, Aerosol, Cloud, and ocean Ecosystem (PACE) mission will make global ocean color measurements to provide extended data records on ocean ecology and global biogeochemistry (e.g., carbon cycle) along with polarimetry measurements to provide extended data records on clouds and aerosols.

OCI (Ocean Color Instrument) will provide Lw and continuous coverage from 340 nm to 890 nm at 2.5 nm resolution with a 5 nm bandwidth

NOMAD provides a validation dataset for validation and algorithm development activities

| **Required products with uncertainty requirements** |
|---|
| Water-leaving reflectances centered on (±2.5 nm) 350, 360, 385 412, 425, 443, 460, 475, 490, 510, 532, 555, and 583 (15 nm bandwidth) |
| Total aerosol optical depth ay 380, 440, 500 and 675 nm |
| **Ocean Color Data Products to be Derived from Water-leaving Reflectances** |
| Concentration of chlorophyll-a |
| Spectral diffuse attenuation coefficients |
| Spectral absorption coefficients (phytoplankton, CDOM+NAP |
| Spectral backscattering coefficients |
| Fluorescence line height |

PACE Science Data Product Validation Plan available at https://pace.oceansciences.org/docs

# SeaBASS data flow: Validation & NOMAD

## SB Analysts

*QA/QC data*

- Assess documentation, calibrations, and methods for completeness and compliance with community protocols
- Visualize the data and/or run software designed to QC the measurements. Iterate with data providers as needed
- Create report. Request any corrections or clarification from submitters (if so, SeaBASS data managers follow-up)
- Datasets are flagged internally and ready for further use in validation** and/or flags for the web File Search

## PACE Validation Leads

*Post-process for validation and algorithm development*

- Calculate validation relevant products.
- Use reports from SB Analysts to cull and flag SeaBASS data
- Format validation datasets and return them such that they can be loaded into the SeaBASS validation database and system. ENV files
- Provide feedback and guidance on QA/QC <leading to and from NOMAD and Analysts>

## NOMAD Lead

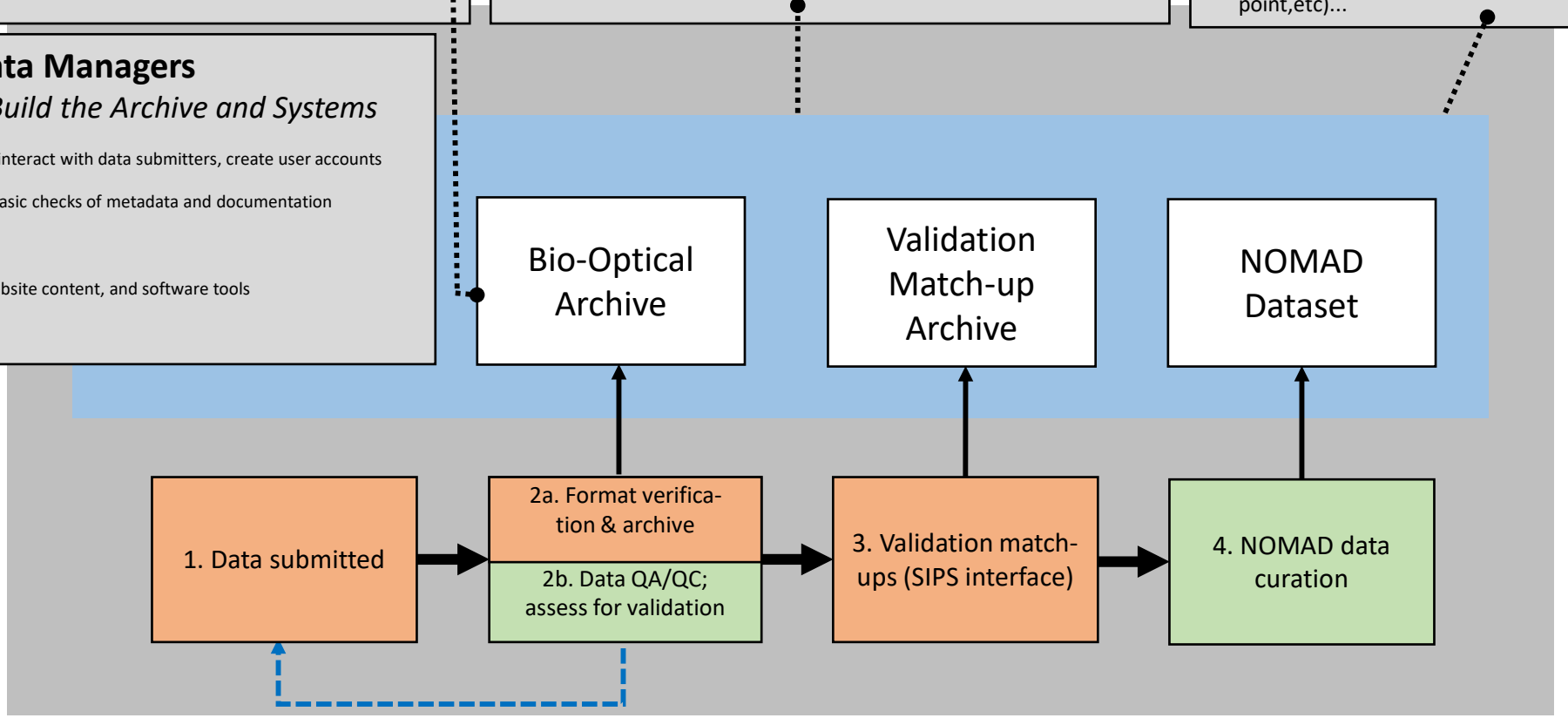
*Catalog data into stations for NOMAD*

- Build and design structured datasets based upon data that were processed for validation
- Perform additional QC as part of cataloging data into stations
- Perform closure analyses
- (Oversight of QA/QC activities of data leading to this point,etc)...

## SB Data Managers

*Drive Submissions, Build the Archive and Systems*

- Shepherd incoming submissions, interact with data submitters, create user accounts
- Check data formatting, perform basic checks of metadata and documentation
- Load data into archive
- Build and maintain databases, website content, and software tools



SeaBASS

# Data submission special requirements

https://seabass.gsfc.nasa.gov/wiki/data_submission_special_requirements

Or find the link in the main menu, under “Contribute Data” -> “Documentation Guidelines”

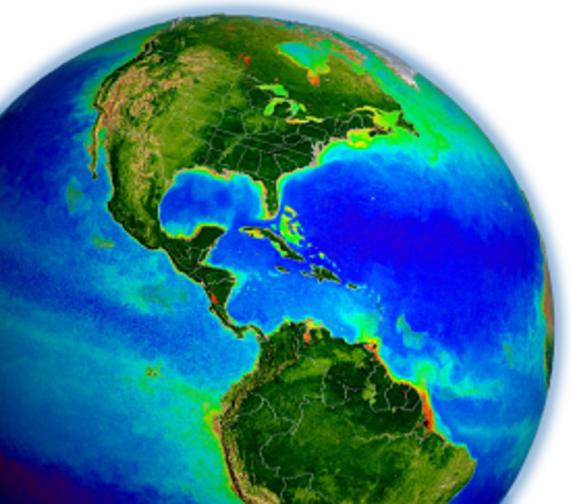
For commonly submitted measurements:

1) **Required Extra Documents** – new checklists
2) **Special Notes** – reminders & tips
3) **Example Submissions**


Goals:

- improve SeaBASS data quality & consistency
- make quality easier to assess
- clarify reporting requirements to reduce unnecessary back and forth during data submission process

# QA/QC: JIRA



[OBDAACPM-2065] Siegel PnB

bugs.earthdata.nasa.gov/browse/OBDAACPM-2065?filter=20578&jql=project%20%3D%20OBDAACPM%20AND%20status%20in%20(...

EARTHDATA Find a DAAC

Jira Dashboards Projects Issues Capture Boards Service Desk BigPicture Create Search

OB.DAAC - OBPG Project Management / OBDAACPM-2064 incoming/nguillocheau/data_submission/PnB/ (ap, ag) / OBDAACPM-2065

1 of 18

Return to search

## Siegel PnB 317/318 ag/ap

Edit | Add comment | Assign | More | Blocked | Complete | Stop Progress | Export

**Details**

| | | | |
|---|---|---|---|
| Type: | Sub-task | Status: | IN PROGRESS |
| Priority: | Minor | Resolution: | Unresolved |
| Affects Version/s: | None | Fix Version/s: | None |
| Component/s: | SeaBASS | | |
| Labels: | PACE_IOP, Stage2QC, sb_checklist_included, sb_no_replicates, sb_val_candidate | | |
| User-Business Value: | 0 | | |

**Description**

Data are ready for QA/QC review.
Files available on or after: 2022.02.01

**Smart Checklist**

0 / 0

Add a checklist item

**Attachments**

**People**

Assignee: Lachlan McKinna
Assign to me
Reporter: Inia Soto Ramos
Cc:: Chris Proctor, Inia Soto Ramos
Votes: 0 Vote for this issue
Watchers: 3 Start watching this issue

**Dates**

Created: 01/Feb/22 4:09 PM
Updated: 24/May/22 11:29 AM

**Development**

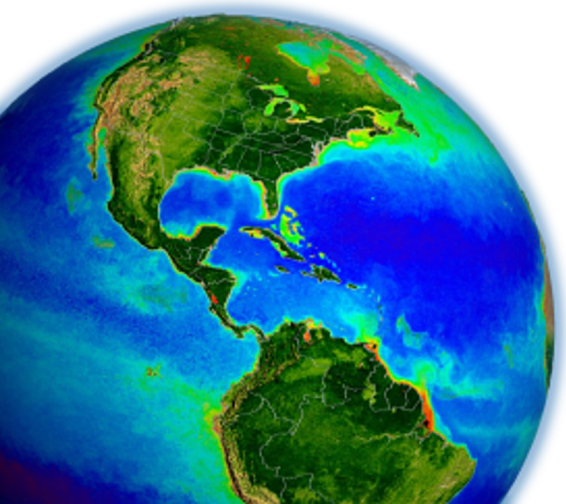
Create branch

**Agile**

View on Board

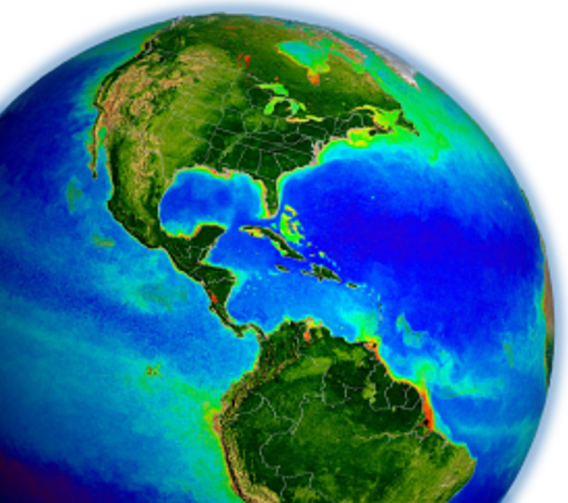
# NOMAD v3.0 specs

- Hyperspectral dataset. Wavelength coverage 400-700 nm with 5 nm interval. Includes specific UV bands at 350, 360, 385 and OCI bands for required science data products
- Uncertainty estimate with standard error product
- Relational database by product.
- Lw obtained from above water Rrs measurements or profile radiometry.
- NOMAD station requires optics (IOP's or radiometry)
- NOMAD station within 1 hour and 0.1º, with exceptions on special locations
- Global coverage. 2010-on.
- Advanced biogeochemical products



# ENV files

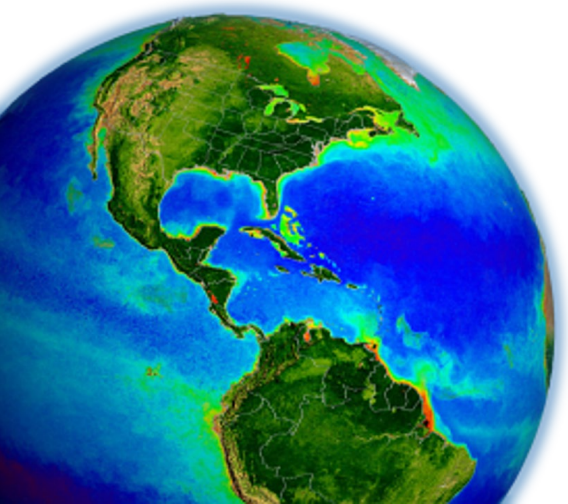
- **aop**: Lw, Es, Ed, Kd.
- **a_lab**: absorption from lab measurements (benchtop spectrophotometer). ap, ads, ag, (plus slopes).
- **a_cont**: absorption from ac-s /ac-9 systems. Includes ap, ag.
- **bb:** bbr, bb, bb_slope.
- **pigments**: includes extracted chl (extracted), chl_a,  HPLC.
- **BGC**: poc, pic, c_phy (phytoplankton carbon).
- **CTD:** data primary T, S.



# ENV flags

D: available data
I: instruments
P: data processing
E: environmental

| bit | abbreviation | usage | Description |
|---|---|---|---|
| 0 | AOP | D | Radiometry, Lw or Rrs |
| 1 | CHL | D | Fluorometrically derived C a |
| 2 | HPLC | D | HPLC-derived C a |
| 3 | AOT | D | Aerosol optical depths |
| 4 | A | D | Absorption coefficients |
| 5 | BB | D | Backscattering coefficients |
| 6 | KD | D | Diffuse downwelling attenuation coefficient |
| 7 | CONT | I | Continuous measurement |
| 8 | DISC | I | Discreet measurement |
| 9 | VERT | I | Vertical measurement |
| 10 | HOR | I | Horizontal measurement |
| 11 | OBPG_PROC | P | OBPG software: VSB, HypinSpace |
| 12 | VAL | E | Validation conditions |
| 13 | OVER | E | Diffuse sky conditions |
| 14 | BLOOM | E | Bloom conditions |
| 15 | COAST | E | Optically complex/coastal |
| 16 | SAT_PASS | D | Satellite overpass |



$19141 = ( 2^{0}$ (AOP) + $2^{2}$ (HPLC) + $2^{6}$ (KD) + $2^{7}$ (CONT) + $2^{9}$ (VERT) + $2^{11}$(OBPG_PROC) + $2^{14}$(BLOOM))

# ENV files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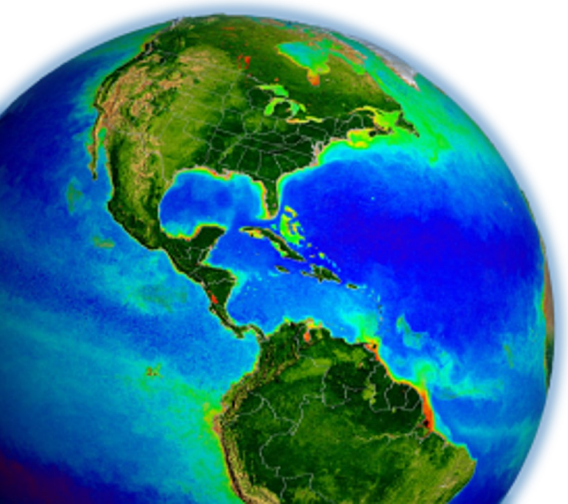
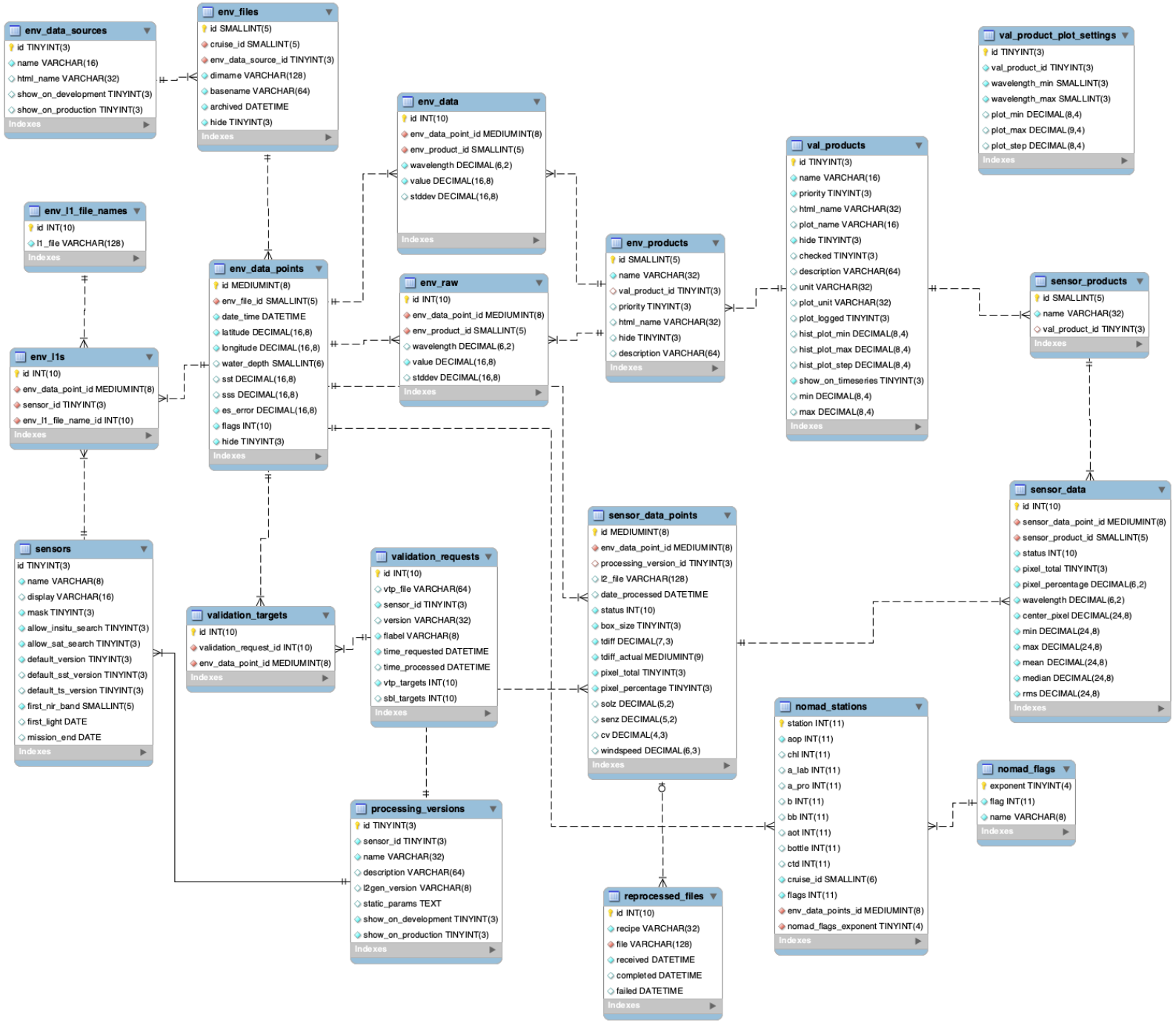
# SEABASS (MOLA) Database





# IN WATER AOP PROCESSING: VISUAL SEBASS V3.0

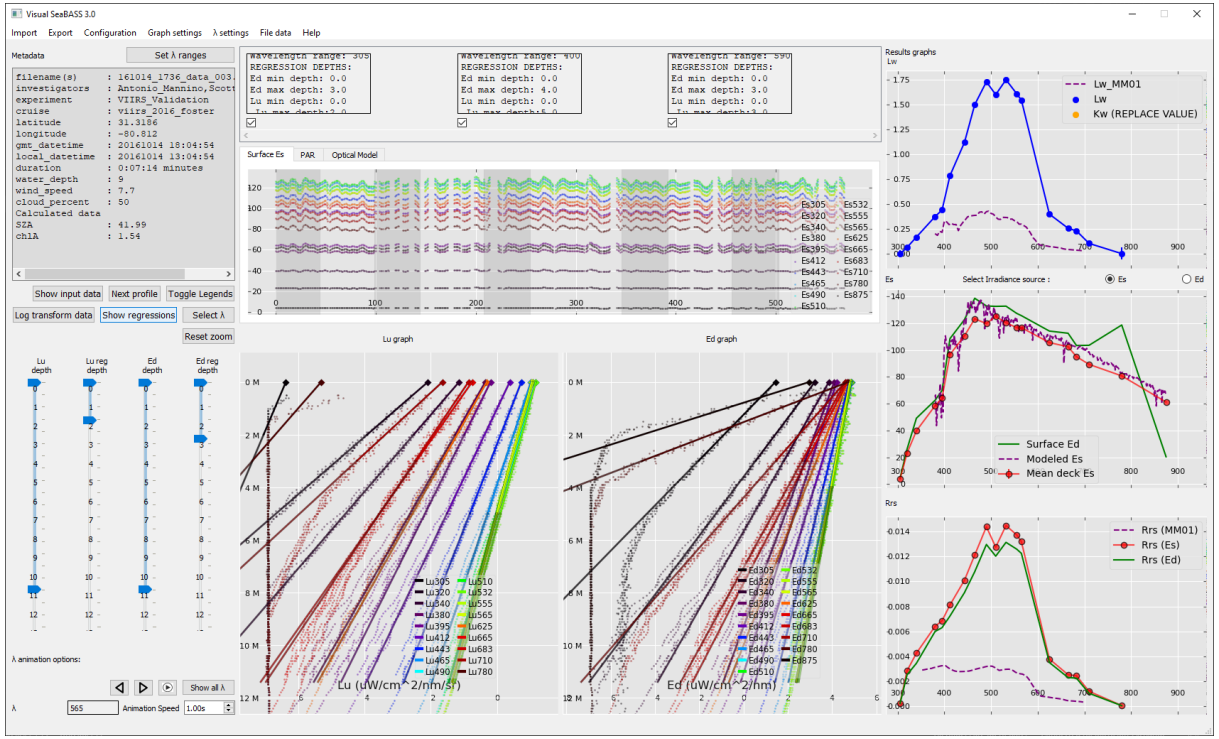
Visual SeaBass has been used historically to generate validation data from in-situ radiometry
Currently is being updated following new AOP processing community requirements as well as standard error calculations on generated products

1. Data processing  for single cast acquisition
    - Radiometric data with fixed sampling frequency (C-OPS)
        - Processing by time-stamp reference time-stamp
        - Processing by sample number
    - Radiometric data with variable sampling frequency (Hyperpro, Micropro )

2. Data processing for multicast acquisition
3. Buoy mode acquisition

Added features:

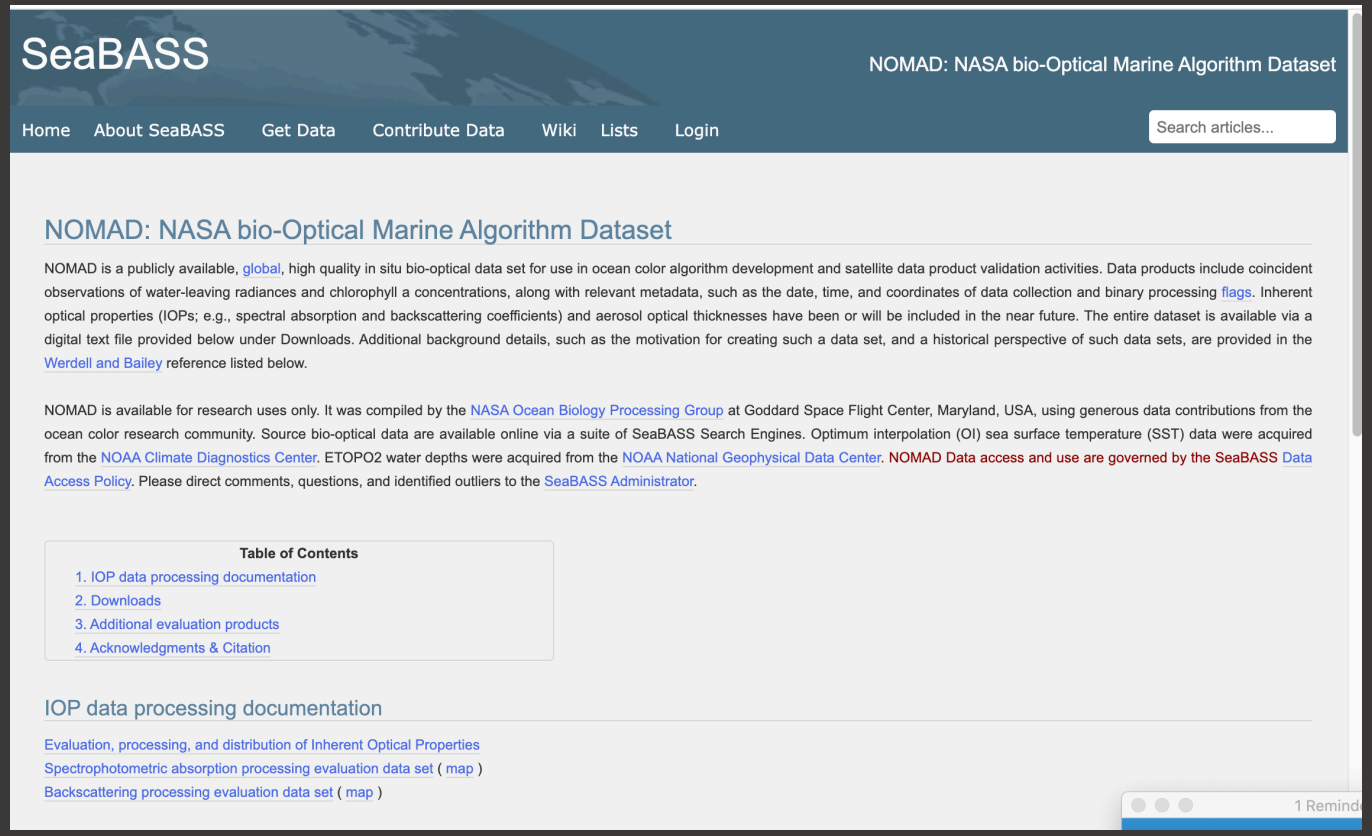
- Robust statistical processing for Lw, Kd with std err
- surface irradiance normalization
- user input for sea-air coefficient calculation




*consider future data stream from autonomous platforms

# Updates

- Hyperspectral coverage
- Uncertainty estimates
- Product file traceability
- Relational database: query for specific NOMAD conditions
- Revisited processing methodologies for Lw including error calculation
- Visual Seabass 3.0 software update
- Generating .ENV files




https://seabass.gsfc.nasa.gov/wiki/NOMAD