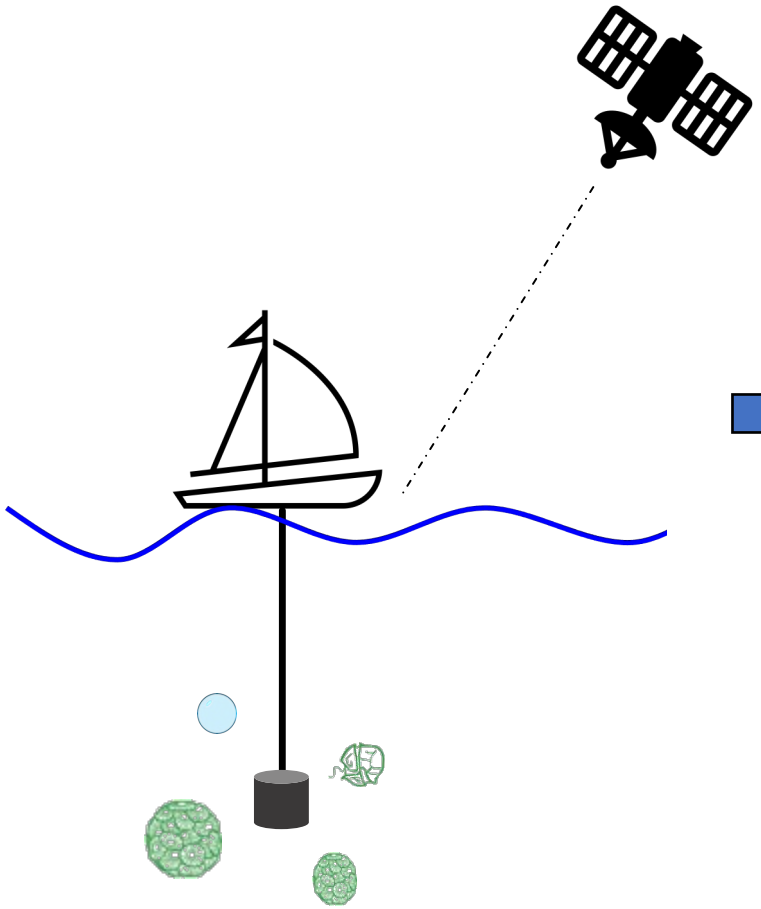
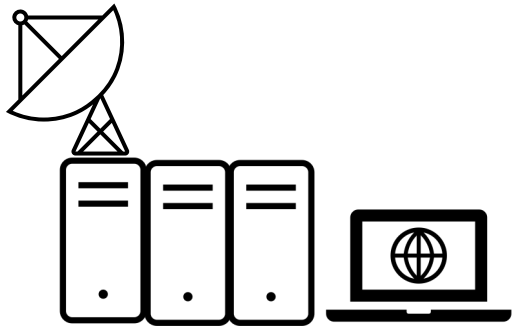
VALIDATING OCEAN COLOR PRODUCTS

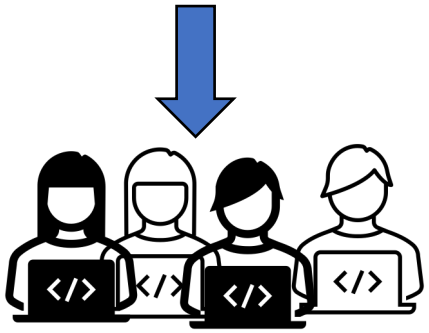
Thanks to Chris Proctor and SeaBASS team

What is SeaBASS?

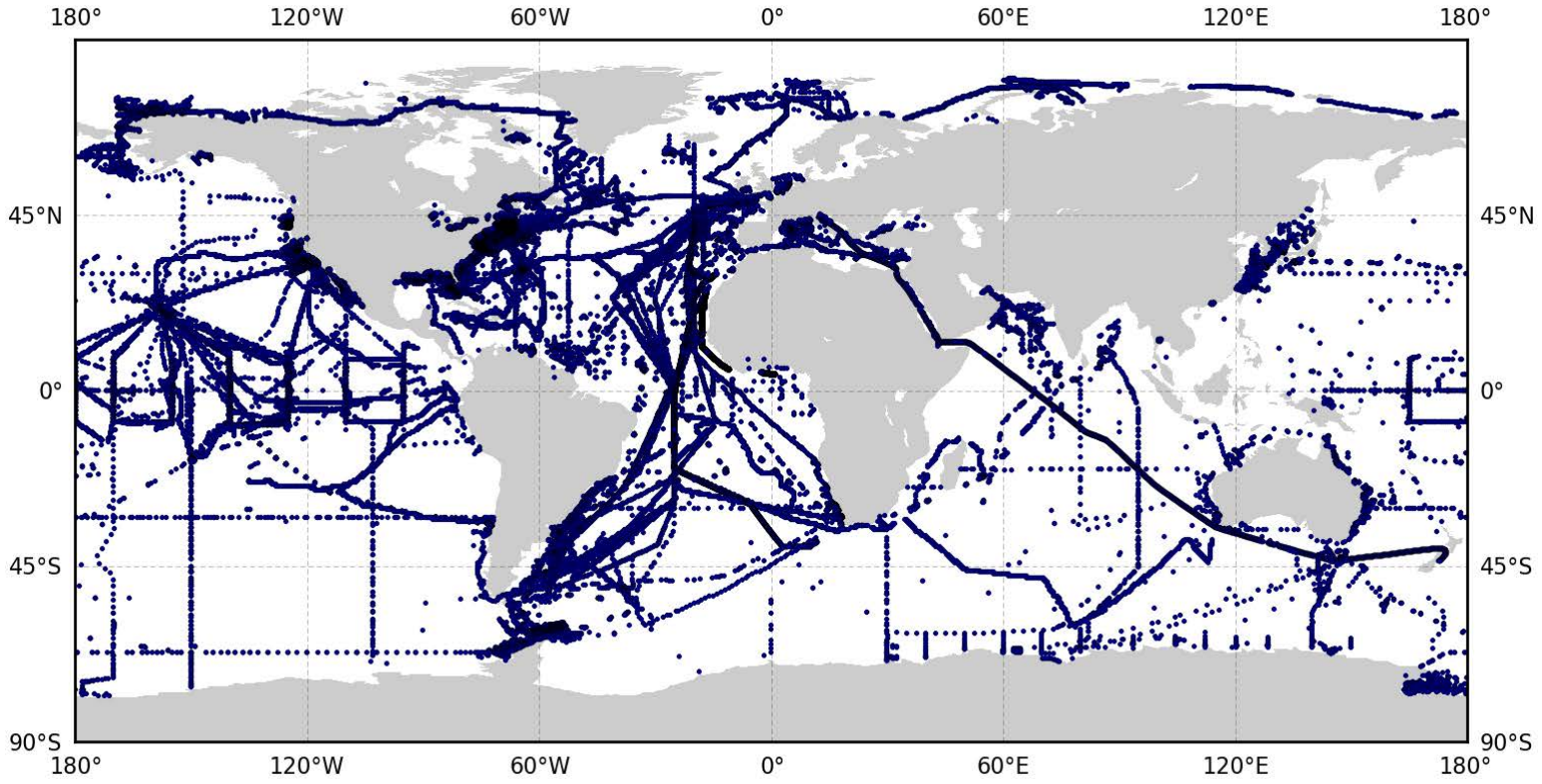


- Data Archive
- Data Format (.sb)
- Services & Tools



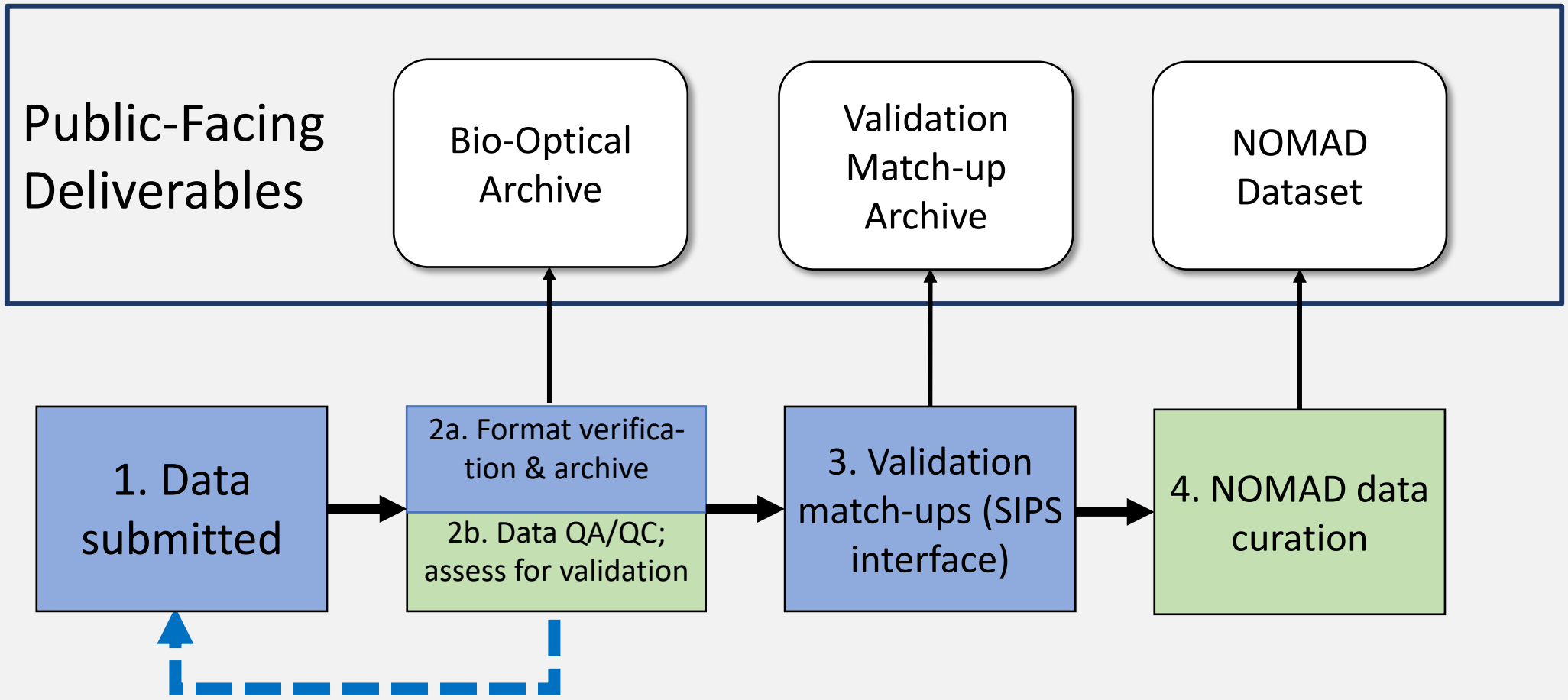


Data Archive

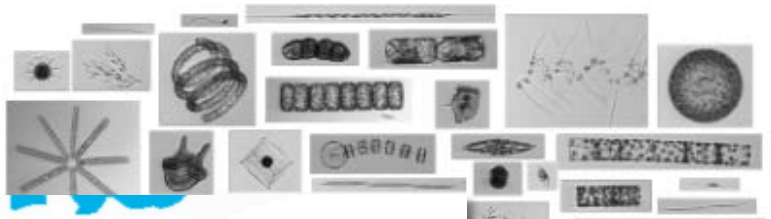


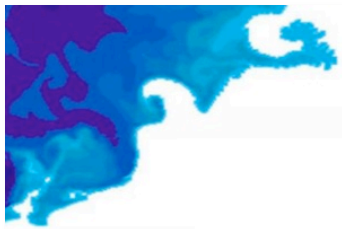
http://seabass.gsfc.nasa.gov

SeaBASS Core Functions



Standards and practices for reporting plankton and other particle observations from images
Technical Manual





IOCCG

IOCCG Protocol Series

Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

Volume 6: Particulate Organic Matter Sampling and Measurement Protocols: Consensus Towards Future

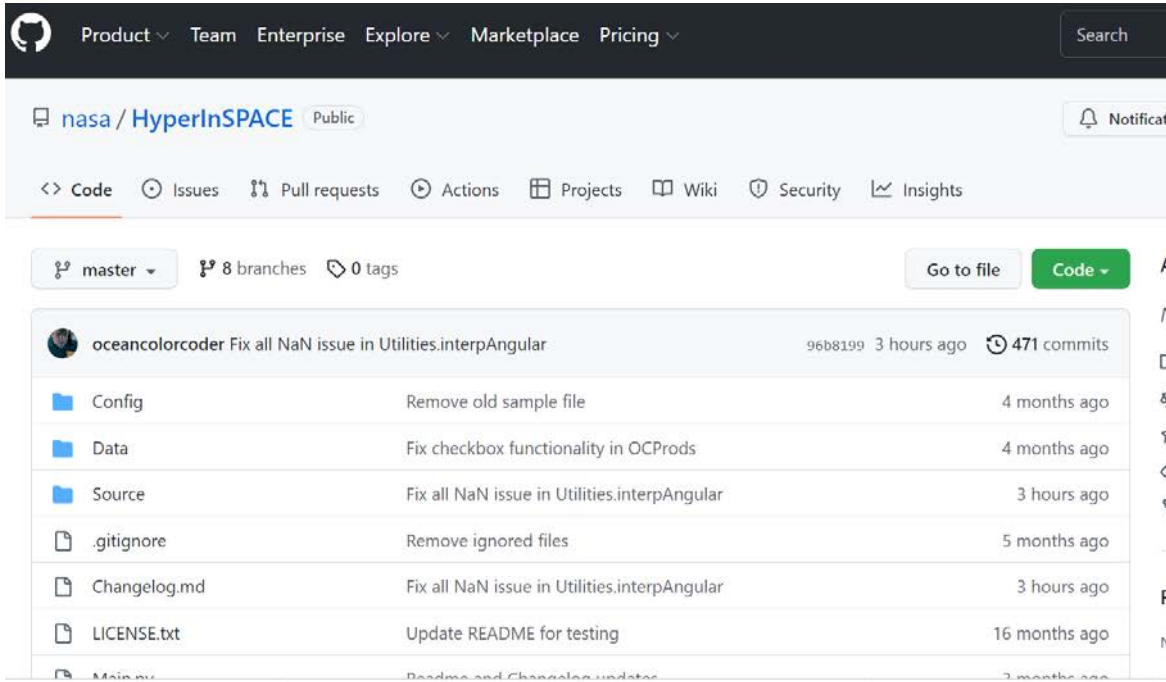
IOCCG

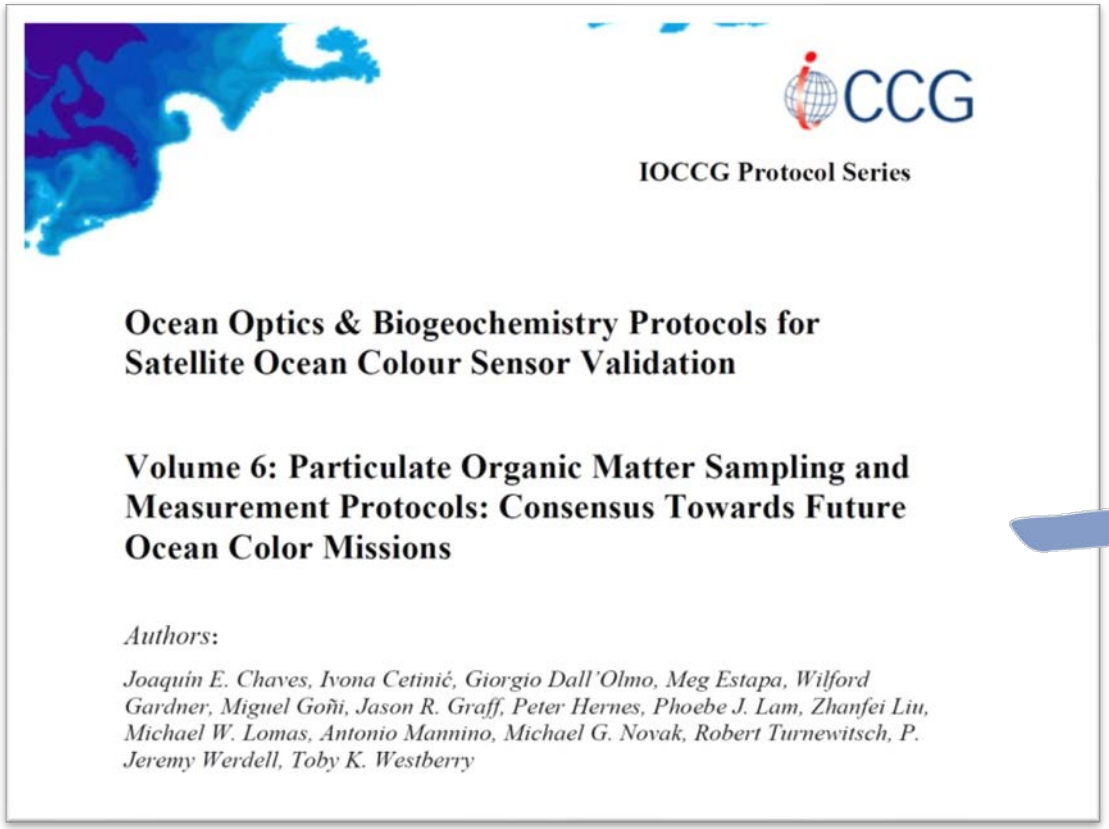
Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation

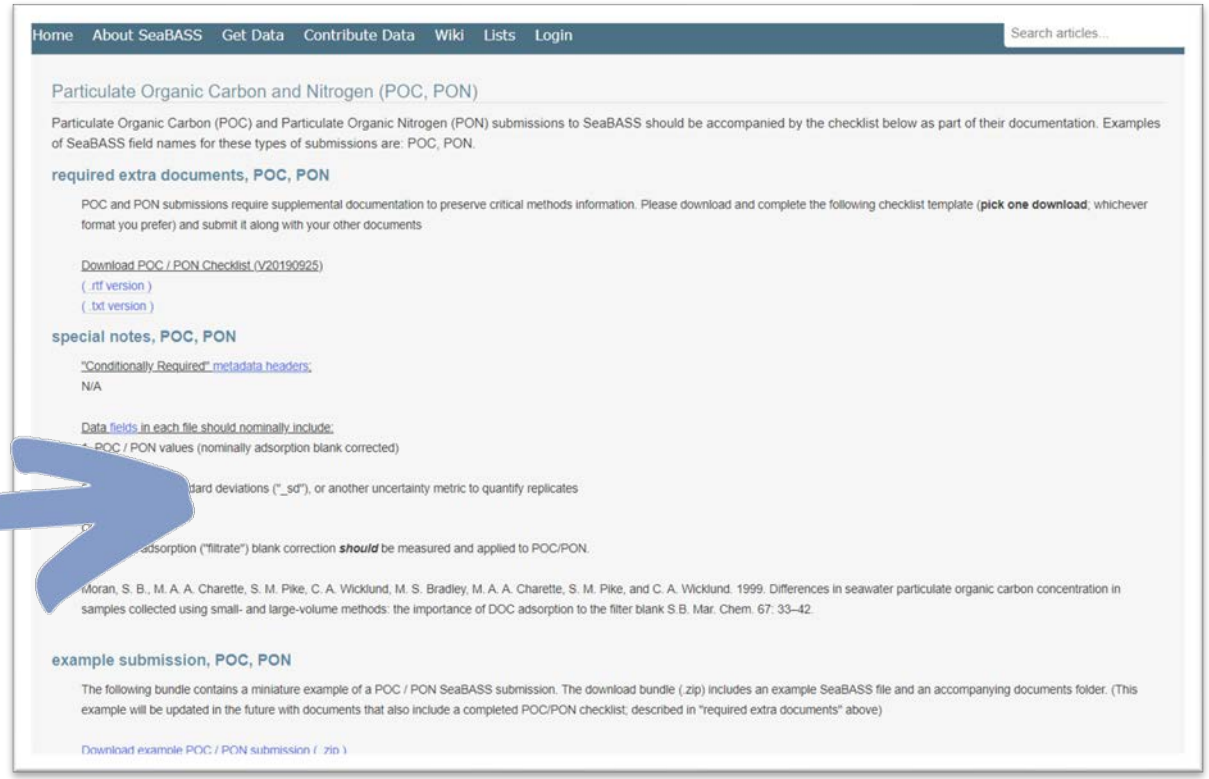
IOCCG Protocol Series Volume 7.0, 2021

Aquatic Primary Productivity Field Protocols for Satellite Validation and Model Synthesis (DRAFT)

Report of a NASA-sponsored workshop with contributions (alphabetical) from:




CCG
IOCCG Protocol Series
Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation
Volume 6: Particulate Organic Matter Sampling and Measurement Protocols: Consensus Towards Future Ocean Color Missions
Authors:
Joaquin E. Chaves, Ivona Cetinić, Giorgio Dall'Olmo, Meg Estapa, Wilford Gardner, Miguel Goñi, Jason R. Graff, Peter Hernes, Phoebe J. Lam, Zhanfei Liu, Michael W. Lomas, Antonio Mannino, Michael G. Novak, Robert Turnewitsch, P. Jeremy Werdell, Toby K. Westberry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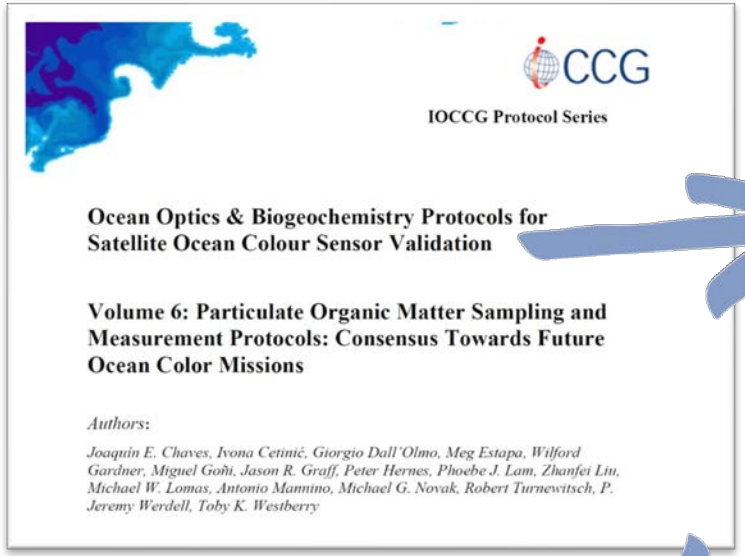
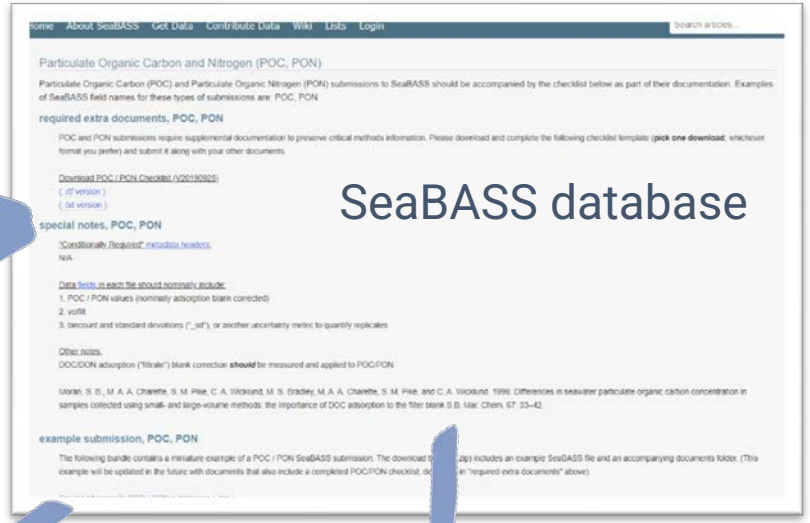
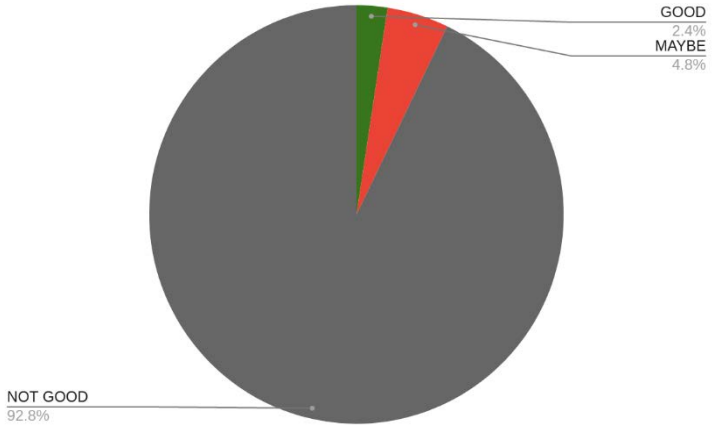
Particulate Organic Carbon and Nitrogen (POC, PON)
Particulate Organic Carbon (POC) and Particulate Organic Nitrogen (PON) submissions to SeaBASS should be accompanied by the checklist below as part of their documentation. Examples of SeaBASS field names for these types of submissions are: POC, PON.
required extra documents, POC, PON
POC and PON submissions require supplemental documentation to preserve critical methods information. Please download and complete the following checklist template (pick one download; whichever format you prefer) and submit it along with your other documents
Download POC / PON Checklist (V20190925)
(.rtf version)
(.txt version)
special notes, POC, PON
"Conditionally Required" metadata headers:
N/A
Data fields in each file should nominally include:
POC / PON values (nominally adsorption blank corrected)
dard deviations ("_sd"), or another uncertainty metric to quantify replicates
dsorption ("filtrate") blank correction should be measured and applied to POC/PON.
Moran, S. B., M. A. A. Charette, S. M. Pike, C. A. Wicklund, M. S. Bradley, M. A. A. Charette, S. M. Pike, and C. A. Wicklund. 1999. Differences in seawater particulate organic carbon concentration in samples collected using small- and large-volume methods: the importance of DOC adsorption to the filter blank S.B. Mar. Chem. 67: 33–42.
example submission, POC, PON
The following bundle contains a miniature example of a POC / PON SeaBASS submission. The download bundle (.zip) includes an example SeaBASS file and an accompanying documents folder. (This example will be updated in the future with documents that also include a completed POC/PON checklist; described in "required extra documents" above)
Download example POC / PON submission (.zip)



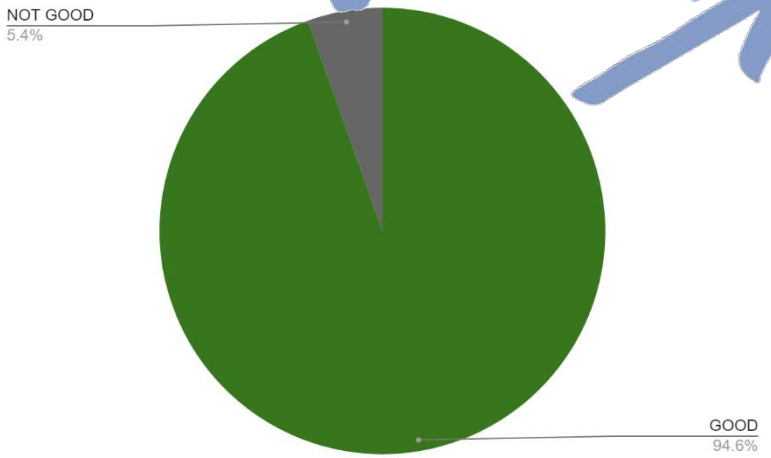


SeaBASS database

OLD DATA

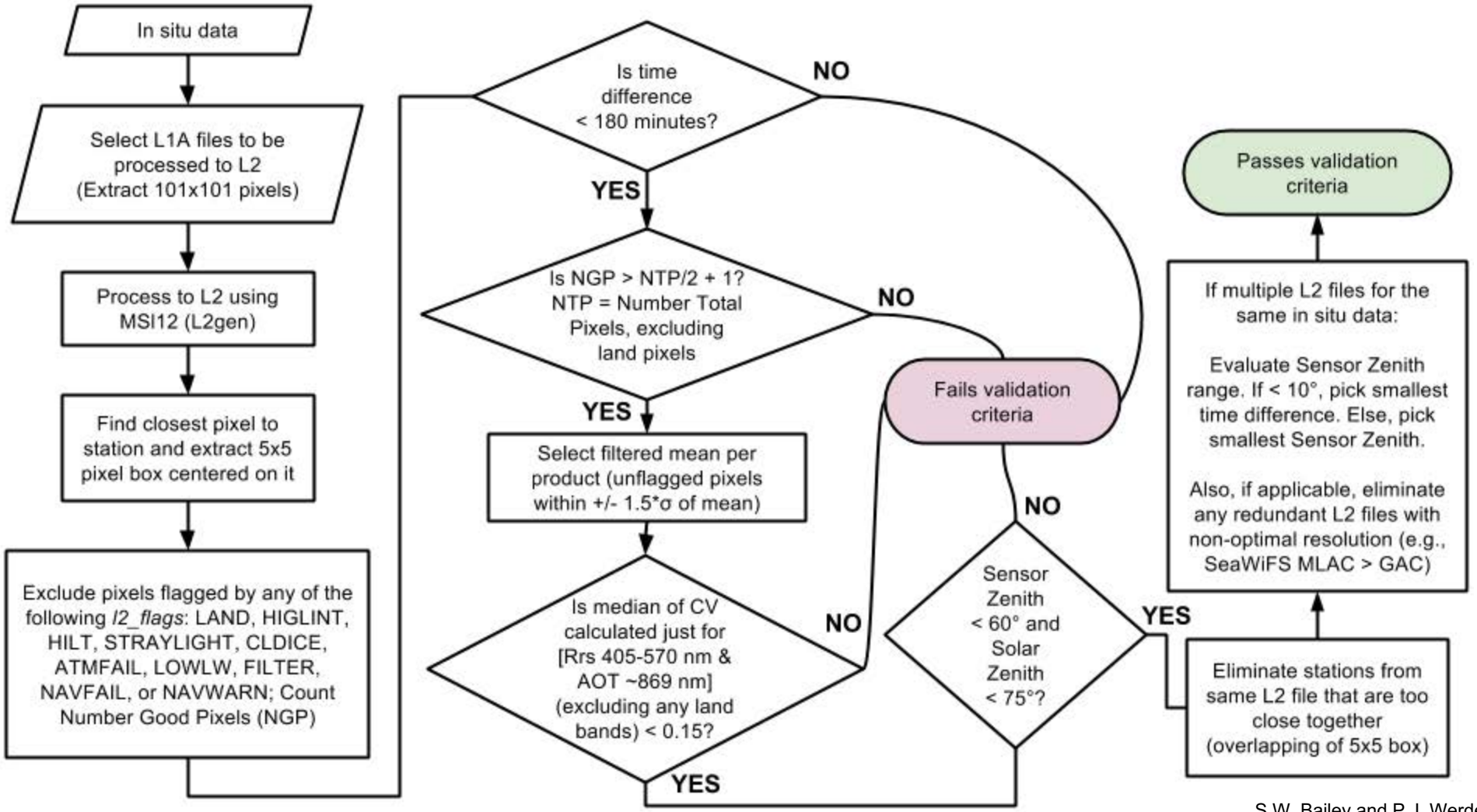


POST 2018 DATA



VALIDATION (NOMAD) (+UNCERTAINTIES)

Level-2 match-ups – extra notes
General processing flow and exclusion criteria



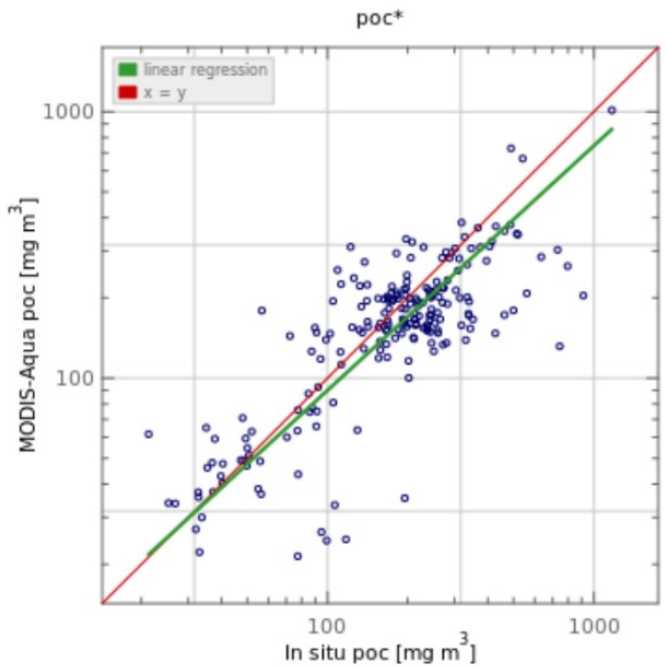
S.W. Bailey and P.J. Werdell, 2006.

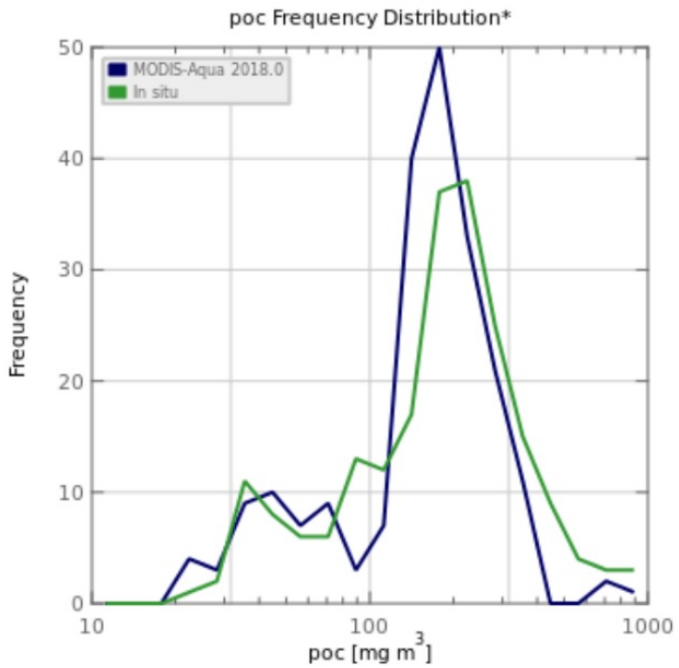
SeaBASS web-based Level-2 Validation Search (https://seabass.gsfc.nasa.gov/search#val)

Statistics | Data

Product Name	#	Mean Bias	Mean Absolute Error (MAE)	MODIS-Aqua Range	In situ Range
poc	210	0.86273*	1.42003*	21.44696 - 1013.09992	21.30000 - 1168.77698

* statistical calculations based on $\log_{10}$ (implies ignoring values equal to or less than zero)

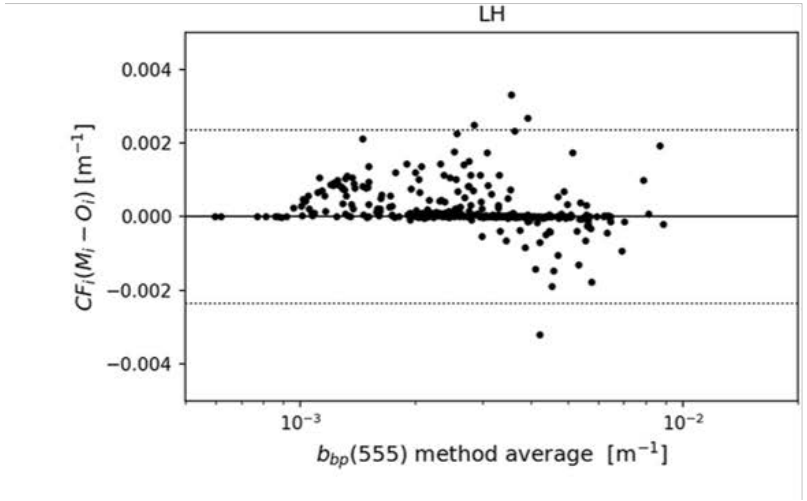


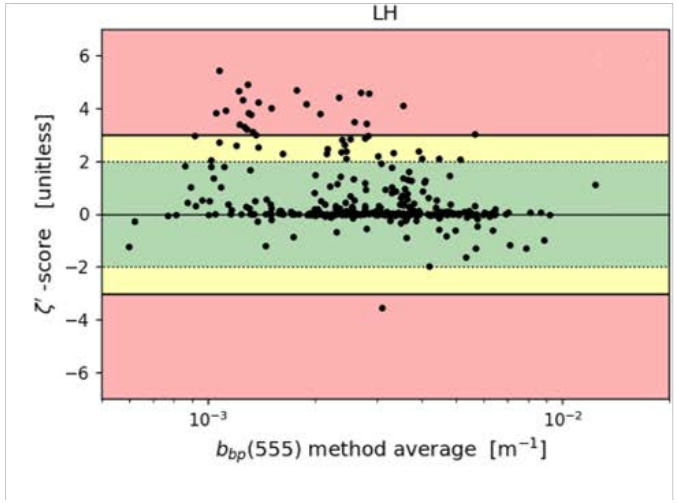


Seegers et al, 2018

Upgrade to validation (graphics and approach)!

Product name	n	bias	Bias'	MAE	MAE'	Mean zeta	Mean zeta'	Range OC	Range in situ
LH	326	1.21	1.12	1.33	1.16	0.888	0.561	???	???





- McKinna et al. 2021
- Similar metrics to what current SeaBASS is using with addition of uncertainties
- Uncertainties are present as a correction factor (~degree of overlap)
- Keep the x/y linear plots but with Bland–Altman-type scatter plots
- Zeta scores with color coding (indicating satisfactory (<|2|), questionable(|2-3|), and unsatisfactory (>|4|) zeta values)

References

- McKinna, L.I.W., Cetinic, I., and P.J. Werdell (2021) Development and Validation of an Empirical Ocean Color Algorithm with Uncertainties: A Case Study with the Particulate Backscattering Coefficient, *J Geophys Res: Oceans, 12*6, doi: 10.1029/2021JC017231
- McKinna, L.I.W., Cetinic, I., Chase, A.P. and P.J. Werdell (2019) Approach for Propagating Radiometric Data Uncertainties Through NASA Ocean Color Algorithms, Front. Earth Sci., 7:176, doi: 10.3389/feart.2019.00176
- Seegers, B.N., Stumpf, R.P., Schaffer B.A., Loftin, K.A., and P.J. Werdell (2018) Performance metrics for the assessment of satellite data products: An ocean color case study, *Opt. Express*, 26(6), 7404-7422, doi: 10.1364/OE.26.007404
- IOCCG protocols - https://ioccg.org/what-we-do/ioccg-publications/ocean-optics-protocols-satellite-ocean-colour-sensor-validation/
- HyperInSPACE github - https://github.com/nasa/HyperInSPACE
- SeaBASS validation - https://seabass.gsfc.nasa.gov/search#val

Designation of data maturity level

- Following the parameter specific validation procedure, data maturity level is assigned to each of the products following NASA's Data Maturity Levels designation.
- **Stage 1 Validation:** Product accuracy is estimated using a small number of independent measurements obtained from selected locations and time periods and ground-truth/field program efforts.
- **Stage 2 Validation**: Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.
- **Stage 3 Validation**: Product accuracy has been assessed. Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. Uncertainties are characterized in a statistically robust way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and periods. Results are published in the peer-reviewed literature.
- **Stage 4 Validation:** Validation results for stage 3 are systematically updated when new product versions are released and as the time-series expands.
- Stolen from: https://science.nasa.gov/earth-science/earth-science-data/data-maturity-levels