International Ocean Colour Science Meeting 2023 | Advancing Global Ocean Colour Observations

Poster Session 1 Lightning Talks

Leveraging mixture density networks to compensate for aerosol contribution over inland and nearshore coastal waters

Poster No. 1

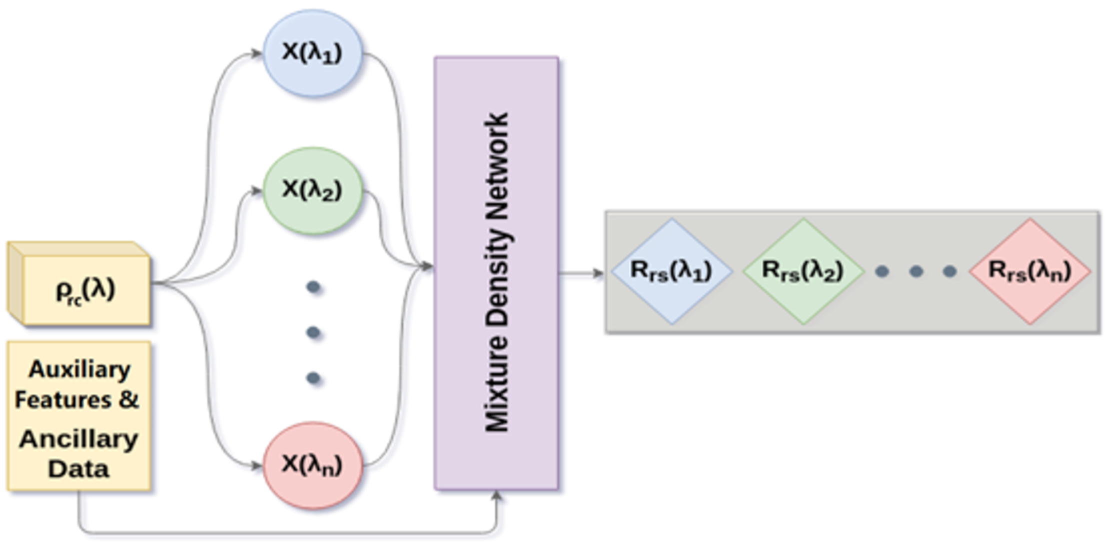
Akash Ashapure[1,2], Nima Pahlevan[1,2], William Wainwright[1,2], Brandon Smith[1,2], Ryan E. O'Shea[1,2], Arun Saranathan[1,2], Daniel Andrade Maciel[3], Peng-Wang Zhai[4]

[1] Science Systems and Applications Inc. (SSAI), Lanham, MD 20706, USA
[2] NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
[3] National Institute for Space Research, Sao Jose dos Campos, SP 12227-010, Brazil
[4] Physics Department, University of Maryland Baltimore County, Department of Physics, Baltimore, MD, 21250

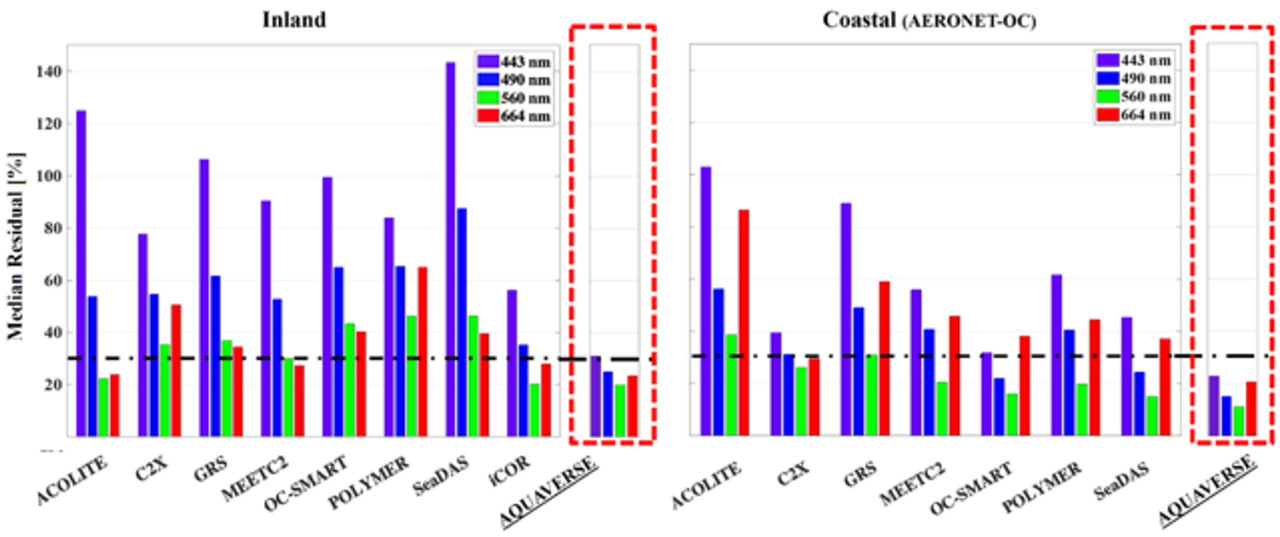
11/14/2023

International Ocean Colour Science Meeting 2023

Aquaverse processing pipeline

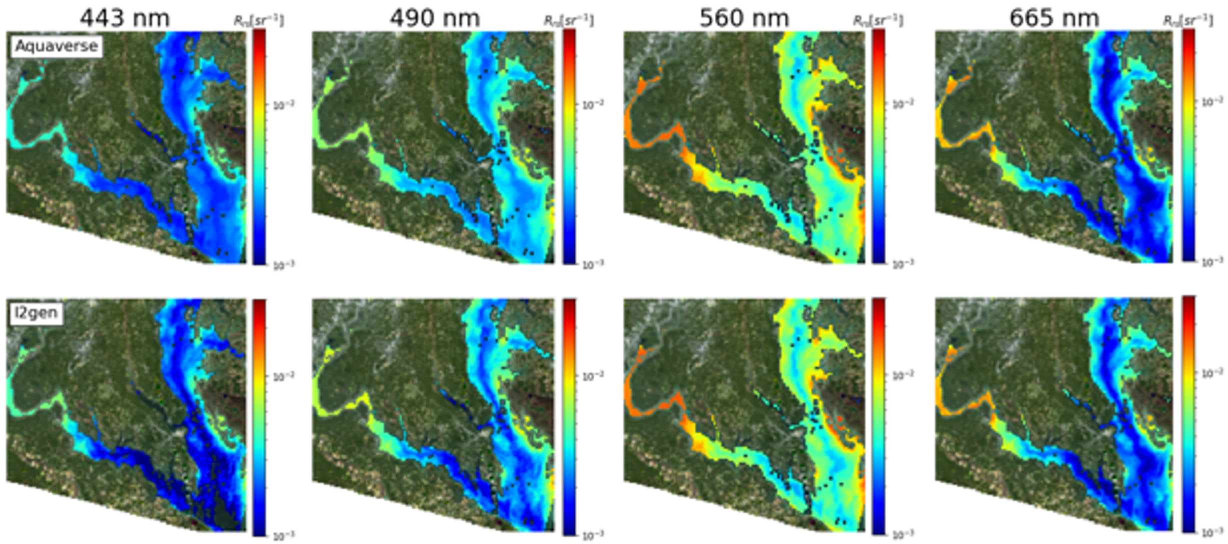


Performance comparison

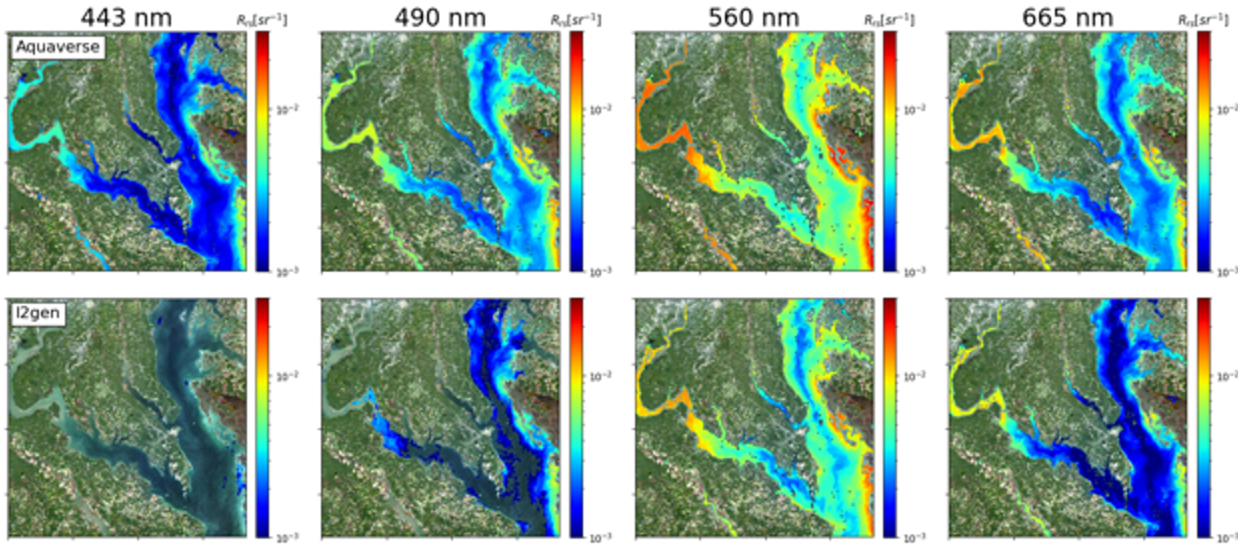


Near simultaneous Rrs retrieval from Landsat-8 and Sentinel-2 images over Chesapeake Bay (10/17/2020)

Landsat-8



Sentinel-2



International Ocean Colour Science Meeting 2023

Poster no. 3

PACE Ocean Color Instrument (OCI) Hyperspectral Surface and Underwater UV Irradiance Algorithm

M.Bandel, N.Krotkov, A.Vasilkov, D.Haffner, Z.Fasnacht, O.Torres, C.Ahn, W.Qin, J.Joiner

Vasilkov A. P., Krotkov, N. A., Haffner, D., Fasnacht, Z., Joiner, J., Estimates of hyperspectral surface and underwater UV planar and scalar irradiances from OMI measurements and radiative transfer calculations, Remote Sensing, volume 14, issue 9:2278, https://doi.org/10.3390/rs14092278

NASA

SSAI

• Adapted Aura/OMI surface UV $E_s(\lambda)$ algorithm to PACE/OCI.

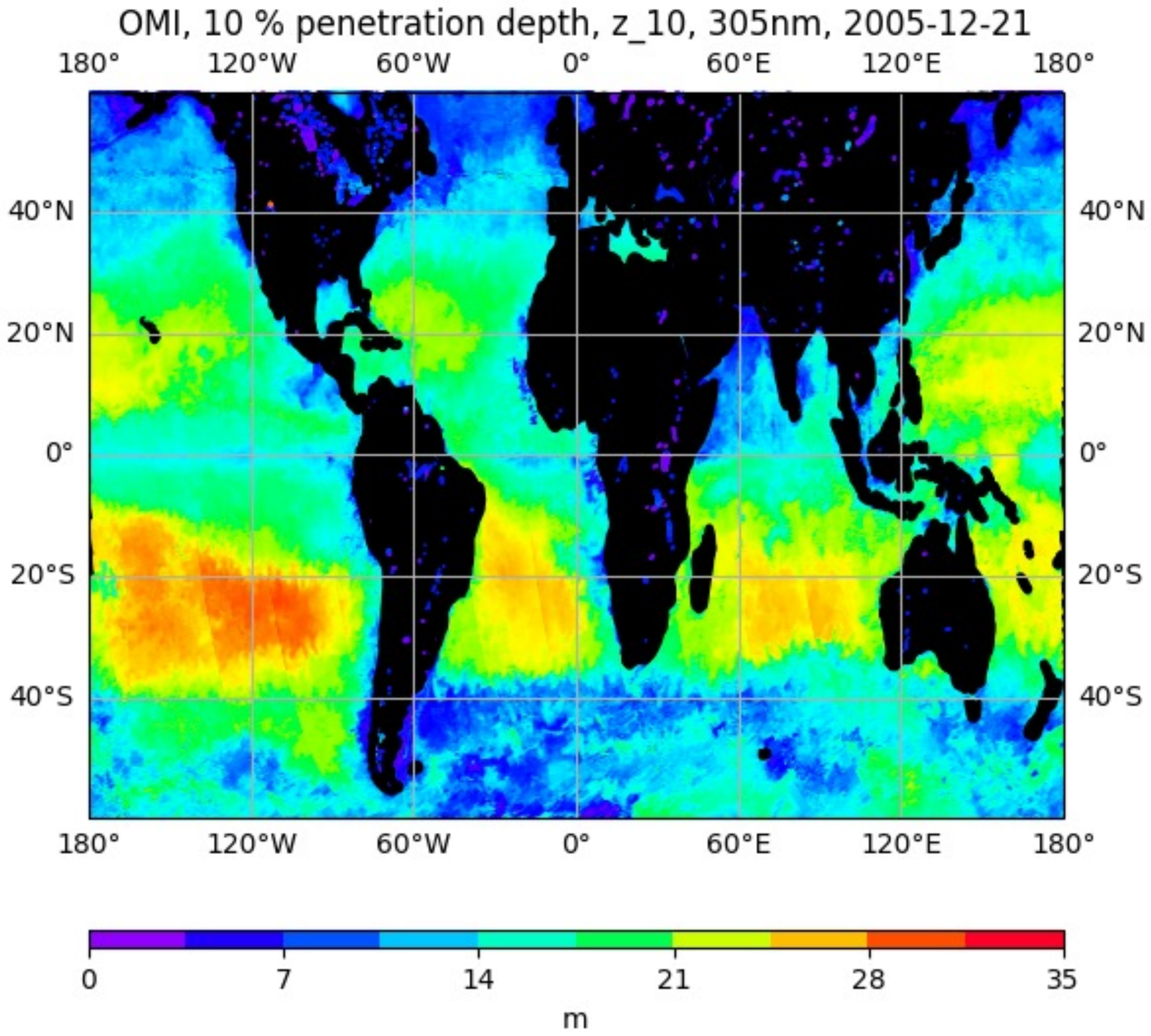
• Extended Case 1 IOP model into UV [Vasilkov et. al., 2005], https://doi.org/10.1364/AO.44.002863

• Uses Hydrolight to pre-calculate hyperspectral LUTs $K_d(\lambda)$, $E_d(\lambda)$, $E_o(\lambda)$

• Calculates 10 % penetration depths for hyperspectral irradiances and DNA damage dose rates.

• Tested with OCI synthetic data.

• Continues OMI UV Climate Data Record with OCI (2004 – current).

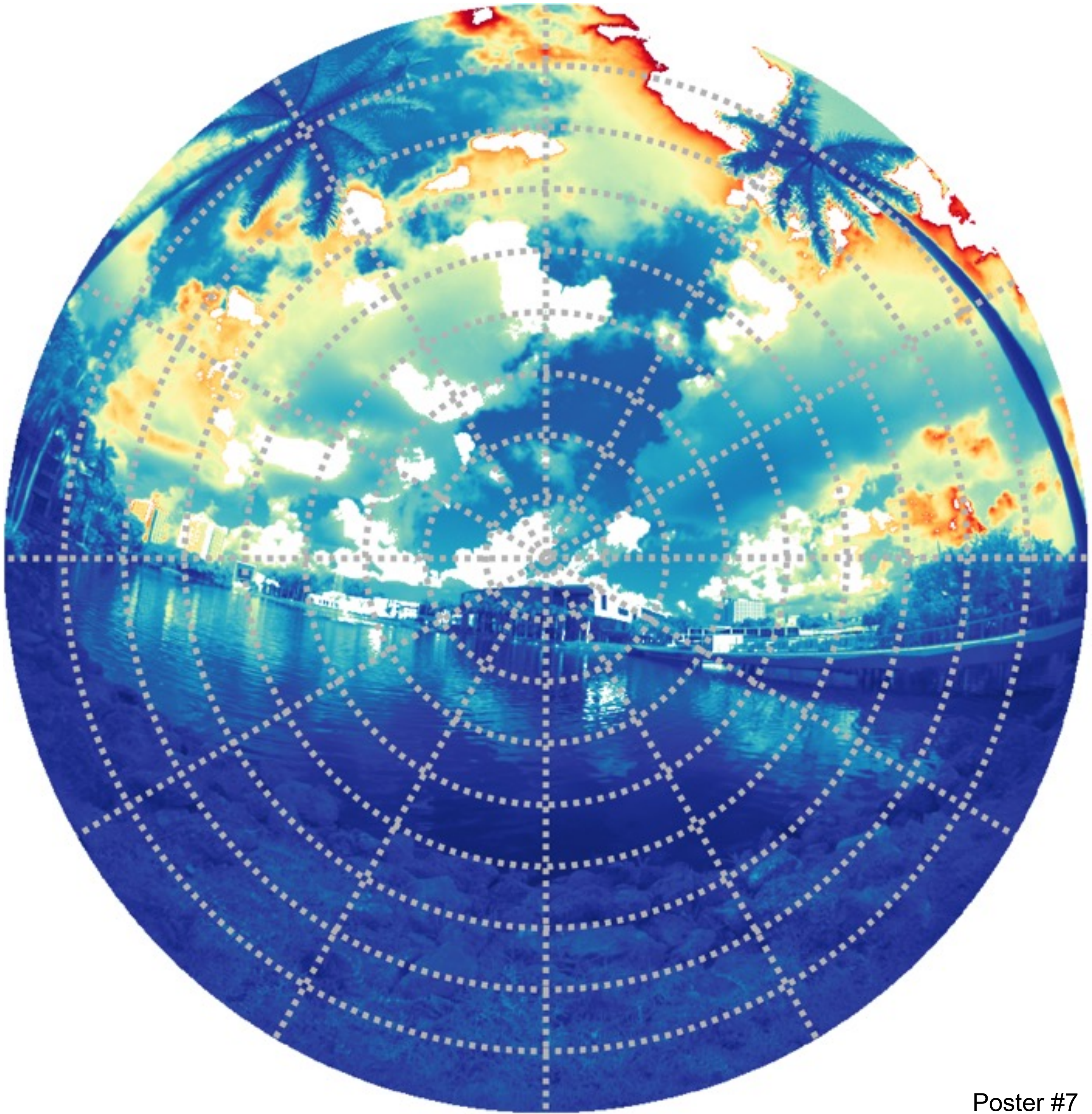


December 21, 2005 10% penetration depth at 305nm, derived from OMI measurements

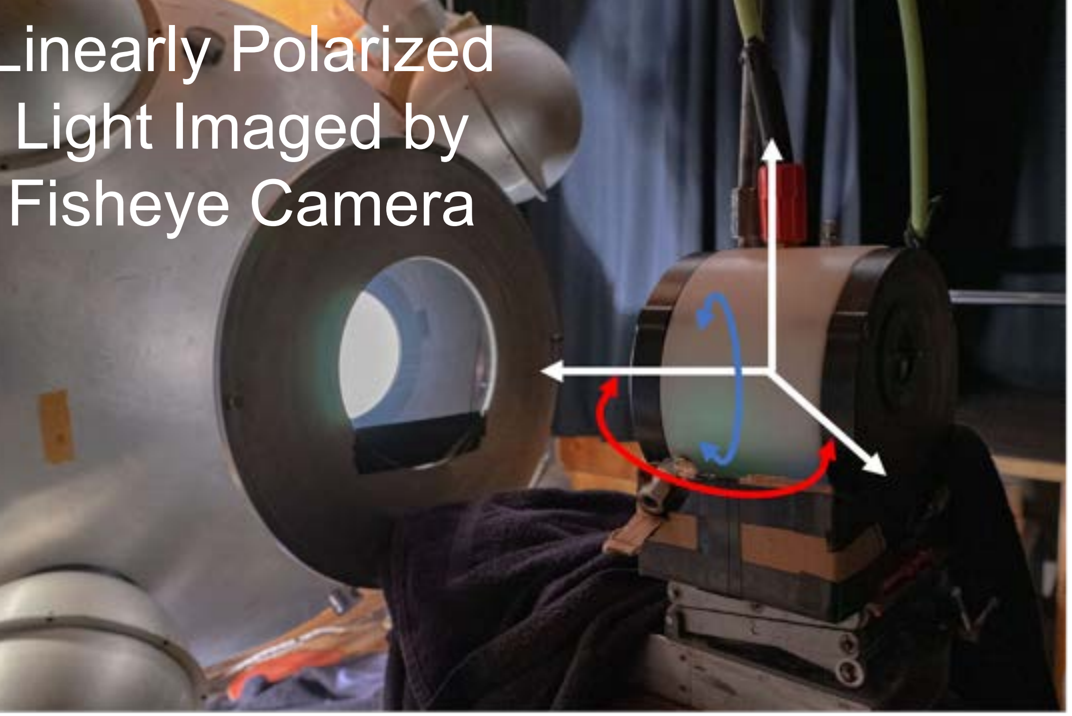
The Rotation of Reference Frame Dependent Polarimetric Variables for Equidistant Fisheye Lens Projections

E. Riley Blocker[1,2] and Kenneth J. Voss[3]

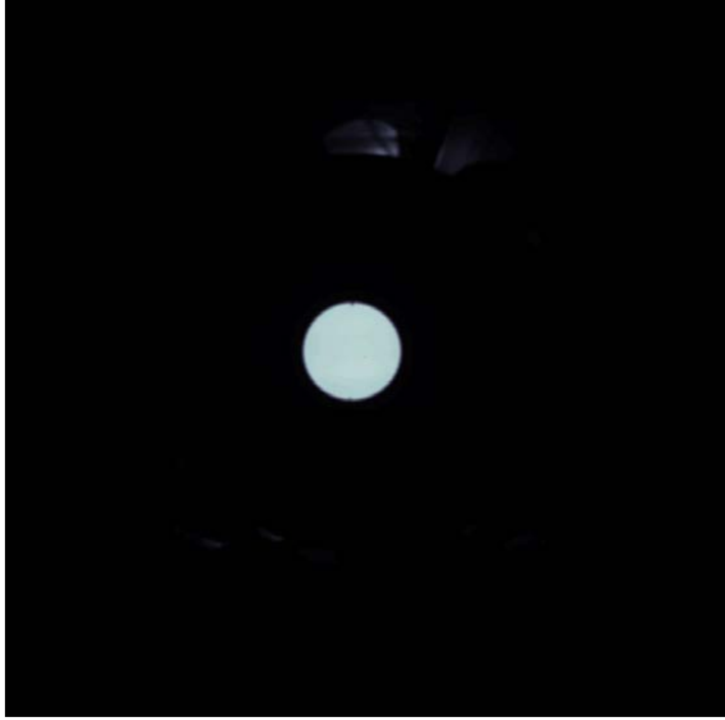
[1]Ocean Ecology Laboratory – Code 616, NASA Goddard Space Flight Center, Greenbelt, Maryland 20771, USA (edward.r.blocker@nasa.gov)
[2]Science Systems and Applications, Inc., Greenbelt, MD, USA
[3]University of Miami, Department of Physics, 1320 Campo Sano Drive, Coral Gables, Fl 33134, USA

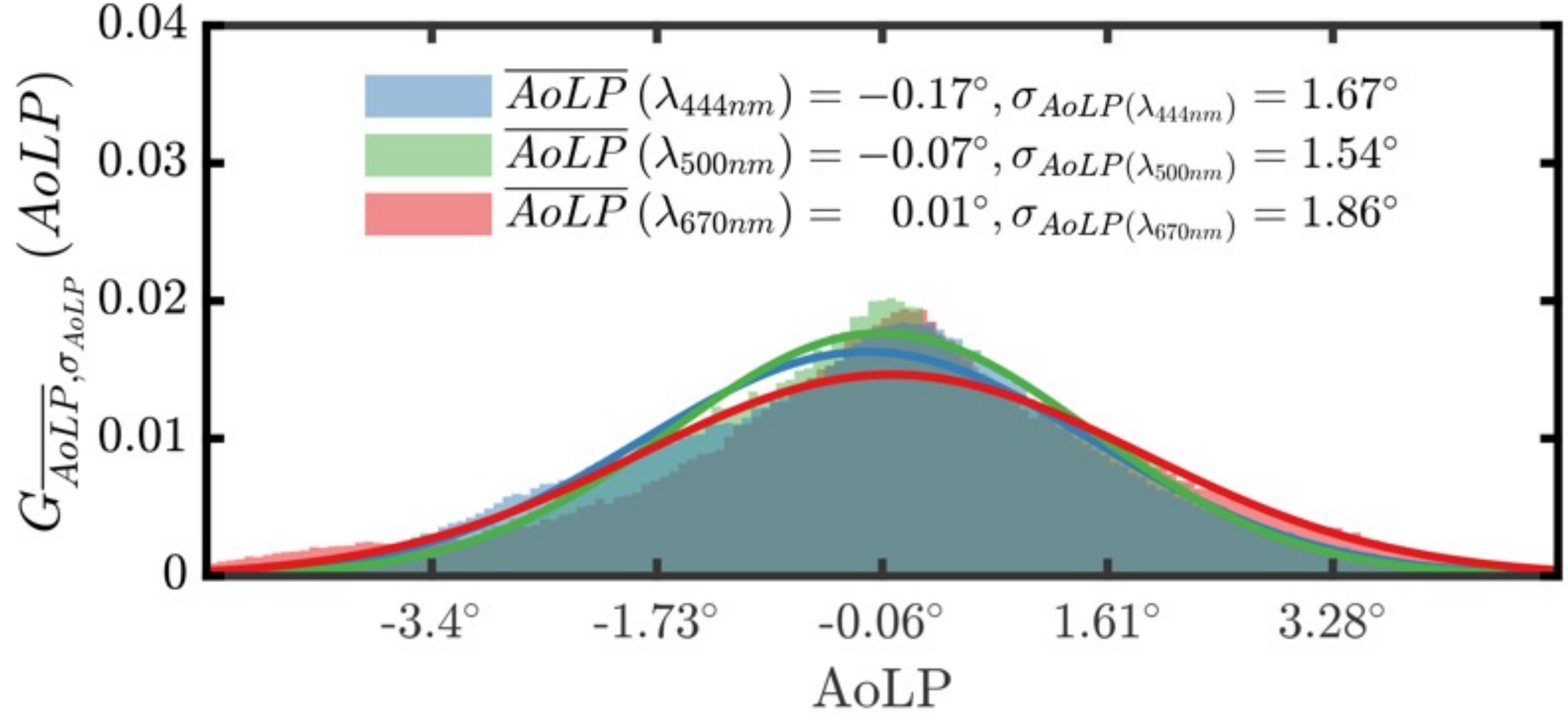


Poster #7



Form a composite image composed of images captured at different orientations of the fisheye camera

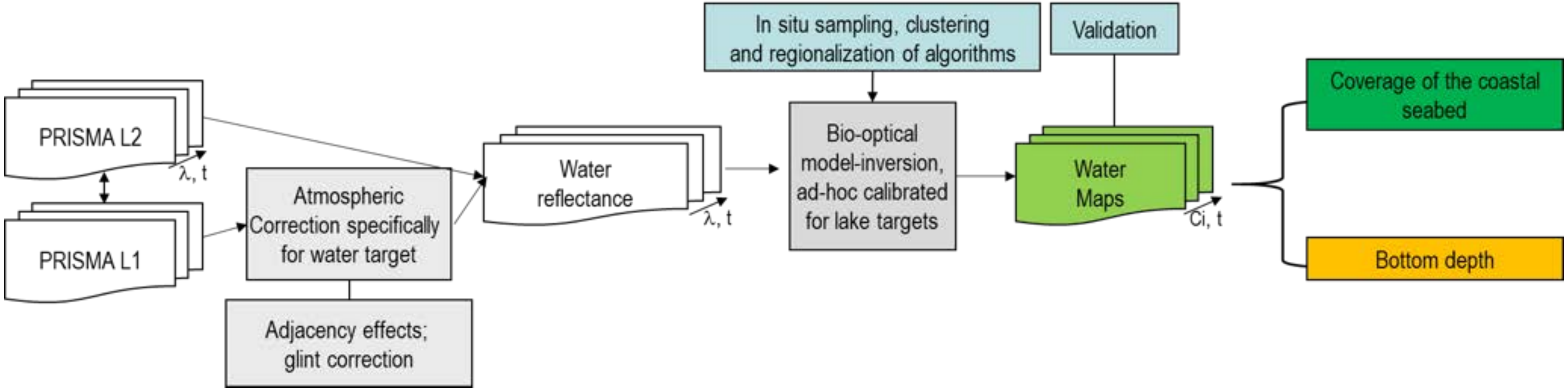


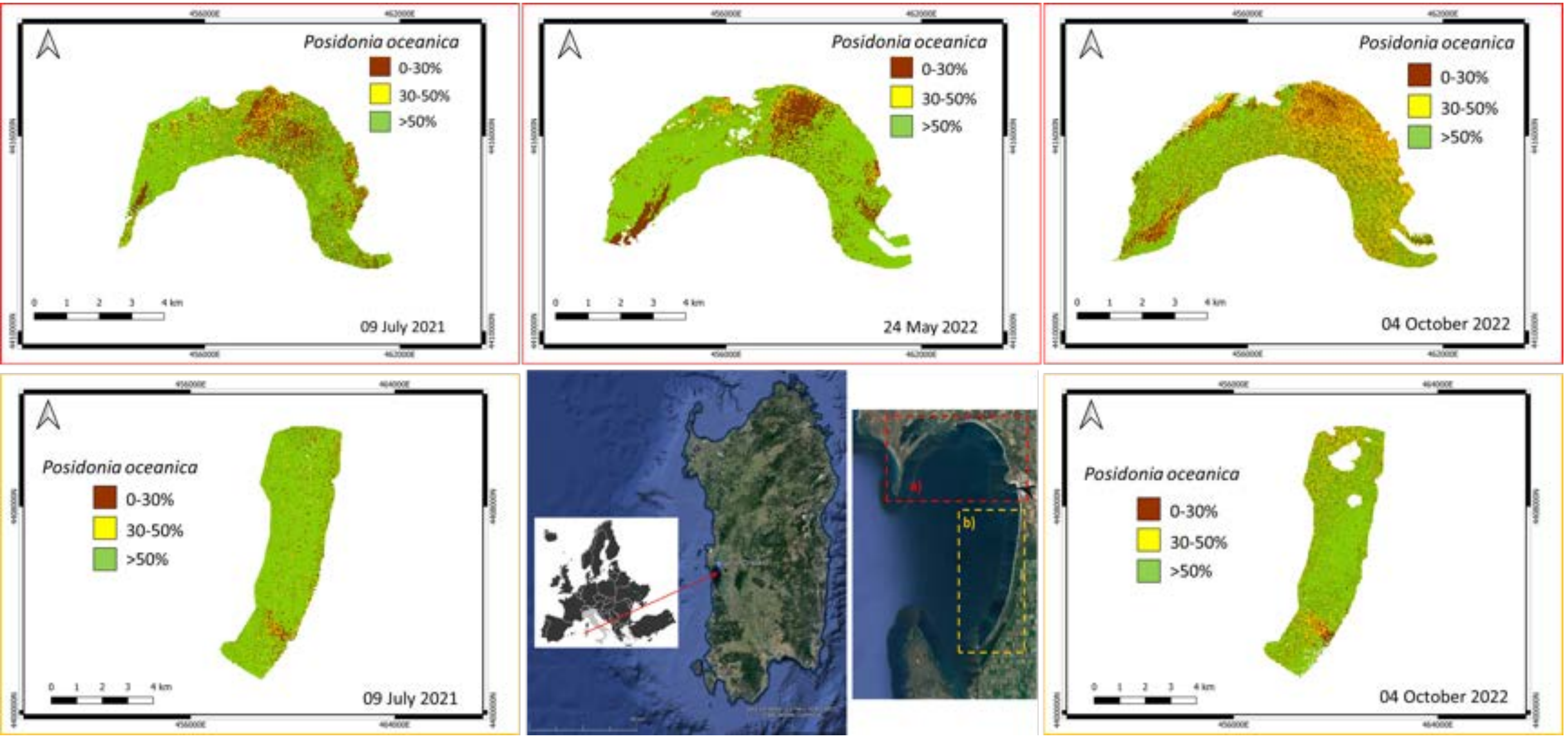


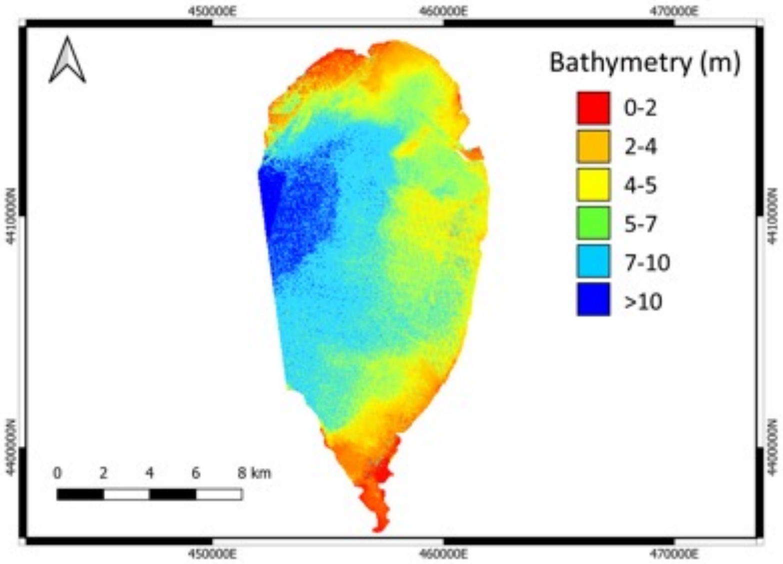
MAPPING COASTAL AREA DYNAMICS IN ORISTANO GULF (ITALY) USING PRISMA HYPESPECTRAL IMAGES

Mariano Bresciani[(a)], Monica Pinardi[(a)], Salvatore Mangano[(a)], Alice Fabbretto[(a)], Andrea Satta[(b)], Emiliana Valentini[(b)], Andrea Taramelli[(c)], Claudia Giardino[(a)]

Poster n. 9


PRISMA L2
PRISMA L1
λ, t
Atmospheric Correction specifically for water target
Adjacency effects; glint correction
Water reflectance
λ, t
In situ sampling, clustering and regionalization of algorithms
Bio-optical model-inversion, ad-hoc calibrated for lake targets
Validation
Water Maps
Ci, t
Coverage of the coastal seabed
Bottom depth


Posidonia oceanica
0-30%
30-50%
>50%
09 July 2021
24 May 2022
04 October 2022
a)
b)

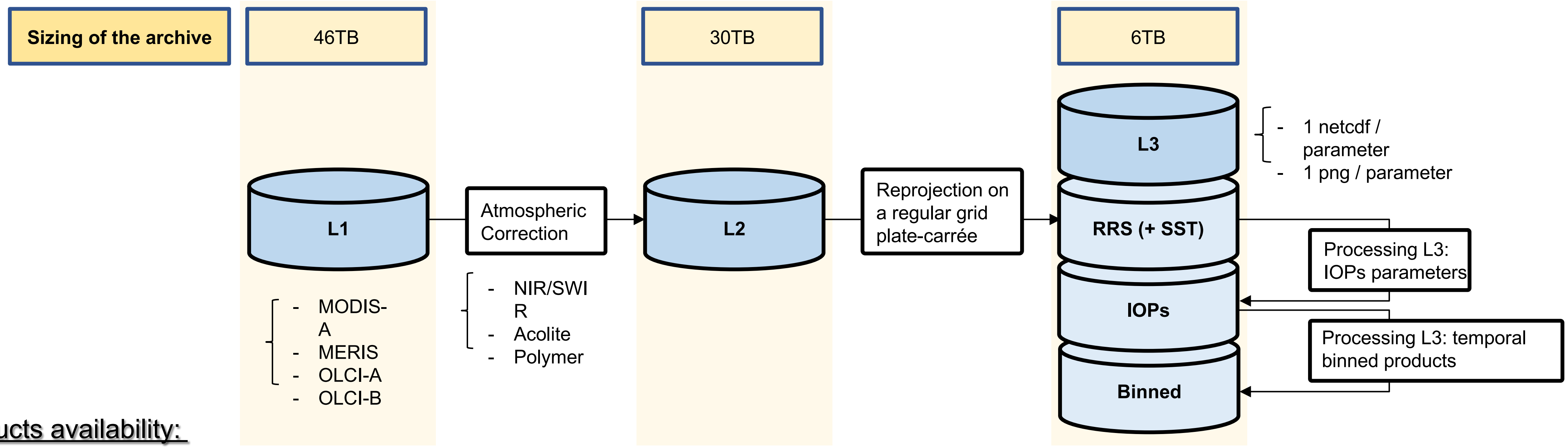

Bathymetry (m)
0-2
2-4
4-5
5-7
7-10
>10
0 2 4 6 8 km
450000E
460000E
470000E

Laboratory for Medium Resolution Ocean Colour Products through ODATIS data center

M. Bretagnon[1], A. Prat[1], A. Mangin[1], D. Doxaran[2], V. Vanterpotte[3]

New and emerging technologies in ocean colour - Poster #10

Processing chain:



Products availability:

	CHL-OC5	CHL-GONS	BBP	SPM-G	SPM-R	T-FNU	CDOM	DOC	POC
Algorithm	Gohin et al., 2002	Gons et al., 2005 Gernez et al., 2017	Loisel et al., 2018 Jorge et al., 2021	Han et al., 2016	Novoa et al., 2017	Dogliotti et al., 2015	Loisel et al., 2014	Vantrepotte et al., 2015	Tran et al., 2019
Open Ocean	X		X	X			X	X	X
Coastal Ocean	X	X	X	X	X	X	X	X	X

\+

RRS
SST

All products are available:

- For the French coastal areas (up to 200 km offshore)
- For the archive

•MODIS 2002-2021
•MERIS 2002-2012
•OLCI-A 2016-2021
•OLCI-B 2018-2021

The web tool also offer to the end user the possibility to extract matchup for location of his interest

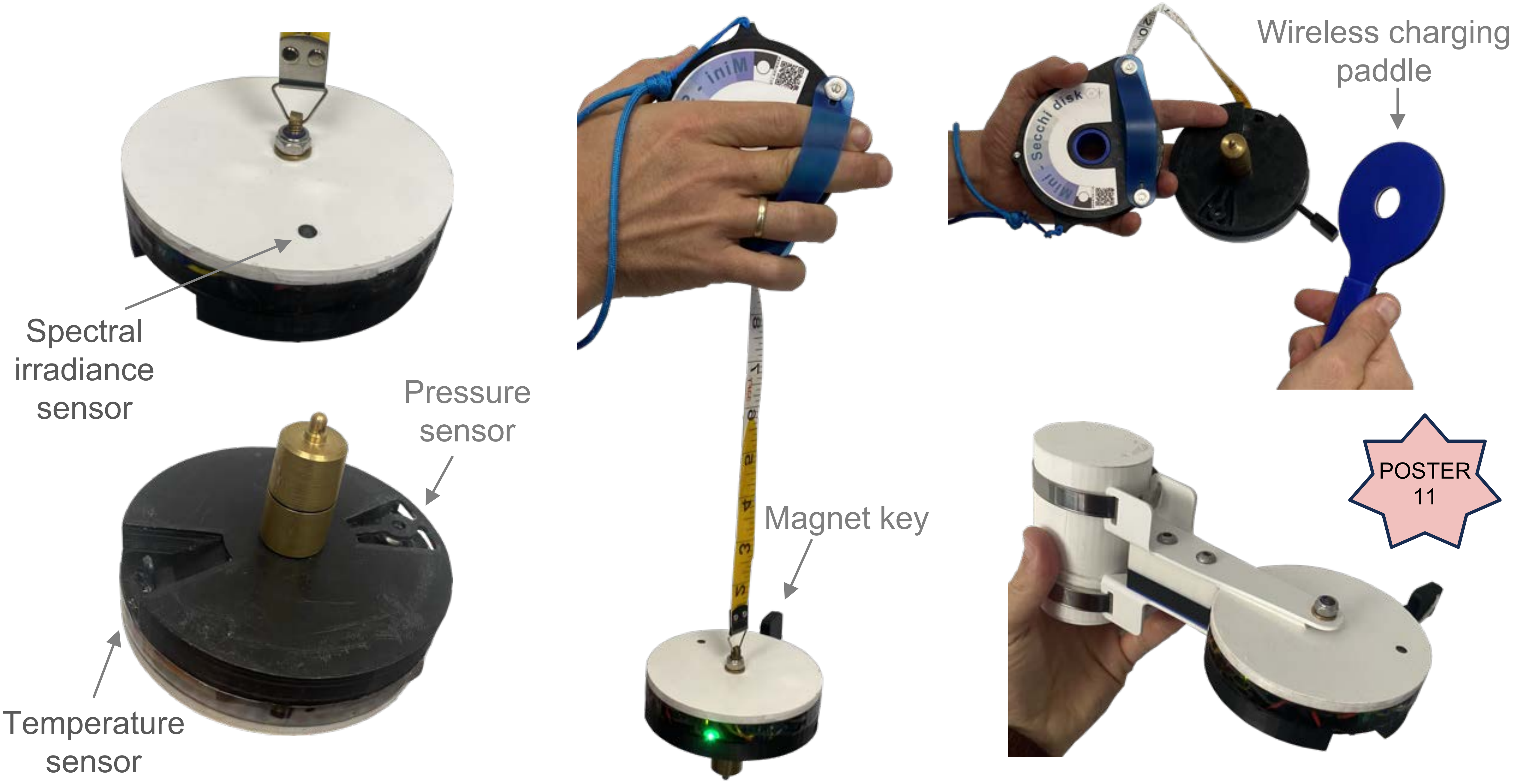
UKRI Future Leaders Fellowships
GORDON AND BETTY MOORE FOUNDATION
UNCW University of North Carolina Wilmington

A low-cost opensource profiling package for monitoring aquatic environments: A lab on a Secchi disk

POSTER 11

Robert (Bob) Brewin, Tom Brewin, Phil Bresnahan,
Keiley Davis, Xuerong Sun, Nicola Wilson, Lars Brunner, Giorgio Dall'Olmo

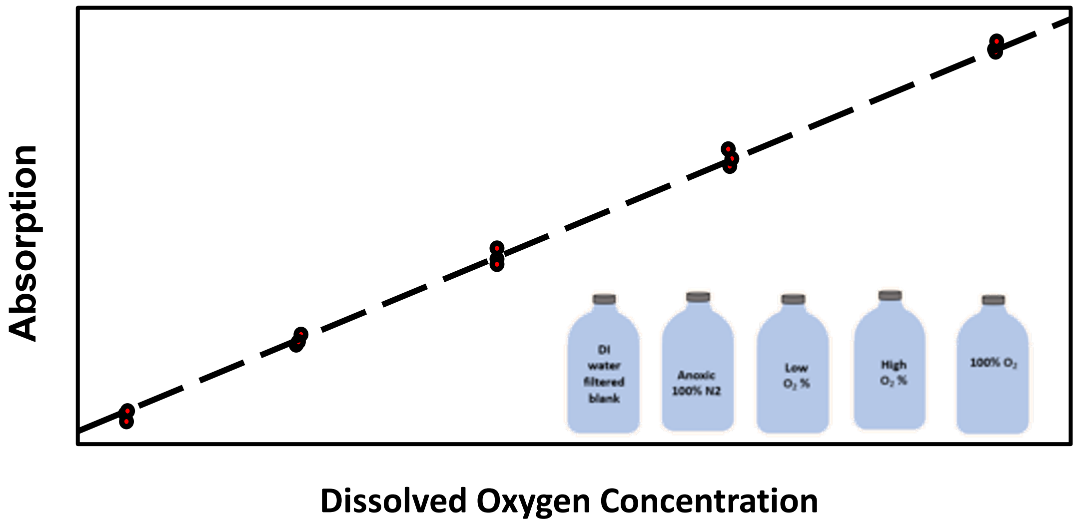
University of Exeter
SAMS Scottish Association for Marine Science
OGS

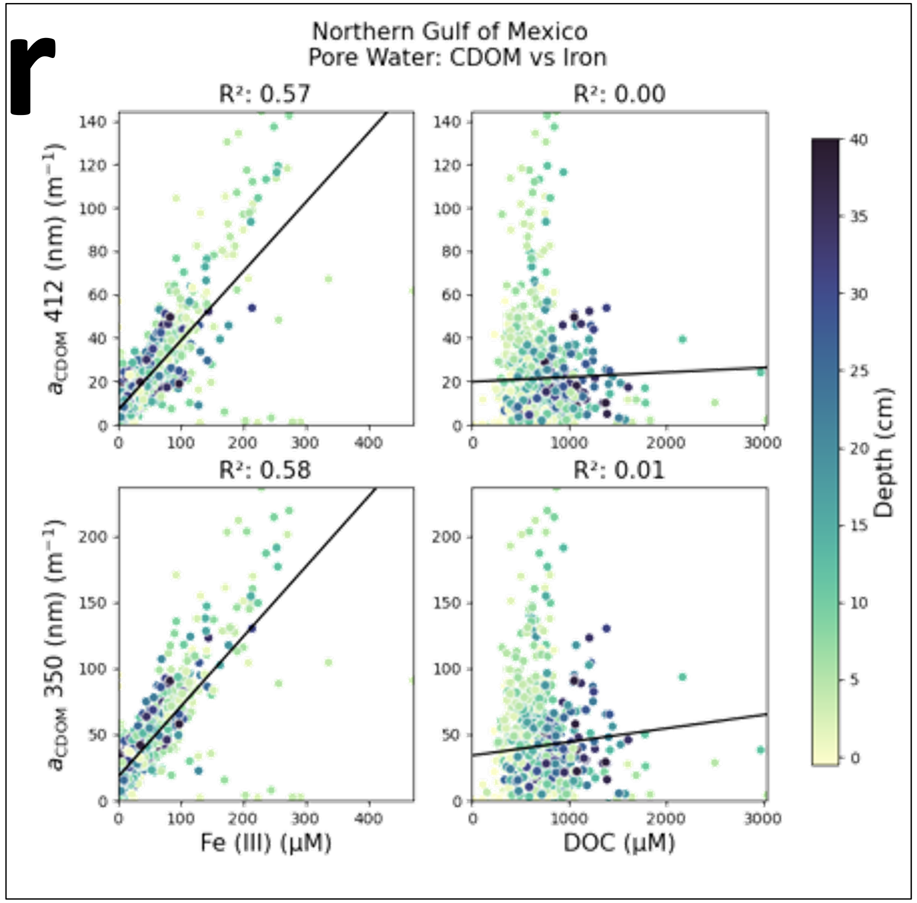


Brewin et al. (Submitted)

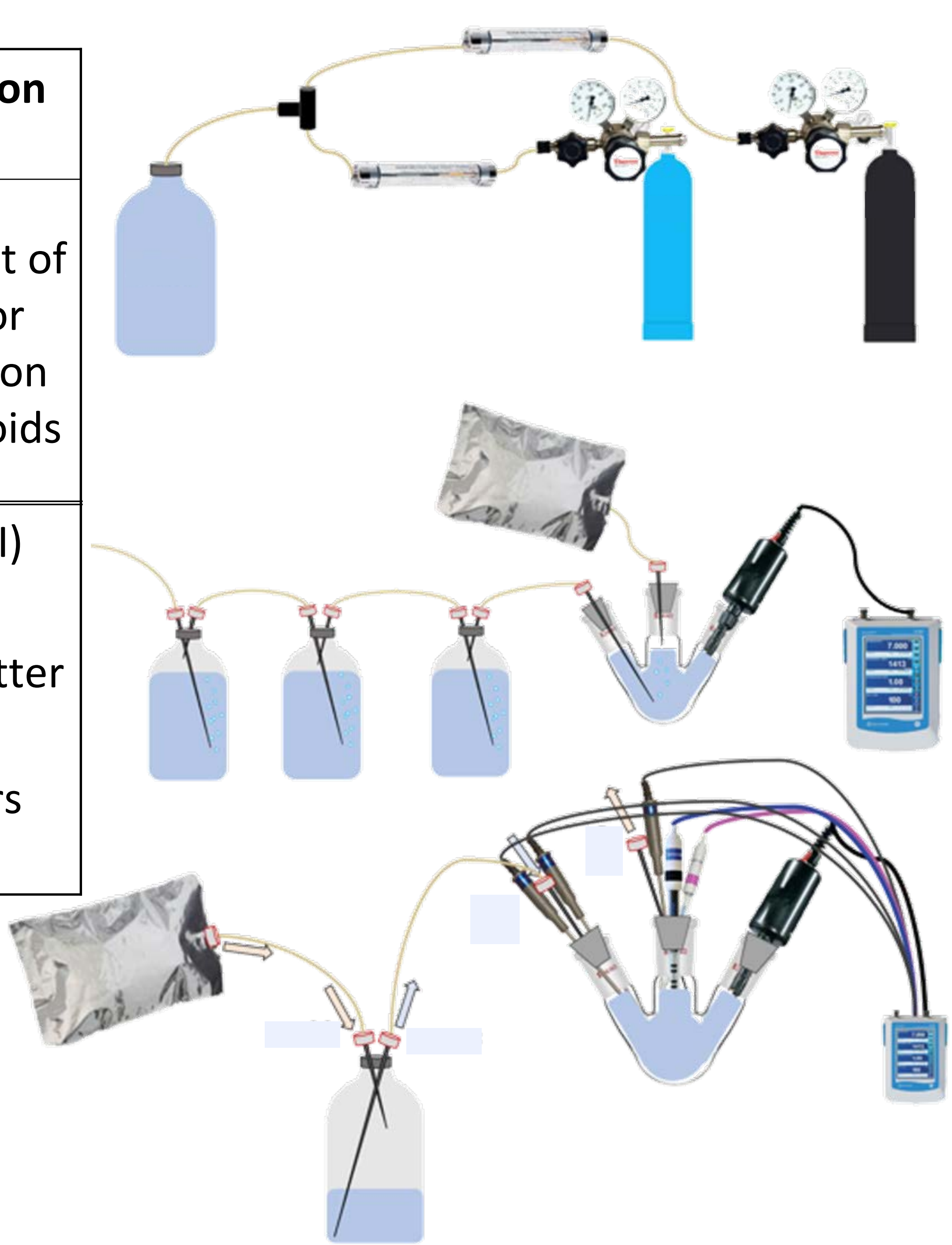
Hanna Bridgham, Christopher Strait,
Dr. Michael Twardowski, Dr. Jordon Beckler

Experiment to assess absorption of non-water constituents in the UV





Phase 1: Seawater	Phase 2: Inorganics	Phase 3: organic-iron complexes
Develop a matrix relevant to the conditions of seawater	Determine the effect of potential inorganic interferences present in sediment-influenced environments	Determine the effect of inorganic Fe, major organics, organic-iron complexes and colloids
oxygen	Nitrogen	Pure organic-Fe(III) standards
seawater matrix	Sulfur	Natural Organic Matter (NOM)
pH	Iron	synthetic chelators
Carbonates	Iodine	



We developed a **computer vision** tool to assist in the **analysis of phytopankton pigment samples** at **NASA** (**yes**, *your* samples!)

A machine learning tool to assist the validation of HPLC analysis of phytoplankton pigments at NASA GSFC

Joaquin E. Chaves[1,2], Crystal Thomas[1,2], Rohan Mittu[3]
[1] Science Systems and Applications Inc.; [2] NASA Goddard Space Flight Center; [3] University of Maryland, College Park

Acknowledgements This work was supported by the NASA Ocean Biology and Biogeochemistry and the Science of Terra and Aqua MODIS programs. Smooth running of the daily activities of the HPLC laboratory is only possible with the assistance of C. Kenemer.

Take a picture to learn more about our analytical facility

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Take a picture to learn more about our analytical facility

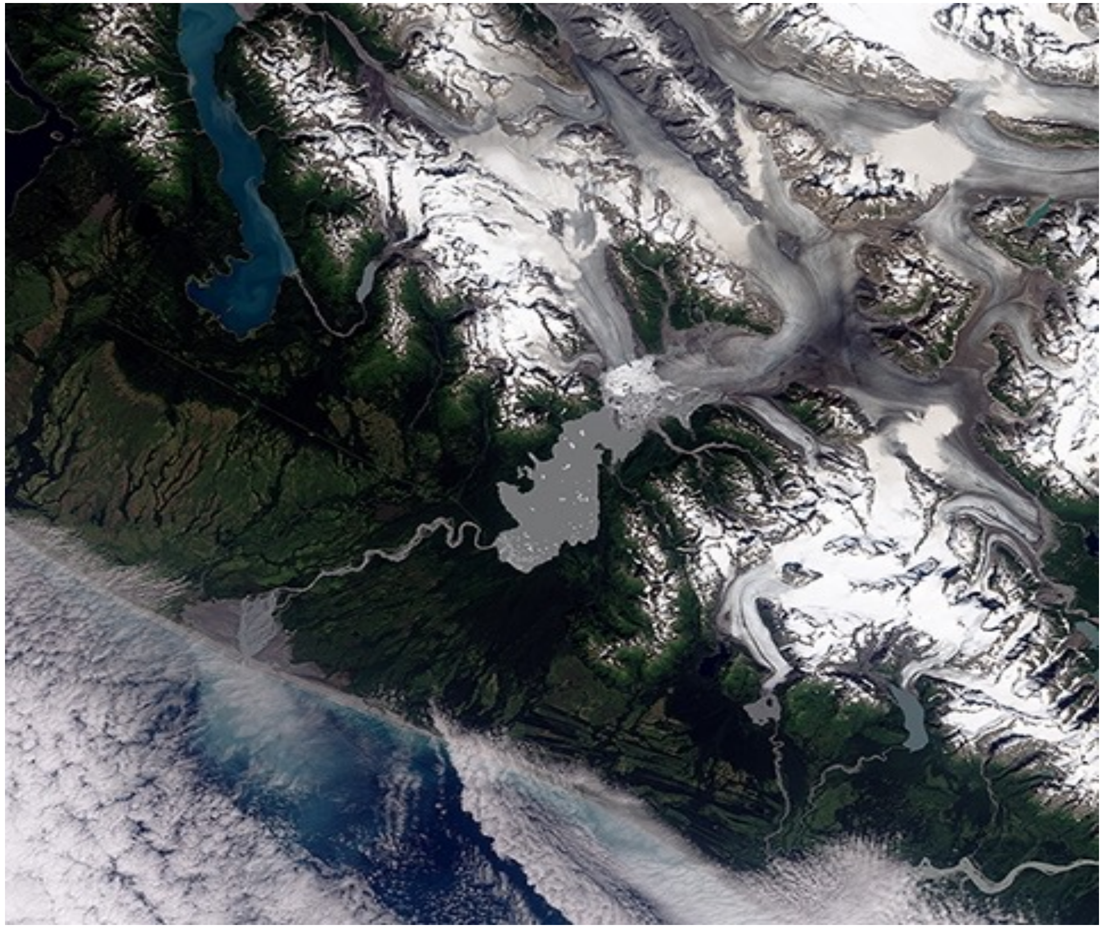
FLuorescence for Ocean Research and Observations (FLORO)

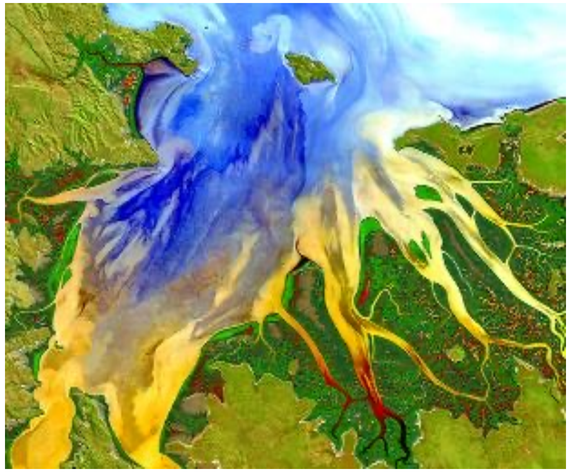
An experiment investigating lidar measurements to identify and characterize marine debris

Madeline Cowell[1], Collin Ward[2], Yongxiang Hu[3], Davida Streett[4], Jessica Shallcross[4], Juan Velasco[4], Betsy Farris[1], Sarah Grunsfeld[1], Van Rudd[1], Zach Rovig[1], Sheston Culpeppe[1]r, Jeff Applegate[1], Sara Tucker[1], Carl Weimer[1]

1. Ball Aerospace – madeline.cowell@ballaerospace.com, 2. Woods Hole Oceanographic Institute, 3. NASA – LaRC , 4. NOAA – NESDIS SAB

GO BEYOND WITH BALL.®



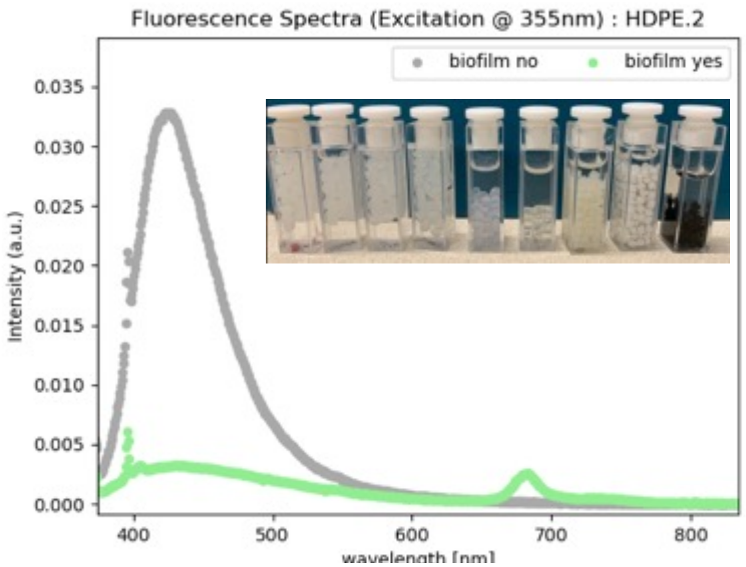


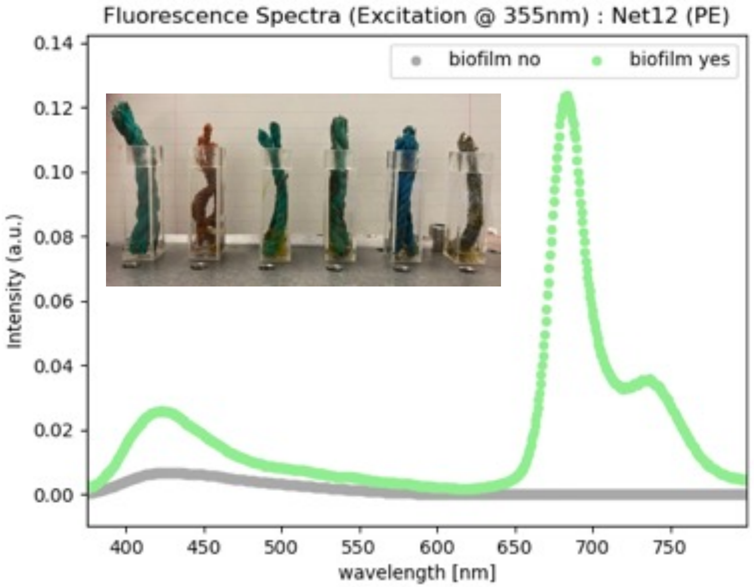
OBSERVATIONS FROM INVESTIGATING PLASTIC DEBRIS WITH LASER INDUCED FLUORESCENCE

FLORO – NASA GRANT GOALS:

- Collect calibrated lab measurements (including fluorescence spectra and lifetime) of marine debris-relevant plastics
- Simulate lidar like retrieval and include water effects through a tank experiment
- Model the performance of an instrument for airborne/spaceborne demonstration

CURIOUS WHAT WE LEARNED? ASK ME QUESTIONS!





A PRINCIPAL COMPONENT AND MACHINE LEARNING APPROACH TO GAP FILL HYPERSPECTRAL OCEAN COLOR SATELLITE RETRIEVALS

ZACHARY FASNACHT[1], JOANNA JOINER[2], MATTHEW BANDEL[1], DAVID HAFFNER[1], ALEXANDER VASILKOV[1], PATRICIA CASTELLANOS[2], NICKOLAY KROTKOV[2]

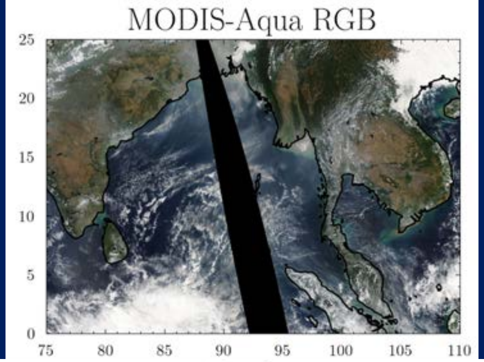
[1] SCIENCE, SYSTEMS, AND APPLICATIONS INC

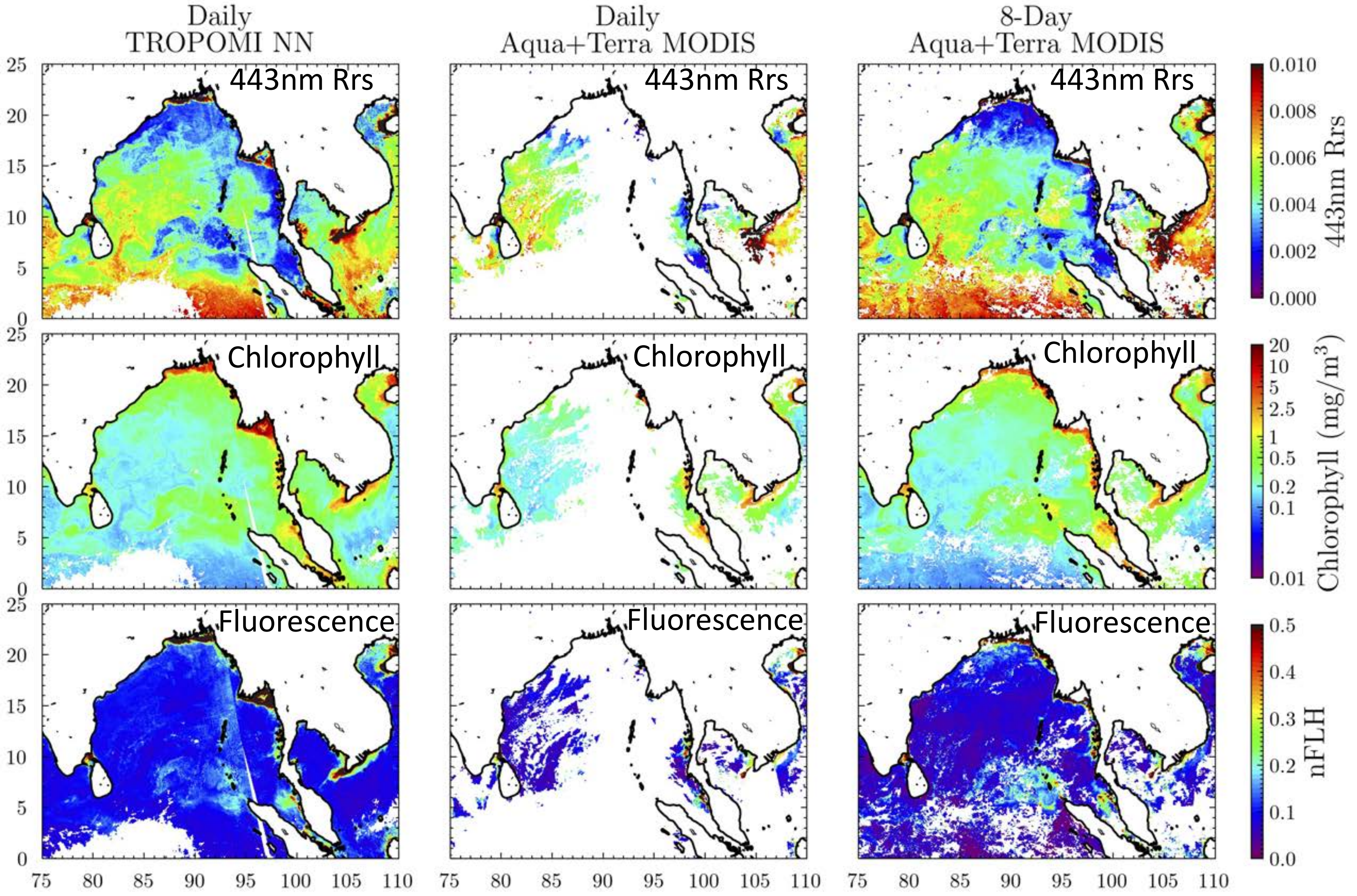
[2] NASA GODDARD SPACE FLIGHT CENTER

IOCS MEETING 2023 – ST. PETERBURG, FL

POSTER #20– NEW AND EMERGING TECHNOLOGIES

January 14, 2020





- PCA+ML approach developed to estimate ocean color properties under cloud & aerosol conditions as well as sun glint using hyperspectral satellite measurements
- Example on left shows technique applied to hyperspectral satellite TROPOMI (left panel) with increased spatial coverage of retrievals compared to standard daily retrievals from MODIS (middle and right panels)
- Can be applied to future hyperspectral instruments PACE and TEMPO to provide gap-filled ocean color products as well as near real time fast ocean color retrievals

No. 21

Field Calibration of HyperNav Spectroradiometer at Mauna Loa Observatory, Hawaii

Robert Frouin[1], Andrew H Barnard[2], Mustapha Moulana[3], Jing Tan[1], Paul Chamberlain[1], Mathieu Compiègne[3], Didier Ramon[3], Emmanuel Boss[4], Nils Haëntjens[4], Matthew Mazloff[1], Cristina Orrico[5]

[1]Scripps Institution of oceanography, University of California San Diego, La Jolla, CA, United States, [2]College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, OR, United States, [3]HYGEOS, Euratechnologies, Lille, Nord, France , [4]School of Marine Sciences, University of Maine, Orono, ME, United States, [5]Sea-Bird Scientific, Philomath, OR, United States

IOCS Meeting, 14-17 November 2023, St. Petersburg, Florida, USA

-Field calibration of a typical HyperNav system was performed at Mauna Loa Observatory, where the atmosphere is less influenced by pollution, boundary layer aerosols, and where ancillary measurements of atmospheric composition (aerosols, ozone, water vapor, trace gases) are available.

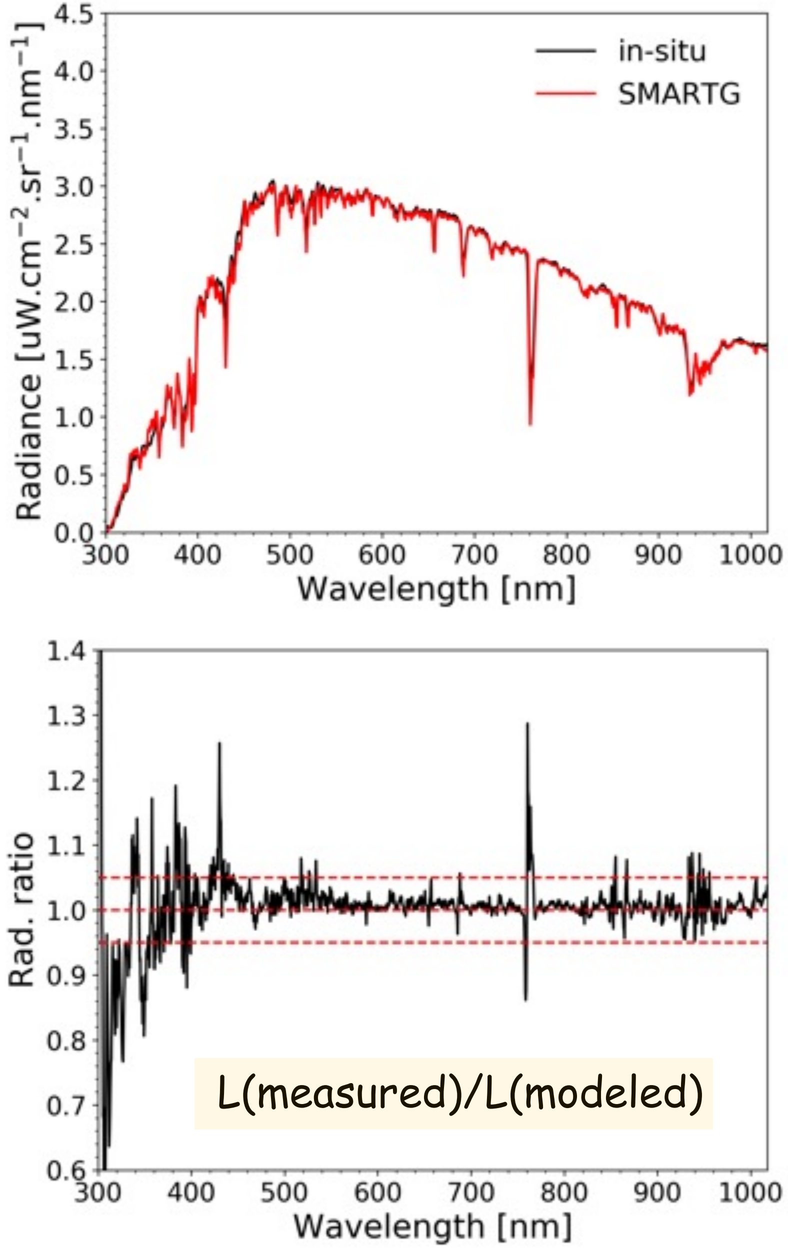
-The methodology consists in viewing a horizontal plaque of know bidirectional reflectance with the Sun disk unobscured and masked, allowing a determination of the direct component of downwelling planar irradiance.

-This measured component is compared to the output of an accurate 3-D Monte Carlo code with proper k-distribution to account for gaseous absorption at the HyperNav 2 nm spectral resolution. (Simulations using 3-D properties of the environment allow correction of residual diffuse light.)

-Field and laboratory calibrations agree to within 2% in the visible to near infrared, but differences reach 5% in some spectral regions of the near ultraviolet domain.

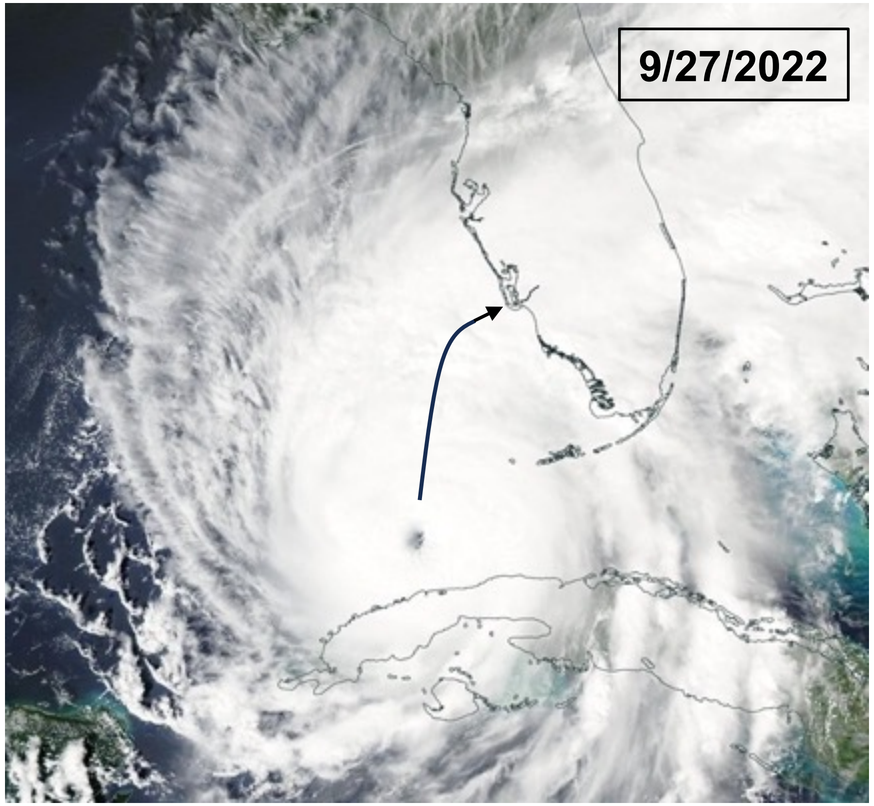
-Performing systematically this type of (i.e., field) calibration pre- and post-deployment near the locations of the measurement sites is recommended.

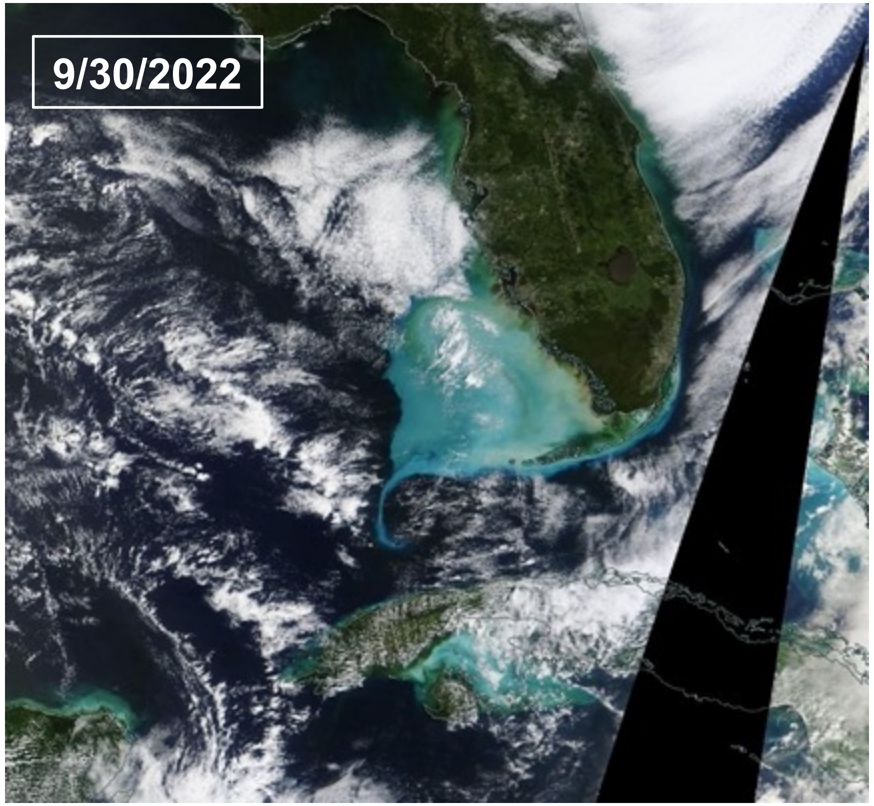
HyperNav field calibration at Mauna Loa, 20 June 2021, 18:55 GMT, SZA = 48.5°

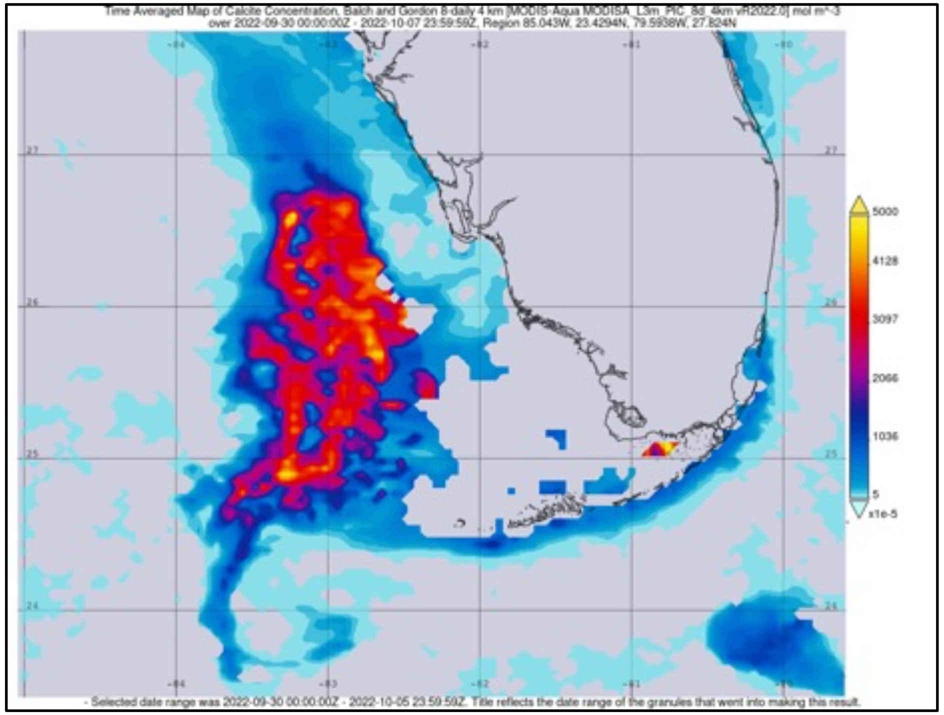


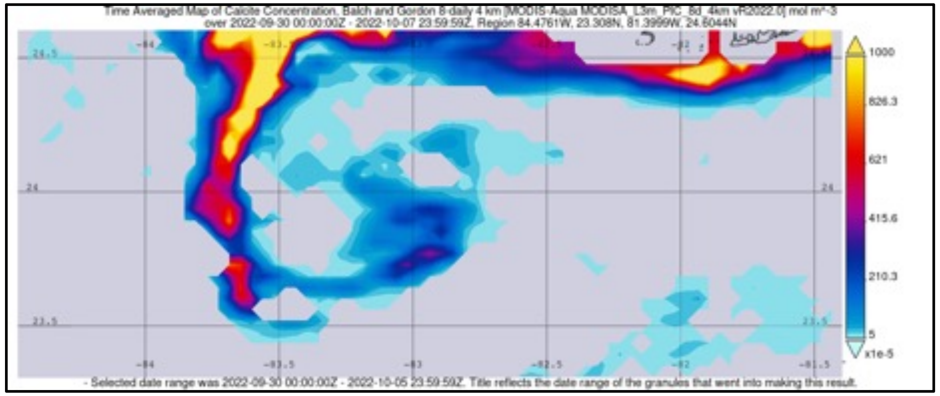
Estimating sediment mass concentration in a plume emanating from the West Florida Shelf induced by the passage of Hurricane Ian

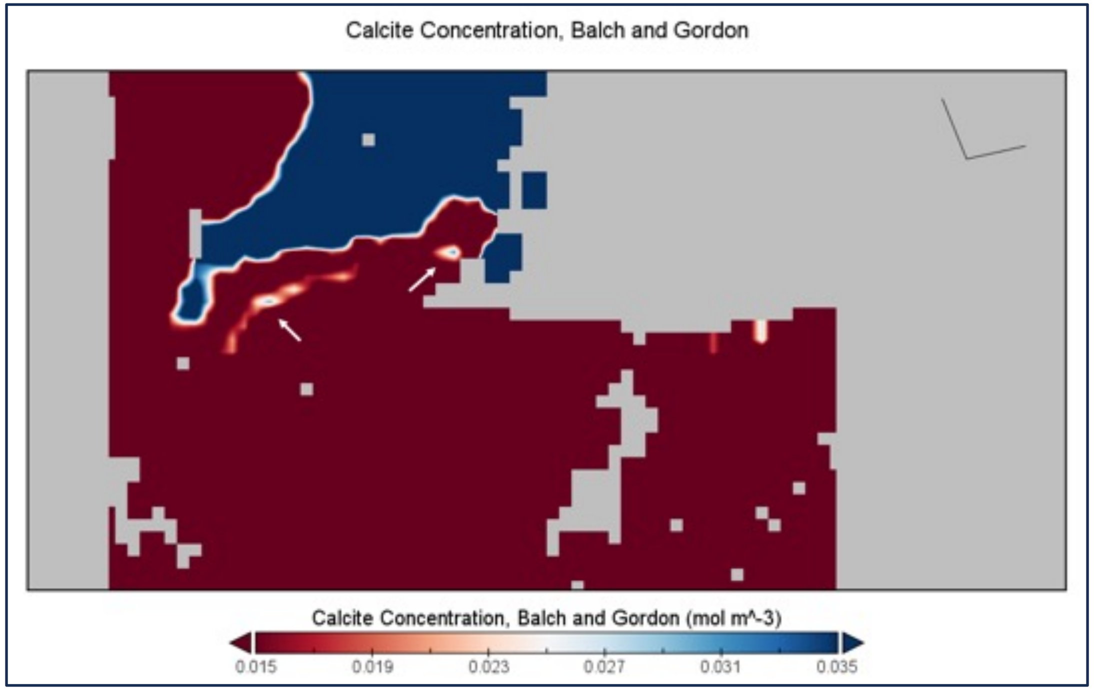
James Acker, *NASA Goddard Earth Sciences Data and Information Services Center;* R. Jude Wilber, *Capella Consulting*











Applying the Particulate Inorganic Carbon (PIC) product to the plume of carbonate sediment induced by Hurricane Ian indicates a maximum concentration of 0.017 to 0.029 mol/m^3, approximately 2-3 g/m^3. This analysis is a first step to quantifying this process for major carbonate environments, and to estimate this process globally.

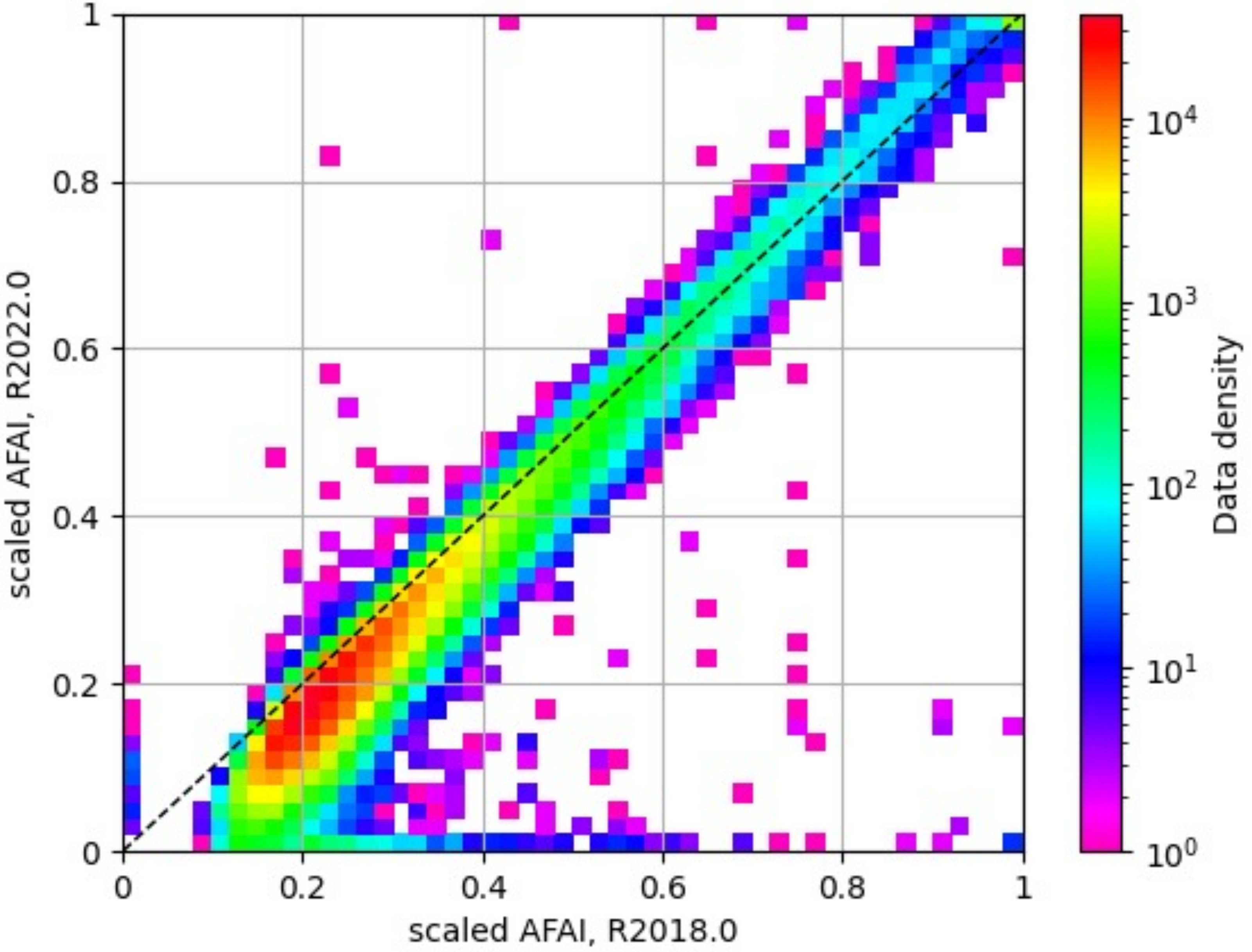
Ocean color mission reprocessing in the machine learning era: impacts of vicarious calibration updates on *Sargassum* retrievals

Brian B. Barnes[1], Sarah Sullivan[1], Lin Qi[2], Yuyuan Xie[1], Chuanmin Hu[1]

[1] College of Marine Science, University of South Florida

[2] NOAA Center for Satellite Applications and Research

IMPACT OF SVC UPDATES ON TRADITIONAL AFAI



125

Uncertainties propagation in HyperInSPACE Community Processor

HyperCP

Agnieszka Bialek[1], Ashley Ramsay[1], Alexis Deru[2], Dirk Aurin[3,4], Viktor Vabson[5], Ilmar Ansko[5], Juan Ignacio Gossn[6], Ewa Kwiatkowska[6], Nils Haëntjens[7], Maycira Costa[8]

[1] National Physical Laboratory, UK

[2] ACRI-ST, France

[3] NASA Goddard Space Flight Center, USA

[4] Morgan State University, USA

[5] Tartu Observatory, University of Tartu

[6] EUMETSAT, Germany

[7] University of Maine, USA

[8] University of Victoria, Canada

Hyperspectral In situ Support for PACE Community Processor

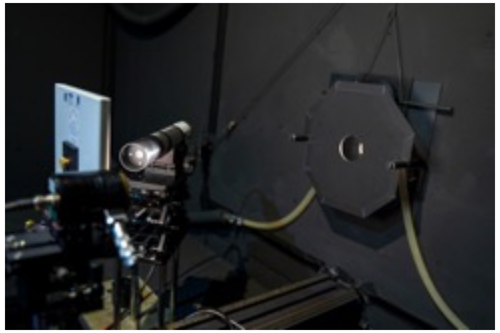
HyperCP

In situ raw data

Trios Ramses

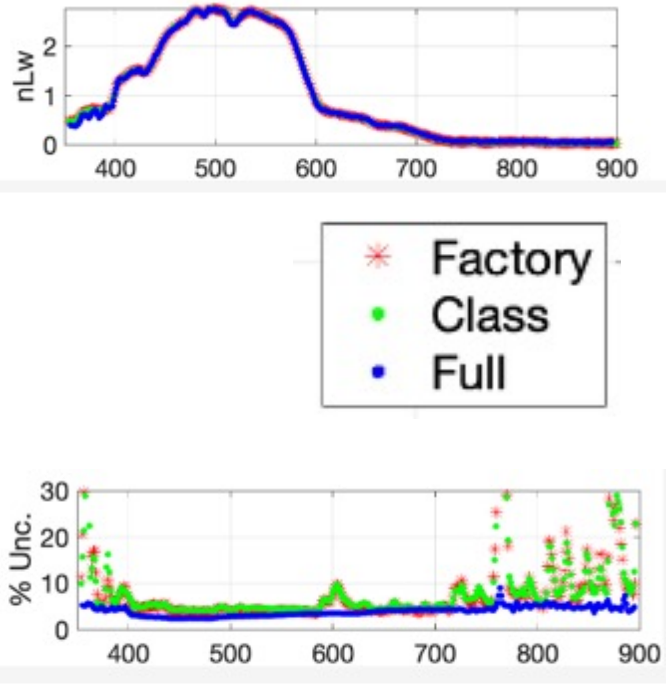
SeaBird HyperOCR

Unique batch laboratory tests



Community processor

Outputs



BRDF correction of S3 OLCI water reflectance products

Vittorio Brando[1], Davide D'Alimonte[2], Tamito Kajiyama[2], Jaime Pitarch[1], Marco Talone[3], Constant Mazeran[4], Michael Twardowski[5], Srinivas Kolluru[5], Alberto Tonizzo[6], Ewa Kwiatkowska[7], David Dessailly[7] & Juan Ignacio Gossn[7]

(1) CNR ISMAR, Roma, Italy, (2) AEQUORA, Lisboa, Portugal (3) ICM, Barcelona, Spain (4) SOLVO, Antibes, France

EUMETSAT Contract Ref.: RB_EUM-CO-21-4600002626-JIG. PI and funders of Aeronet-OC, MOBY, BOUSSOLE, OFS & NIOZ measurement systems and data processing/distribution are duly acknowledged

International Ocean Colour Science Meeting 2023

BRDF correction of S3 OLCI water reflectance

Scope: Implement a BRDF correction in the operational S3 OLCI L2 processor to deliver fully normalized water reflectances.

Reference BRDF correction methods:

- Morel et al. (2002) → M02
- Park and Ruddick (2005) → P05
- Lee et al. (2011) → L11

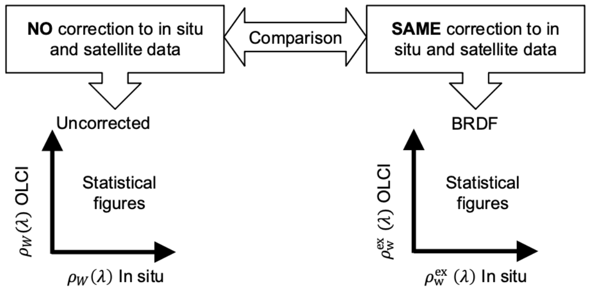
Assessments based on:

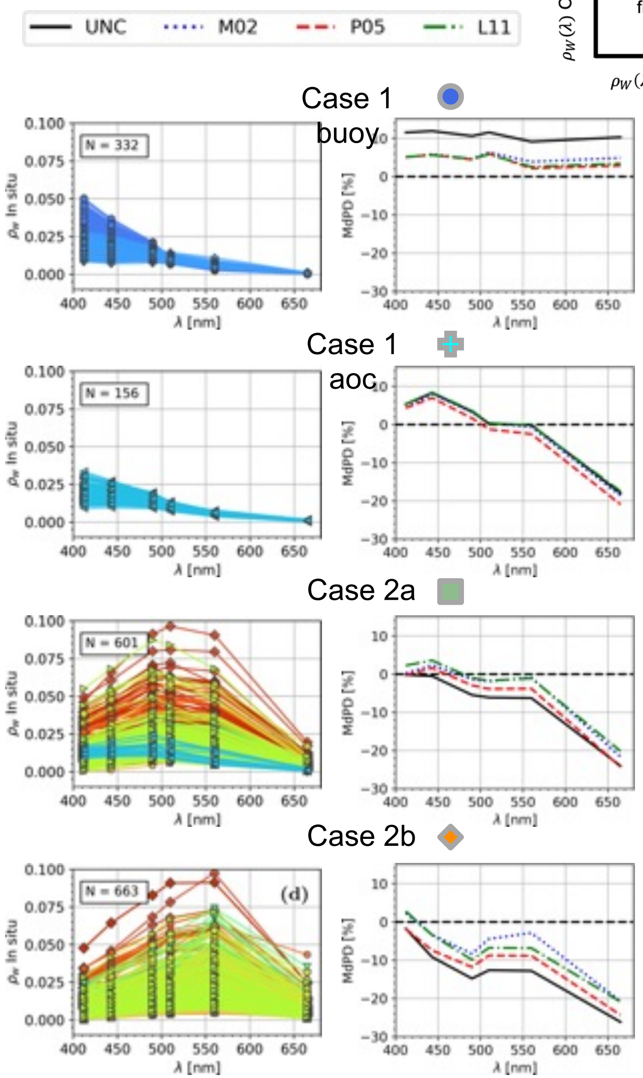
- in situ measurements;
- match-ups with MOBY, BOUSSOLE and Aeronet-OC
- comparison between Sentinel-3A and 3B OLCI images in the northern Adriatic Sea.

Results:

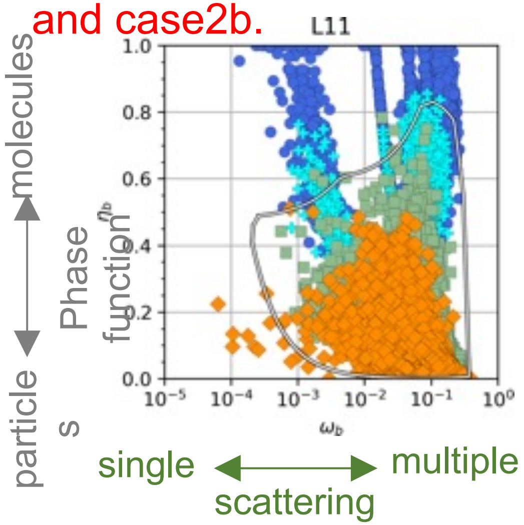
- for match-ups in open ocean waters the considered BRDF correction schemes yield similar performance;
- overall, L11 BRDF correction gives better BRDF correction results for the three assessments.

$$\mathrm{MdPD} = \mathrm{median}\left\{\frac{\mathrm{Rrs}_{\mathrm{OLCI}} - \mathrm{Rrs}_{\mathrm{in\ situ}}}{\mathrm{Rrs}_{\mathrm{in\ situ}}}\right\}$$





Differences are inversely growing with η_b, from case1 buoy to case1 aoc, case 2a and case2b.



Case2b are more driven by particles, and the phase function varies between methods…

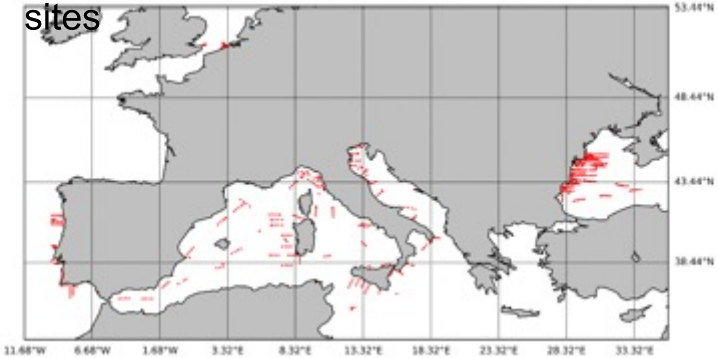
Different Approaches to Uncertainty Estimation in HPLC Phytoplankton Pigments Measurements for Ocean Color Validation Support

E. Canuti[1,2]

[1] University of Urbino, Urbino, Italy; [2] Joint Research Centre, European Commission, Ispra, Italy

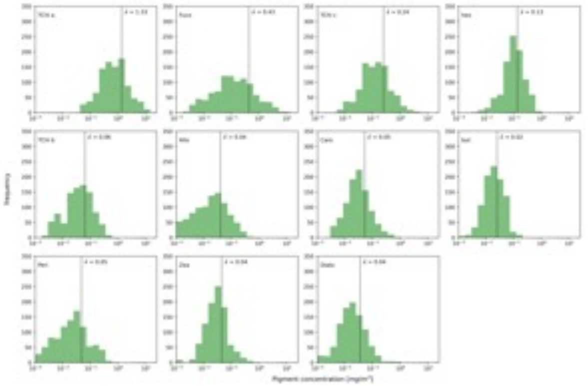
1: COMPARING with a CERTIFIED LABORATORY

Collection sites

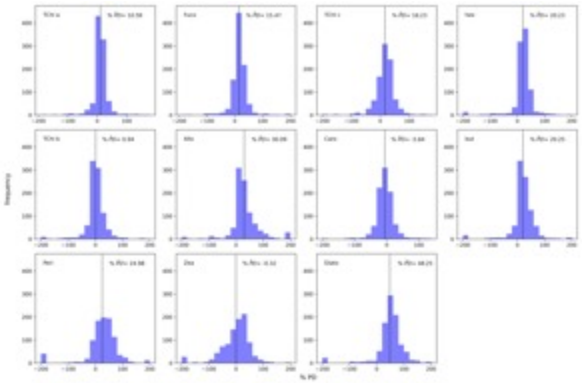


- 967 samples
- Same analytical method

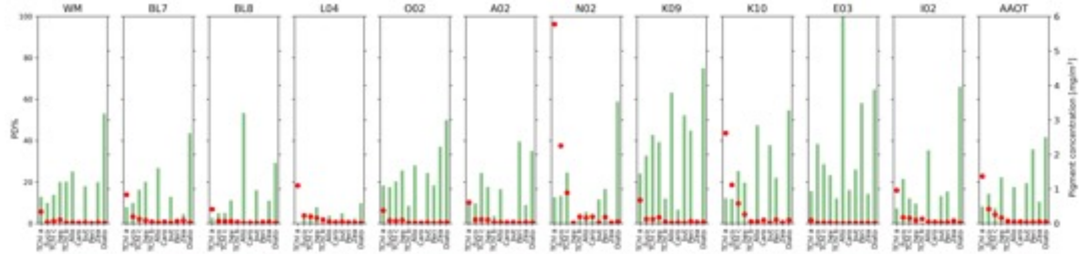
Concentration



Pigment



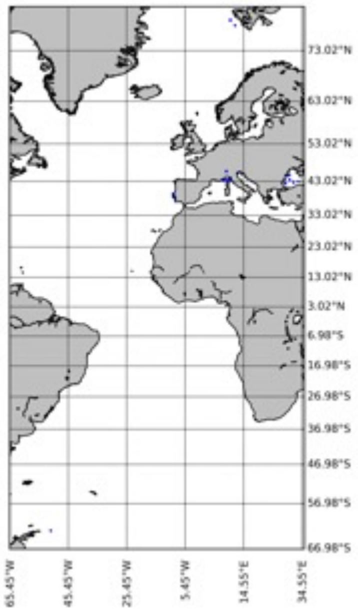
Cruise/Sea



Advantages: higher number of natural samples compared;
Disadvantages: less information on the method performance

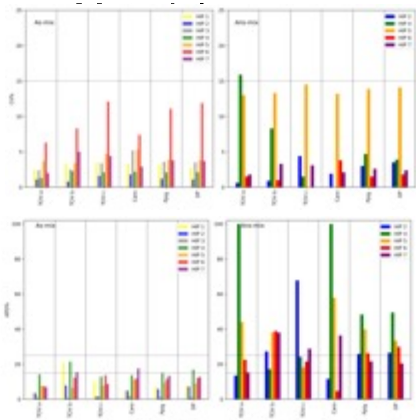
2: INTERCALIBRATION EXERCISES

Collection

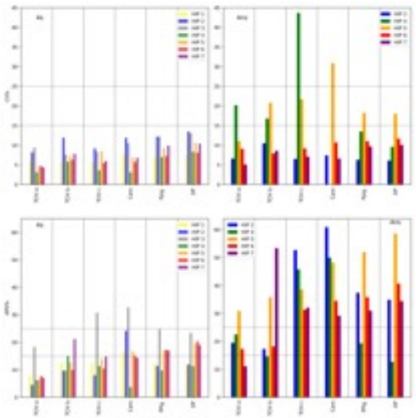


HIPs	HIP-1	HIP-2	HIP-3	HIP-4	HIP-5	HIP-6	HIP-7
y	2010	2011	2012	2014	2019	2020	2021
Lab	3	6	6	5	8	10	10
Meth	2	4	5	3	5	5	5

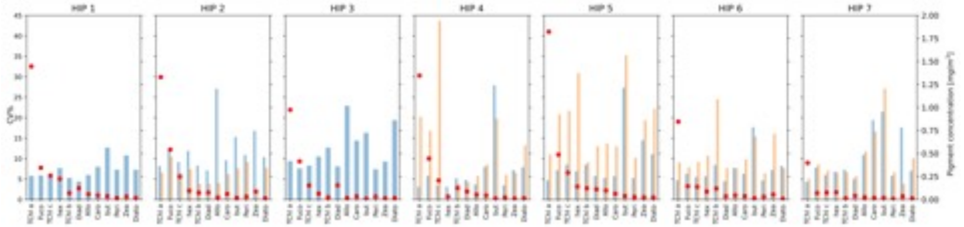
Standard



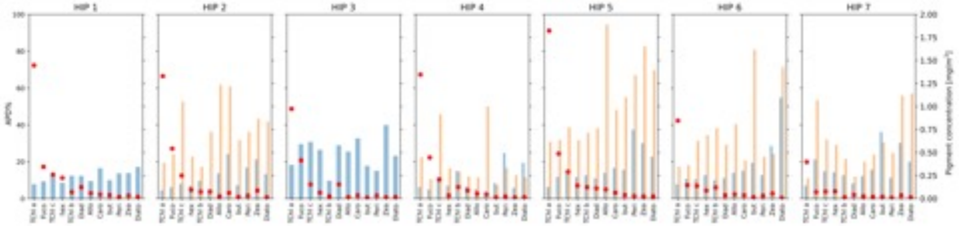
Natural Samples



Precision



Accuracy



Advantages: comparison extended to standards materials;
Disadvantages: required more complex organization