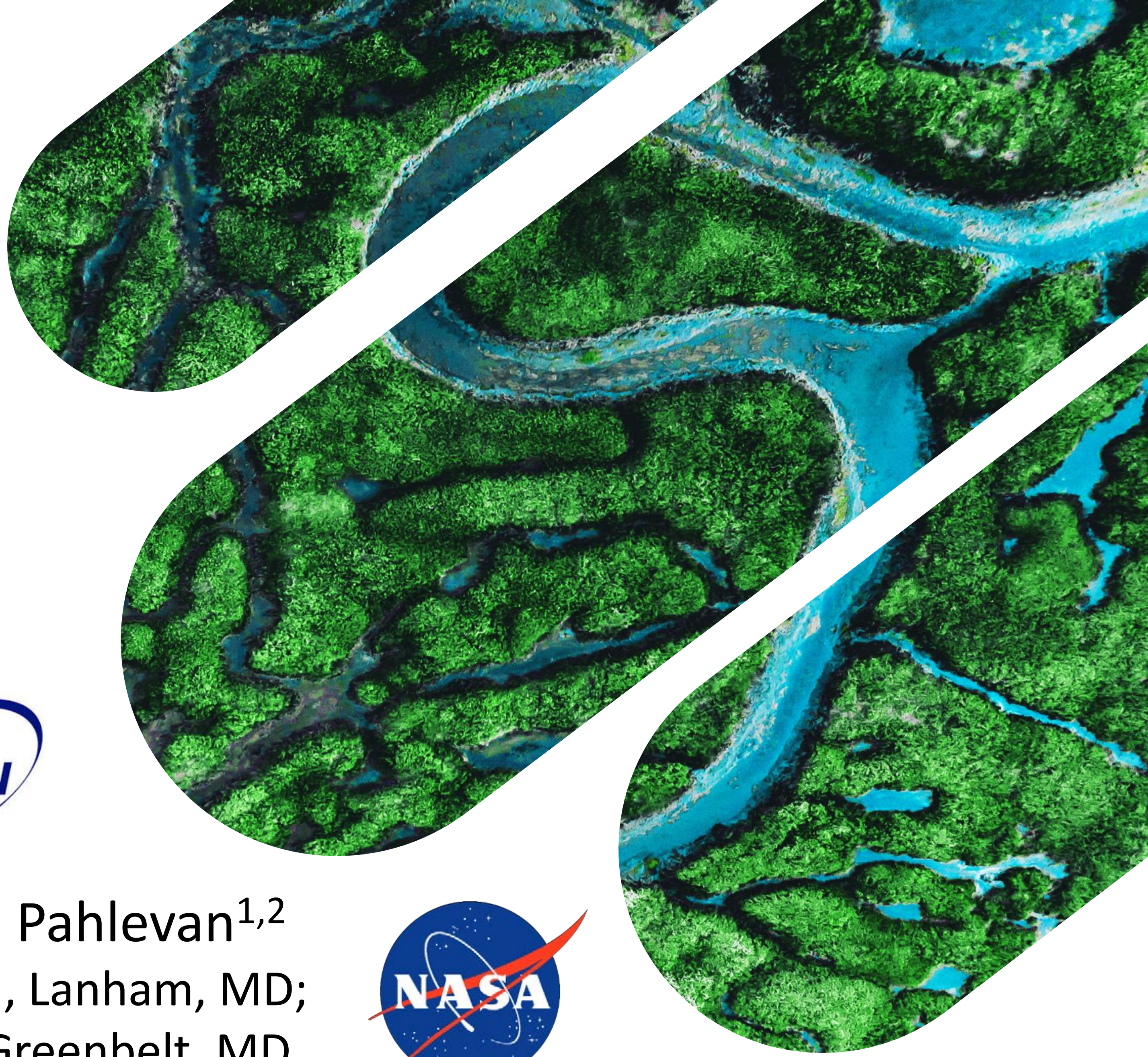
International Ocean Colour Science Meeting 2023 | Advancing Global Ocean Colour Observations

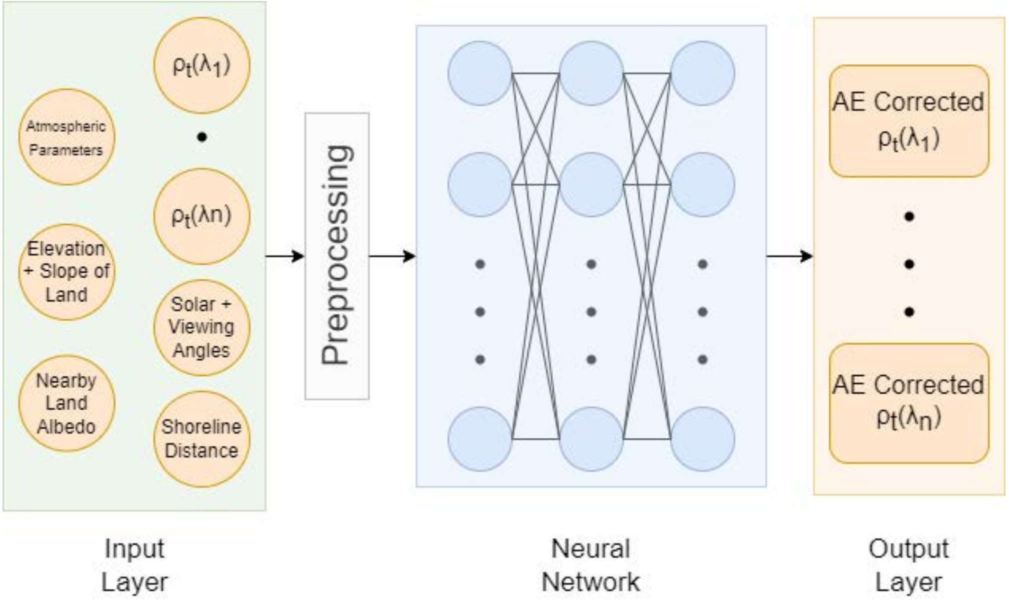
Poster Session 2 Lightning Talks

Developing a Data-Driven Model to Minimize Adjacency Effects in Landsat-8 Imagery



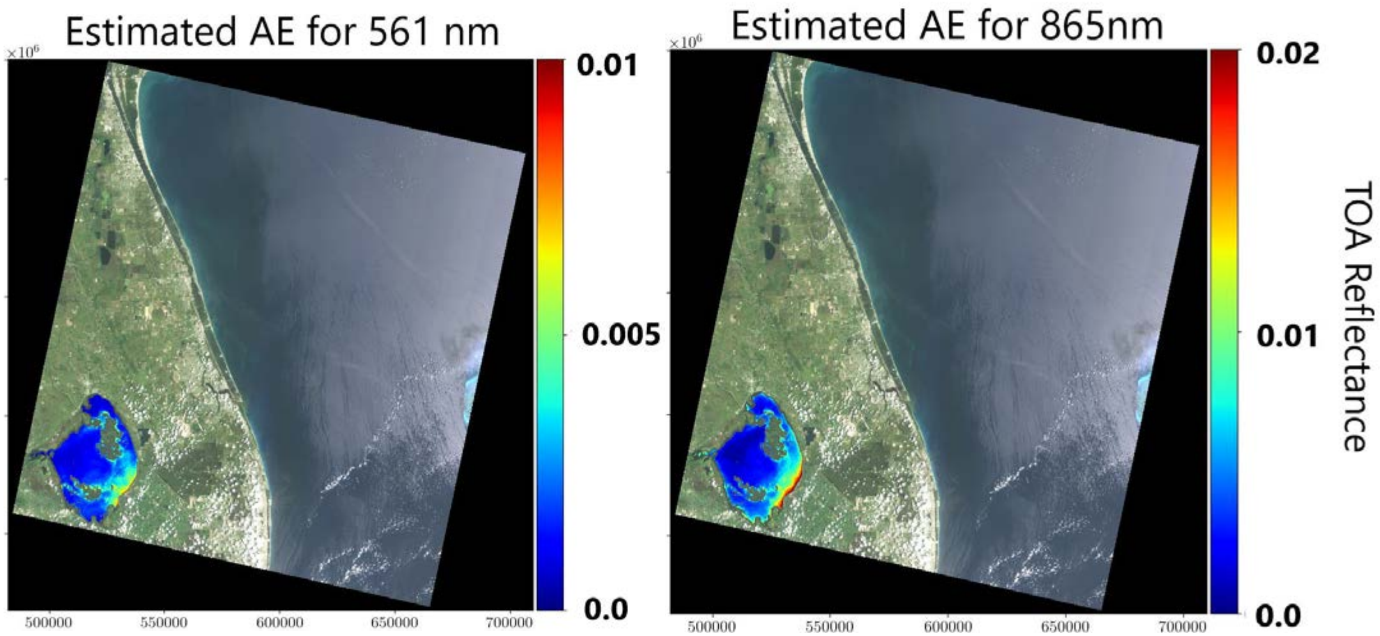
Christopher Begeman[1,2] & Nima Pahlevan[1,2]
[1]Science Systems and Applications Inc., Lanham, MD;
[2]NASA Goddard Space Flight Center, Greenbelt, MD

Mixture Density Network Design

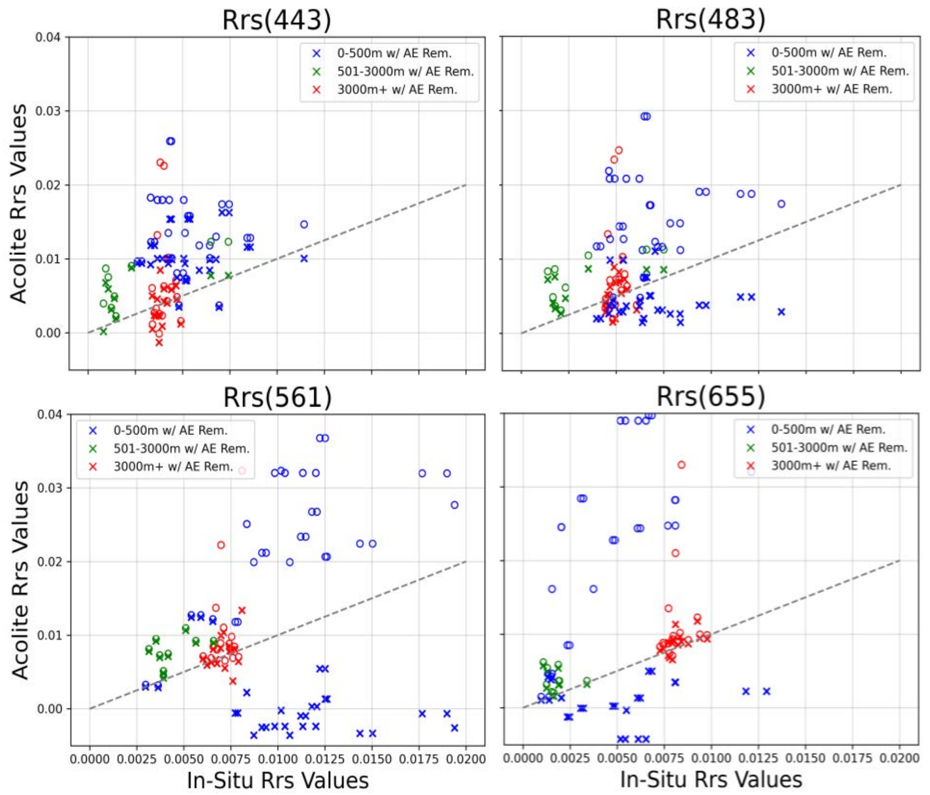


For more in-depth information please visit poster #4

AE Estimations for Lake Okeechobee



AE Validations from In-Situ Matchups

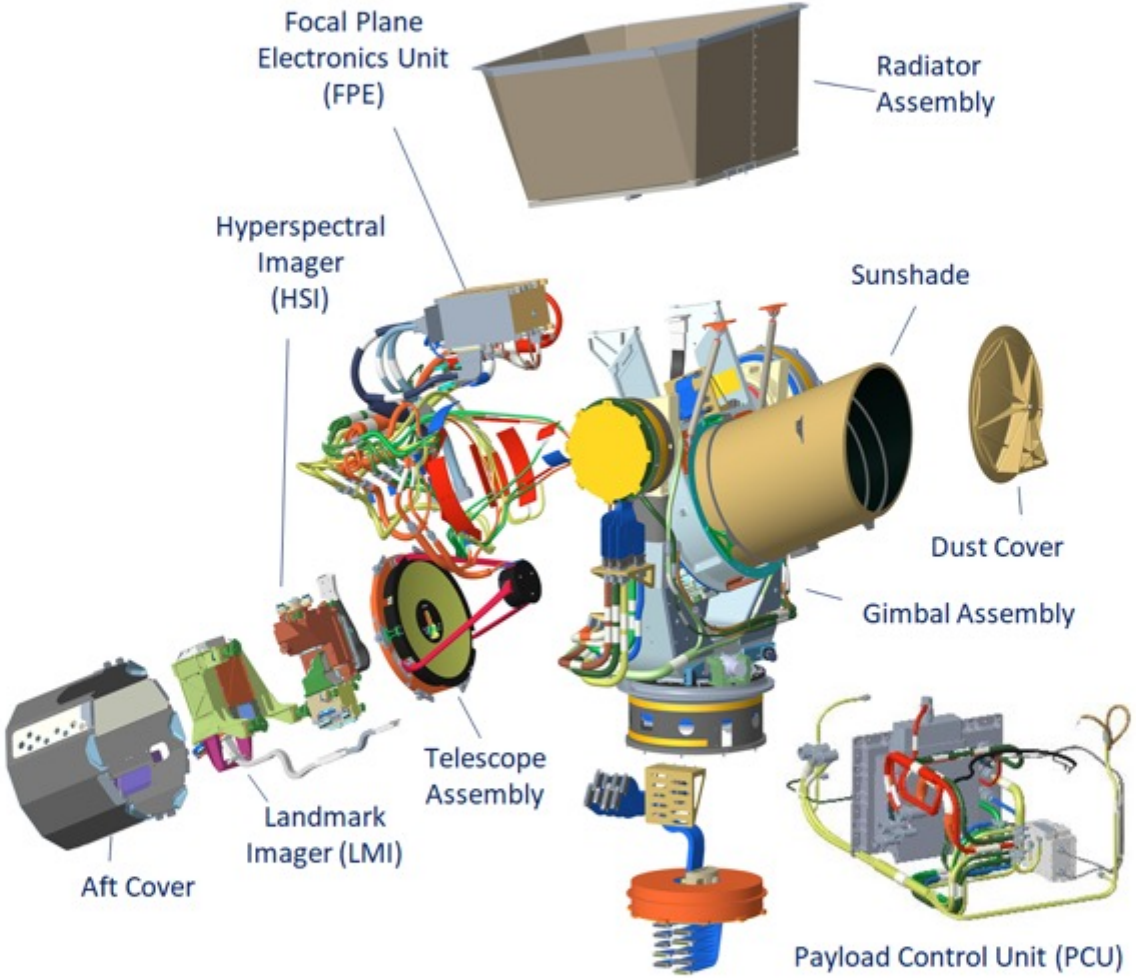


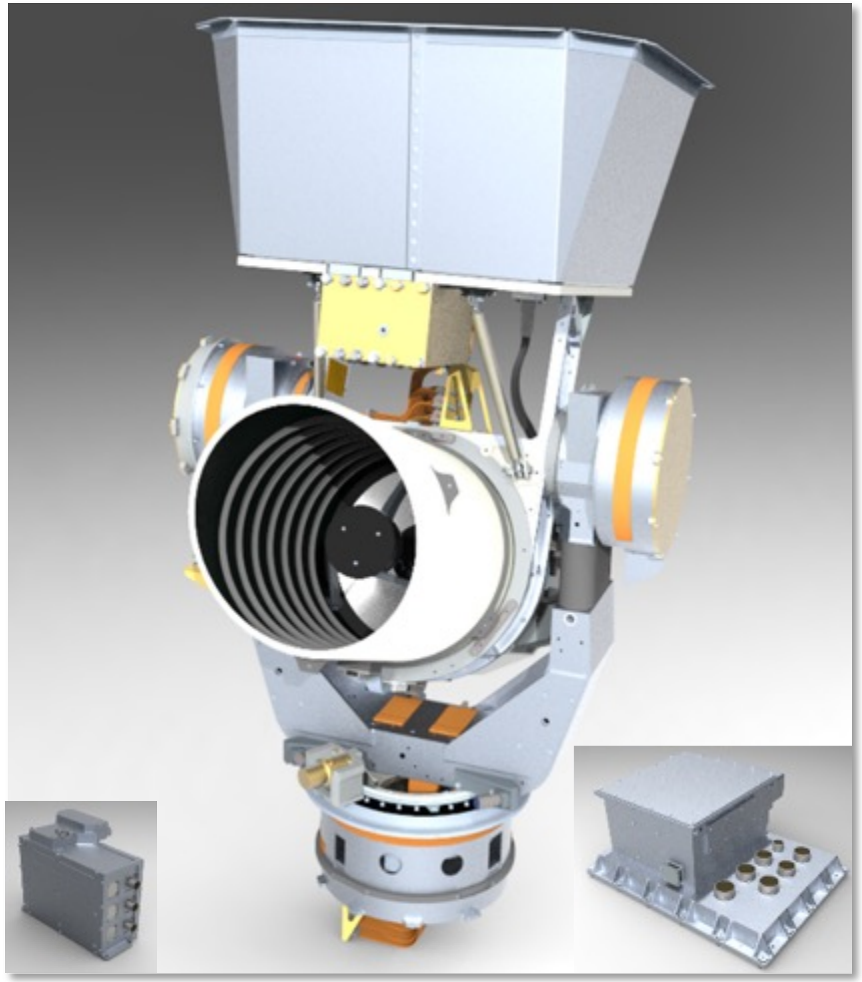
Poster Title: **Geostationary Littoral Imaging and Monitoring Radiometer (GLIMR) Instrument Overview**

Author Names: Dustin Berkovitz[1], John Bloomer[1], Steven Persh[1]

Affiliations: [1] Raytheon, El Segundo, CA

GLIMR Instrument Leverages Existing Hardware and Designs to Enable Pathfinding GEO Ocean Color Science in an Affordable System





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Michigan Tech Research Institute
www.mtri.org

First investigation of freshwater hyperspectral backscattering across multiple trophic levels in the Laurentian Great Lakes

Karl Bosse, Michigan Tech Research Institute (MTRI), krbosse@mtu.edu

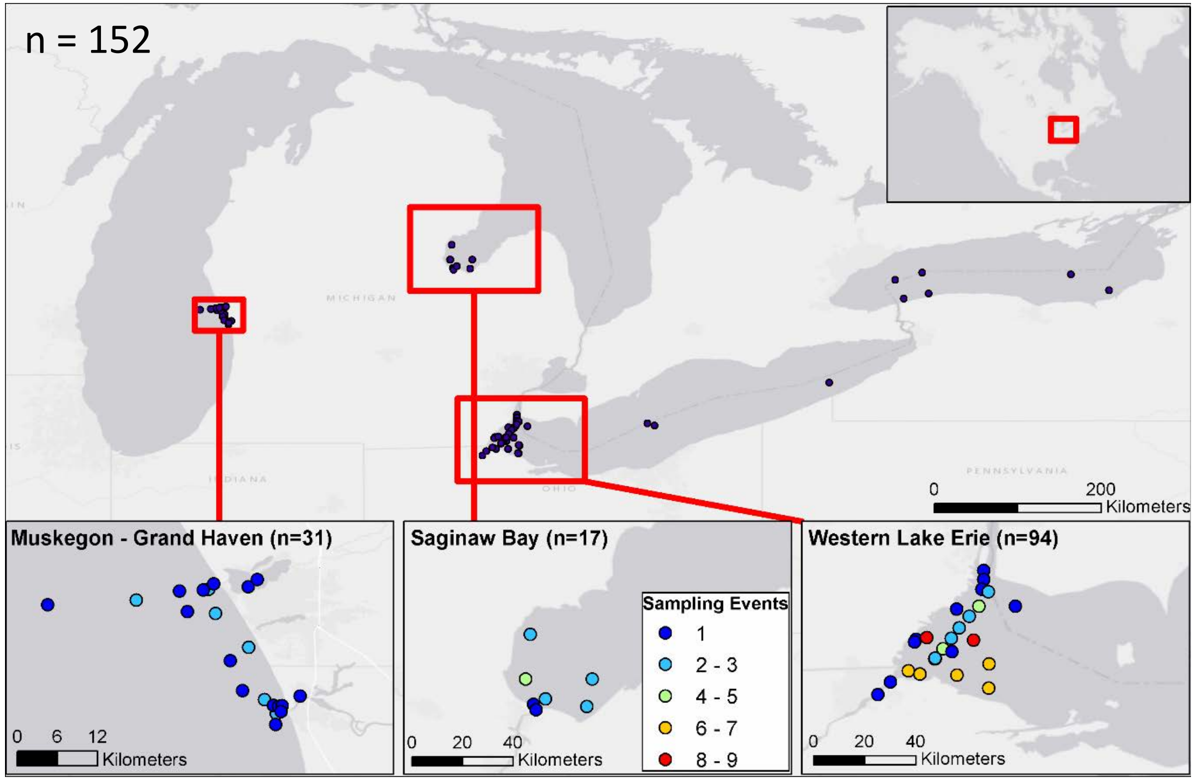
Mike Sayers, PhD, MTRI,

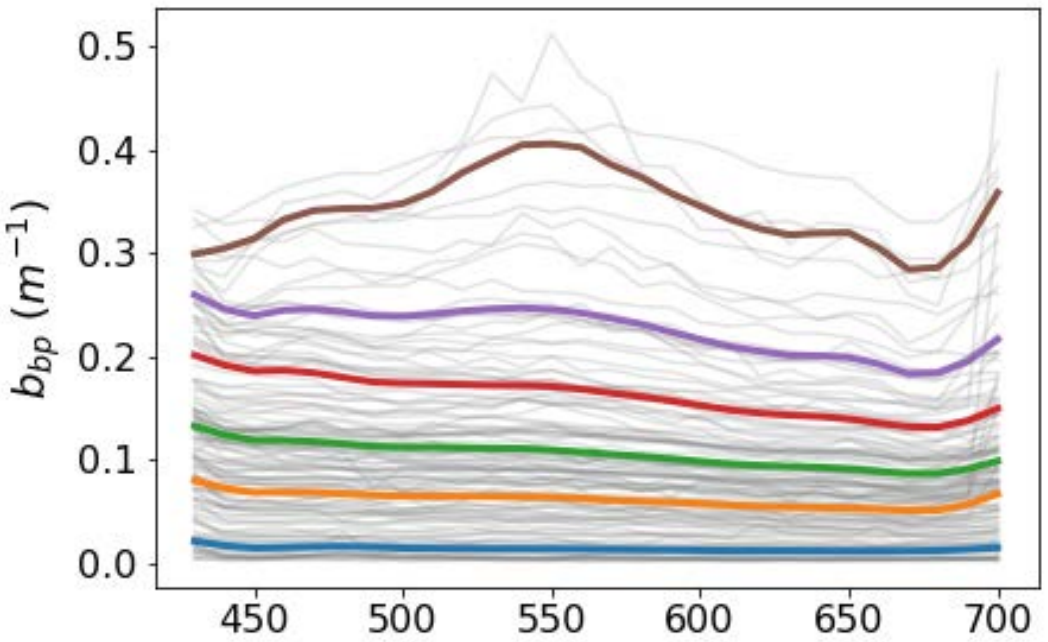
Andrea Vander Woude, PhD, NOAA GLERL

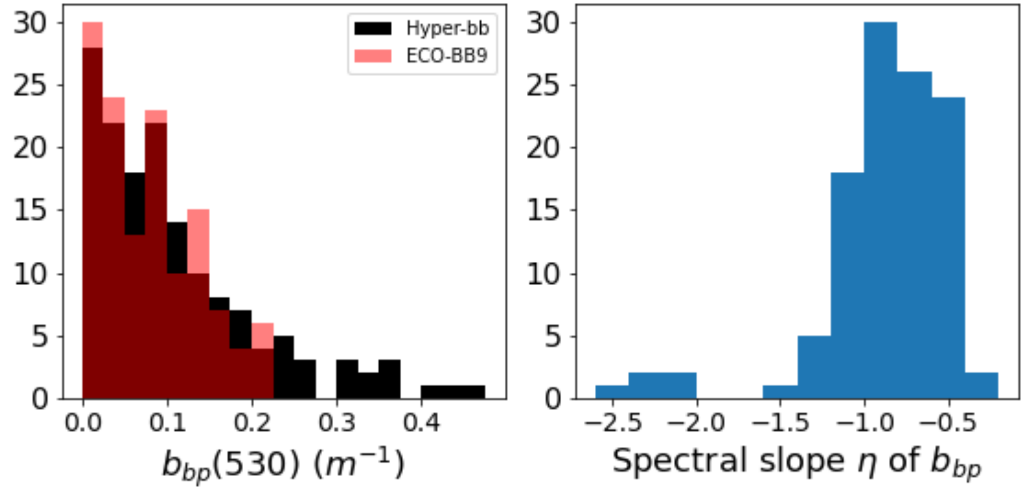
GLERL Great Lakes Environmental Research Laboratory

Michigan Tech Research Institute

Exploration of new hyperspectral b_{bp} dataset







SQOOP: Spaceborne Quantification of Ocean micrO-Plastics

Heidi M. Dierssen, University of Connecticut
Graham Trolley, M.S. Student, UCONN
Kirk Knobelspiesse, NASA GSFC
Amir Ibrahim, NASA GSFC
Jacek Chowdhary, Columbia University/ NASA GISS
Matteo Ottaviani, Terra Research Inc / NASA GISS
Oskar Landi, Photographer, Consultant
Lorraine Remer, Univ. Maryland Baltimore County
Shungu Garaba, Univ. Oldenburg

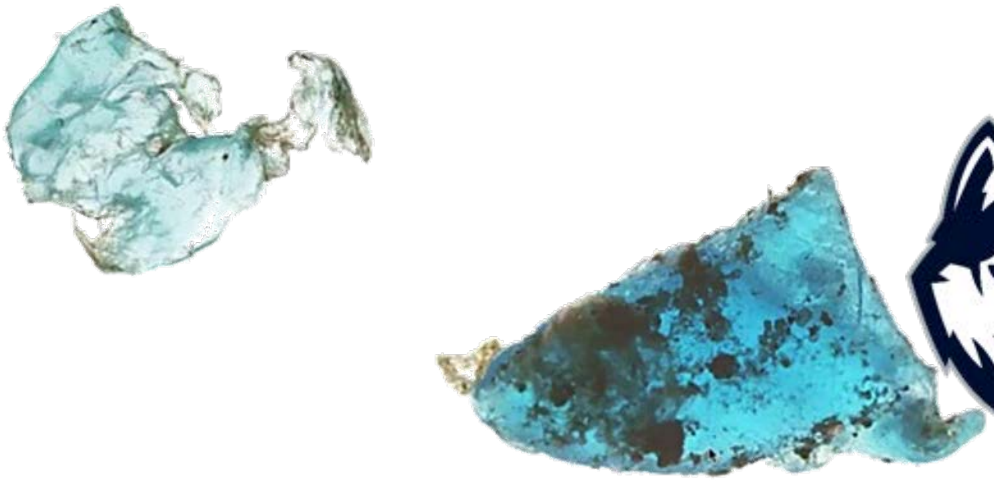
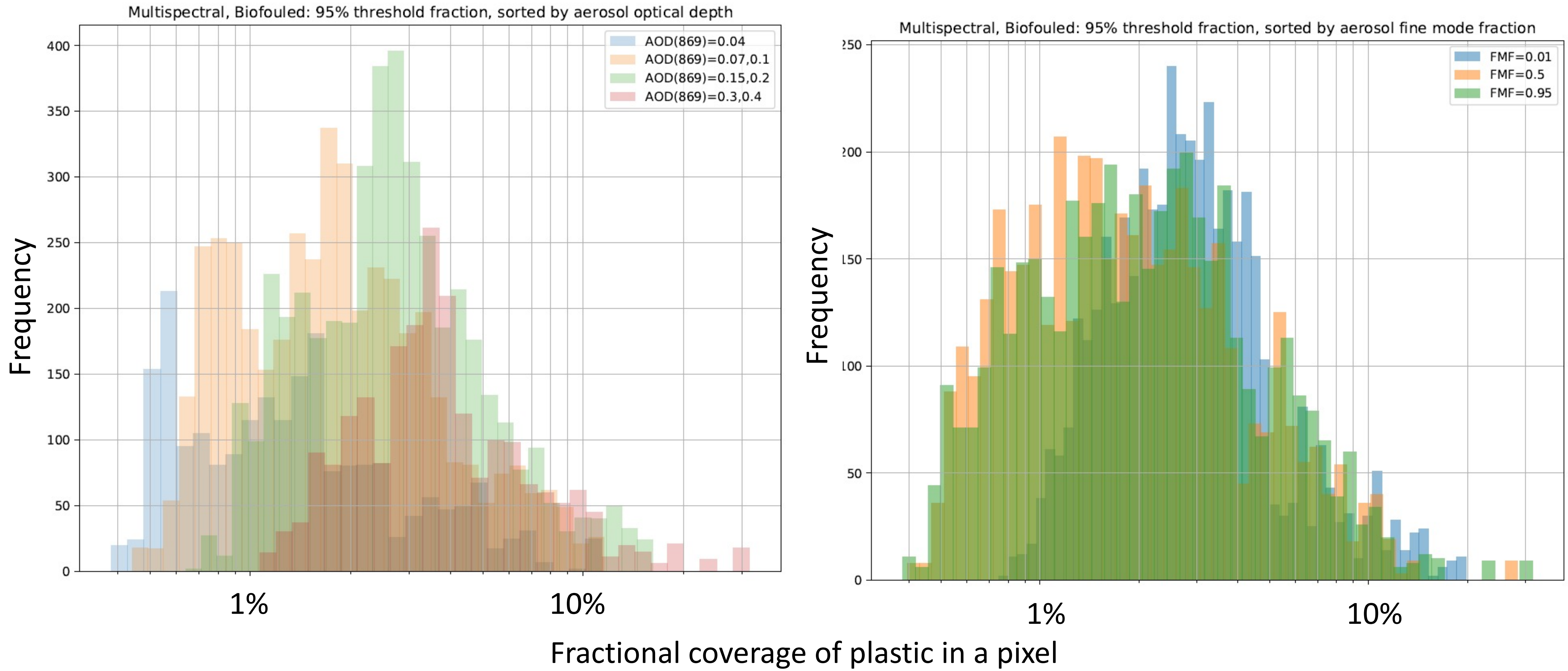


Photo Credit: Oskar Landi

- Our analysis reveals potential for detecting plastics at concentrations **100 times greater** than those reported in the gyre
- Improved detection ability is observed under ideal conditions with low Aerosol Opitcal Depth (AOD) and small Aerosol Fine Mode Fraction (FMF)



Deriving inherent optical properties and associated uncertainties from decomposition of hyperspectral non-water absorption

Brice Grunert[1*], Audrey Ciochetto[1,2], Colleen Mouw[2]

[1]Cleveland State University [2]University of Rhode Island [*]b.grunert@csuohio.edu

CSU Cleveland State University

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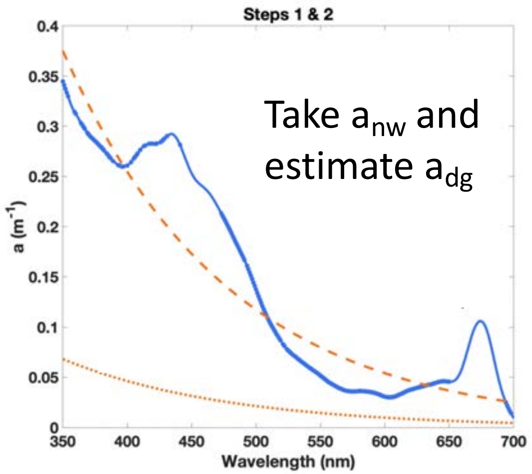
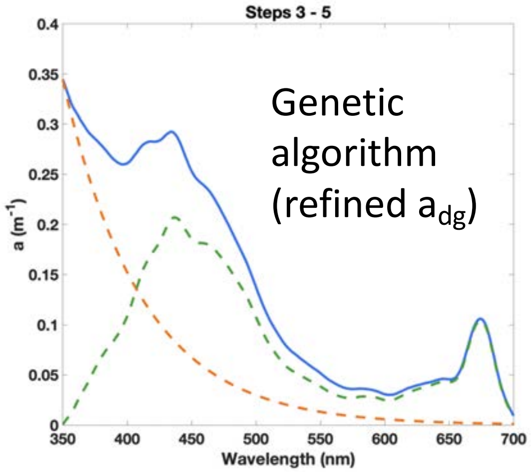
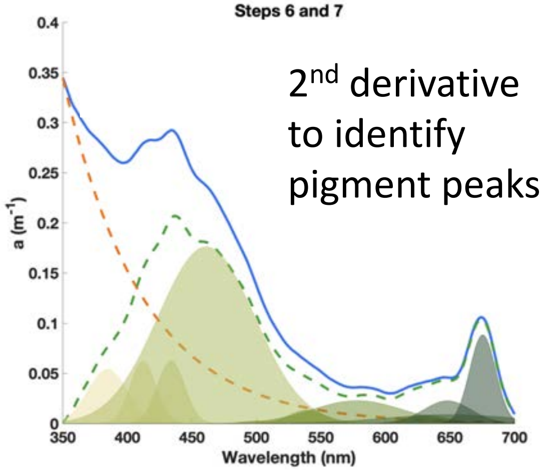
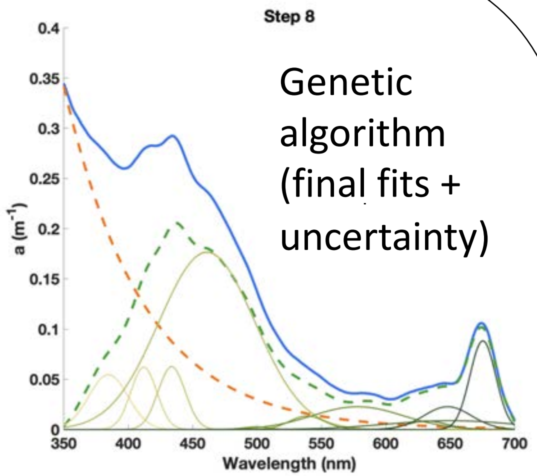
DAISEA

(Derivative Analysis and Iterative Spectral Evaluation of Absorption)





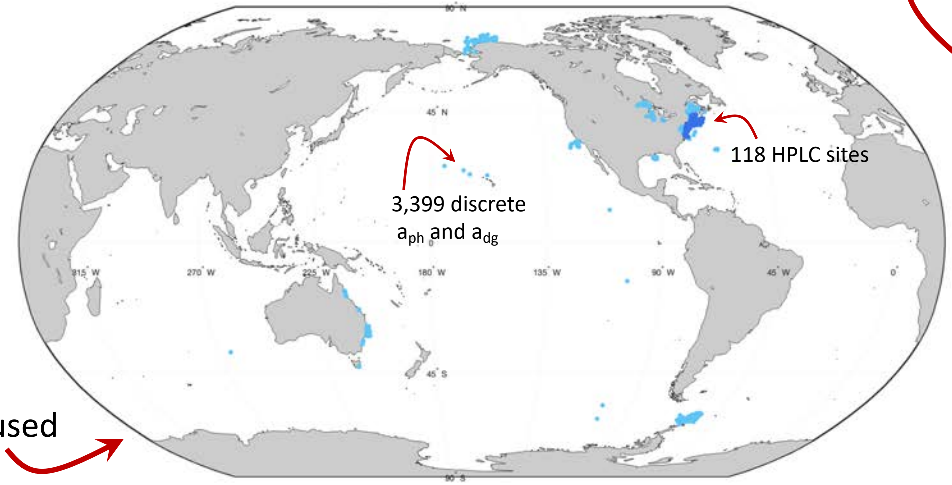


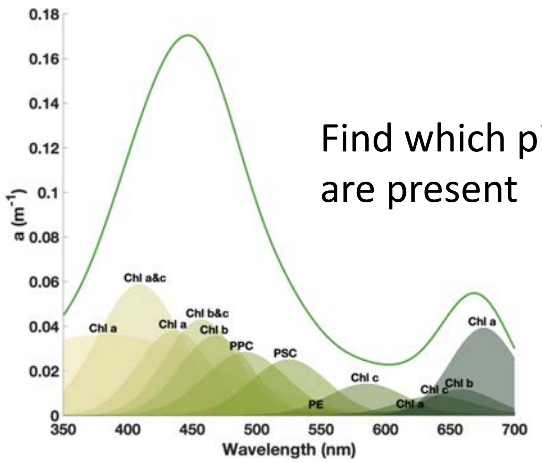


What does DAISEA2 do?

- Takes a_{nw} and splits it into a_{dg} and a_{ph}
- Estimates the slope of a_{dg}
- Finds pigments that make up a_{ph}

Data we used





Find which pigments are present

Come see our poster to see how it performs!

Hyperspectral UV-Blue Atmospheric Correction for the Ocean Color Instrument (OCI)

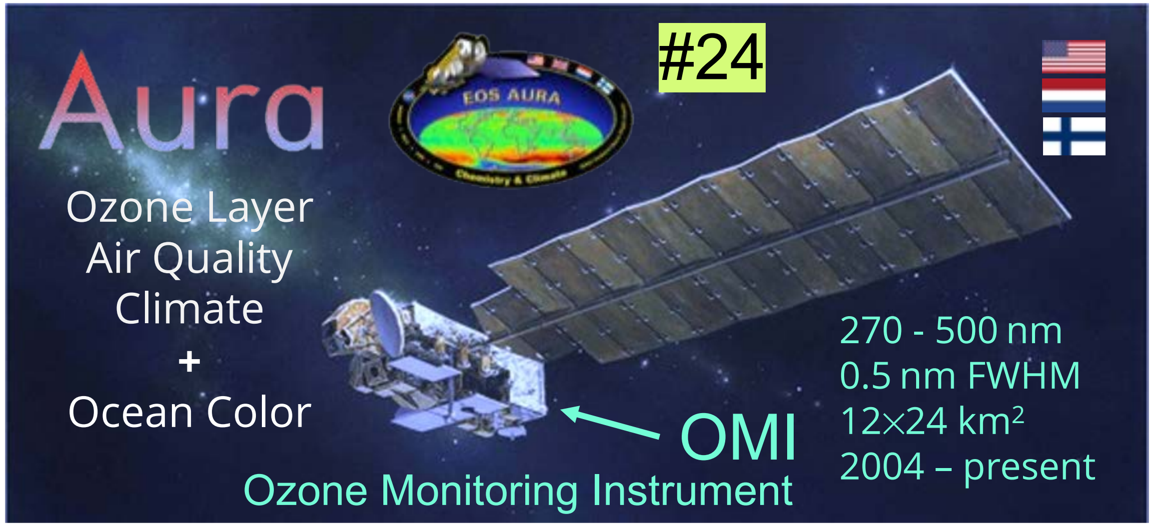
David P. Haffner[1,2], Nickolay A. Krotkov[2] , Alexander P. Vasilkov[1,2], Zachary T. Fasnacht[1,2], Robert J. D. Spurr[3] , Patricia Castellanos[2], Joanna Joiner[2], Omar Torres[2], Changwoo Ahn[1,2], Wenhan Qin[1,2]

[1]Science Systems and Applications, Inc.
[2]NASA Goddard Space Flight Center
[3]RT Solutions, Inc.

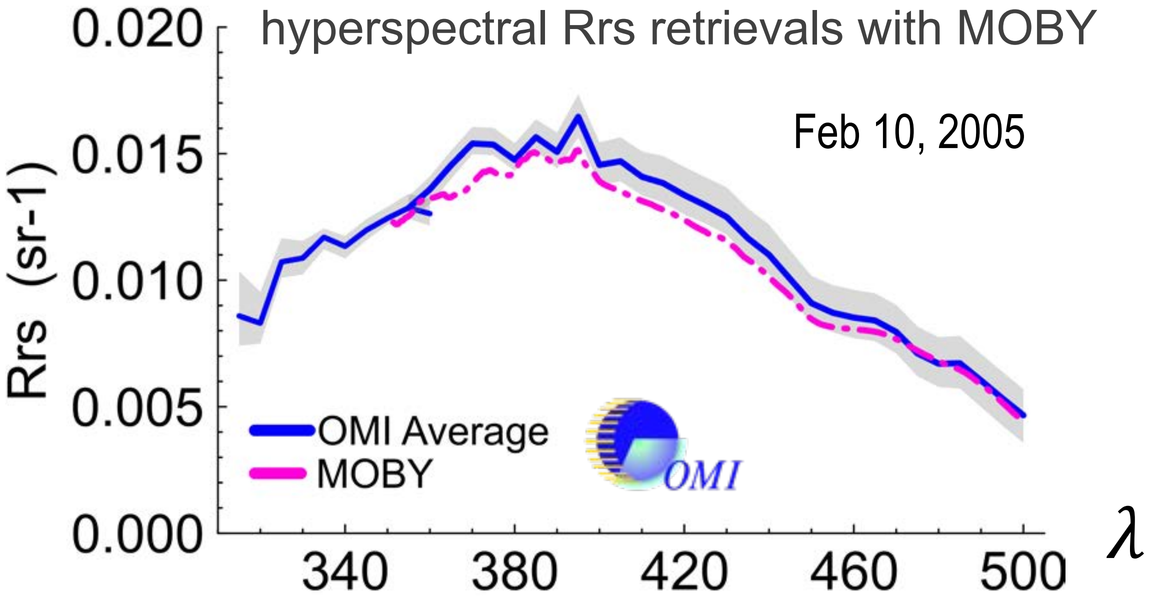
Poster 24

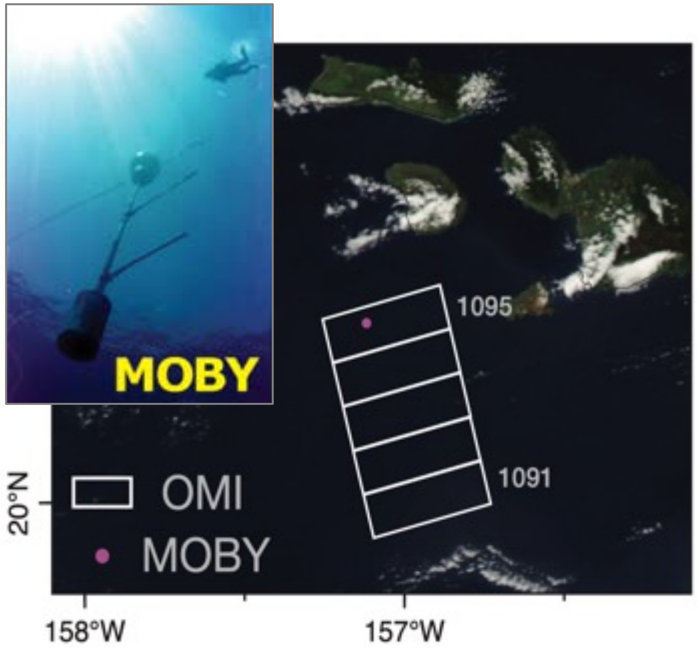
International Ocean Color Science Meeting
13-17 November 2023, St. Petersburg, FL

RTM-based atmospheric correction algorithm for OCI in the UV and blue



Comparison of on-orbit OMI/OCI hyperspectral Rrs retrievals with MOBY





- Hyperspectral satellite Rrs retrievals from Aura/OMI have been used to demonstrate our UV-blue OCI AC.
- OCI proxy data prepared fm. smoothed OMI UV-blue spectra.
- Online ocean-atmosphere RTM calculations using VLIDORT.
- Using assimilated aerosol optical properties (MERRA-2) with AOD scaled to OMI retrievals.
- MOBY Rrs comparisons used to evaluate our AC approach.

Introduction of the novel OLCI Atmospheric Correction for diverse Optical Water Types A4O

Poster #25

Martin Hieronymi [1], **Shun Bi** [1], **Daniel Behr** [1] & **Eike M. Schütt** [1,2]

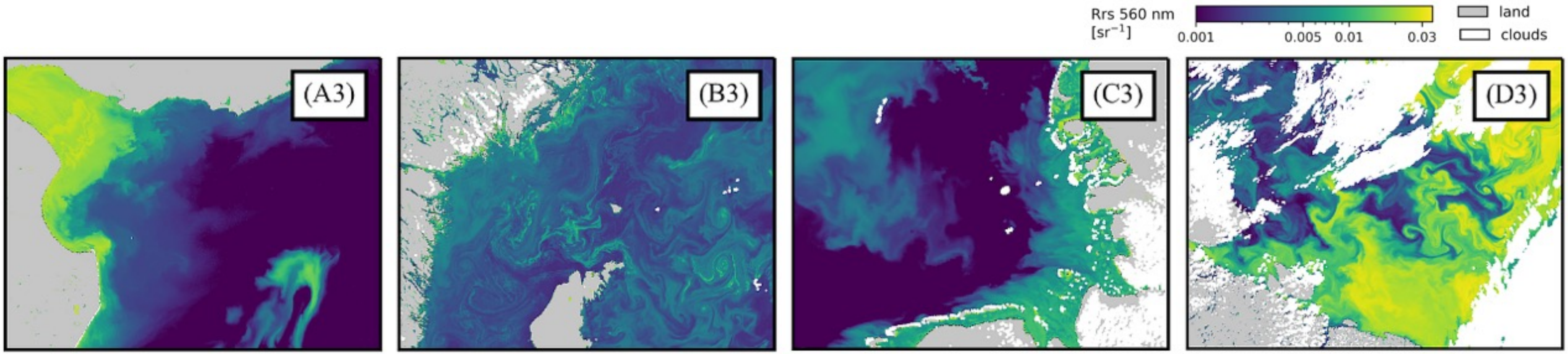
1) Department of Optical Oceanography, Institute of Carbon Cycles, Helmholtz-Zentrum Hereon, Geesthacht, Germany
2) Earth Observation and Modelling, Kiel University, Kiel, Germany

2023 International Ocean Colour Science Meeting
St. Petersburg, FL, USA, 14-17 November 2023

Helmholtz-Zentrum hereon

Bridging optical Oceanography & Limnology

- A4O is a novel atmospheric correction for OLCI designed for all natural waters
- Special emphasis on absorbing (dark) and scattering (bright) waters & phytoplankton diversity
- Features: Provides realistic Rrs spectra, high classifiability in diverse OWT frameworks, low AC-induced noise (high number of possible match-ups), internal estimate of uncertainties, useful flagging



No. 30

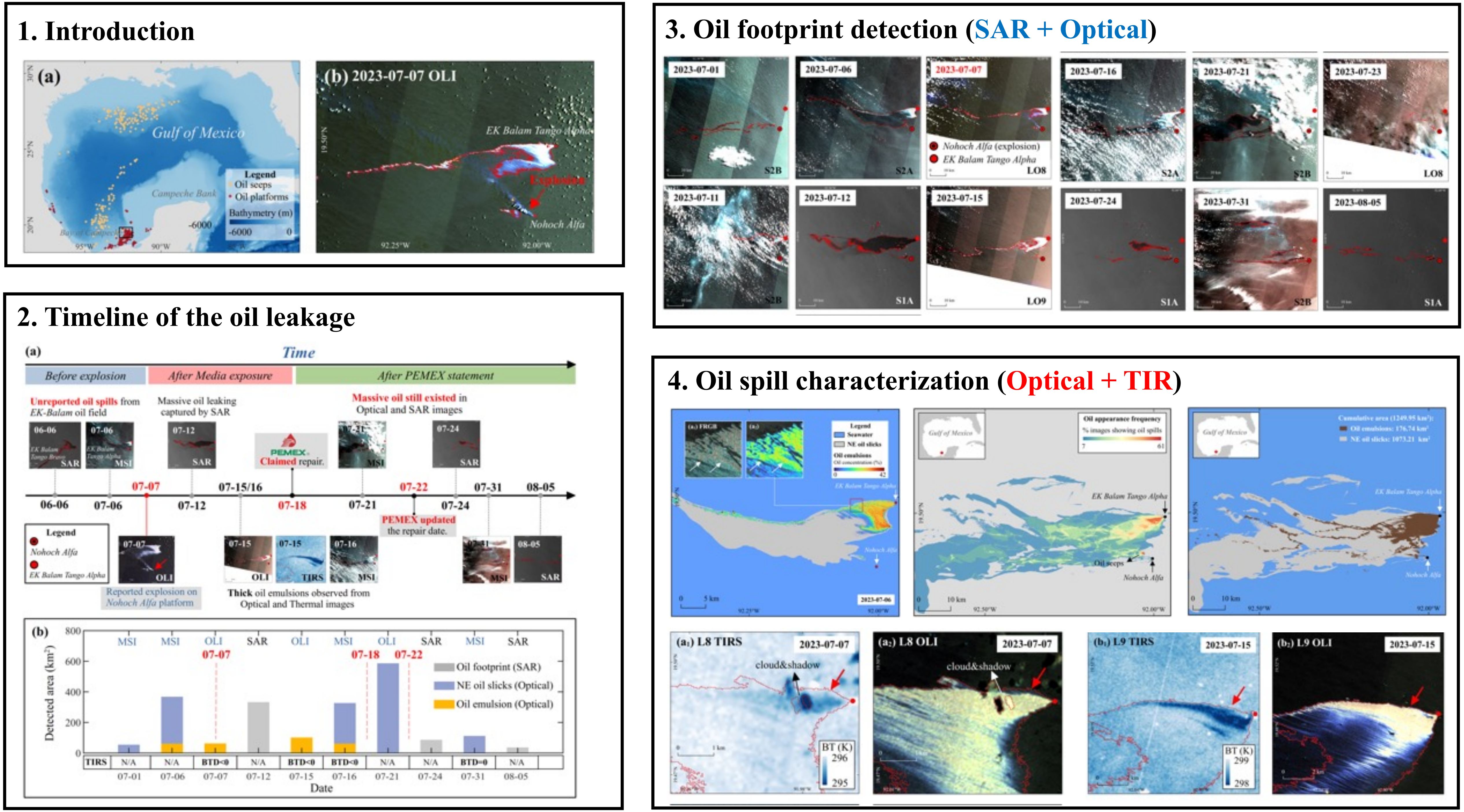
Multi-sensor assessment of accidental oil spills in the Bay of Campeche

Junnan Jiao[1, 2], Chuanmin Hu[2], Yingcheng Lu[1], and Yongxue Liu[1]

1 International Institute for Earth System Science, Nanjing University, Jiangsu, 210046, China;
2 College of Marine Science, University of South Florida, St. Petersburg, FL, 33701, USA;

Corresponding to: Y. Lu (luyc@nju.edu.cn), C. Hu (huc@usf.edu)

International Ocean Colour Science Meeting 2023


1. Introduction
(a)
Gulf of Mexico
Campeche Bank
Bay of Campeche
Legend
Oil seeps
Oil platforms
Bathymetry (m)
-6000
0
95°W
90°W
(b) 2023-07-07 OLI
EK Balam Tango Alpha
Explosion
Nohoch Alfa
92.25°W
92.00°W
2. Timeline of the oil leakage
(a)
Time
Before explosion
After Media exposure
After PEMEX statement
Unreported oil spills from EK-Balam oil field
Massive oil leaking captured by SAR
Massive oil still existed in Optical and SAR images
PEMEX Claimed repair.
PEMEX updated the repair date.
Legend
Nohoch Alfa
EK Balam Tango Alpha
Reported explosion on Nohoch Alfa platform
Thick oil emulsions observed from Optical and Thermal images
06-06
07-06
07-07
07-12
07-15/16
07-18
07-21
07-22
07-24
07-31
08-05
(b)
Detected area (km²)
Oil footprint (SAR)
NE oil slicks (Optical)
Oil emulsion (Optical)
TIRS
N/A
BTD<0
BTD=0
Date
3. Oil footprint detection (SAR + Optical)
2023-07-01
2023-07-06
2023-07-07
2023-07-16
2023-07-21
2023-07-23
2023-07-11
2023-07-12
2023-07-15
2023-07-24
2023-07-31
2023-08-05
Nohoch Alfa (explosion)
EK Balam Tango Alpha
S2B
S2A
LO8
LO9
S1A
4. Oil spill characterization (Optical + TIR)
Oil appearance frequency
Cumulative area (1249.95 km²):
Oil emulsions: 176.74 km²
NE oil slicks: 1073.21 km²
Oil seeps
(a₁) L8 TIRS 2023-07-07
(a₂) L8 OLI 2023-07-07
(b₁) L9 TIRS 2023-07-15
(b₂) L9 OLI 2023-07-15
cloud&shadow
BT (K)

U.S. NAVAL RESEARCH LABORATORY

POSTER 31

Operational Application of Satellite Ocean Color Data to Improve Ocean Model Performance

Jason K. Jolliff, Travis A. Smith, Sherwin Ladner, Richard L. Crout, Adam Lawson

All Authors:

U.S. Naval Research Laboratory

Stennis Space Center, Mississippi, USA

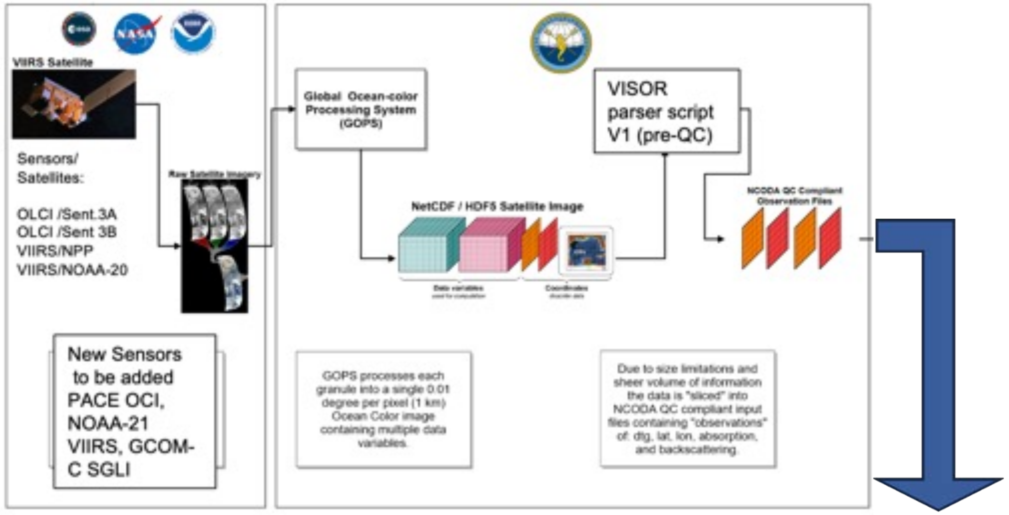
Operational Application of Satellite Ocean Color Data to Improve Ocean Model Performance

U.S. NAVAL RESEARCH LABORATORY

POSTER 31

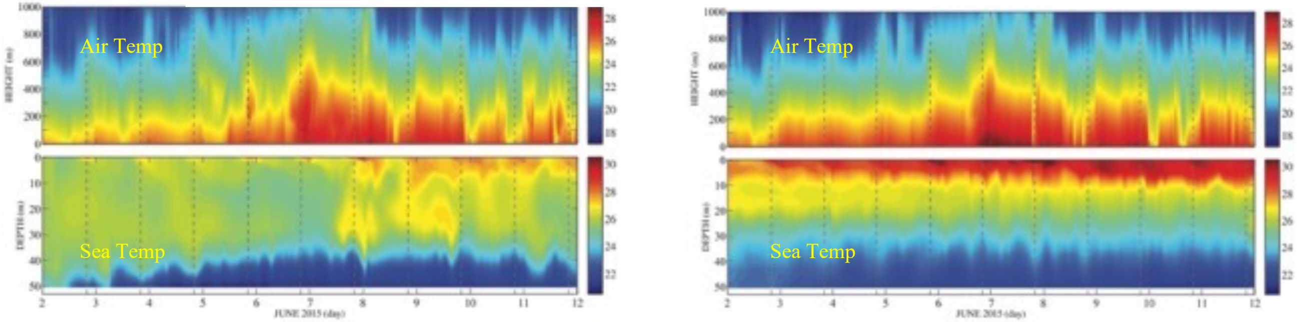
6.4 Visible Band Satellite Data to Improve Ocean Model Radiative Transfer (VISOR)

CONOPS



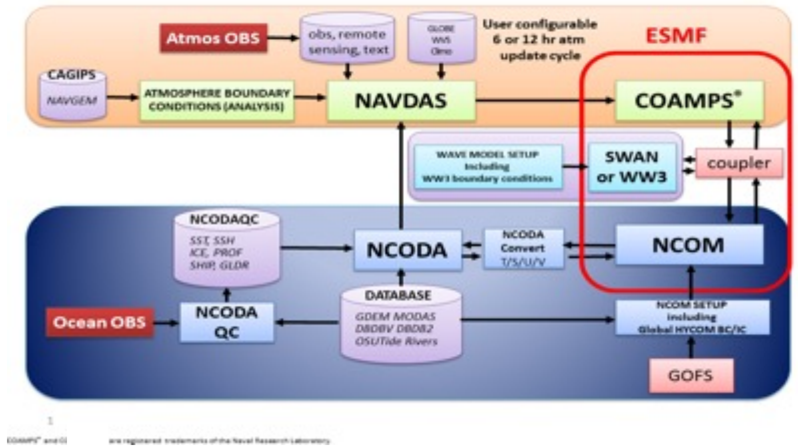
Operational Modeling Systems FNMOC

COAMPS Air-Sea Sensitivity



CONTROL **Realistic Attenuation**

COAMPS (Air/Ocean/Wave Current Configuration)

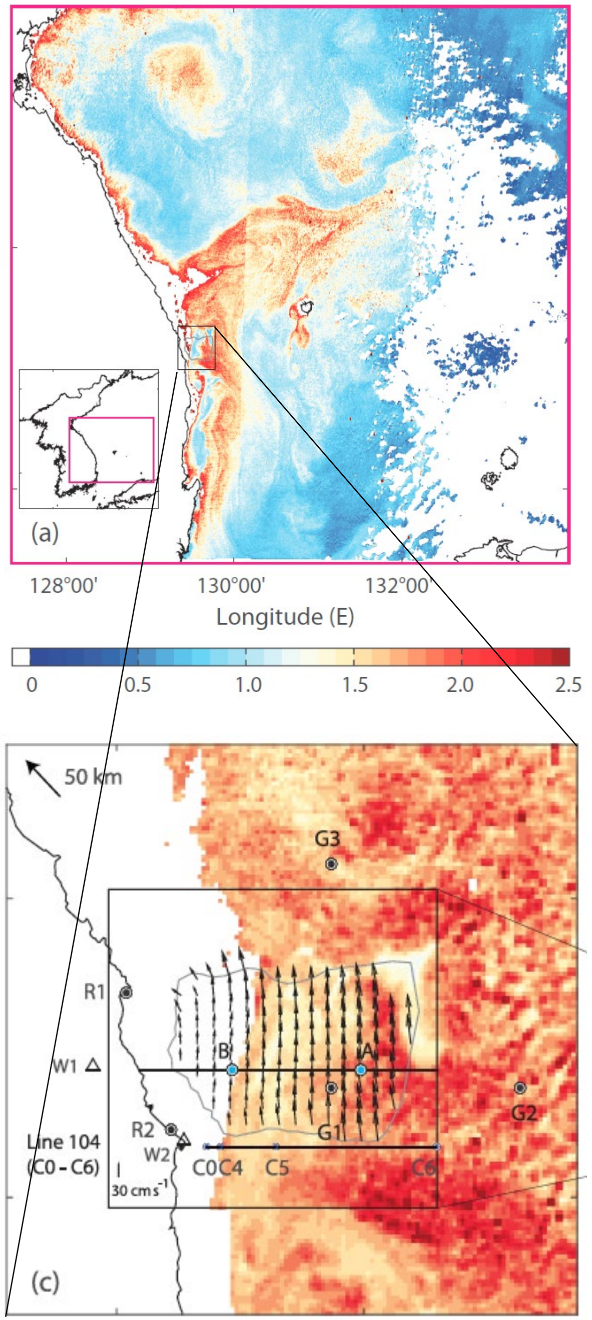


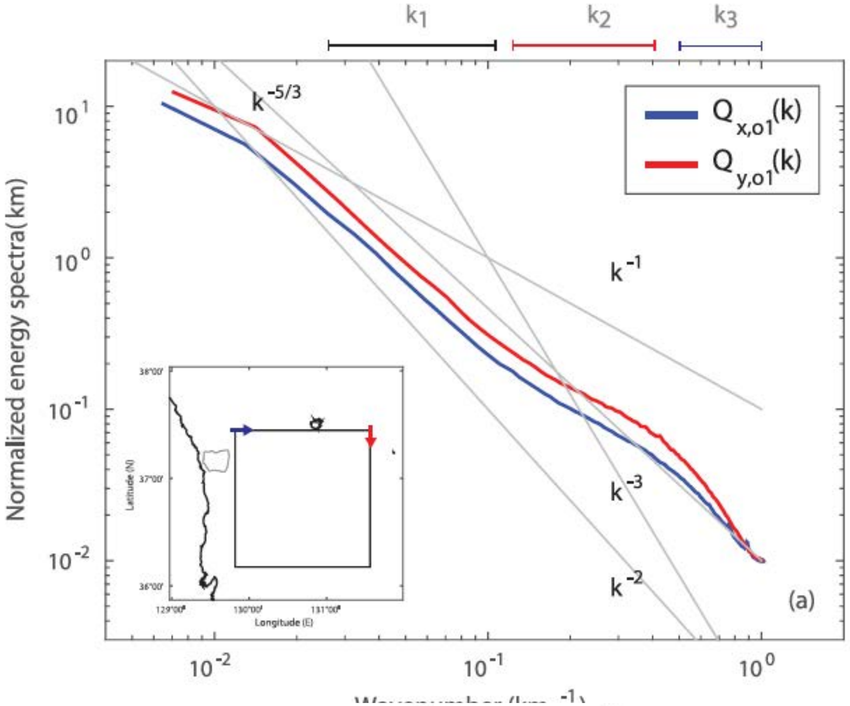
#2727

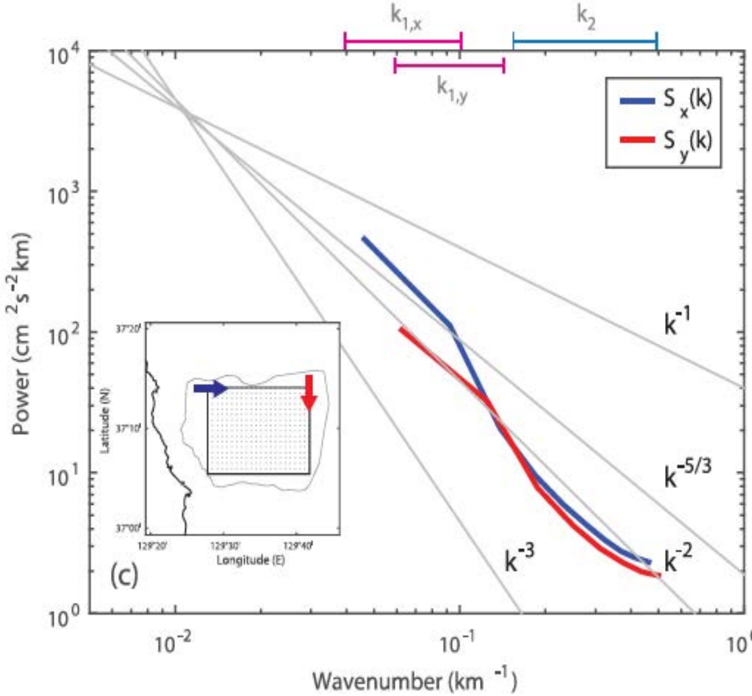
Studies of oceanic geophysical turbulence using observations of geostationary ocean color imageries

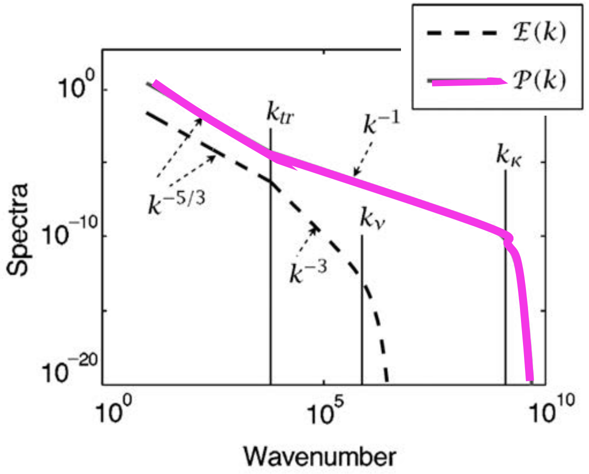
Eun Ae Lee and Sung Yong Kim

Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology,

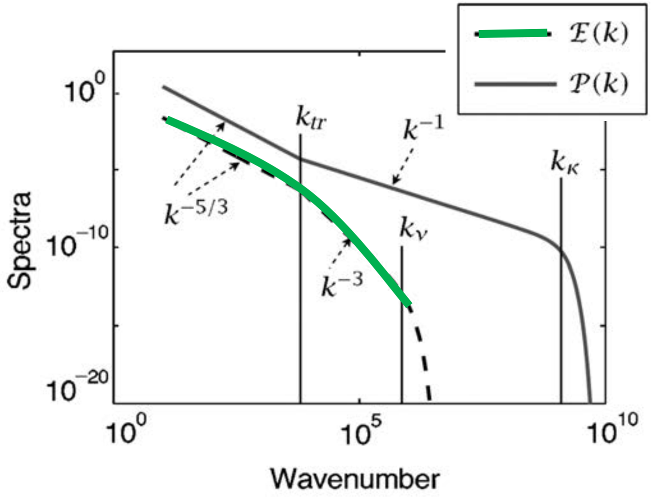








- Geostationary ocean color imagery (GOCI)-derived 0.5 km and daytime hourly chlorophyll concentration maps (CHLs; 8 times a day): Tracers
- High-frequency radar (HFR)-derived 1-km and hourly surface currents: Currents

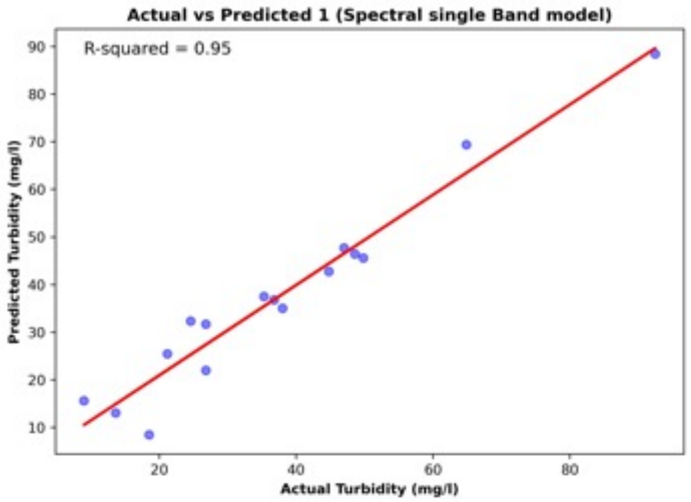


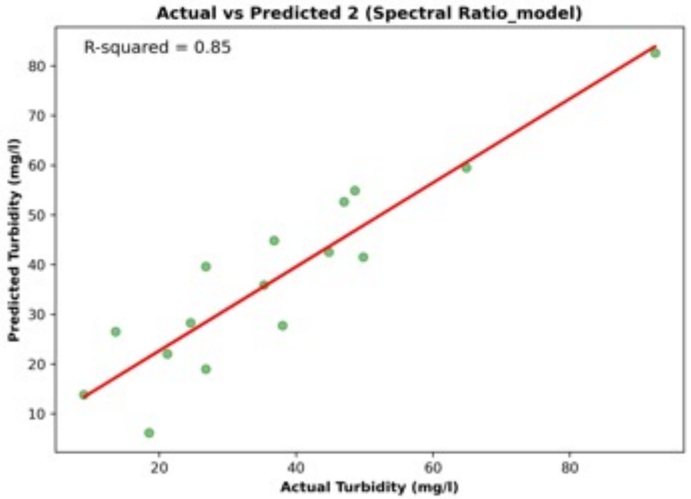
SPATIAL - TEMPORAL DYNAMICS OF WATER QUALITY IN LAKE OKEECHOBEE AND ITS IMPACT ON ENVIRONMENTAL HEALTH

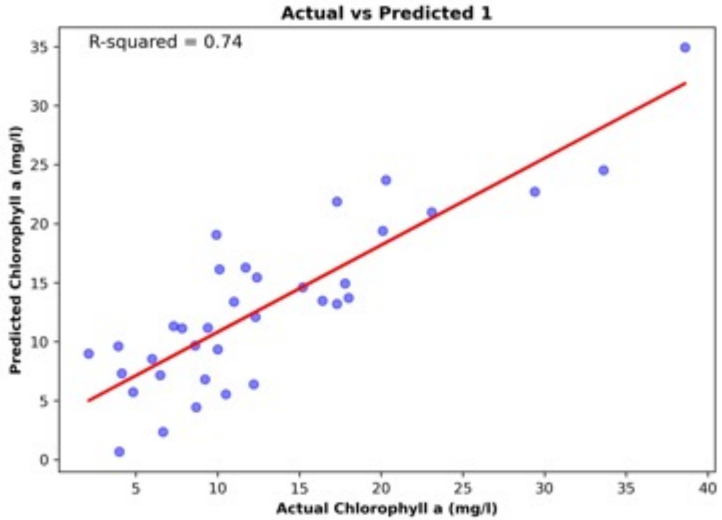
Moses Kiwanuka, Rafael Carbonell, Andrea Bustos, Kimberly Gutierrez, Maruthi Sridhar Balaji Bhaskar.

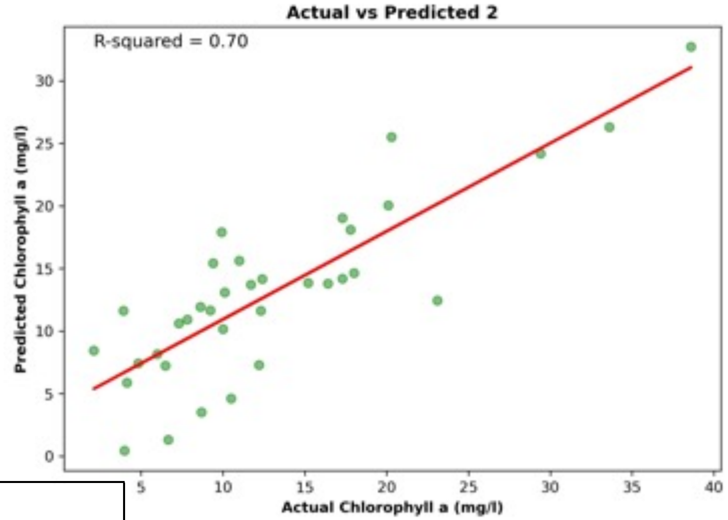
Department of Earth and Environment, Florida International University, 11200 SW 8th St, Miami, FL 33199.

Poster #33







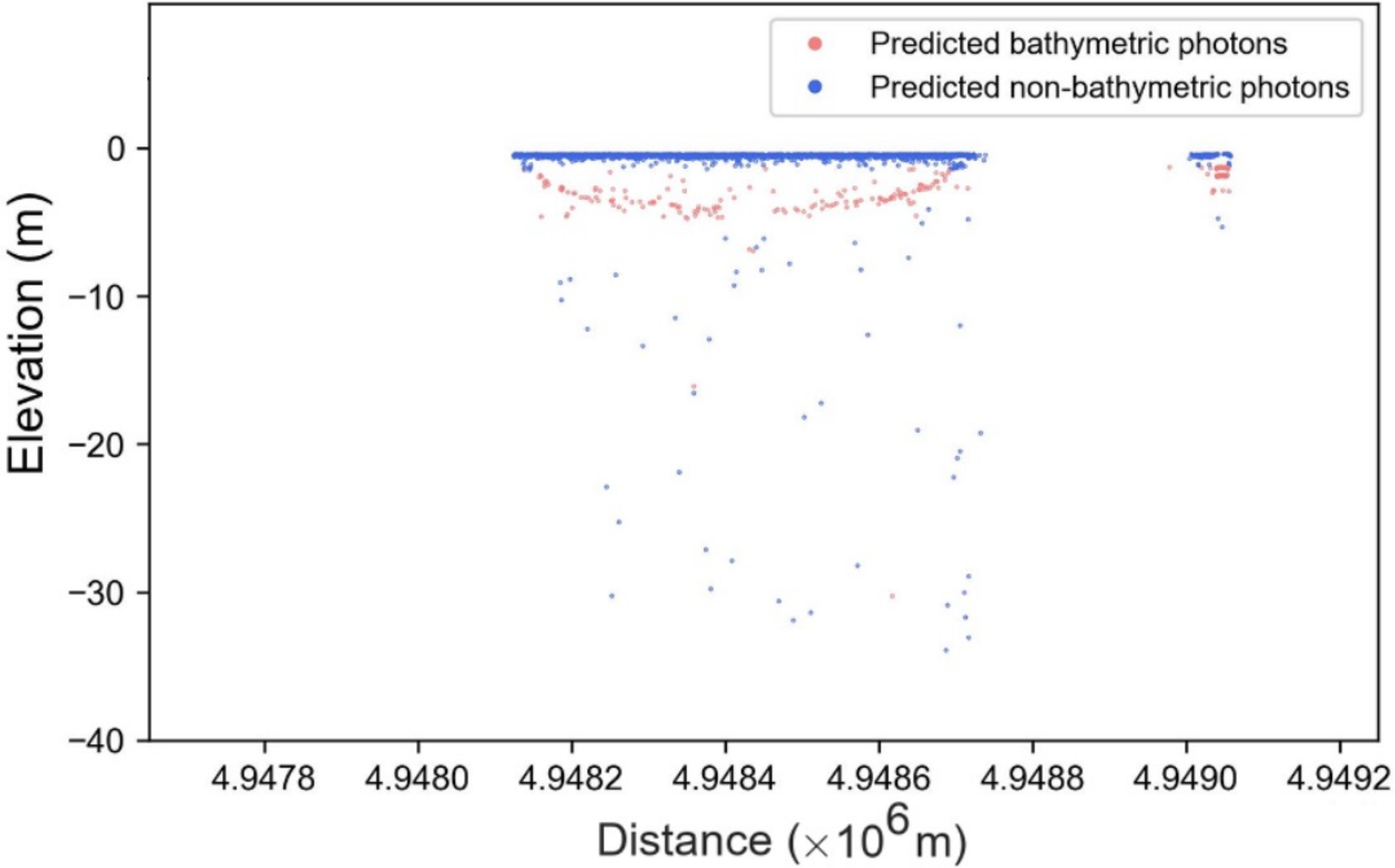


Element	Best Spectral single and Ratio Models
	-23.16 + 0.14934 DOSB5 - 0.1246 DOSB6
Turbdity	-230.2 + 175.8 R21 + 125.7 R54
	26.52 - 0.1171 DOSB2 + 0.0859 DOSB3 - 0.03035 DOSB5 + 0.1388 DOSB7 - 0.0431 DOSB9
Chlorophyll a	140.0 - 137.3 R21 + 50.39 R41 - 39.8 R43 - 22.52 R52 + 40.75 R61

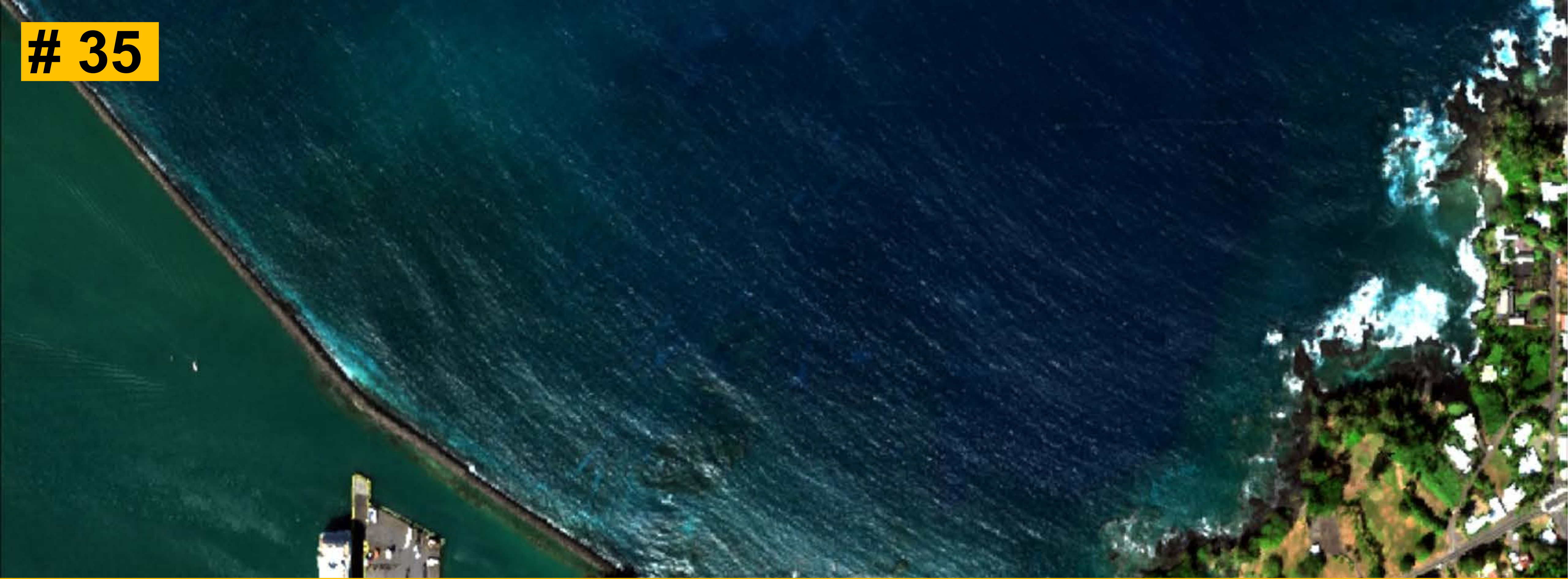
Global automated extraction of bathymetric photons from ICESat-2 data based on a PointNet++ model

Anders Knudby[1,2], Yiwen Lin[1]

1) University of Ottawa, Ottawa, Canada, aknudby@uottawa.ca ; yiwen.lin@uottawa.ca
2) Liquid Geomatics Ltd., Ottawa, Canada, liquidgeomaticscanada@gmail.com



Predicted bathymetric photons
Predicted non-bathymetric photons
0
−10
−20
−30
−40
Elevation (m)
4.9478
4.9480
4.9482
4.9484
4.9486
4.9488
4.9490
4.9492
Distance (×10^6 m)



Effects of atmospheric and glint correction approaches on remote sensing reflectance estimation from airborne imaging spectroscopy

Center for Global Discovery and Conservation Science
Arizona State University

Marcel König[1] [mkoenig3@asu.edu], Kelly L. Hondula[1], Brice K. Grunert[2], Niklas Bohn[3], Jie Dai[1], Elahe Jamalinia[1], Nicholas R. Vaughn[1], Gregory P. Asner[1]

[1]Center for Global Discovery and Conservation Science, Arizona State University, Tempe, AZ, USA
[2]Biological, Geological and Environmental Sciences, Cleveland State University, Cleveland, OH, USA
[3]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

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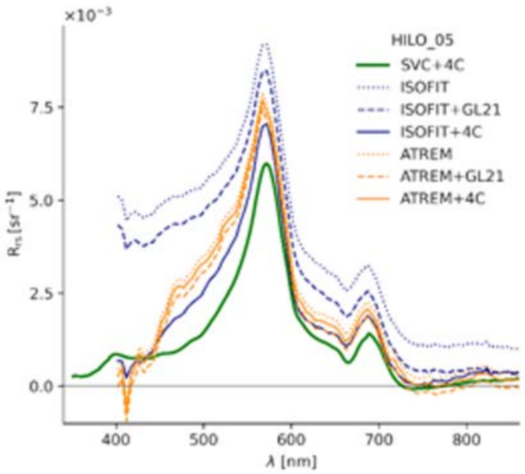
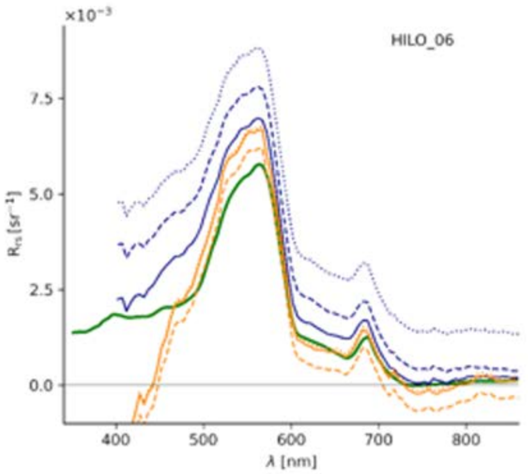
- 2 atmospheric correction algorithms (ISOFIT & ATREM)
- analytical 4-component sun & sky glint correction
- sun glint correction by Gao & Li (2021)
- evaluation based on field spectroscopy





Accuracy of SeaHawk-HawkEye remote sensing reflectance products in globally distributed aquatic sites

Srinivas Kolluru[1*], Sara Rivero Calle[1] and Philip J. Bresnahan[2], Kohei Arai[3], Timothy S Moore[4], Susan Kratzer[5]

[1]Skidaway Institute of Oceanography, University of Georgia, Savannah 31411, GA (USA)

[2] Center for Marine Science, University of North Carolina, Wilmington 28409, NC (USA)

[3]Saga University,1 Honjomachi, Saga, 840-8502, Japan

[4]Harbor Branch Oceanographic Institute, Florida Atlantic University, Fort Pierce 34946, FL (USA)

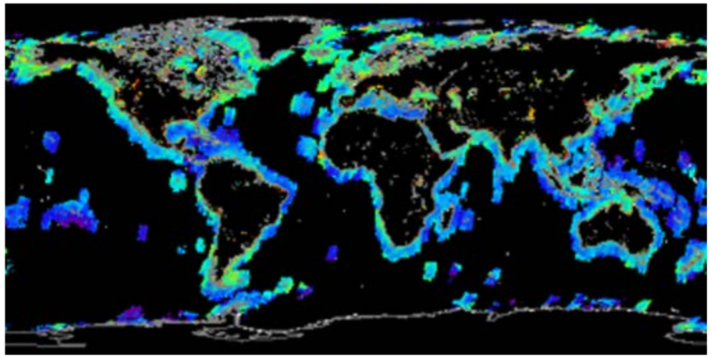
[5] Environment and Plant Sciences (DEEP), Stockholm University,106 91 Stockholm

Correspondence: Srinivas.Kolluru@uga.edu, rivero@uga.edu

Srinivas Kolluru - Poster #36

HawkEye – Ocean Color CubeSat – low cost

- ~120 m spatial resolution
- ~8000+ images acquired in orbit
- 8 spectral bands



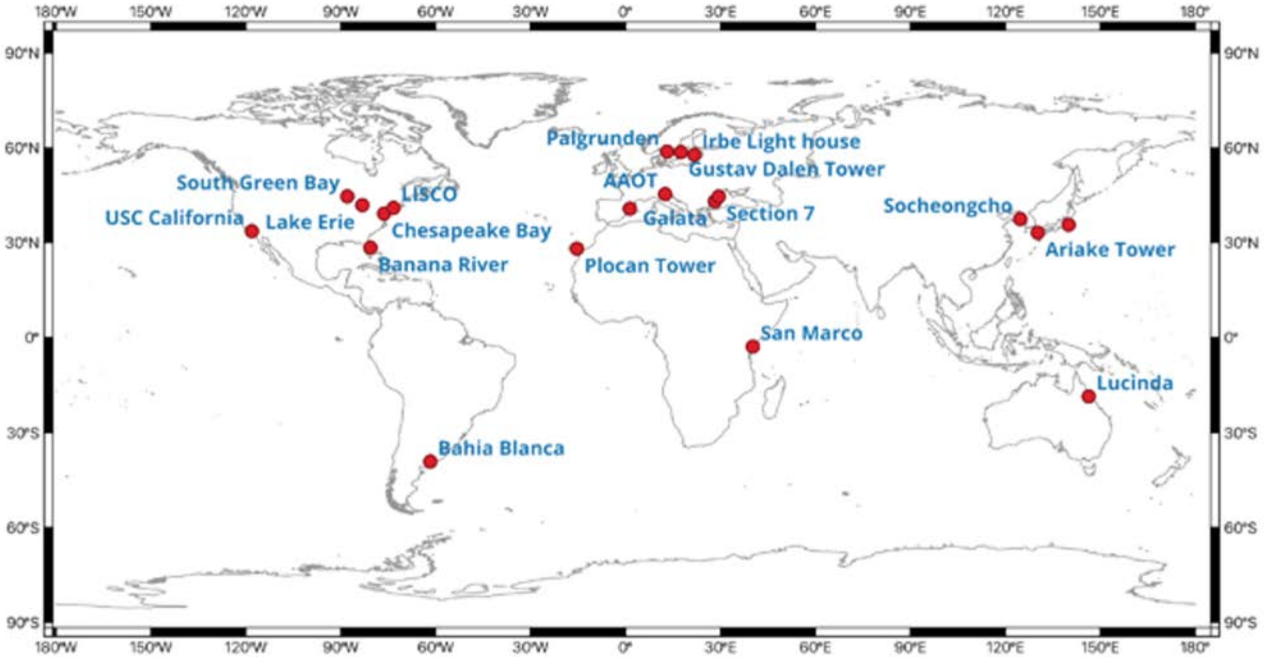


Fig. 1. Location of the twenty AERONET-OC sites used in this study

Result: HawkEye' Rrs accuracy varied with wavelength, with Rrs at 556 nm band being the most accurate and with decreasing accuracy towards blue bands.

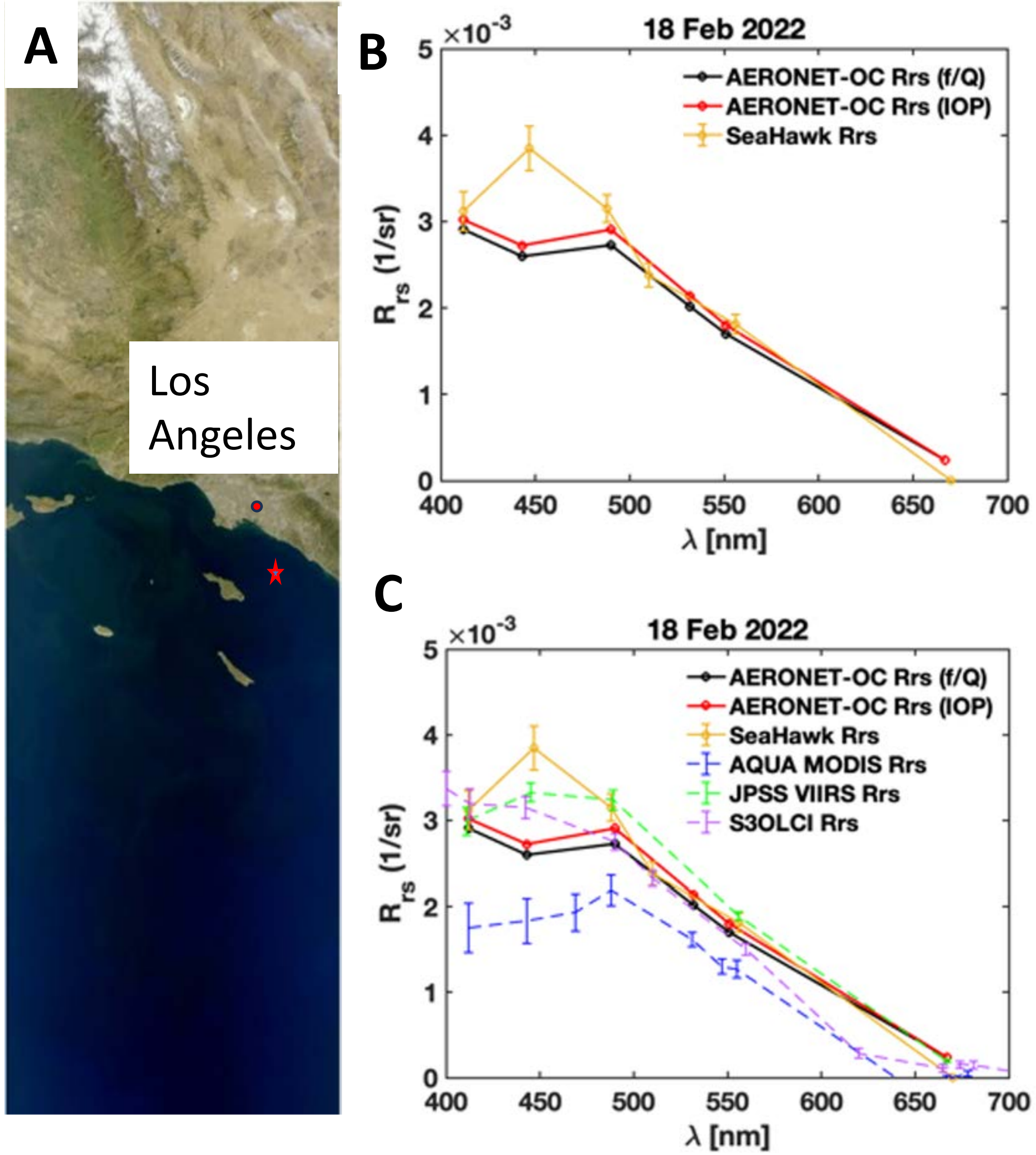


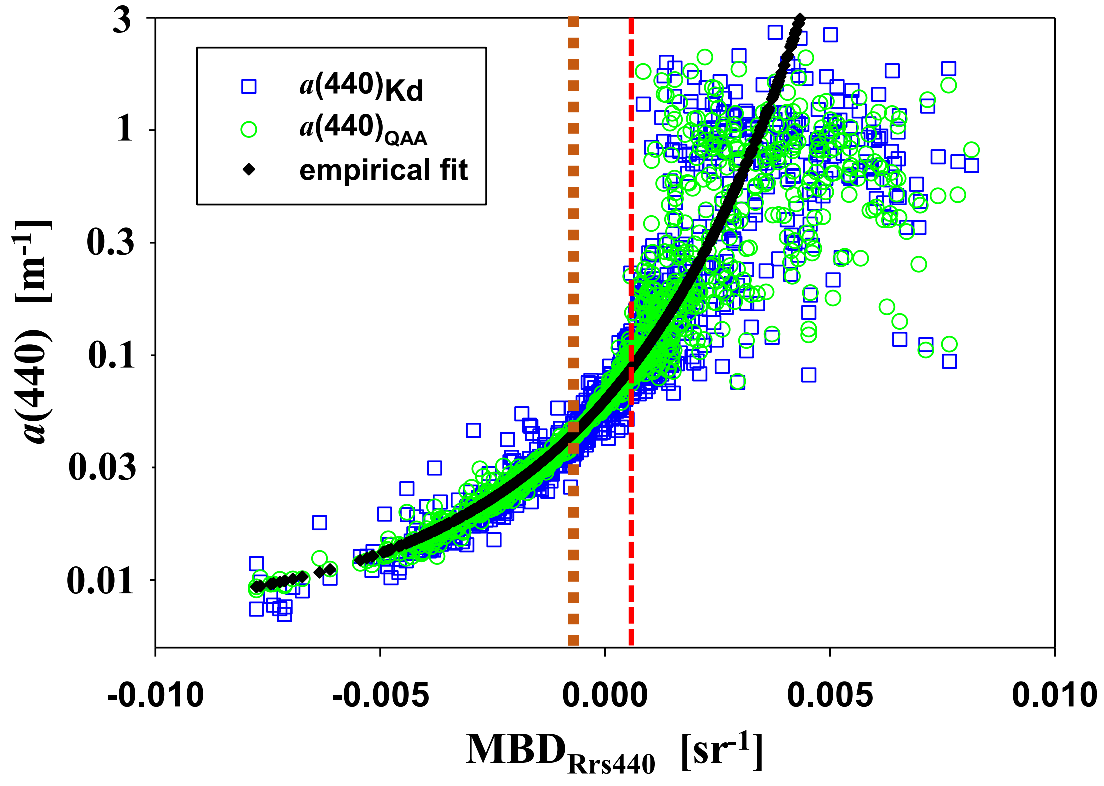
Fig. 2 A) HawkEye Image over Southern California (Feb 18, 2022) with AERONET-OC 'USC Sea PRIRSM 2 site' (Red star) **B**) Rrs comparison between HawkEye (yellow line) and AERONET-OC 'USC SeaPRISM 2' derived from IOP (red) and f/Q (black) algorithms on Feb 18, 2022 (left panel) and with other sensors data (**C**).

Estimation of absorption coefficient of oceanic waters via band difference of remote sensing reflectance and its applications

Zhongping Lee
MEL, COES, Xiamen University

In collaboration with

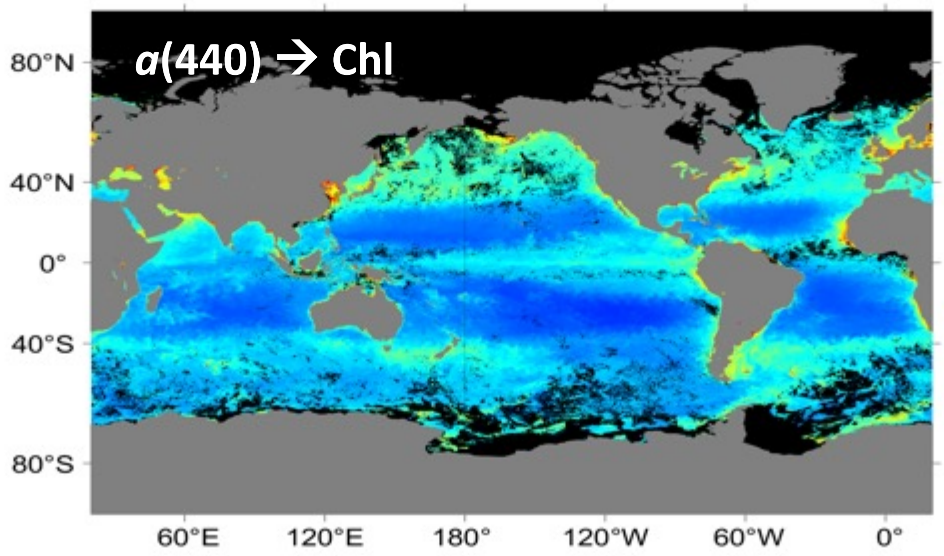
Longteng Zhao, Chuanmin Hu, Daosheng Wang, Junfang Lin, Shaoling Shang

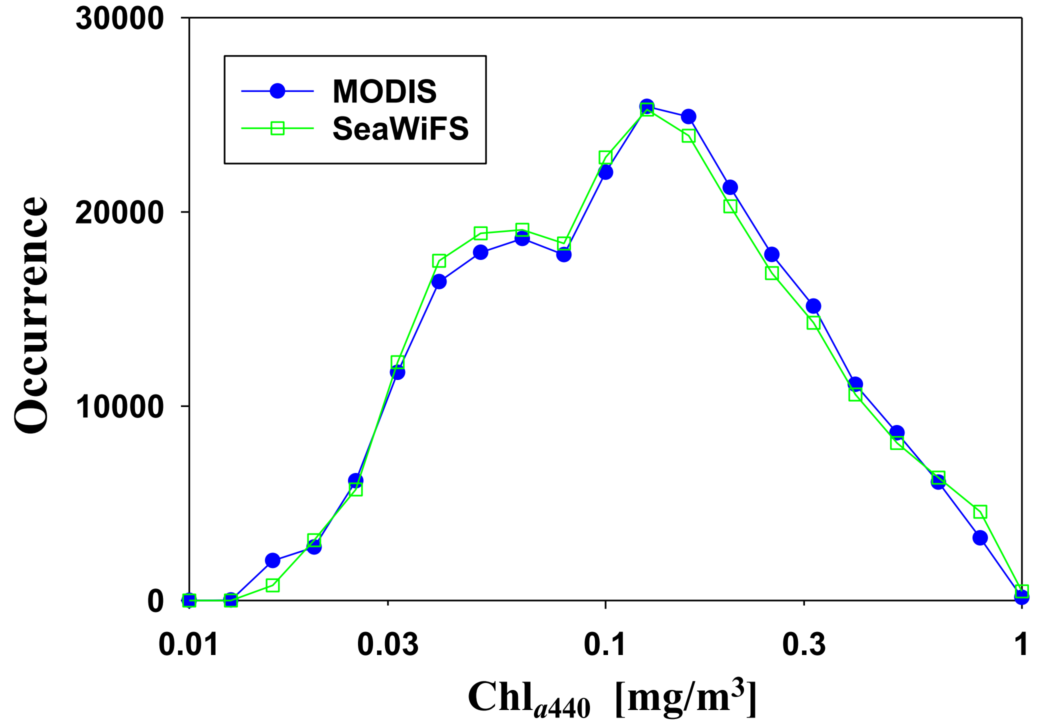


$$MBD_{Rrs} = R_{rs}(\lambda_G) - \left[R_{rs}(\lambda_B) + \frac{\lambda_G - \lambda_B}{\lambda_R - \lambda_B}\left(R_{rs}(\lambda_R) - R_{rs}(\lambda_B)\right)\right]$$

$$a(440) = 10^{-2.21 + 1.01\,\mathrm{Exp}(228.82 \times MBD_{Rrs440})}$$

The threshold of MBD_{Rrs440} changed from -0.0005 sr^{-1} to 0.0005 sr^{-1} ; → 75% of global ocean to ~91%.





(Lee et al., *J. Remote Sens.* 2023;3:Article 0063)

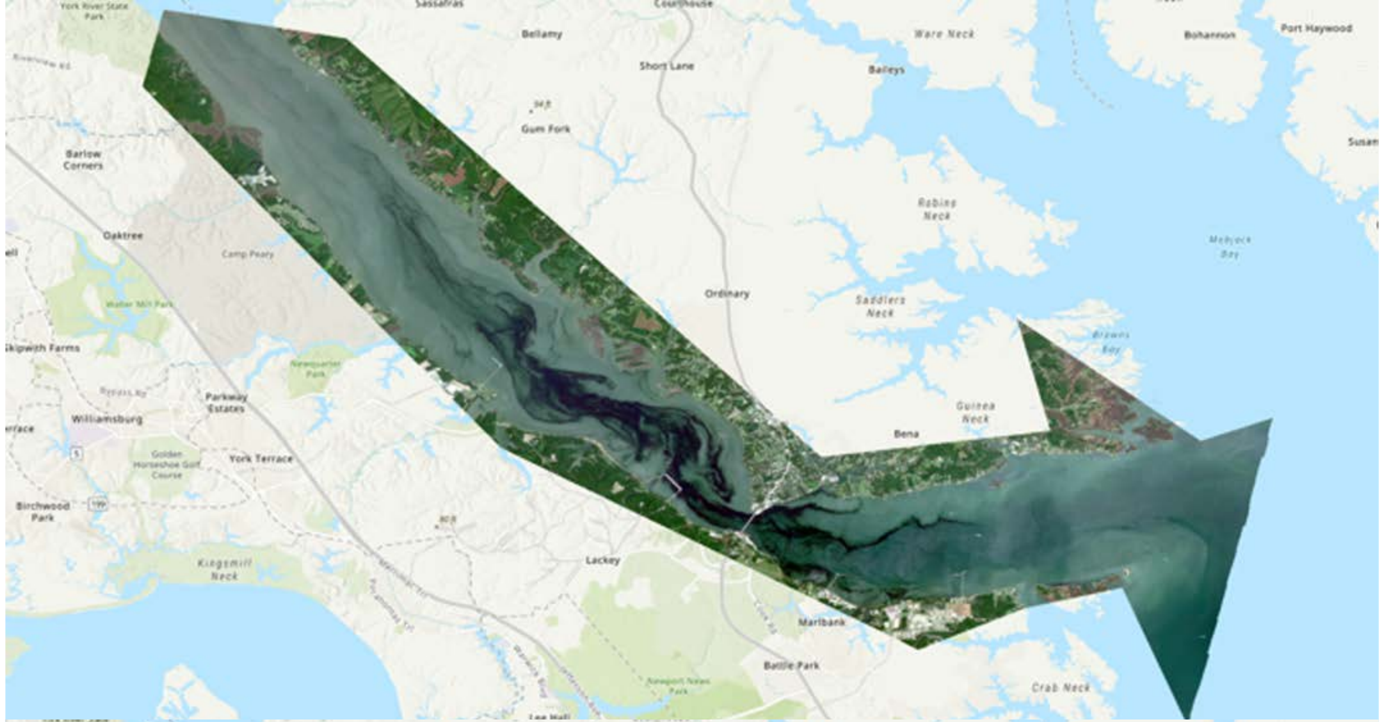
Using Planet Satellite Imagery to Map and Quantify Harmful Algal Blooms in Chesapeake Bay Tributaries

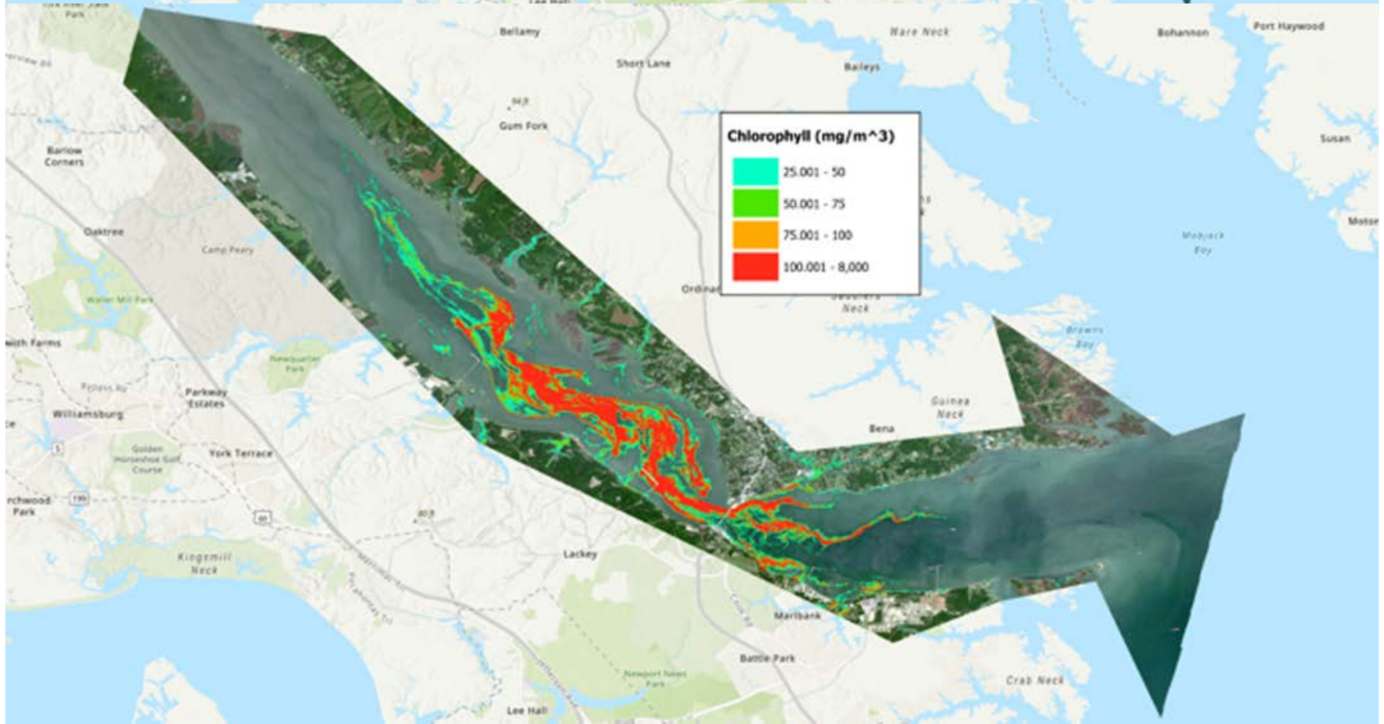
[1]Mary LePere, [2]Dr Victoria Hill
Department of Ocean and Earth Science, Old Dominion University
[1]mlepe001@odu.edu, [2]vhill@odu.edu

YORK RIVER

August 26th, 2022

We can successfully calculate chlorophyll content from satellite imagery during bloom events





Manuel, A. and Blanco, A. C.: **TRANSFORMATION OF THE NORMALIZED DIFFERENCE CHLOROPHYLL INDEX TO RETRIEVE CHLOROPHYLL-A CONCENTRATIONS IN MANILA BAY**, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-4/W6-2022, 217–221, https://doi.org/10.5194/isprs-archives-XLVIII-4-W6-2022-217-2023.

International Ocean Colour Science Meeting 2023 | 14-17 November 2023
St. Pertersburg, FL, USA

Poster#39

Enhancing the reliability of GCOM-C/SGLI-derived chlorophyll-a data in the upper Gulf of Thailand

Jutarak Luang-on[1], Eko Siswanto[1], Kazunori Ogata[1], Mitsuhiro Toratani[2], Anukul Buranapratheprat[3], Joji Ishizaka[4]

[1]*Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan*

[2]*Tokai University - Shonan Campus, Japan*

[3]*Burapha University, Thailand*

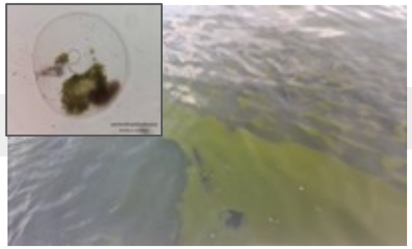
[4]*Institute for Space-Earth Environmental Research (ISEE), Nagoya University, Japan*

GCOM-C: Global Change Observation Mission - Climate "SHIKISAI”
SGLI: Second generation GLobal Imager

Email: jutaraklua@jamstec.go.jp

The 2023 super Green *Noctiluca scintillans* blooms (Jul ~ Sep 2023) → Hypoxia → massive fish mortality

08/18

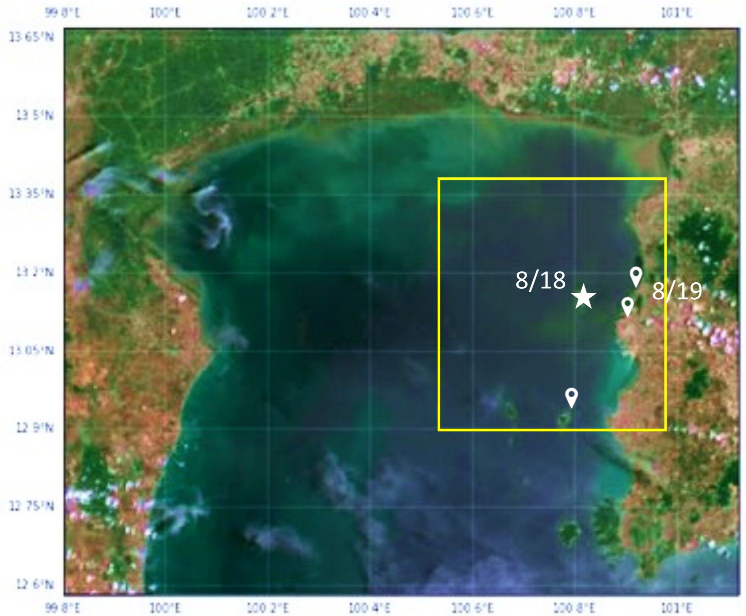


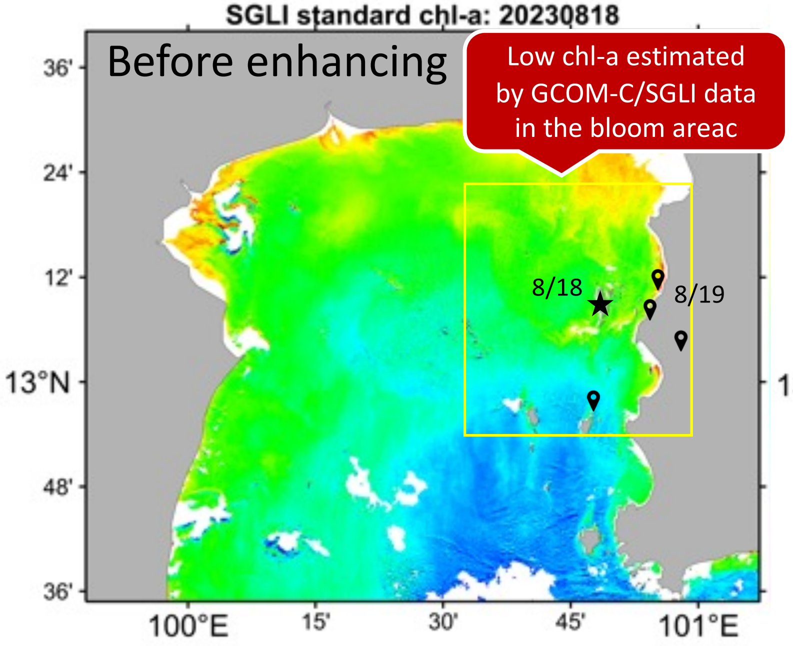
08/19

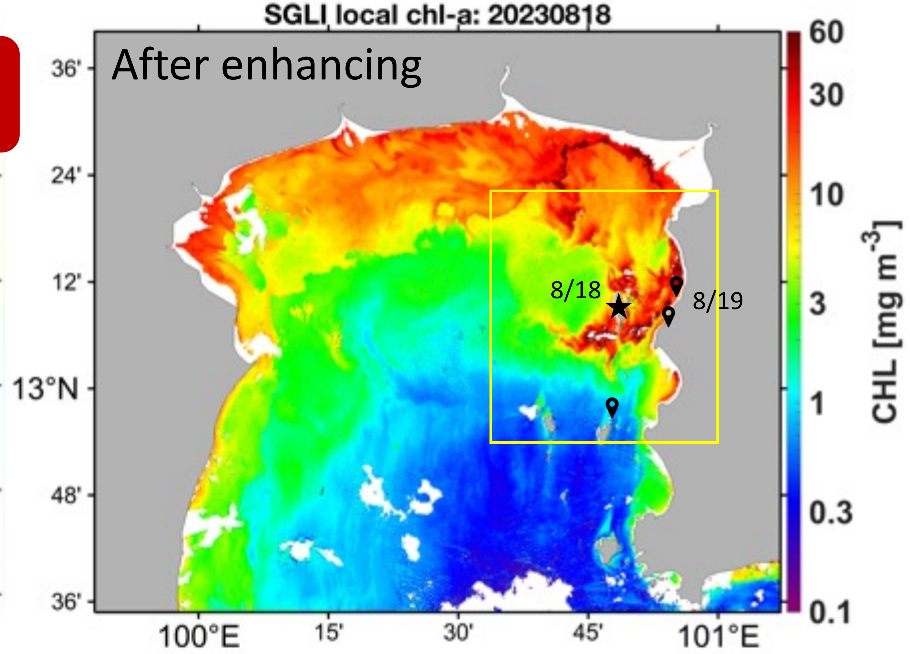
08/20

- **6/23** – Offshore bloom
- **7/6** – **7/29**: East coast (weak – middle blooms)
- **7/29** – **8/19** – **8/28**: East coast (strong – super blooms)
- **9/1**: Move to the north

GCOM-C/SGLI image in the upper Gulf of Thailand: 18 August 2023







GCOM-C: Global Change Observation Mission - Climate "SHIKISAI"
SGLI: Second generation GLobal Imager

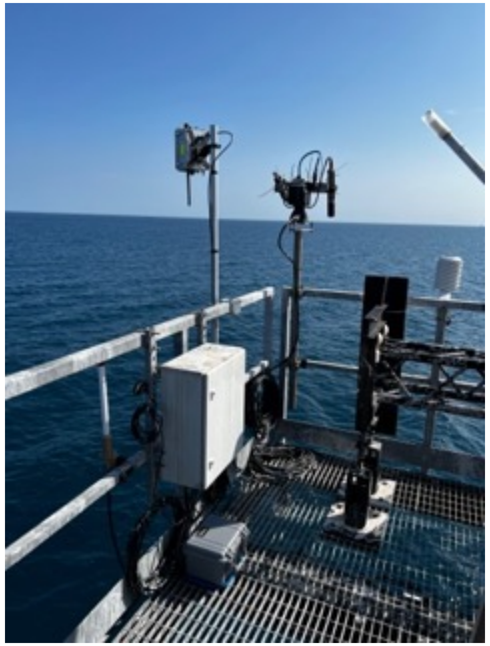
Email: jutaraklua@jamstec.go.jp

CSIRO

SMARTSAT
Cooperative Research Centre

HydraSpectra: low-cost optical above-surface water quality sensor

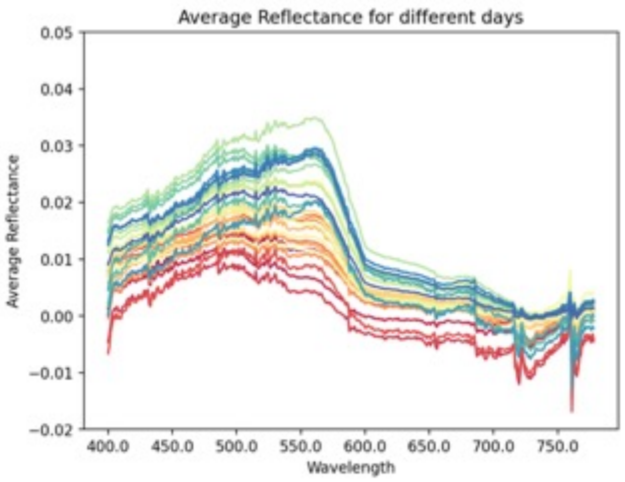
Tim Malthus, Mark Baird, Faisal Islam, Nathan Drayson, Erin Kenna, Xiubin Qi, Tarun Sanders, Tim Bolton, Stephen Gensemer

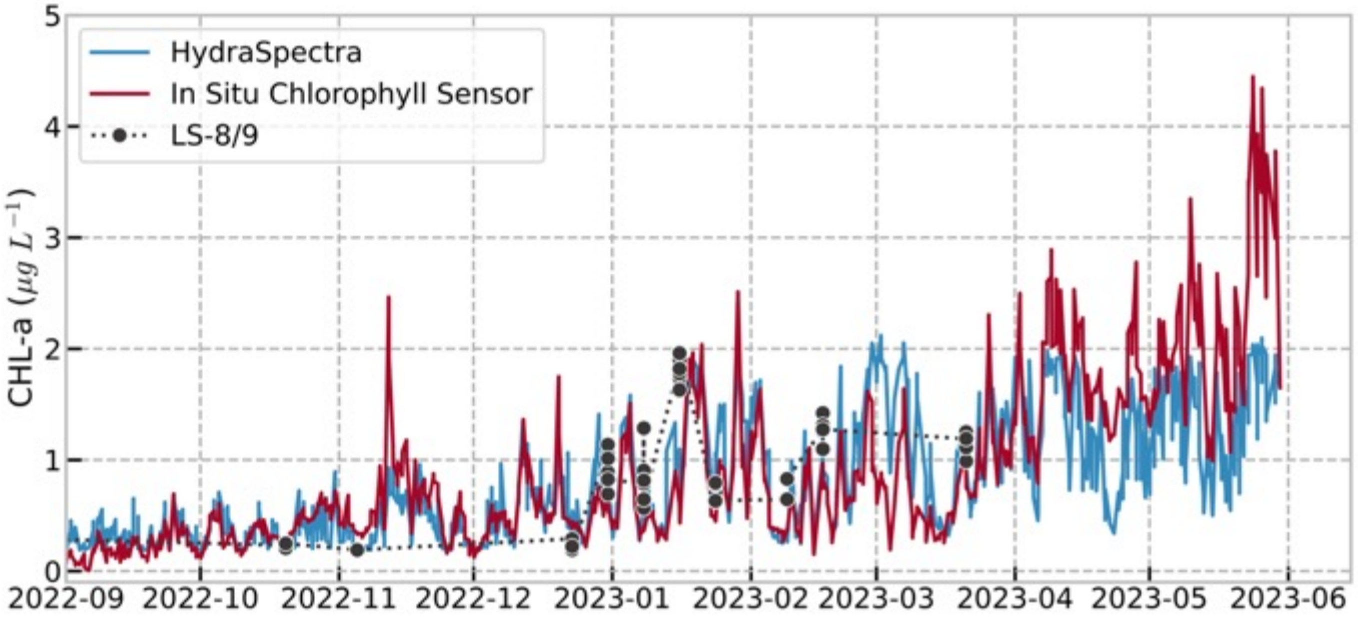


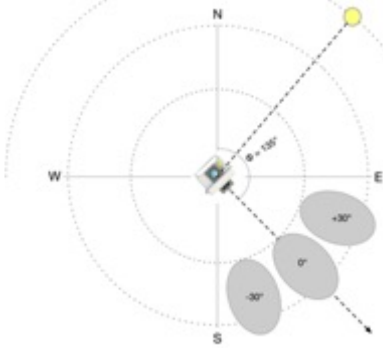
AquaWatcch Australia Mission – IOCS 2023

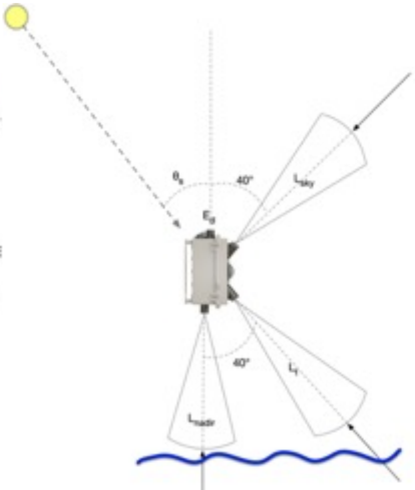
HydraSpectra

- Measures above surface reflectances to support continuous:
    - Water quality monitoring
    - Satellite validation
    - Algal bloom alerting
- Patented technology
- Low cost, low maintenance









Masud-Ul-Alam, Poster # 43

SeaHawk Low-Cost Ocean Color CubeSat Produces High Spatial Resolution and High-Quality Data: A Comparison with NOAA-20 VIIRS, NASA MODIS-Terra and MODIS-Aqua

Md Masud-Ul-Alam[1,2], Benjamin Lowin[1], Gene Carl Feldman[3], Alan Holmes[4], John Morrison[5], Liang Hong[3], Alicia Scott[3], Philip Bresnahan[5], Sean Bailey[3], and Sara Rivero-Calle[1]

[1]University of Georgia Skidaway Institute of Oceanography, Savannah GA (USA),
[2]BSMR Maritime University, Dhaka (Bangladesh),
[3]NASA Goddard Space Flight Center, MD (USA),
[4]SBIG Goleta, CA (USA),
[5]University of North Carolina Wilmington, NC (USA)

Correspondence: masudocndu@uga.edu, rivero@uga.edu

GORDON AND BETTY MOORE FOUNDATION

Bio-Optical and Satellite OCEANOGRAPHY LAB

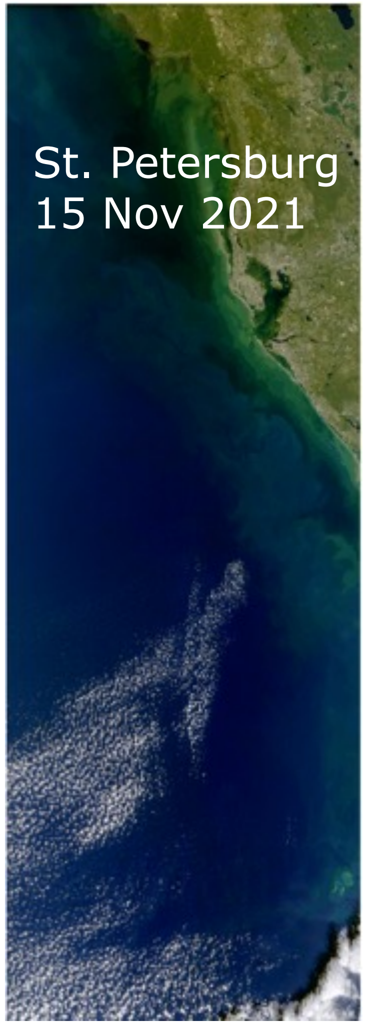
UNIVERSITY OF GEORGIA Skidaway Institute of Oceanography

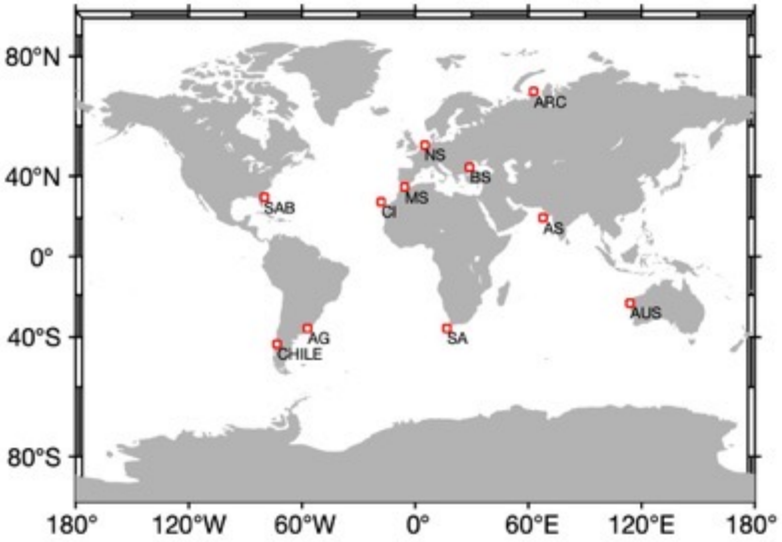
SBIG

NASA

UNCW

Poster # 43

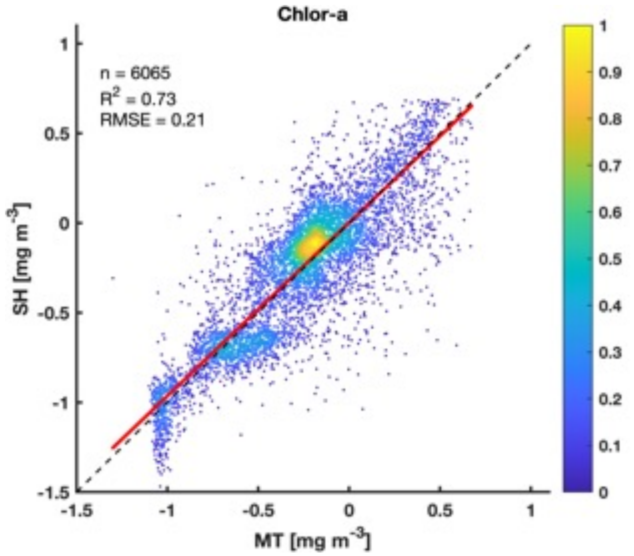


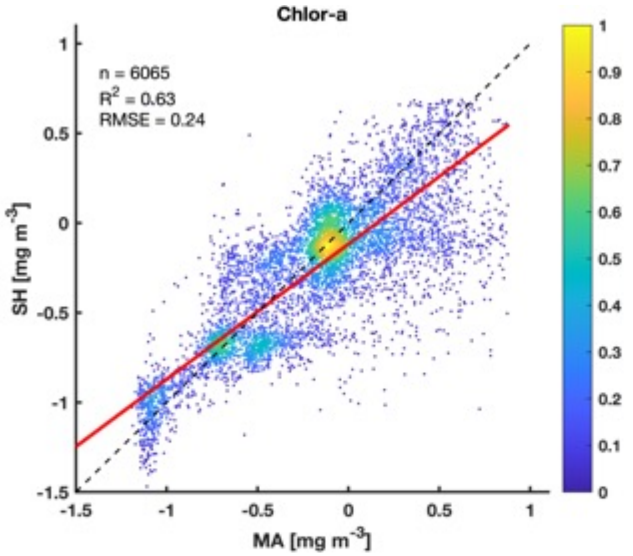


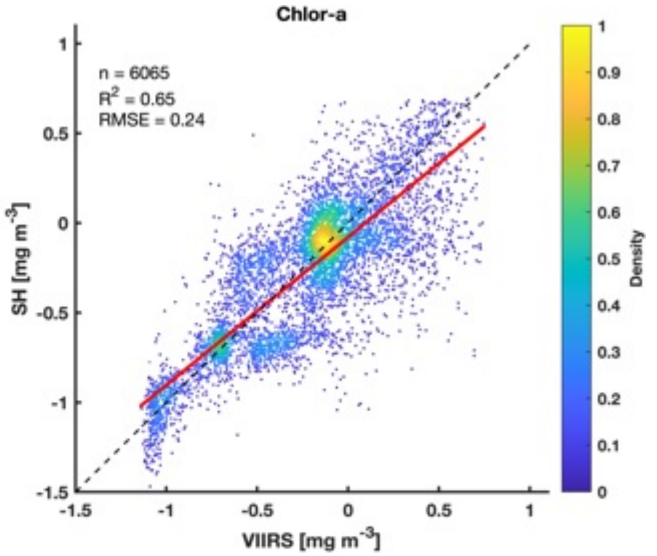
SeaHawk and MODIS Terra tended to agree well.

SeaHawk is comparable to other operational sensors.

555nm band performs best







Spatio-Temporal Variations of Bio-Optical Properties in Coastal Arctic Waters

Wesley J. Moses, Steven G. Ackleson, J. Blake Clark, Ahmed El-Habashi, Daniel W. Koestner, Alana Menendez, Jonathan Sherman, Kyle Turner, Maria Tzortziou, and Hisatomo Waga

Funded by U.S. Naval Research Lab Project Work Unit #72-1L28 and NASA OBB Project Grant # 80HQTR21T0050

U.S. NAVAL RESEARCH LABORATORY

The City College of New York

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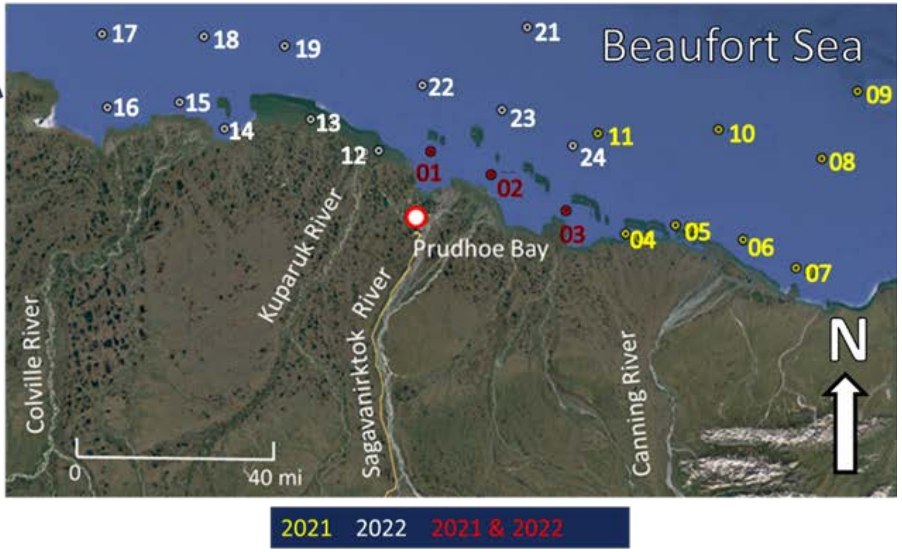
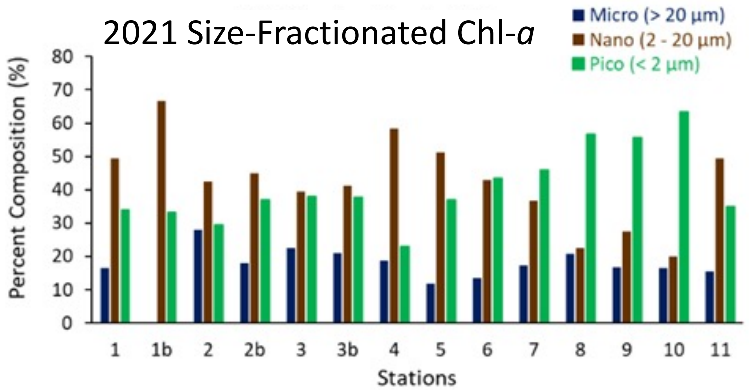


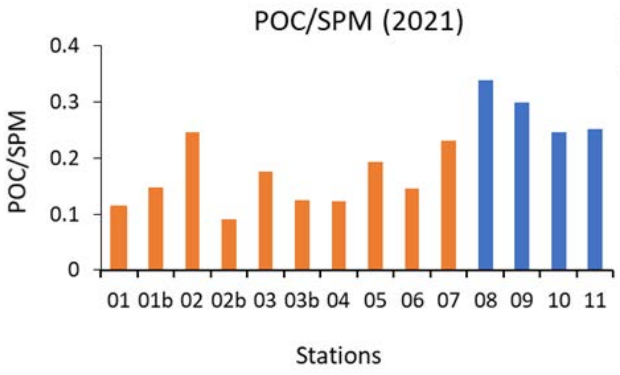
Two field campaigns in summers of 2021 and 2022

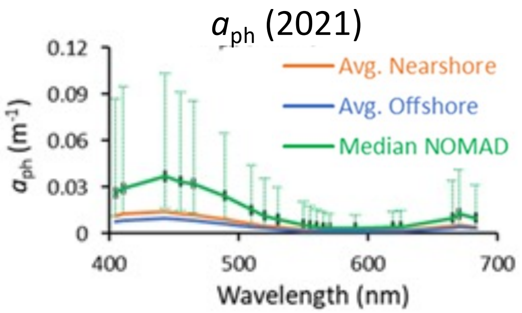
<u>Constituent Concentrations:</u> chl-*a*, SPM, POC, CDOM, DOC, Nutrients

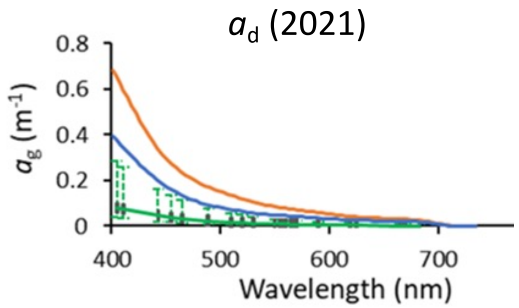
<u>Optical Properties:</u> Absorption & Scattering–particulate (total, phytoplankton, non-algal); dissolved

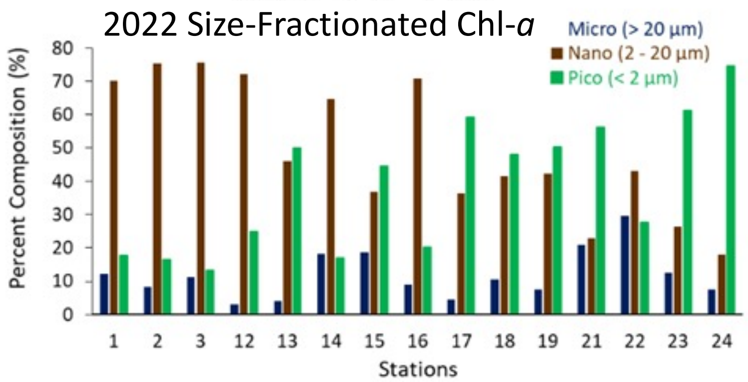
Comparisons to lower-latitude waters
Effect of river discharge

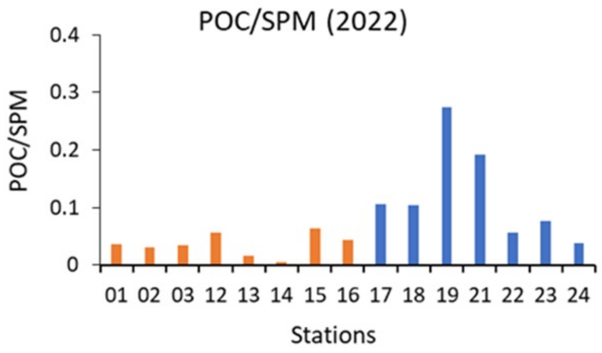


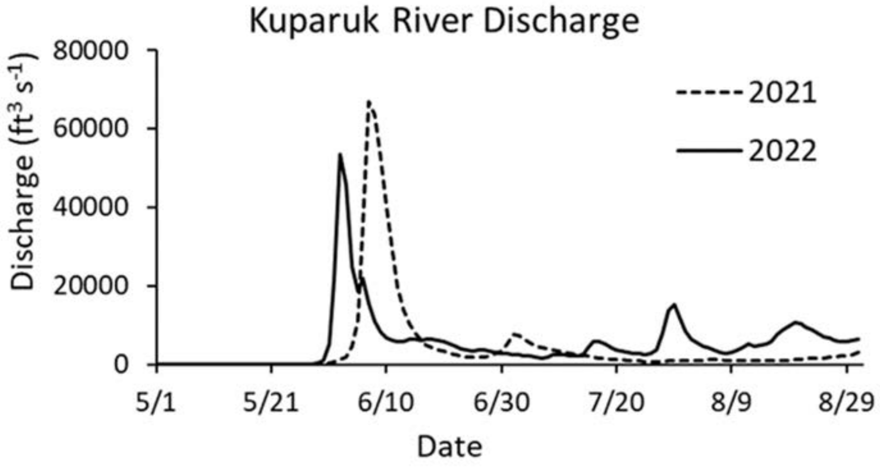












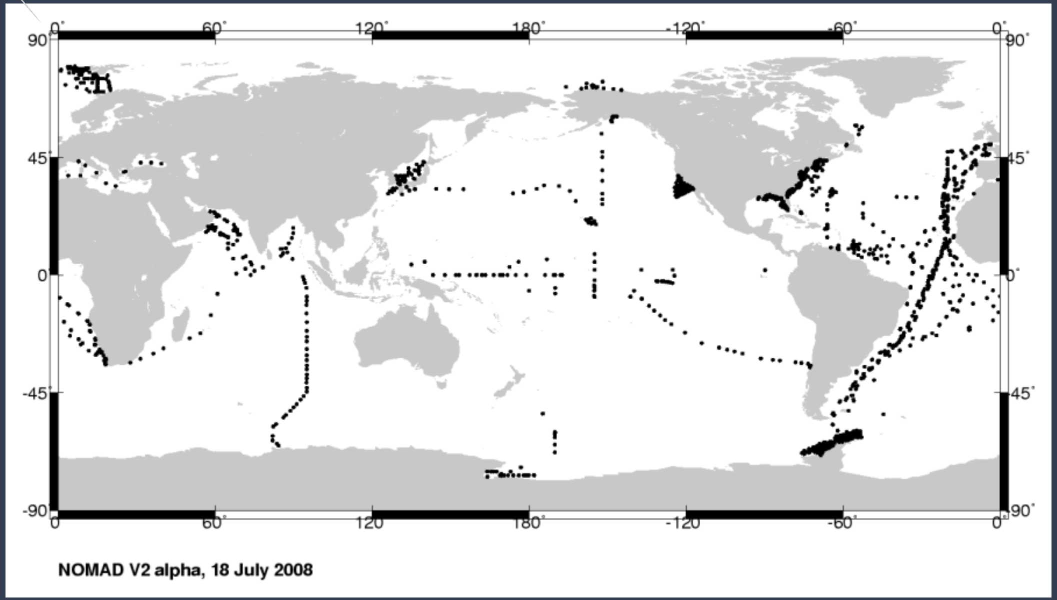
NOMAD v3.0: Supporting PACE validation activities

PACE

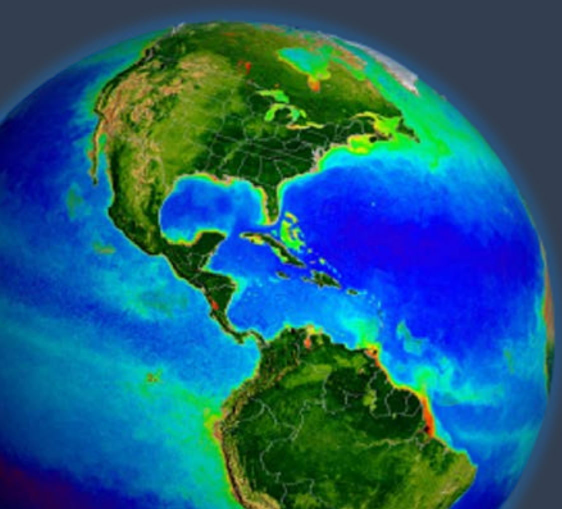
Violeta Sanjuan Calzado, Christopher Proctor, Jeremy Werdell

Ocean Ecology Lab. NASA Goddard Space Flight Center. Maryland. USA

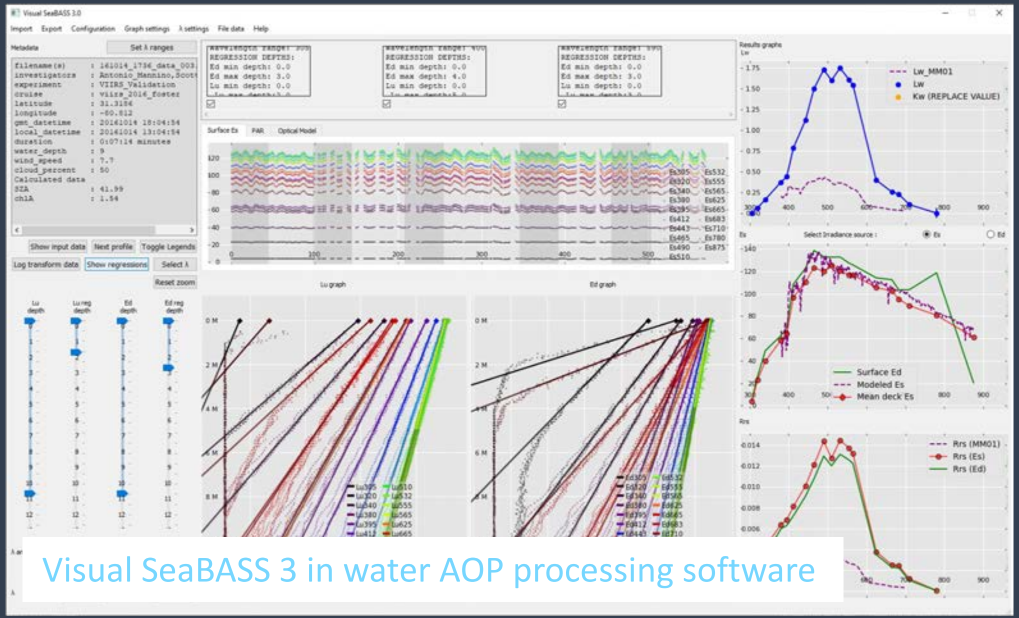
NOMAD 3.0: Supporting PACE mission for validation and algorithm development



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	VERTICAL	I	Vertical measurement
8	DISCRETE	I	Discrete measurement
9	OBPG_PROC	P	OBPG software: VSB, HyperInSpace
10	INT_CHL	P	Depth integrated fluorometric Chl
11	INT_HPLC	P	Depth integrated HPLC derived Chl
12	SHADE	P	Instrument self shading correction applied
13	FQ	P	f/Q correction applied to Lw
14	ES	P	Es available from reference measurement
15	RRS	I	Lw estimated from Rrs
16	HYPER	I	Hyperspectral observation of Lw or Rrs
17	ABOVE_WATER	I	Above water radiometric observation
18	ALG_TRAIN_DATA	P	Data point used in algorithm development



- Hyperspectral database
- Product uncertainty
- AOP, IOP, biogeochemical products, atmospheric products
- Relational database
- Global coverage
- Data available on SeaBASS
- Traceable to SeaBASS files
- Flag system



Visual SeaBASS 3 in water AOP processing software