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

Poster Session 3 Lightning Talks

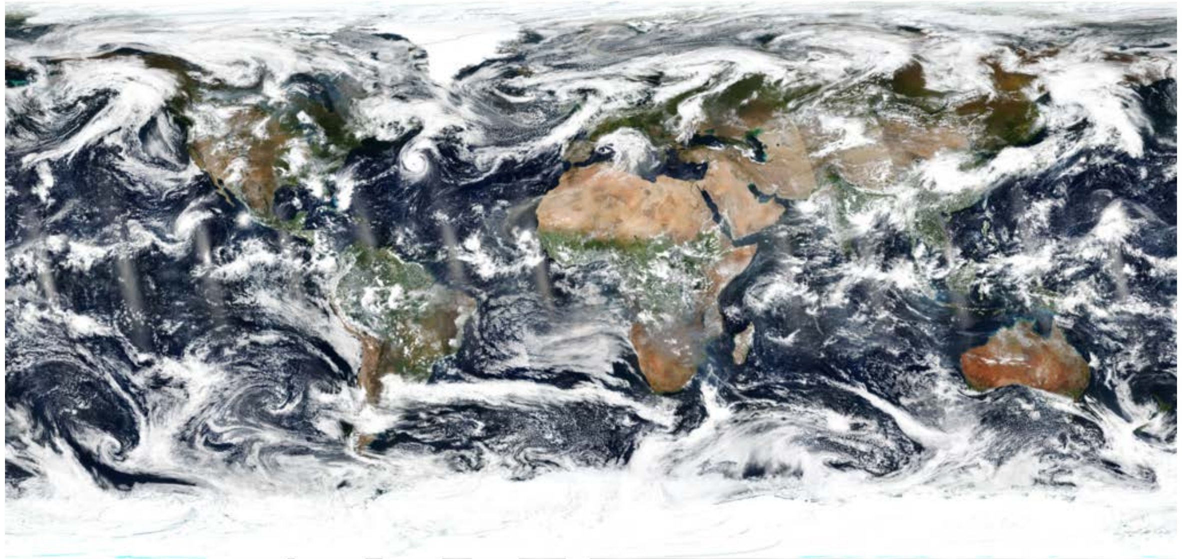
Poster # 44

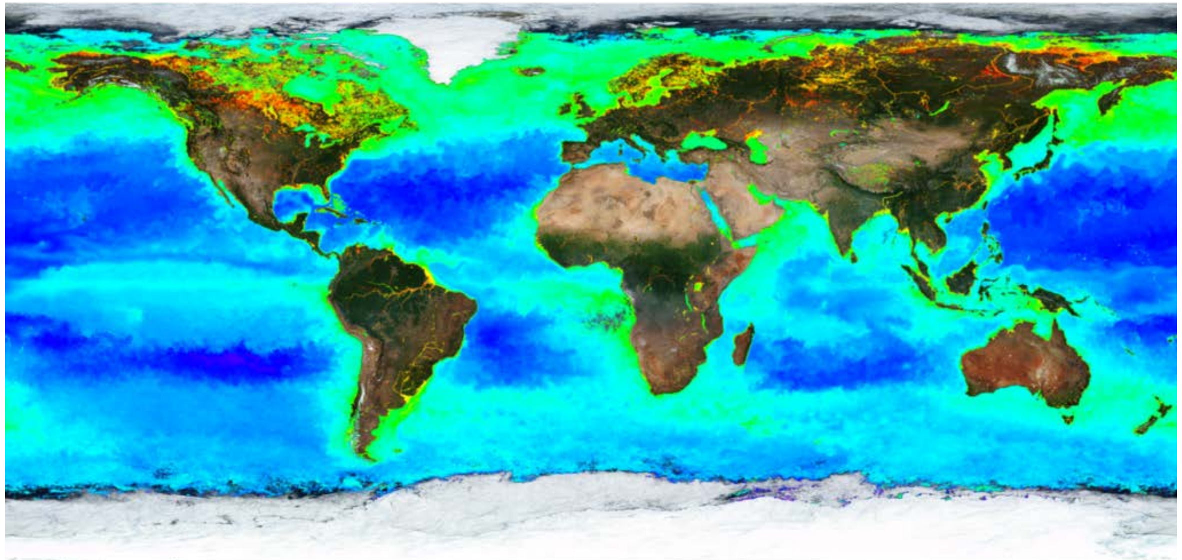
NEW DATA AND FUNCTIONALITY OF THE NOAA OCEAN COLOR VIEWER (OCVIEW)

Karlis Mikelsons[a,b] **and Menghua Wang**[a]

[a]NOAA/NESDIS Center for Satellite Applications & Research, College Park, MD, USA
[b]Global Science and Technology, Inc, Greenbelt, Maryland, USA

www.star.nesdis.noaa.gov/socd/mecb/color/ocview/ocview.html



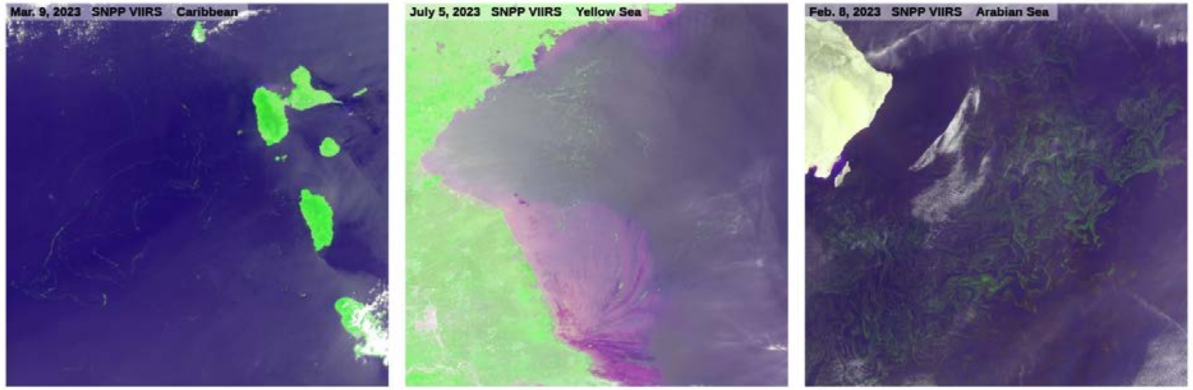


NEW DATA AND FUNCTIONALITY OF THE NOAA OCVIEW

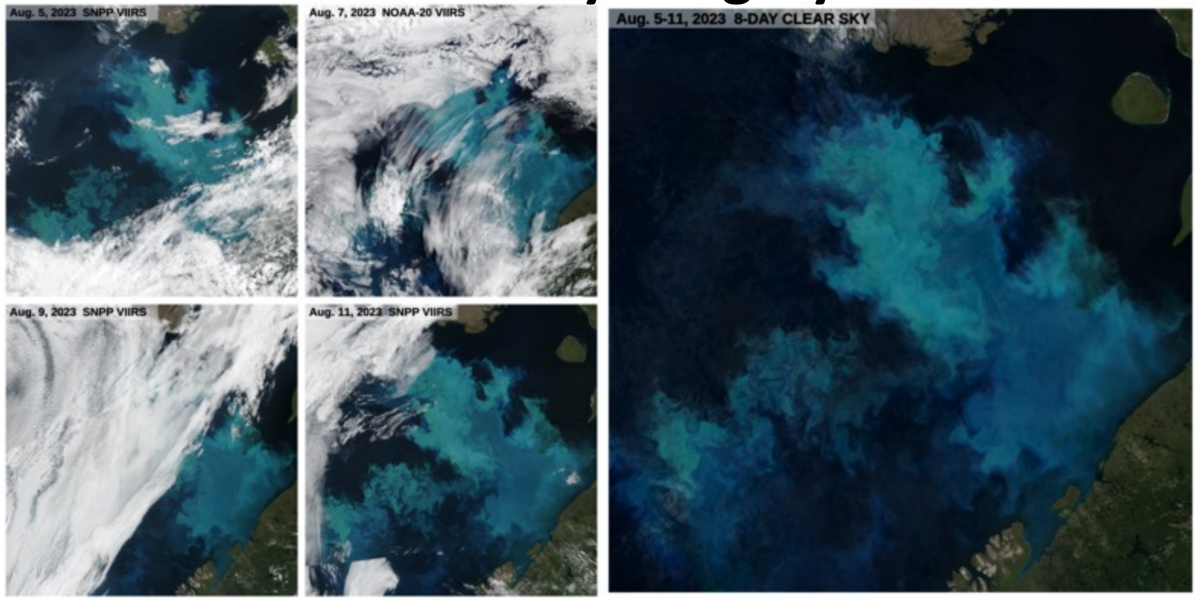
www.star.nesdis.noaa.gov/socd/mecb/color/ocview/ocview.html

Poster # 44

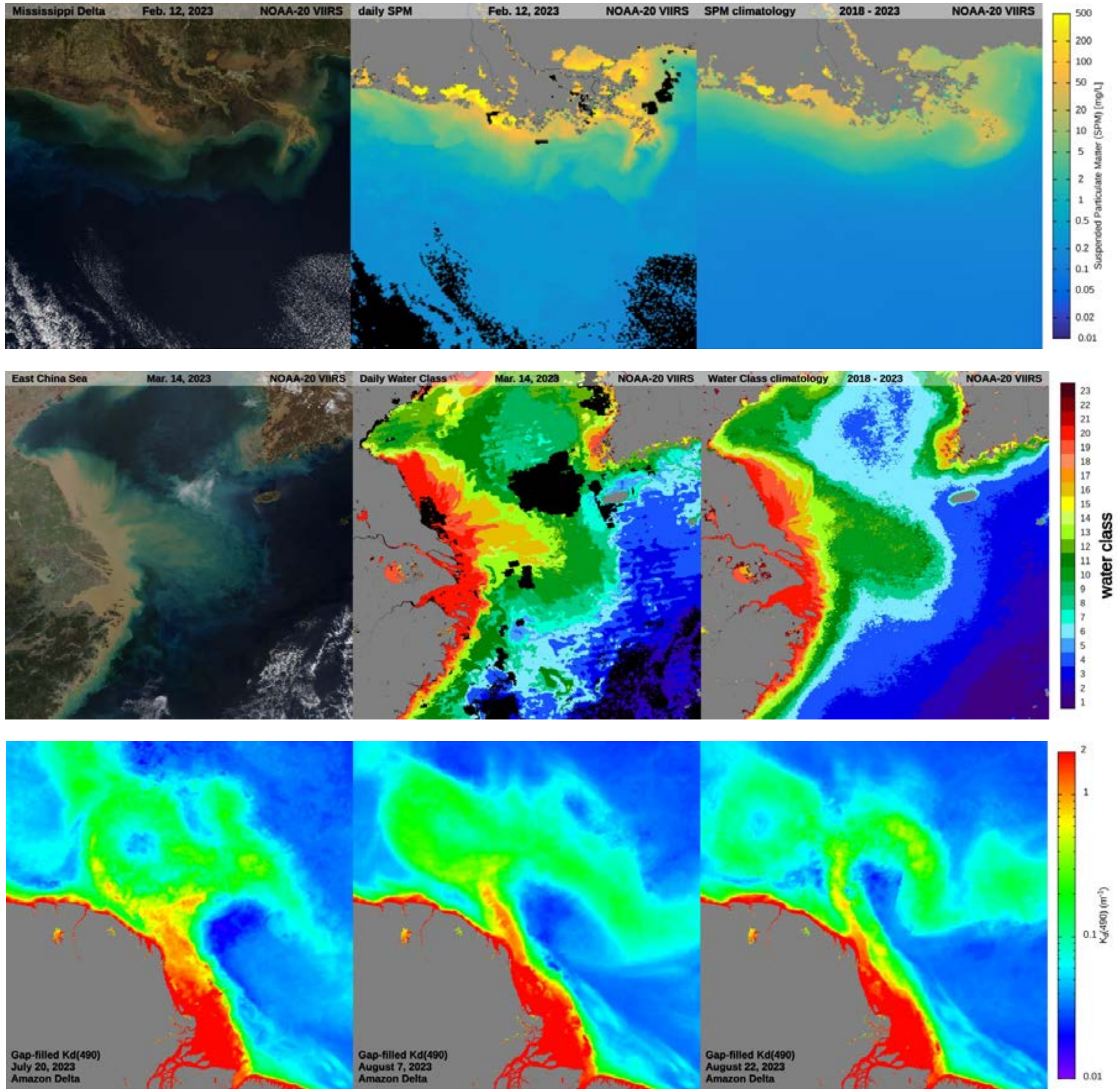
False color imagery



Clear sky imagery



New ocean color data products



A simulated PACE dataset to evaluate optical closure and phytoplankton community composition algorithms

Anna E. Windle[1,2], Ivona Cetinic[1,3], Cecile Rousseaux[1], Emerson Sirk[1,2], Amir Ibrahim[1], Lachlan McKinna[1,4], Jeremy Werdell[1]

[1]Ocean Ecology Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA

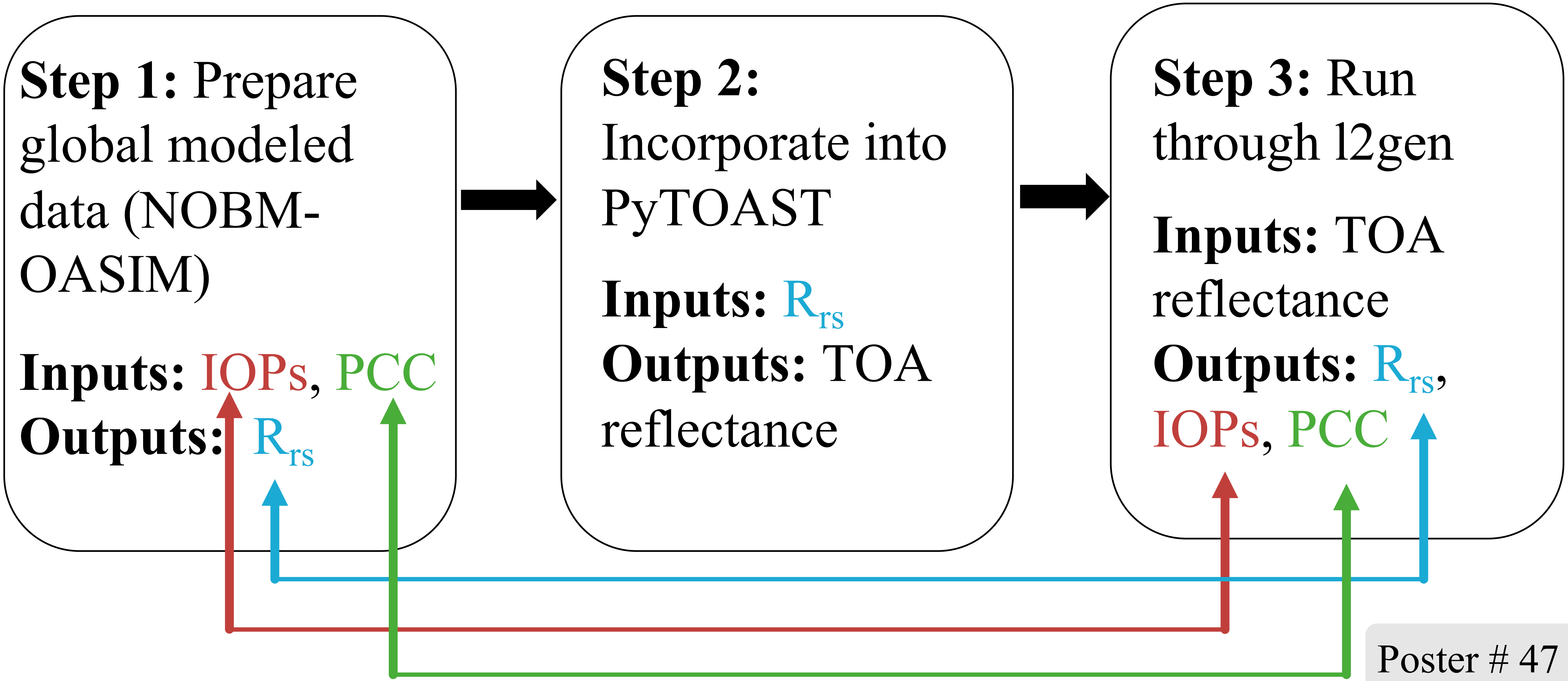
[2]Science Systems and Applications, Inc., 10210 Greenbelt Road, Lanham, MD 20706 USA

[3]GESTAR II, Morgan State University, Baltimore, MD 21251 USA

[4]GO2Q, Sunshine Coast, QLD, Australia

Poster # 47

A simulated PACE dataset, in OCI orbit dimensions and geometries, to test and assess PACE retrieval algorithms.



Poster # 47

#49

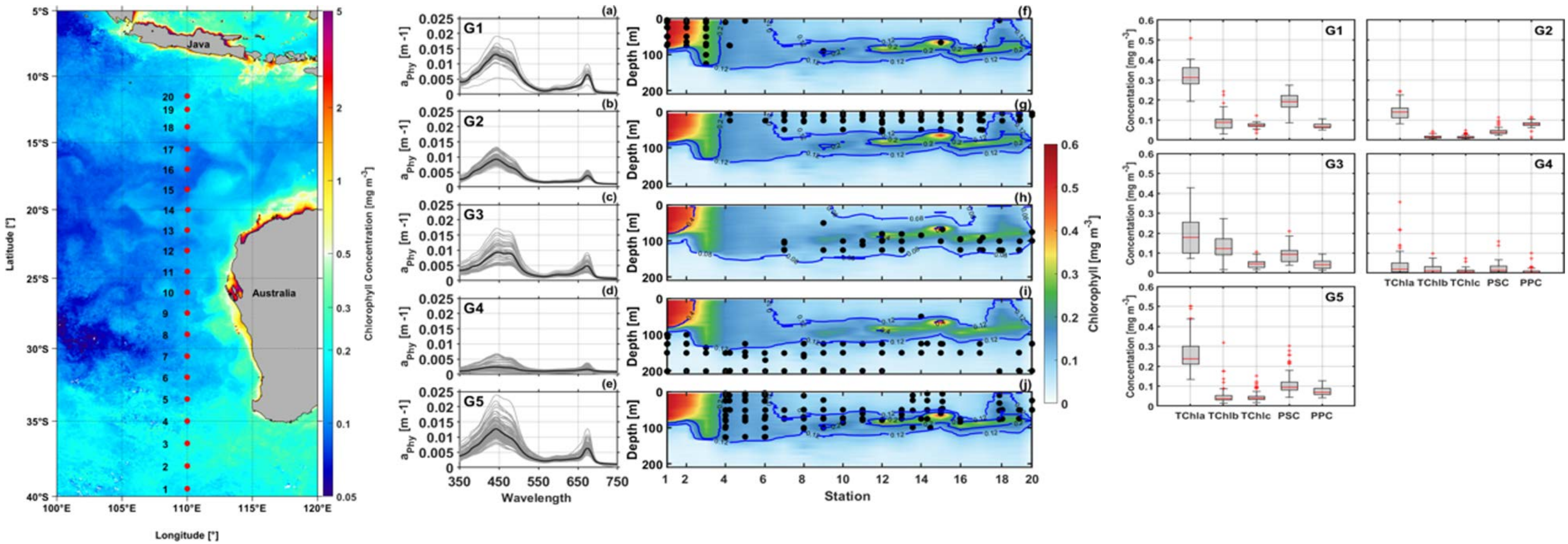
Phytoplankton communities distribution along a physical gradient in the eastern Indian Ocean based on their pigment and absorption properties.

Chandanlal Parida & David Antoine

Remote Sensing and Satellite Research Group, School of Earth & Planetary Science, Curtin University, Perth, Australia

Curtin University

Australian Government
Australian Research Council



R/V Investigator (May-June 2019) → Spectral cluster analysis → Discrimination of phytoplankton pigment assemblages with their location in the water column

Spectral cluster analysis to the absorption of phytoplankton data analysis indicates the potential of the absorption spectra data for discriminating phytoplankton pigment and their position in the aquatic environments.

Spatial-temporal dynamics of phytoplankton functional types on the West Coast of Canada derived from hyperspectral remote sensing Reflectance

Vishnu Perumthuruthil Suseelan[1], Justin Del Bel Belluz[2], Hongyan Xi[3], Midhun Shah Hussain[4], Astrid Bracher[3] , Maycira Costa[1]

[1]SPECTRAL Remote Sensing Laboratory, University of Victoria, Victoria.

[2]Hakai Institute, Victoria, BC, Canada.

[3]Phyto-optics Group, Physical Oceanography of Polar Seas, Climate Sciences, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany.

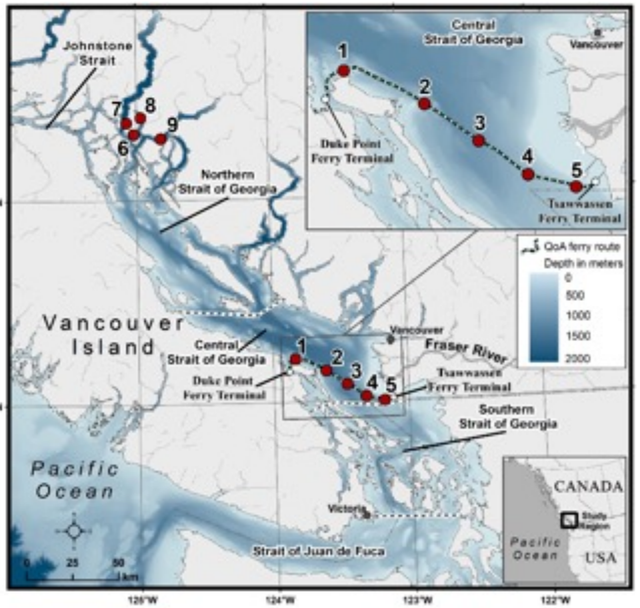
[4]Dept of Marine Biology, Microbiology and Biochemistry, Cochin University of Science and Technology, India.

Poster #51

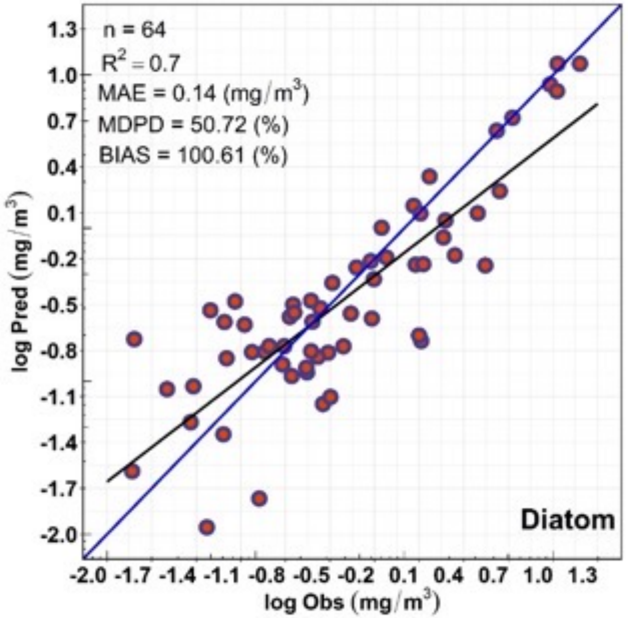
2023 IOCS meeting, November 14-17, USA

Highly-resolved Diatom Concentration from Hyperspectral Rrs

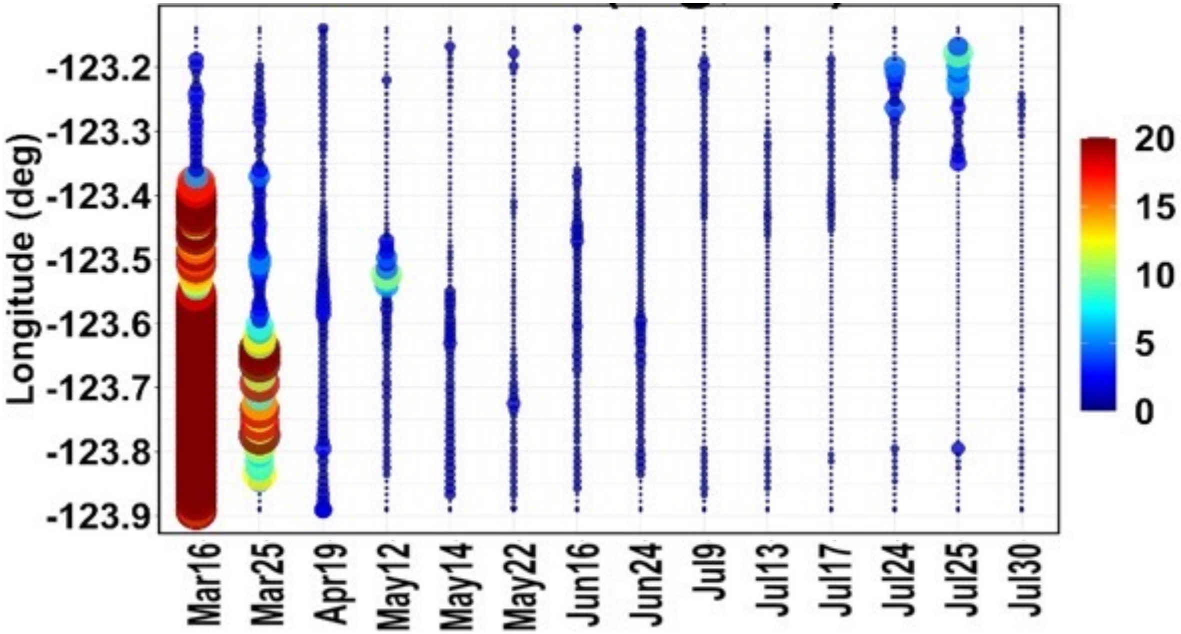
Study Area



Model Evaluation



Model Application



- ➢ Highly-resolved diatom concentration for the first time across the optically complex Strait of Georgia.
- ➢ Seasonal spring-bloom dominated by diatom was evident along the ferry track.
- ➢ Diatom peaked during March with max conc reaches to 20 mg/m^3.
- ➢ Reduced Diatom concentration was observed towards the end of spring or summer.

GLIMR

Hyperspectral Ocean Color from a New Vantage Point

Joseph Salisbury, Antonio Mannino

Maria Tzortziou & many more (GLIMR Team)

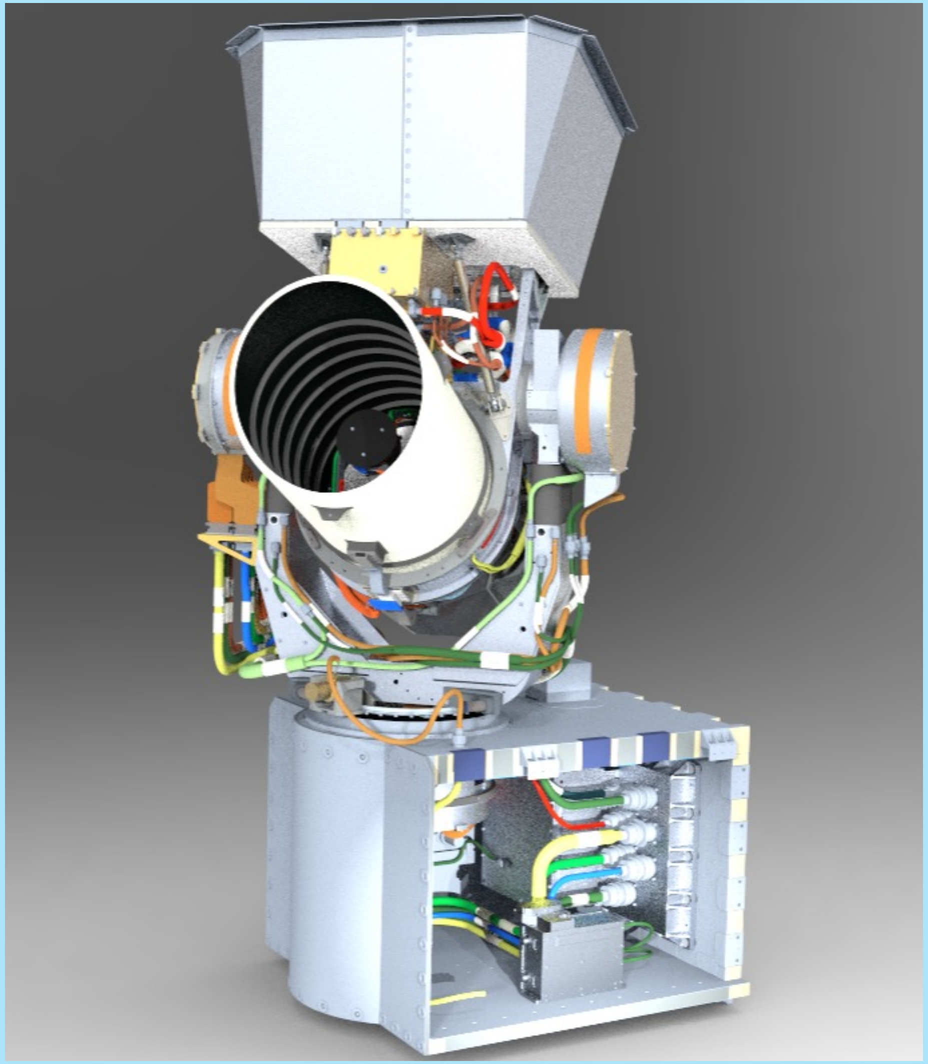
https://eos.unh.edu/glimr

University of New Hampshire

GODDARD EARTH SCIENCES

Raytheon Intelligence & Space

SwRI



What is GLIMR?

It's NASA's newest Ocean Color instrument: A hyperspectral spectrometer in Geostationary orbit

Hyperspectral

- 340-1040 nm
- <10 nm resolution UV-Vis
- <5 nm sampling UV-Vis

High Temporal

- ~hourly scans of Gulf of Mexico (6x/day)
- 2x/day other regions
- 3x/day HAB target sites

High Spatial

- 300 m GSD nadir
- ~328 m Gulf of Mexico
- <500 m over coastal CONUS

High SNR

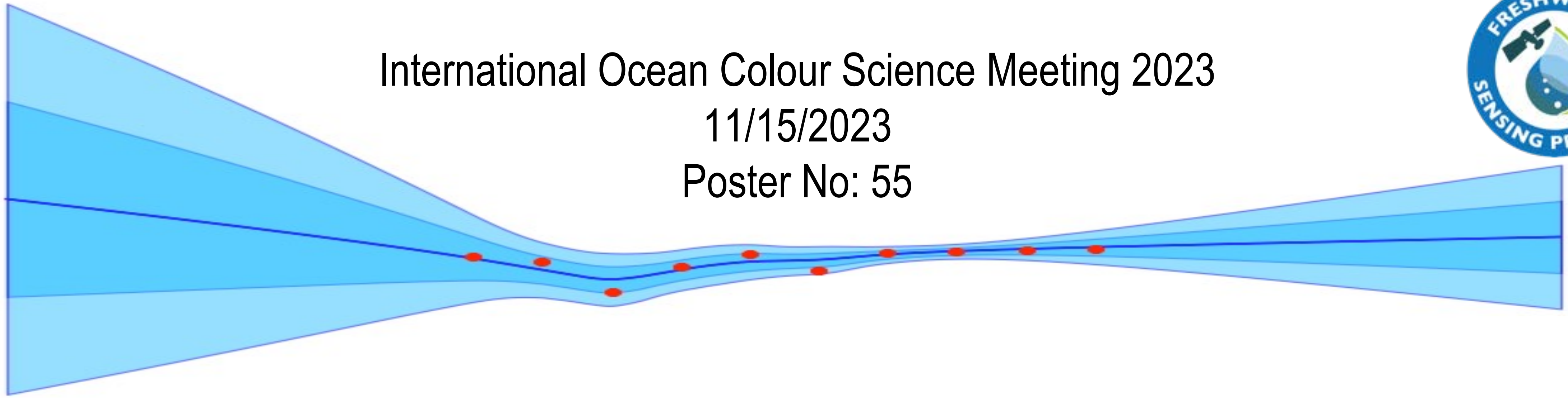
Requirements at Ocean Ltyp

- > 420, UV
- > 1000, 400-580 nm
- > 750, 580-650 nm
- > 580, 650-712 nm
- > 500, 713-880

Geostationary Littoral Imaging and Monitoring Radiometer (GLIMR):

Raytheon - Approved for Public Release

Assessment of Density-Based Neural Networks for the Dual Estimation of Water Quality Indicators and Uncertainties from Multi- and Hyperspectral Remote Sensing



International Ocean Colour Science Meeting 2023
11/15/2023
Poster No: 55

Arun M. Saranathan[1,2], Nima Pahlevan[1,2], Mortimer Werther[3], and Daniel Odermatt[3.4]

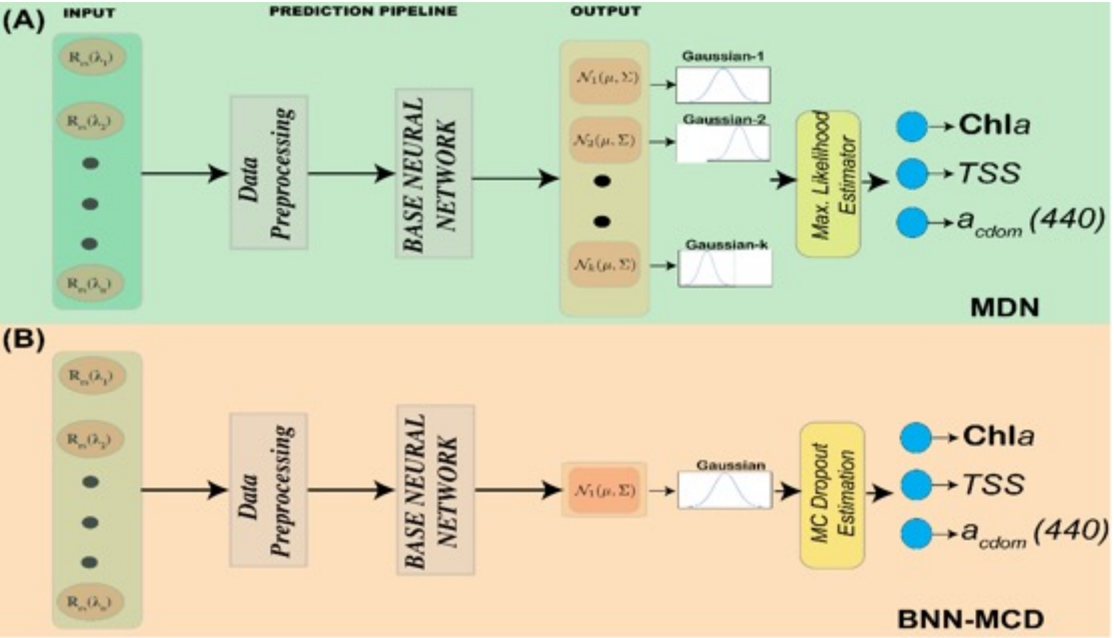
[1]GSFC-619.0, NASA Goddard Space Flight Center, Greenbelt 20771, MD, USA.

[2]Freshwater Sensing Program, Science Systems and Applications, Inc. (SSAI), Lanham 20706, MD, USA.

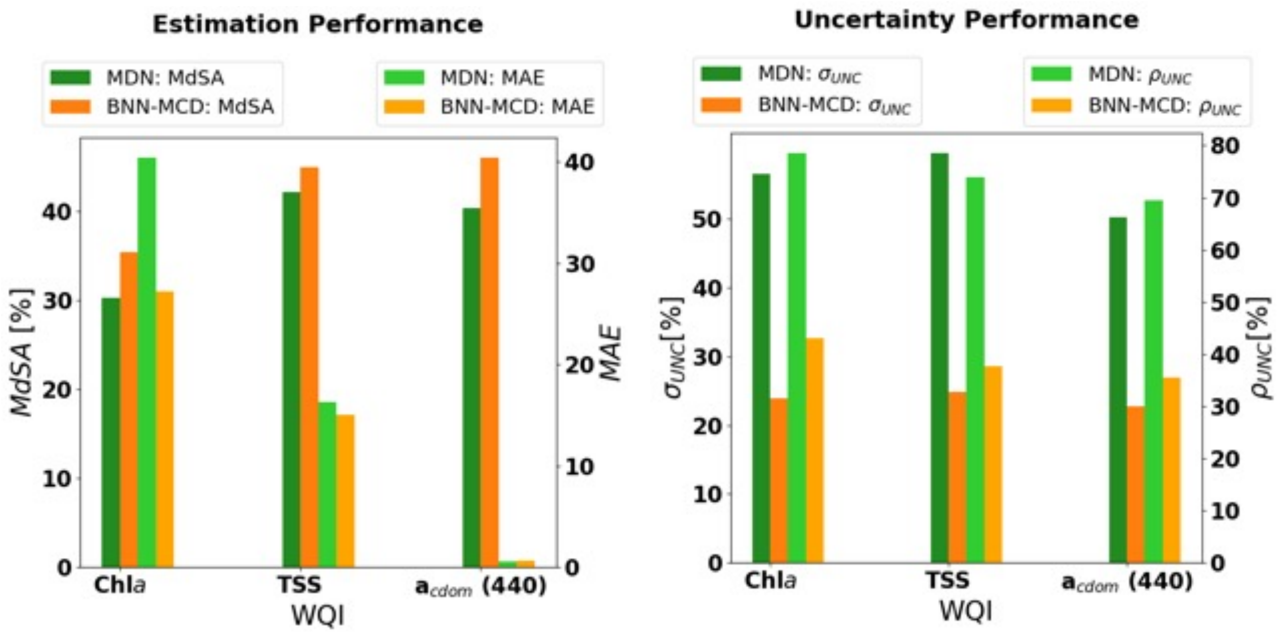
[3]Swiss Federal Institute of Aquatic Science and Technology, Dübendorf 8600, Switzerland.

[4]Department of Geography, University of Zurich, Zürich 8057, Switzerland

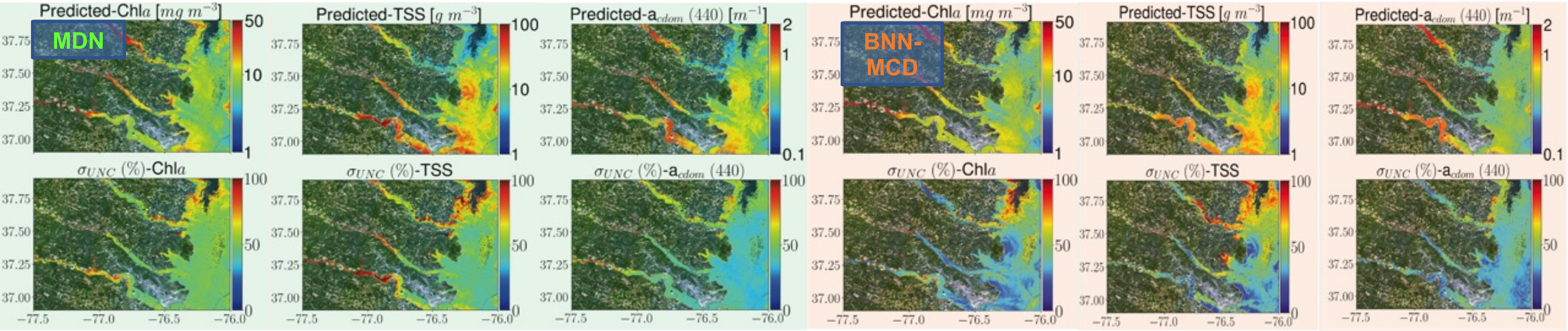
PREDICTION PIPELINES FOR MDN & BNN-MCD



MODEL VALIDATION ON *IN SITU* GLORIA DATASET- MSI



PREDICTIONS FOR MSI IMAGE OF CHESAPEAKE BAY (October 17th, 2020)

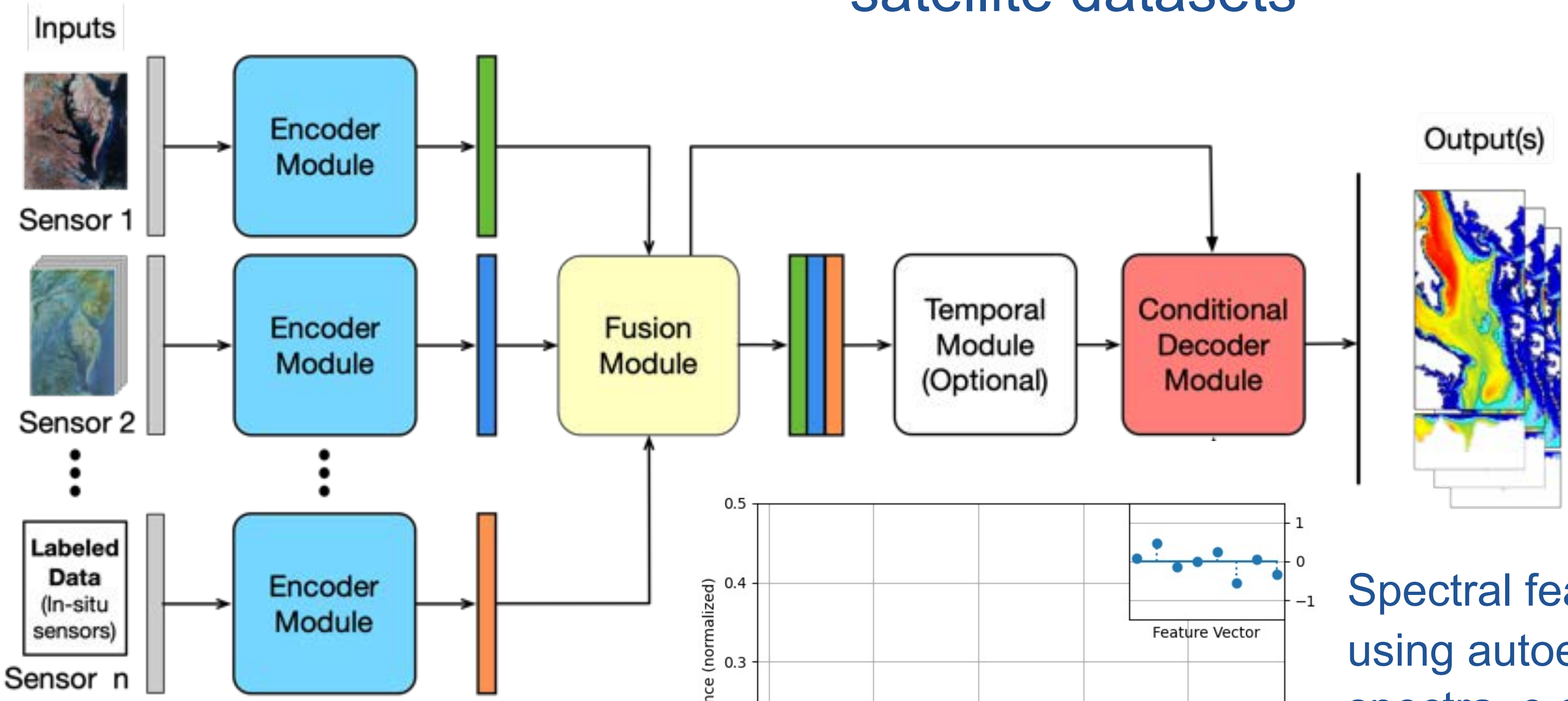


Deep learning for Environmental Ecological Prediction, eValuation, Insight with Ensembles of Water quality (DEEP-VIEW) for coastal applications

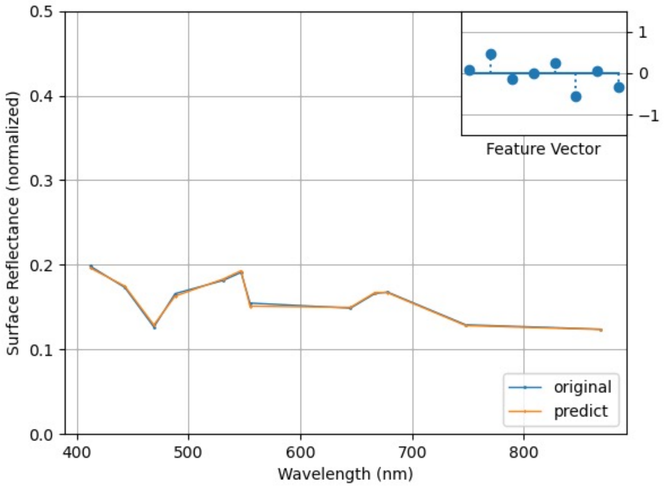
Stephanie Schollaert Uz[1],
Troy J. Ames[1], J. Blake Clark[1,2], Dirk Aurin[1,3],
Samantha Smith[1,4]

[1]NASA Goddard Space Flight Center, Earth Science Division, Greenbelt, Maryland
[2]University of Maryland Baltimore County, Baltimore, Maryland
[3]Morgan State University, Baltimore, Maryland
[4]Science Systems and Applications, Inc., Lanham, Maryland

Ensemble of generalized modules based on monitoring needs to exploit available satellite datasets



Water quality indicators, e.g. Kd, secchi depth, ecosystem health



Spectral feature unsupervised learning using autoencoder architecture on spectra, e.g. MODIS-Aqua: 2002-2021

Training with 50K cloud-free pixels

Trained encoder supervises decoder

Bigelow | Laboratory for Ocean Sciences

NASA

Ocean Color Remote Sensing Insights into the Spatiotemporal Distribution of Surface Calanus finmarchicus in the Gulf of Maine

Rebekah Shunmugapandi[1], Cait McCarry[2], David McKee[2,3], Catherine Mitchell[1]

[1]Bigelow Laboratory of Ocean Sciences, East Boothbay, Maine, USA

[2]University of Strathclyde, Glasgow, UK

[3]University of the Arctic in Tromsø, Norway

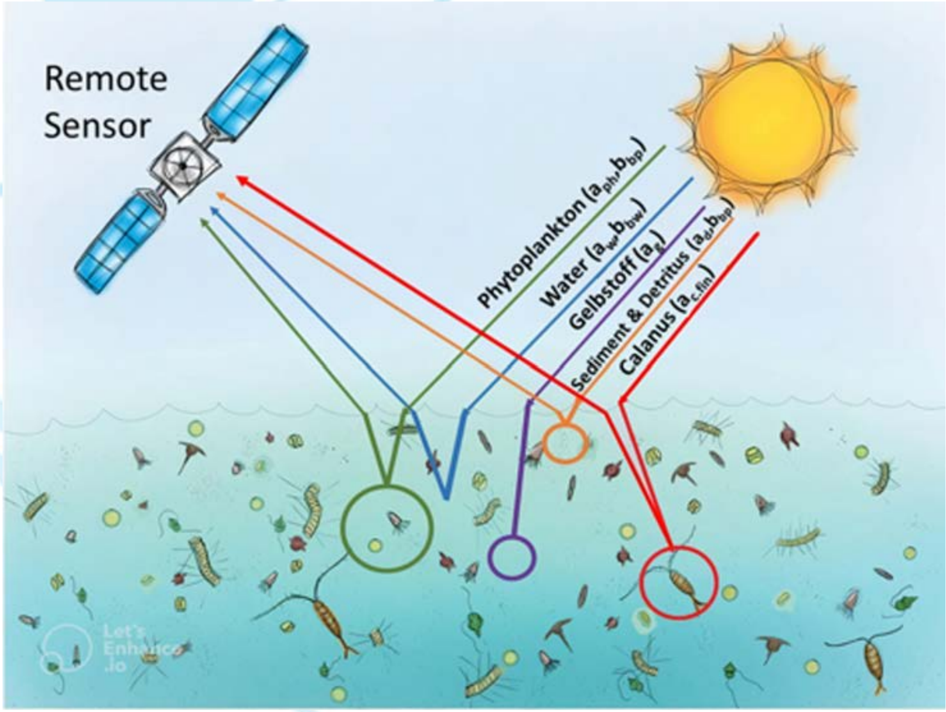
Correspondence Email: rshunmugapandi@bigelow.org & cmitchell@bigelow.org

How ocean color remote sensing is used to detect surface Calanus distribution in the Gulf of Maine?

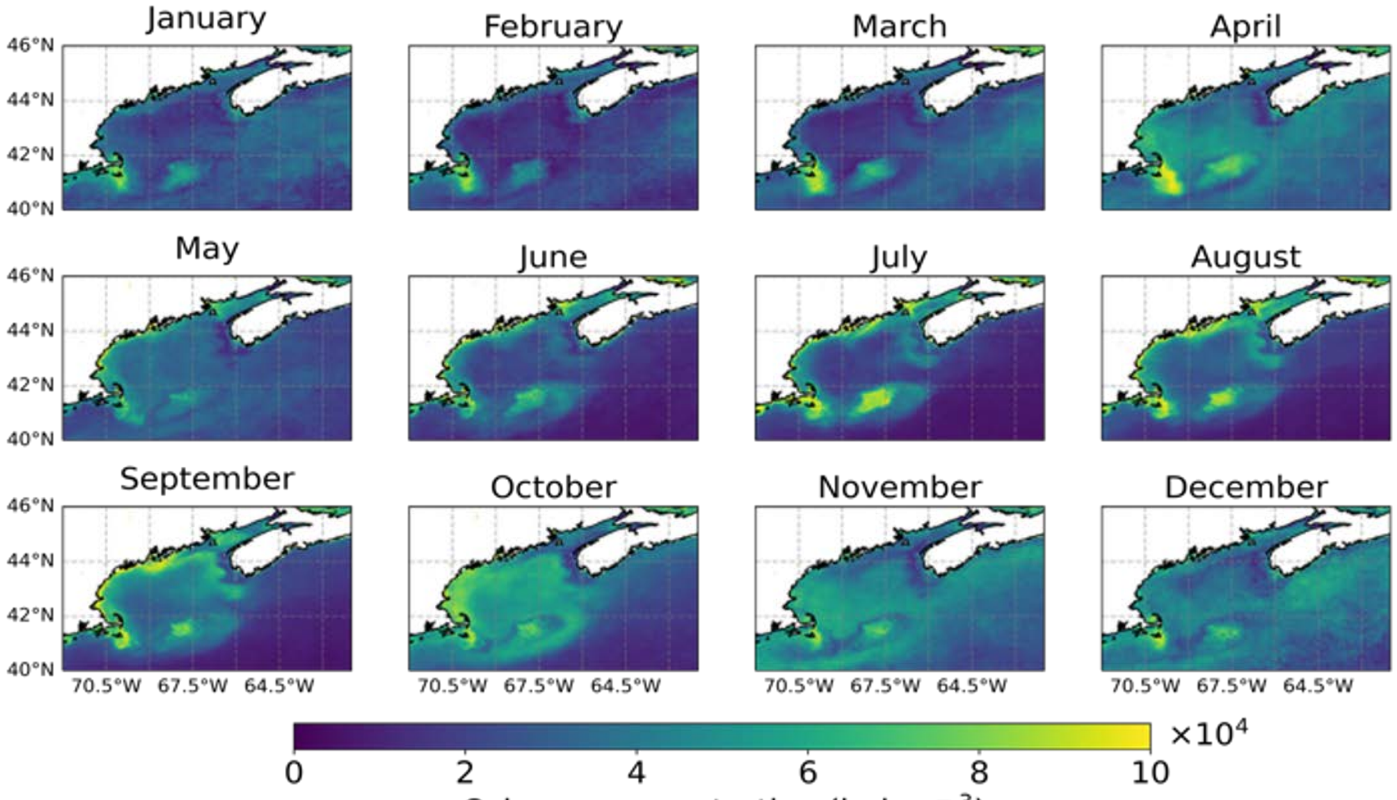
Calanus finmarchicus

Highlights

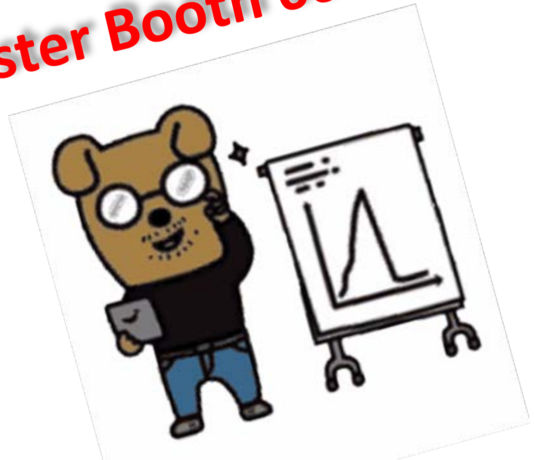
- The pigment astaxanthin in Calanus significantly affects reflective remote sensing signals when abundance is high.
- This study emphasizes the importance of understanding all of the significant contributions to ocean color remote sensing signals and highlights the potential of eRGB color matching methods for identifying the occurrence of high abundances of astaxanthin-rich/red species.



Spatiotemporal pattern of surface Calanus in the Gulf of Maine



Poster Booth 60 !!

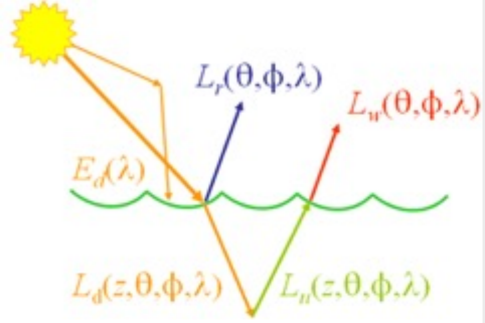


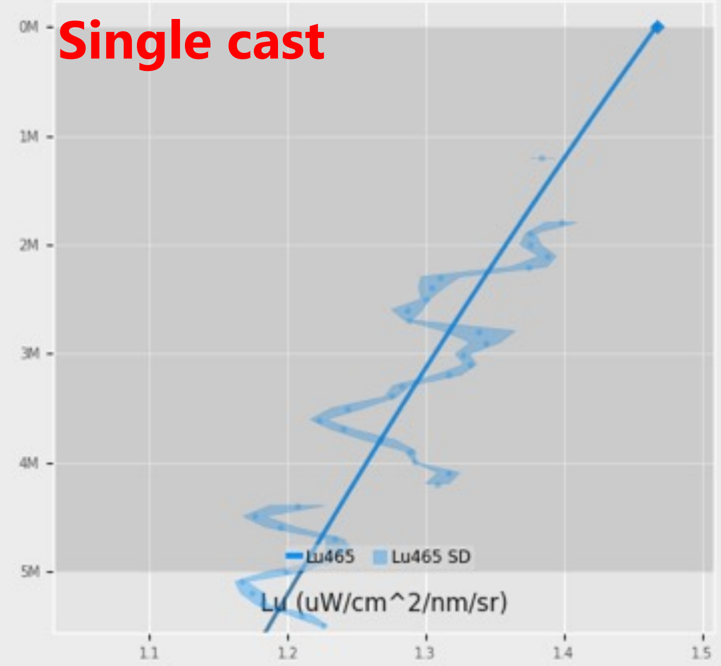
VISUAL SEABASS 3 in-water AOP processing software

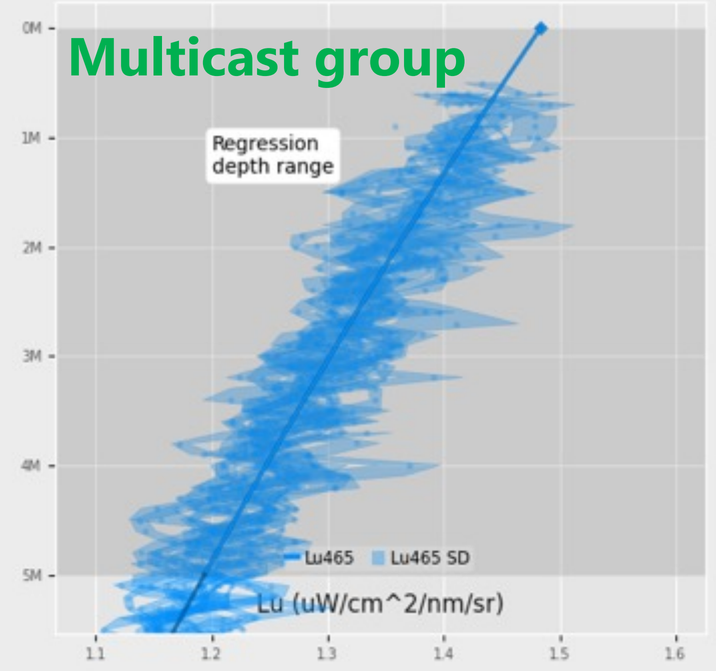
Harrison Smith[1,2], Violeta Sanjuan Calzado[1,3], Chris Proctor[1,2], Noah Vegh-Gaynor[1,2]

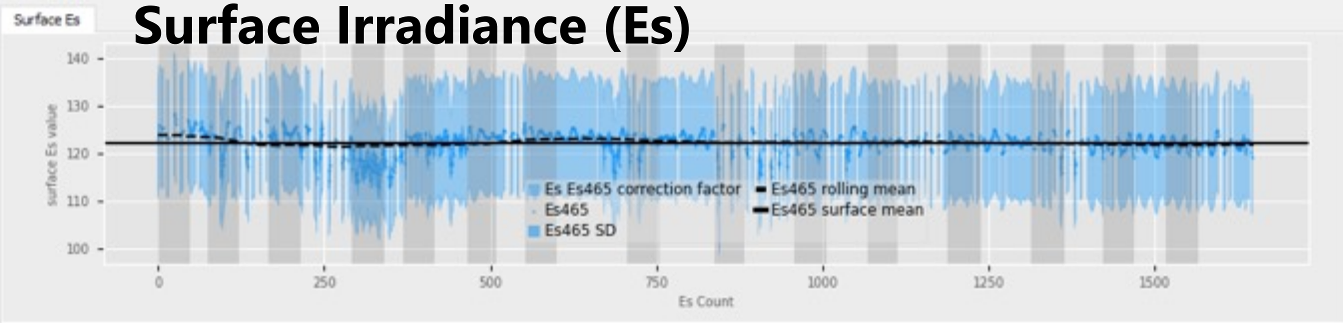
[1]NASA Goddard Space Flight Center [GSFC] [2]Science Systems Applications Inc. [SSAI] [3]University of Maryland Baltimore County [UMBC]

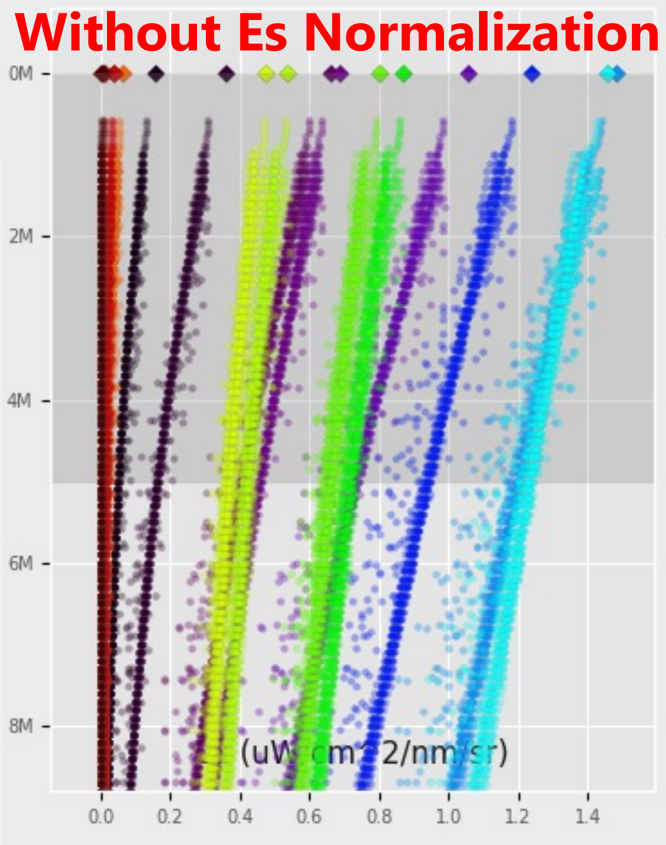
Inputs: SeaBASS files (Es, Ed, Lu)
Outputs: Water-leaving radiances, K slopes, Uncertainties

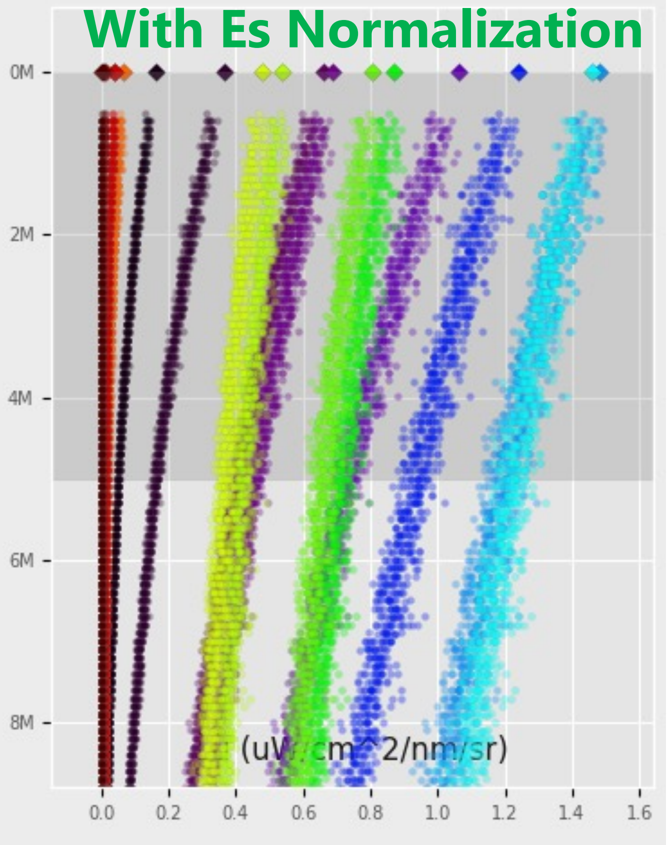






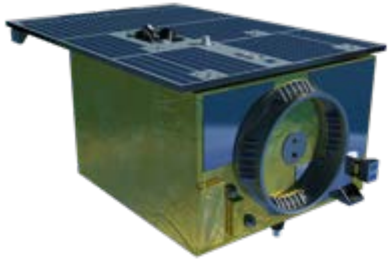


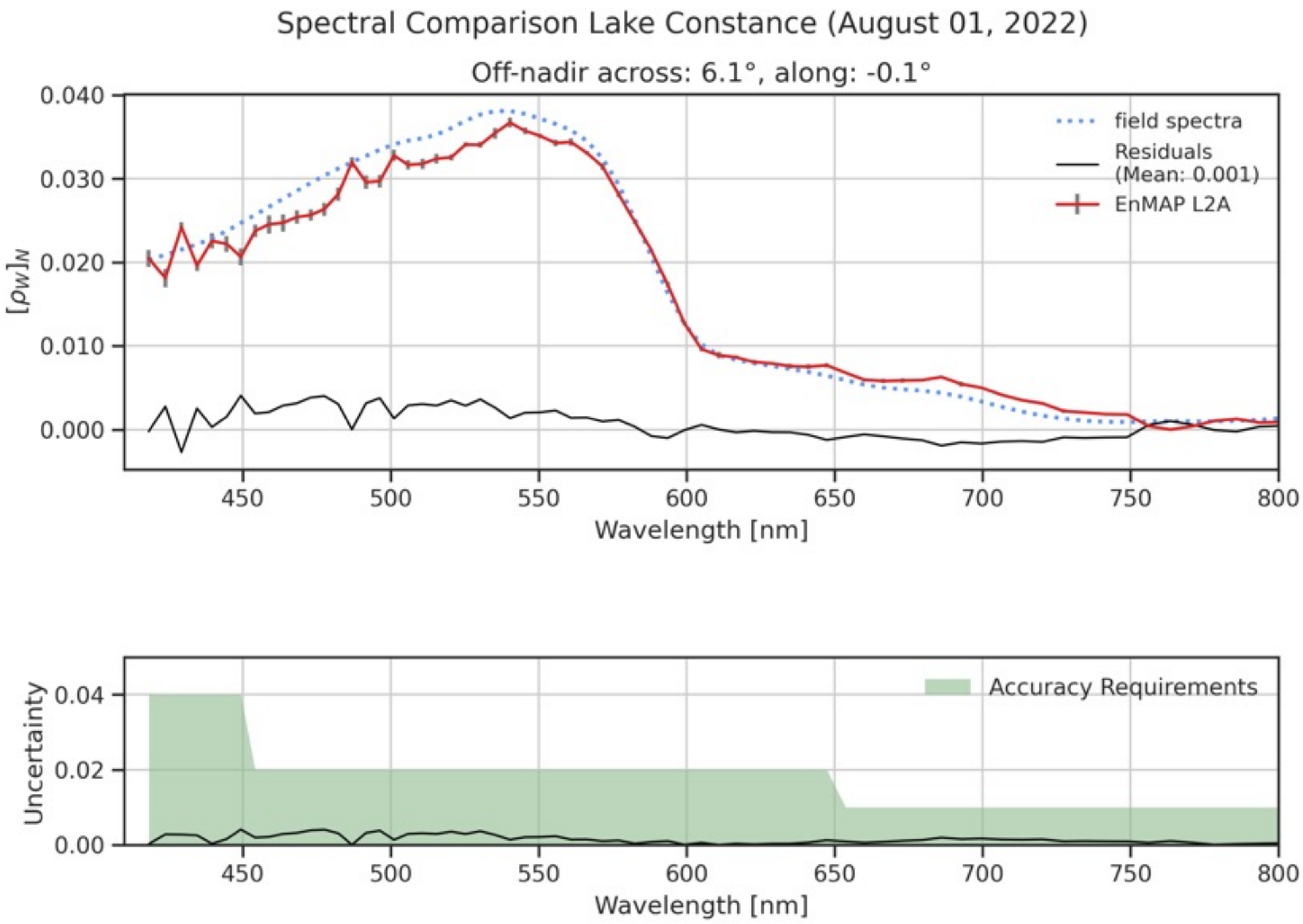




Evaluation of EnMAP water reflectance product during the commissioning phase and first operational year

M. A. Soppa, M. Brell, S. Chabrillat, L. Alvarado, P. Gege, S. Plattner, I. Somlai-Schweiger, T. Schroeder, V. Brando, S. Colella, M. Bresciani, C. Giardino, Q. Vanhellemont, F. Steinmetz, D. Scheffler, M. Langheinrich, E. Carmon, M. Bachmann, M. Pato, T. Storch, A. Schickling, S. Fischer, A. Bracher





Spectral Comparison Lake Constance (August 01, 2022)
Off-nadir across: 6.1°, along: -0.1°
field spectra
Residuals (Mean: 0.001)
EnMAP L2A
$[\rho_W]_N$
0.040
0.030
0.020
0.010
0.000
450
500
550
600
650
700
750
800
Wavelength [nm]
Accuracy Requirements
Uncertainty
0.04
0.02
0.00
450
500
550
600
650
700
750
800
Wavelength [nm]

No. 67

Reconstructing hyper-spectral downwelling irradiance from multi-spectral measurements

***Jing Tan[1]**, Robert Frouin[1], Nils Häentjens[2], Andrew Barnard[3], Emmanuel Boss[2], Paul Chamberlain[1], Matt Mazloff[1] and Cristina Orrico[4]*

[1]Scripps Institution of oceanography, University of California San Diego, La Jolla, CA, United States

[2]School of Marine Sciences, University of Maine, Orono, ME, United States

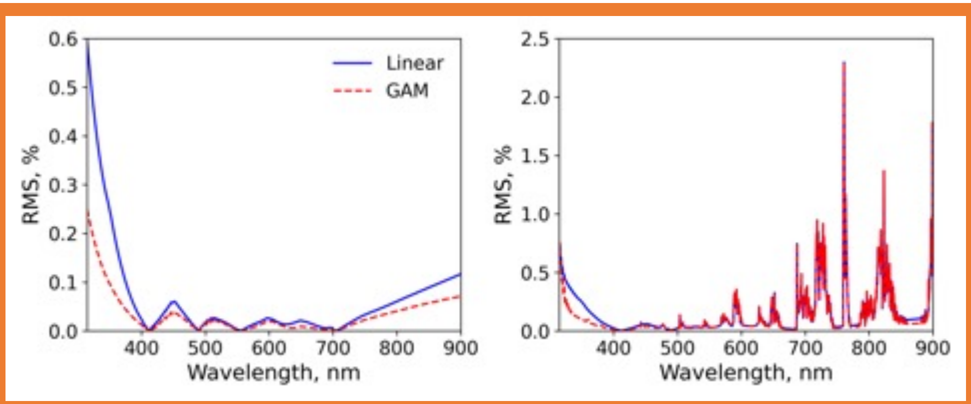
[3]College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, OR, United States

[4]Sea-Bird Scientific, Philomath, OR, United States

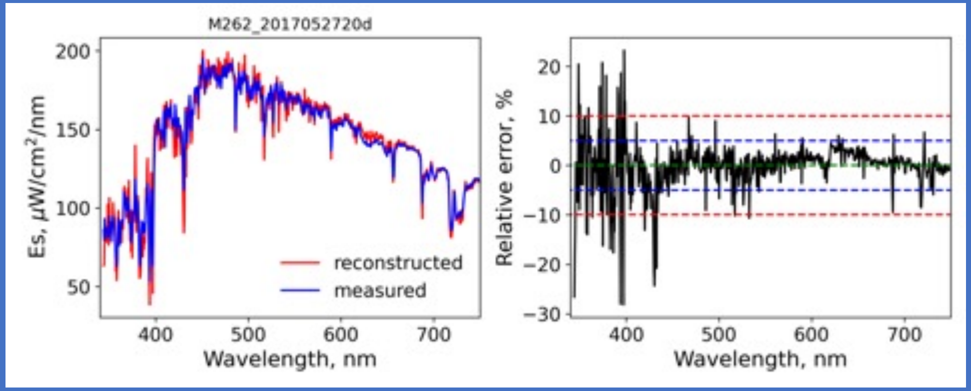
E_s at four 10-nm wide wavelengths (412, 489, 555, and 705 nm)

Hyperspectral E_s from 315 to 900 nm

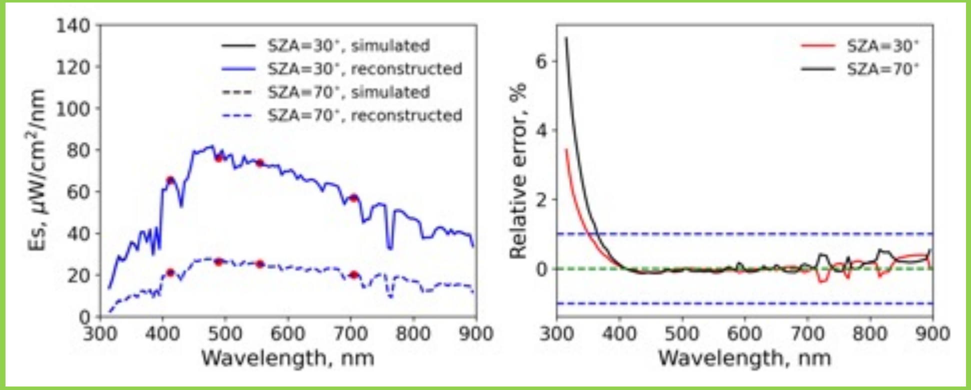
Theoretical Uncertainties

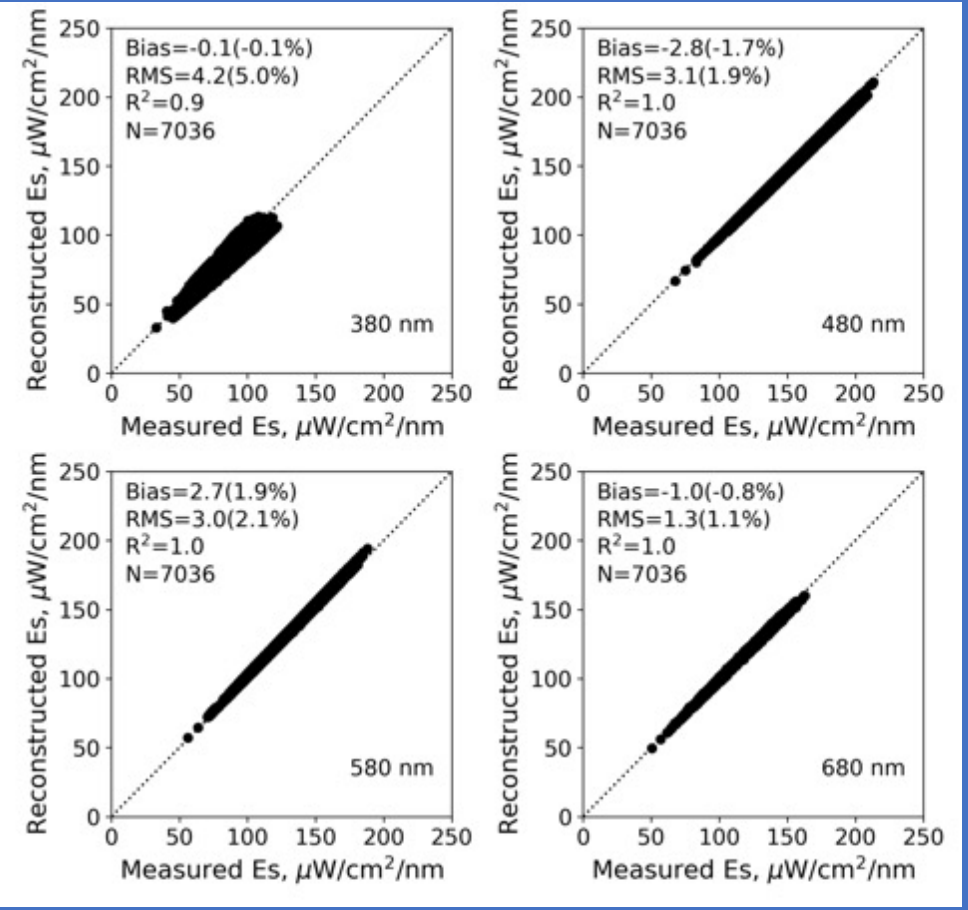


MOBY Evaluation



OCI Application





Reconstructing hyperspectral E_s from measurements at a few coarse bands can be done accurately!

Merging satellite datasets to observe decadal trends in Cyanobacterial Index and turbidity products for Lake Okeechobee, FL, USA

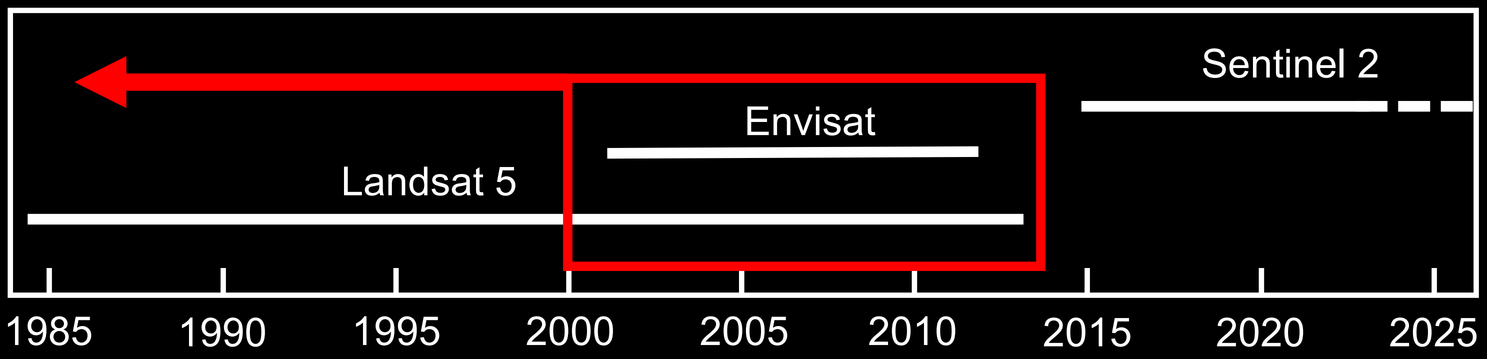
Zack Wistort[1] and Tim Moore[1]

1- FAU Harbor Branch Oceanographic Institute, Fort Pierce, FL

Algae bloom on Lake Okeechobee, central Florida, 8/21/2005. Image taken by Landsat 5 (USGS).

HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY

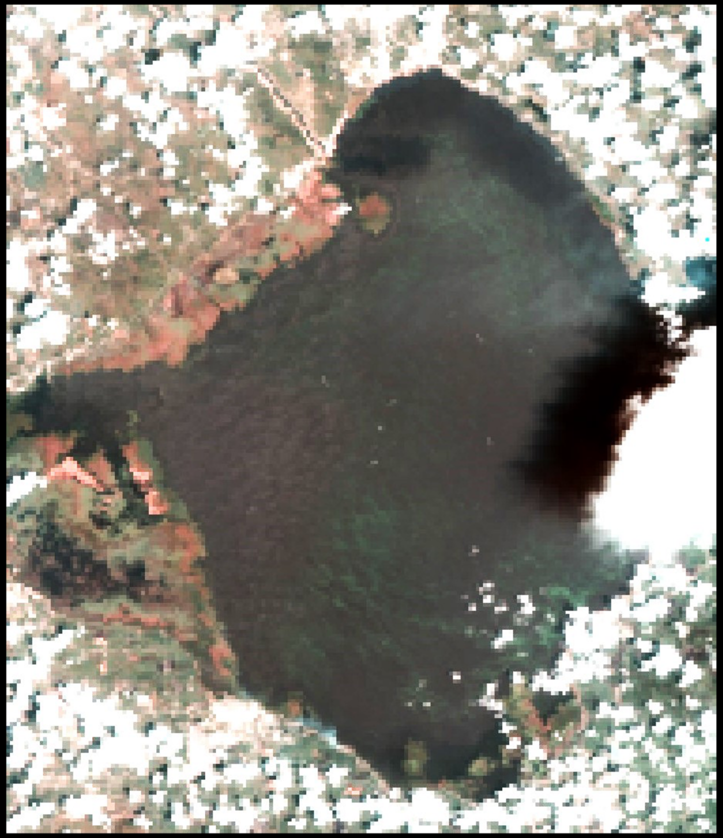


- Is there a reliable proxy to extend the Lake Okeechobee CI timeseries using Landsat 5 imagery?

Landsat 5 (TM)

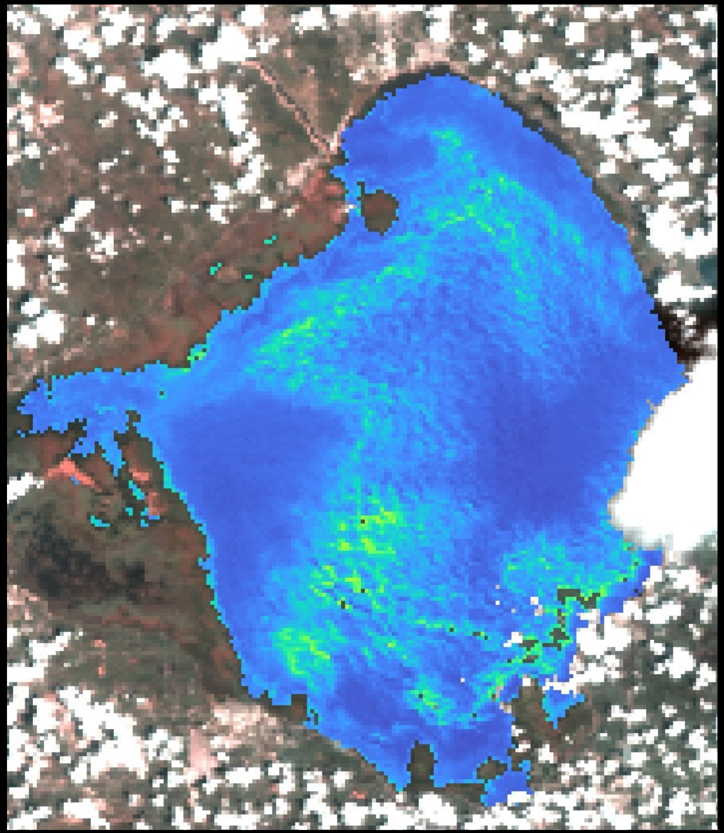
8/21/2005

Envisat (MERIS)



8/22/2005

Cyanobacterial Index



8/22/2005

Adjacency-effect correction in remote sensing of coastal and inland waters for Sentinel-2 MSI and Landsat-8 OLI imagery

Yulun Wu[1], Anders Knudby[1], Nima Pahlevan[2,3], David Lapen[4], Chuiqing Zeng[5], Christopher Begeman[2,3]

[1]Department of Geography, Environment and Geomatics, University of Ottawa, Ottawa, ON, Canada
[2]Science Systems and Applications Inc., Lanham, MD, USA
[3]NASA Goddard Space Flight Center, Greenbelt, MD, USA
[4]Ottawa Research Development Centre, Agriculture and Agri-Food Canada, Ottawa, ON, Canada
[5]Environment and Climate Change Canada, Canada Centre for Inland Waters, Burlington, ON, Canada

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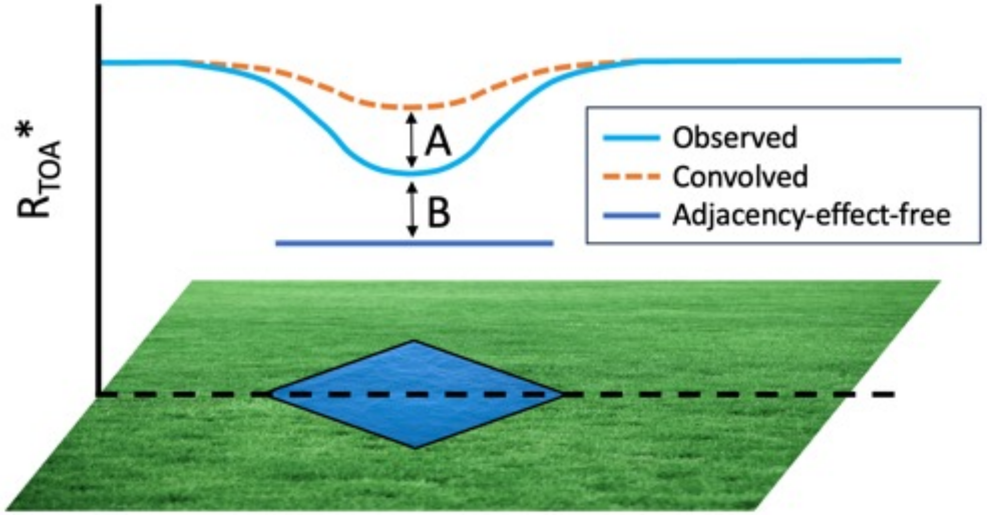
Methodology



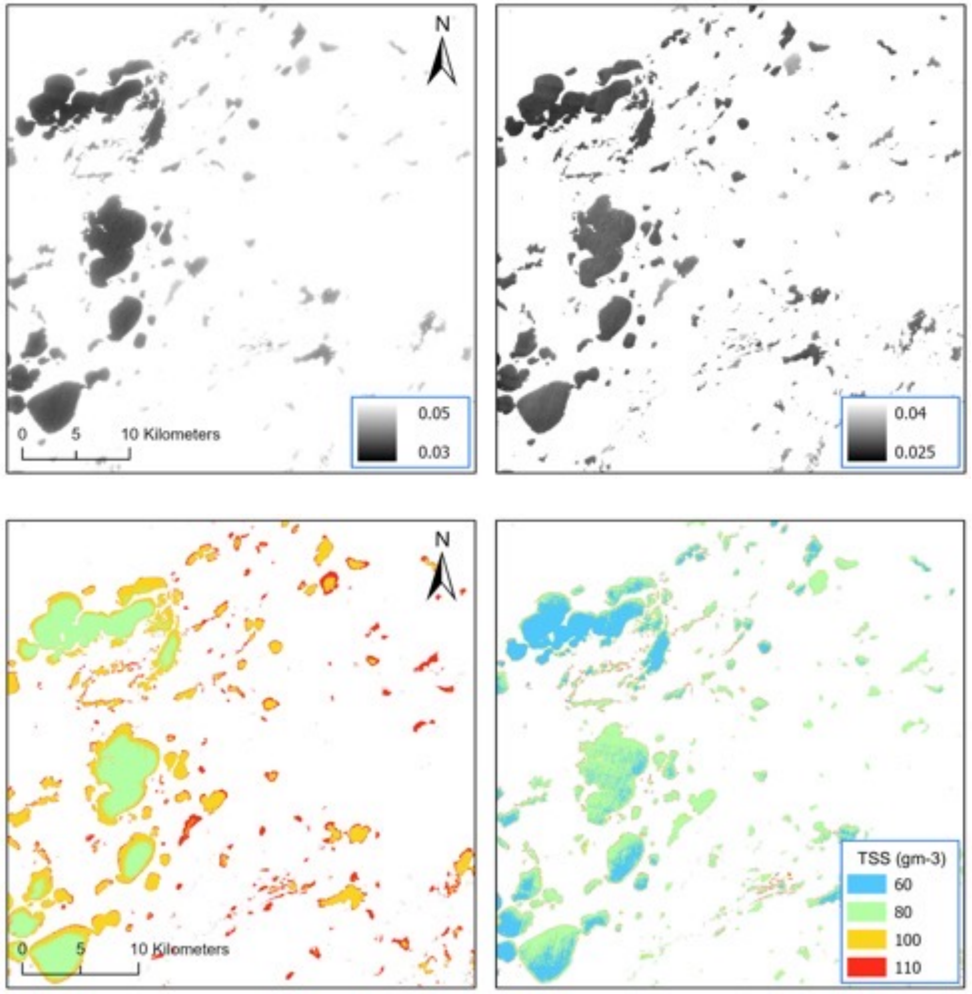
Steps:

1. Calculate the Point Spread Function (PSF)
2. Convolve TOA reflectance with the PSF
3. Estimate and correct for the AE from the difference between observed and convolved TOA reflectance

Code and instruction:
https://github.com/yulunwu8/tmart

Case Study: Lakes in Minnesota

Before AE correction | After AE correction



TOA Reflectance at 740 nm

TSS Retrieval

Algorithm: Nechad et al. 2010

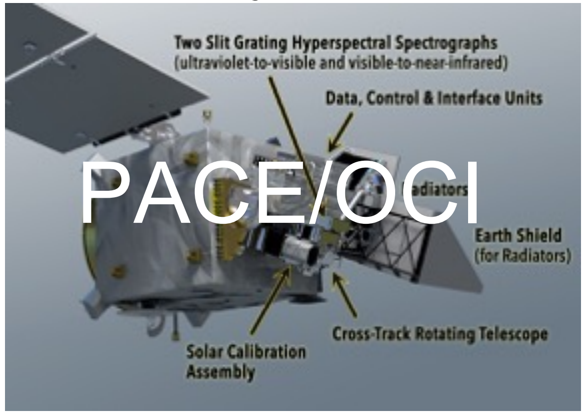
Hyperspectral optimization for optically shallow water retrievals: application to HICO and implications for the PACE mission

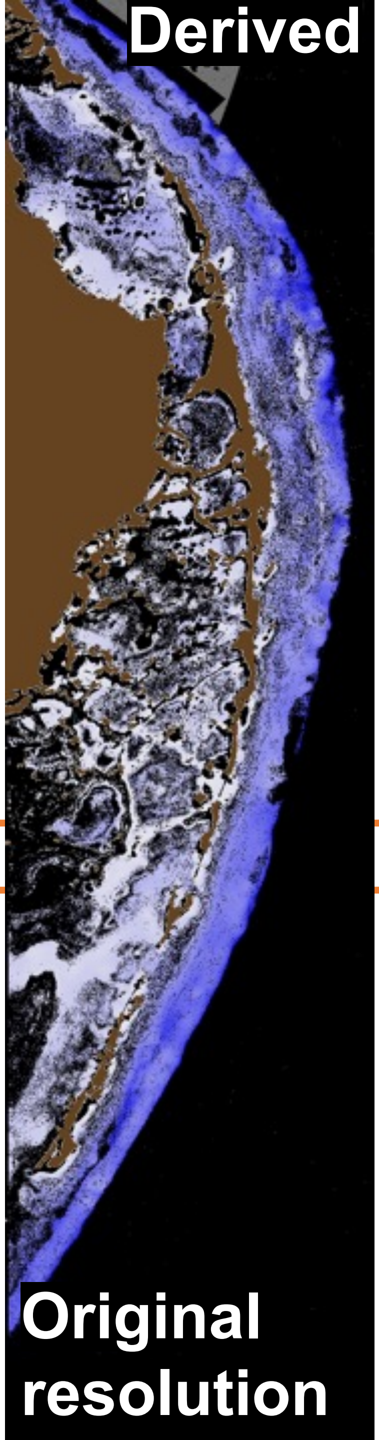
Yuyuan Xie (yuyuan@usf.edu), Brian B. Barnes, Chuanmin Hu
College of Marine Science, University of South Florida

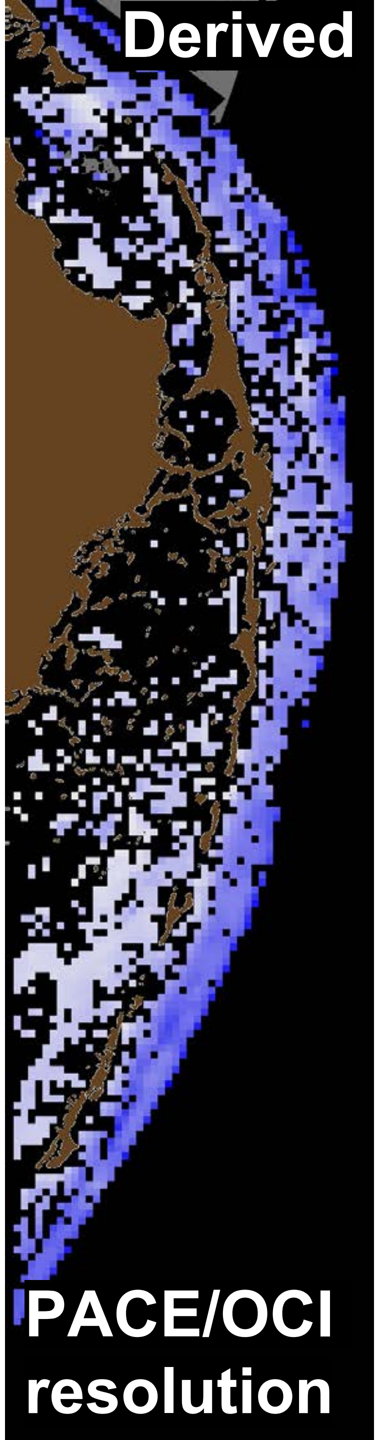
Mapping depths

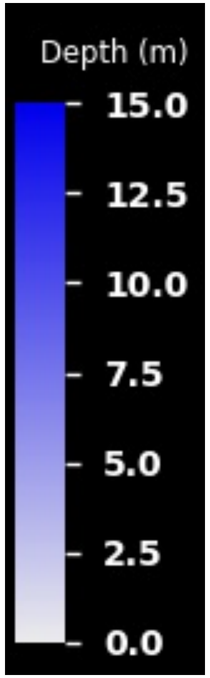
This study

Next year









Poster No. 74, Session 3, IOCS Meeting 2023

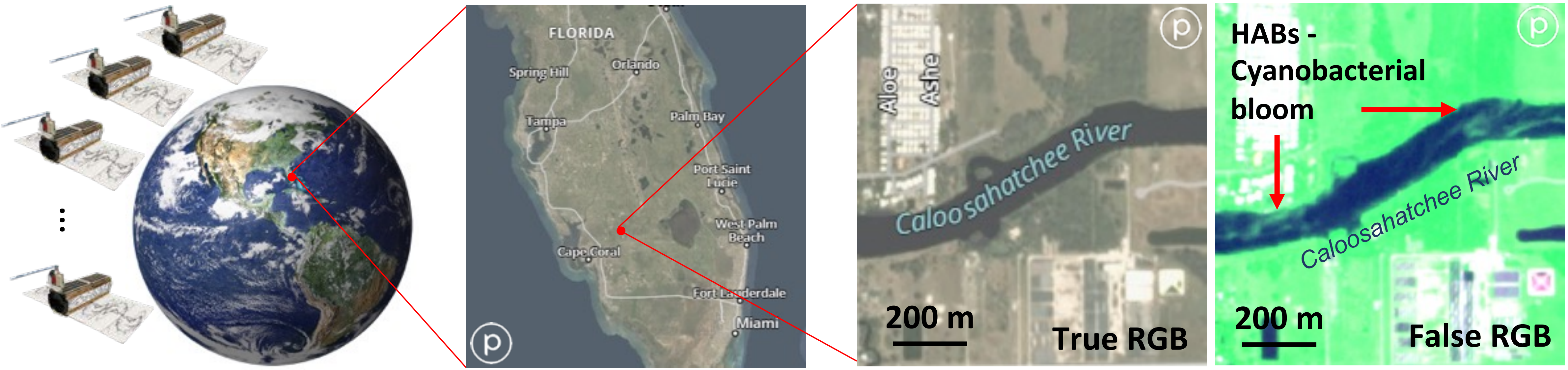
UNIVERSITY of SOUTH FLORIDA

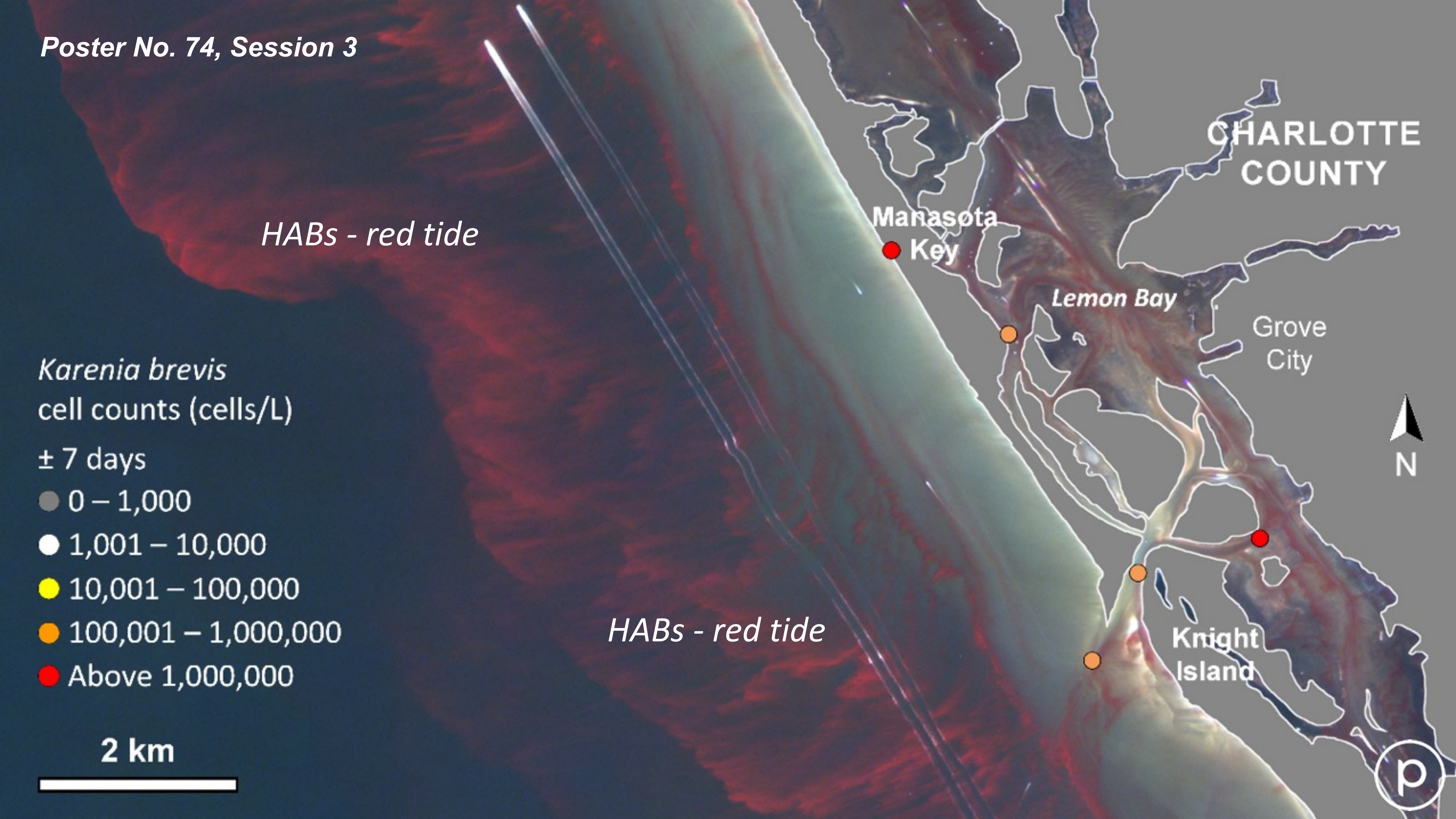
Application of Dove/SuperDove imagery in monitoring Harmful Algal Blooms in nearshore and inland waters

Yao Yao[1], Chuanmin Hu[1*], Jennifer P. Cannizzaro[1], Brian B. Barnes[1], Yuyuan Xie[1]

1 College of Marine Science, University of South Florida

Corresponding to: huc@usf.edu




Poster No. 74, Session 3
HABs - red tide
Manasota Key
CHARLOTTE COUNTY
Lemon Bay
Grove City
Karenia brevis
cell counts (cells/L)
± 7 days
0 – 1,000
1,001 – 10,000
10,001 – 100,000
100,001 – 1,000,000
Above 1,000,000
N
HABs - red tide
Knight Island
2 km

Hypoxia forecasting for Chesapeake Bay using artificial intelligence

Guangming Zheng [1,2] and Stephanie Schollaert Uz [3], Marjorie Friedrichs [4], Pierre St-Laurent [4], Amita Mehta [5], Paul M. DiGiacomo [1]

[1] NOAA/NESDIS/Center for Satellite Applications and Research, 5830 University Research Court, College Park, MD 20740
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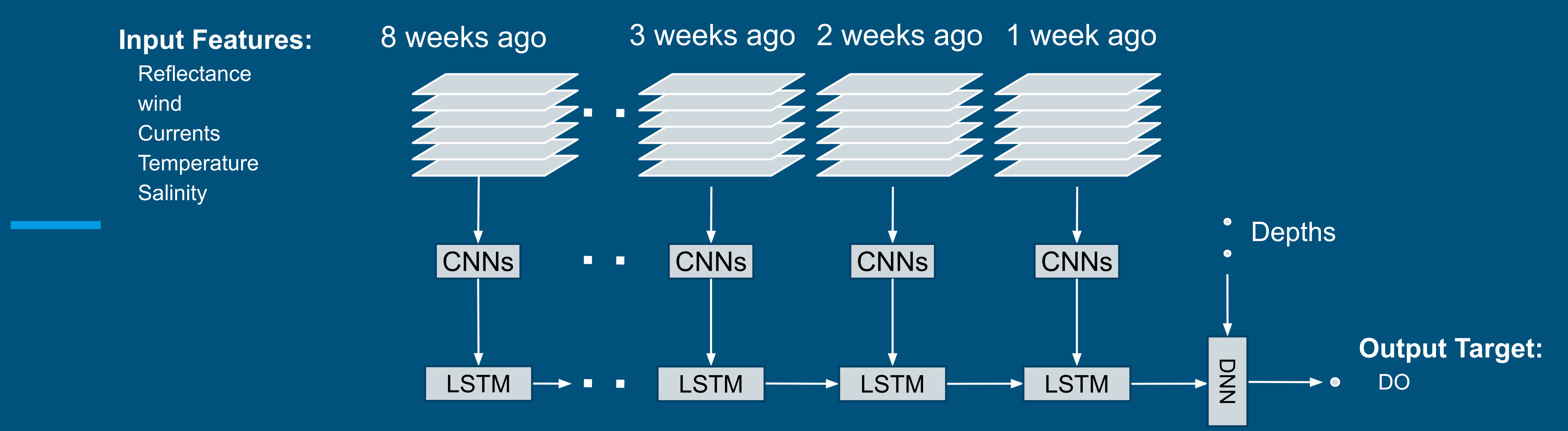
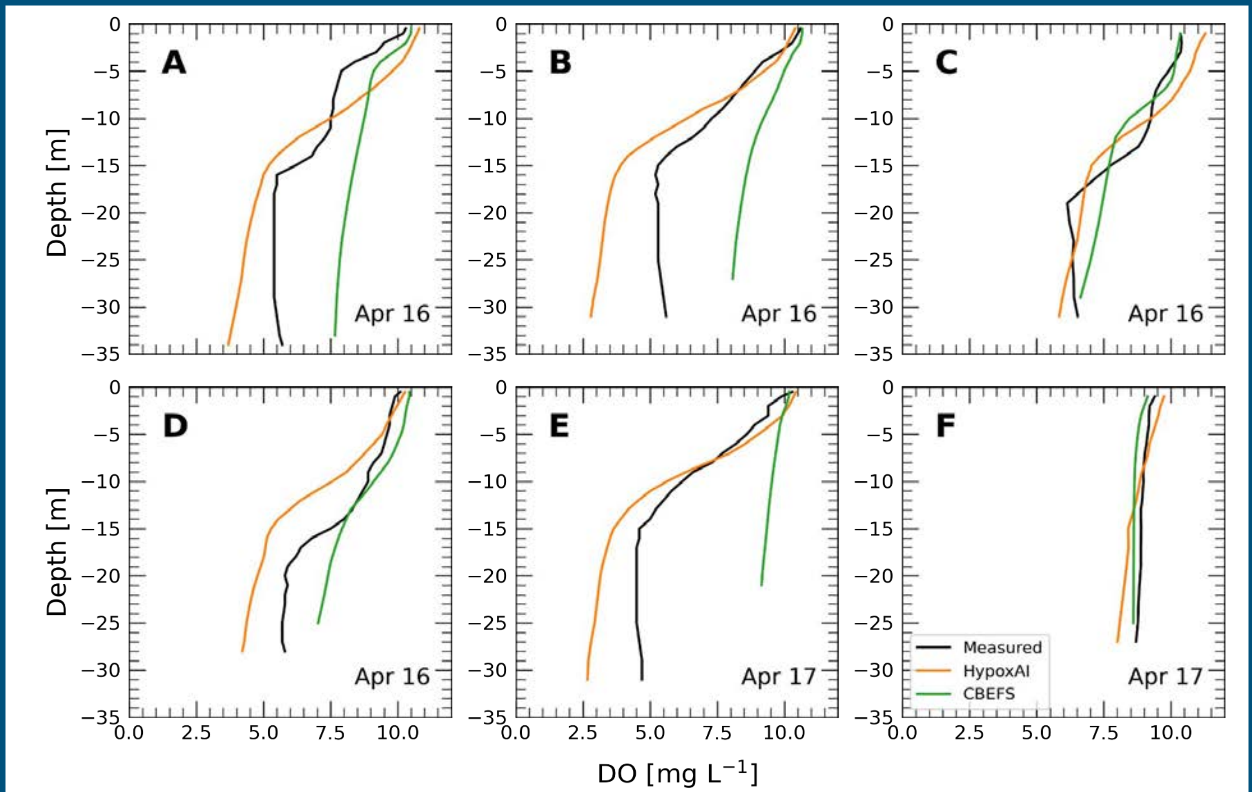
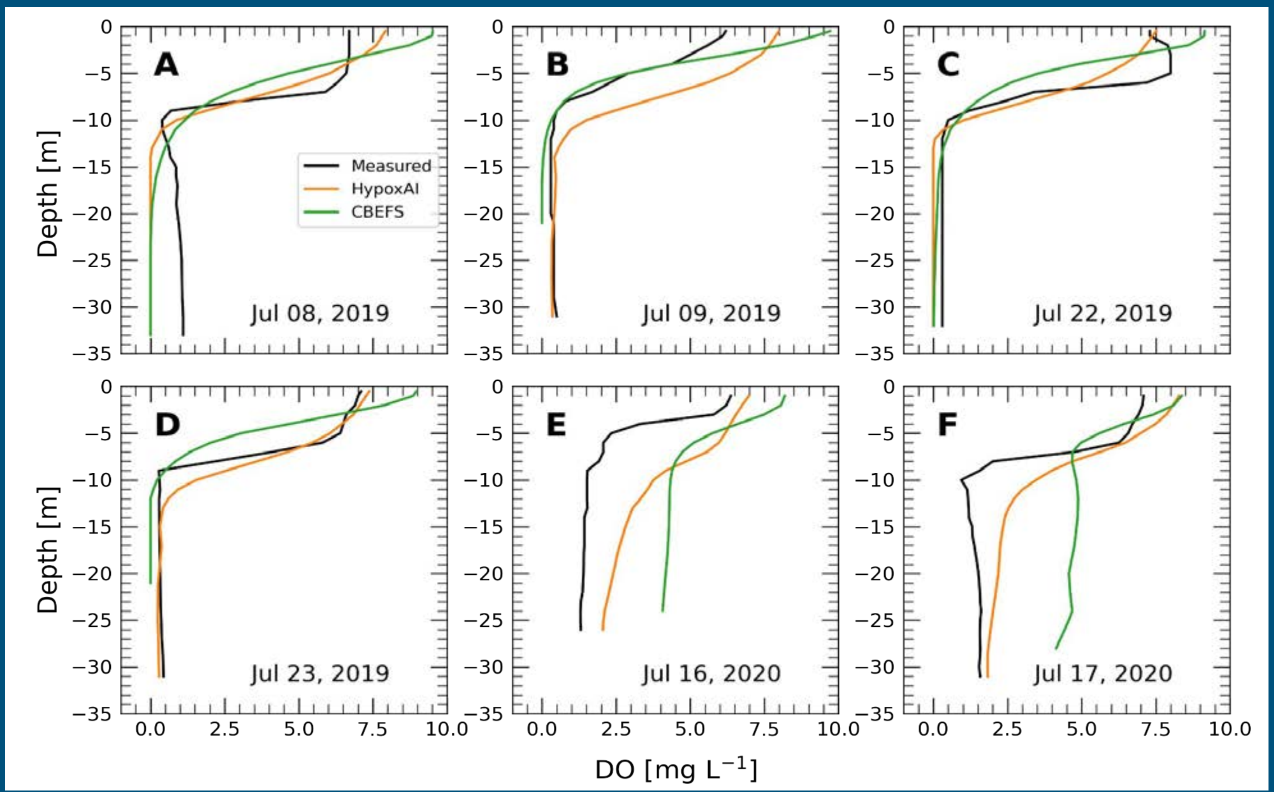

Input Features:
Reflectance
wind
Currents
Temperature
Salinity
8 weeks ago
3 weeks ago
2 weeks ago
1 week ago
CNNs
LSTM
Depths
DNN
Output Target:
DO


A
B
C
D
E
F
Apr 16
Apr 17
Depth [m]
DO [mg L^{-1}]
Measured
HypoxAI
CBEFS


A
B
C
D
E
F
Jul 08, 2019
Jul 09, 2019
Jul 22, 2019
Jul 23, 2019
Jul 16, 2020
Jul 17, 2020
Depth [m]
DO [mg L^{-1}]
Measured
HypoxAI
CBEFS

A Low-Cost Spectroradiometer System for Measuring the Radiometric Properties and Color of Natural Waters

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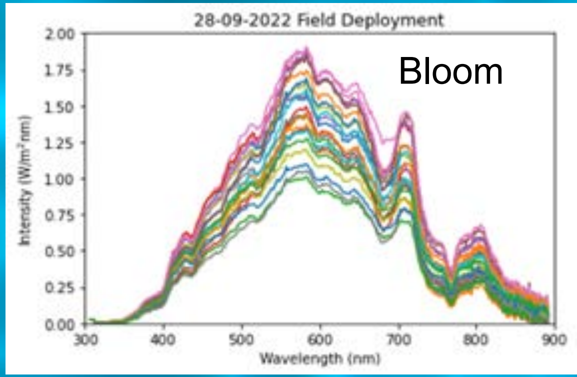
[2]Physics Department, Old Dominion University, Norfolk, VA

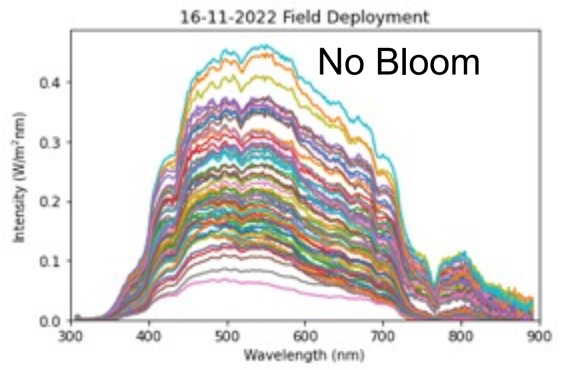
[3]Department of Physics, University of Texas, Austin, TX

A
B
C
D

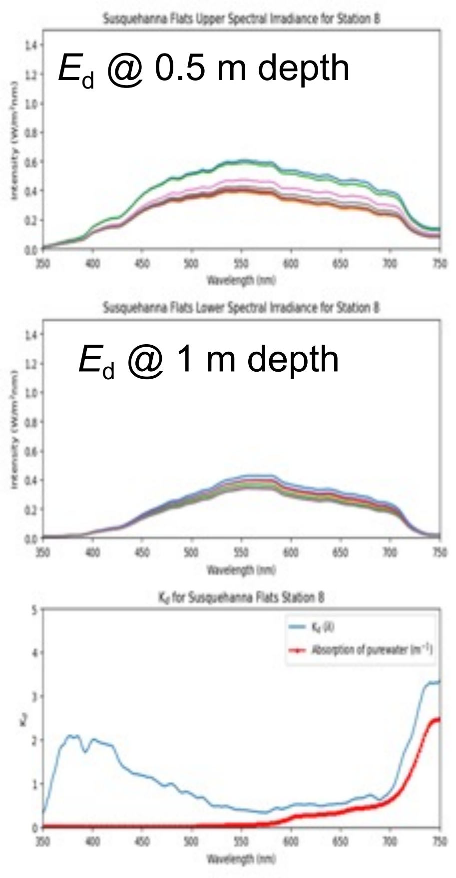
E_d @ 0.5 m depth



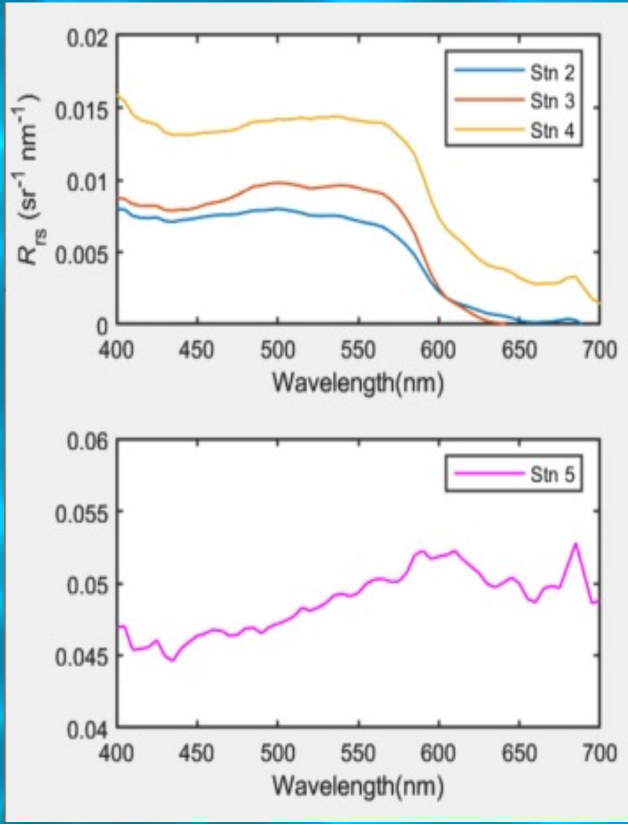
28-09-2022 Field Deployment
Bloom
Intensity (W/m²nm)
Wavelength (nm)



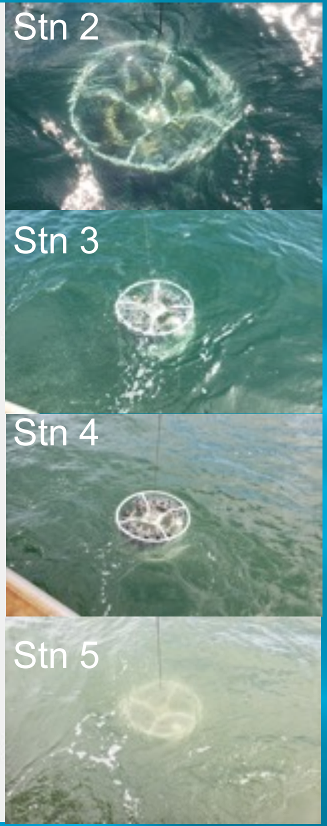
16-11-2022 Field Deployment
No Bloom
Intensity (W/m²nm)
Wavelength (nm)



Susquehanna Flats Upper Spectral Irradiance for Station 8
E_d @ 0.5 m depth
Wavelength (nm)
Susquehanna Flats Lower Spectral Irradiance for Station 8
E_d @ 1 m depth
Wavelength (nm)
K_d for Susquehanna Flats Station 8
Wavelength (nm)



R_rs (sr^-1 nm^-1)
Stn 2
Stn 3
Stn 4
Wavelength(nm)
Stn 5
Wavelength(nm)



Stn 2
Stn 3
Stn 4
Stn 5