International Ocean Colour Science Meeting 2023

Advancing Global Ocean Colour Observations

Poster Session 6 Lightning Talks

No: 133

Contrasting suspended particle characteristics and optical properties in two estuaries in the northern Gulf of Mexico: Seasonal trends

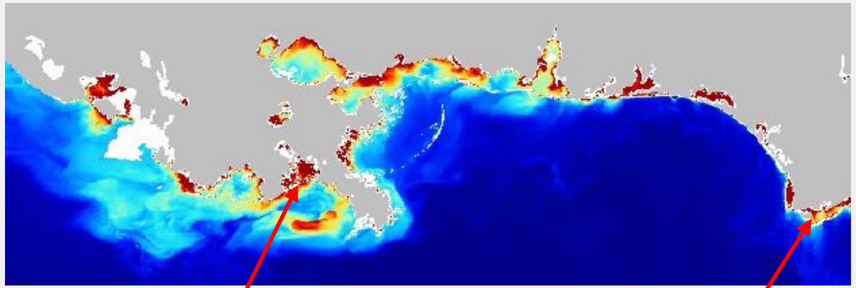
Eurico D'Sa, Louisiana State University

Ishan Joshi, Scripps Institution of Oceanography

Bingqing Liu, University of Louisiana, Lafayette

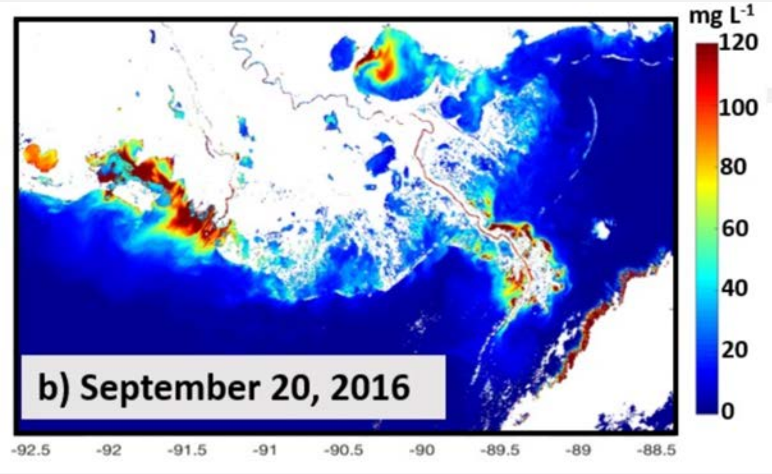
IOCS, 14-17 Nov. 2023

Seasonal variability SPM in two estuaries in northern GoM

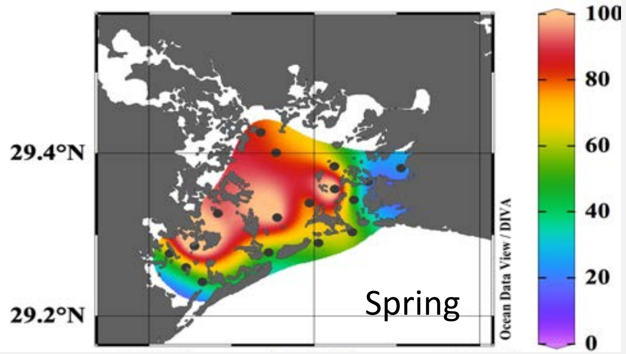


Barataria Bay estuary Apalachicola Bay estuary

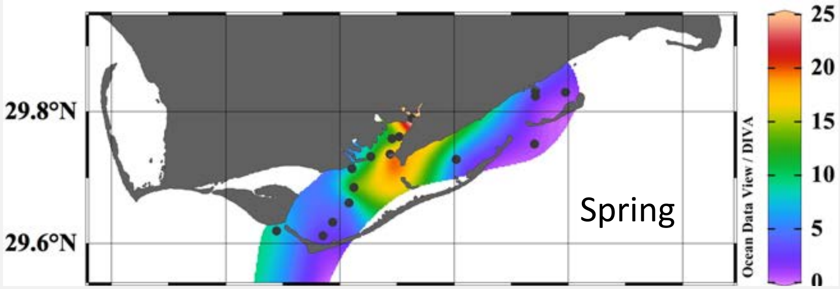
SPM using Adaptive QAA
(Joshi & D'Sa, 2020)



Particle characteristics: Volume Concentration, size and slope



SPM mg/L



Distinct trends in seasonal/spatial variability in SPM and its characteristics in the two optically complex estuaries

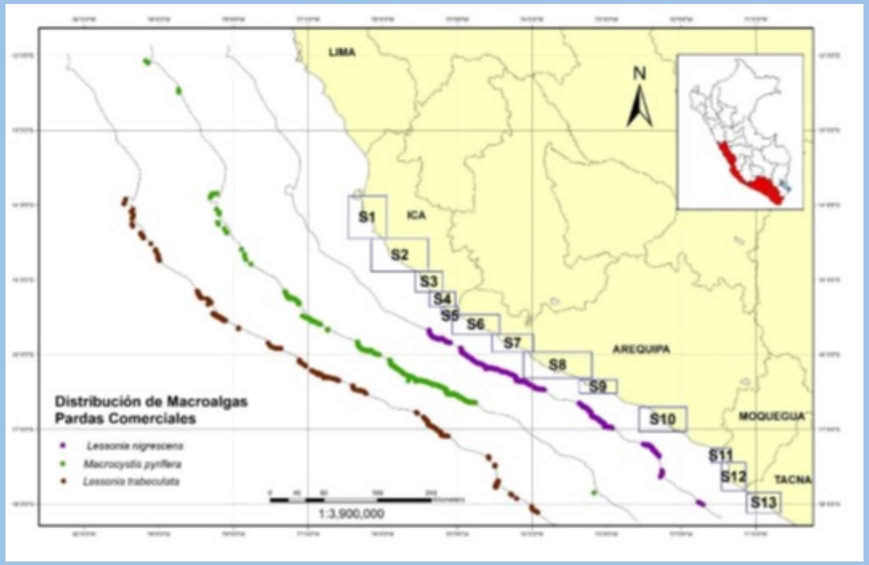
Identification of the Spectral Pattern of Brown Algae in the southern area of Perú

Luis Escudero[1], Carlos Paulino[1], German Velaochaga[1], Jaime Atiquipa[1], Han Xu[1] & Edward Alburqueque[1]

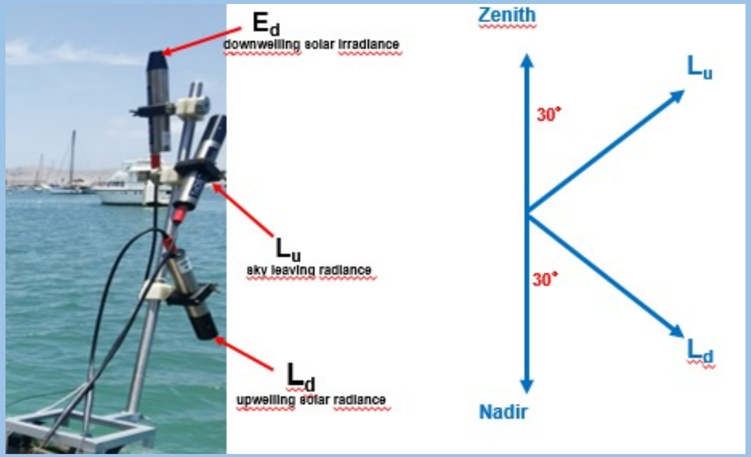
[1] Remote Sensing Laboratory, Instituto del Mar del Perú

STUDY AREA

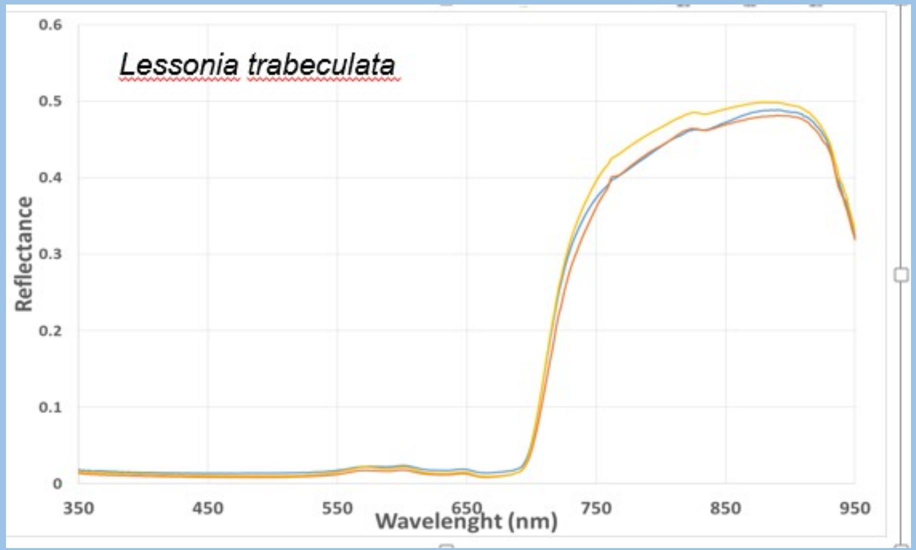
Brown algae distribution

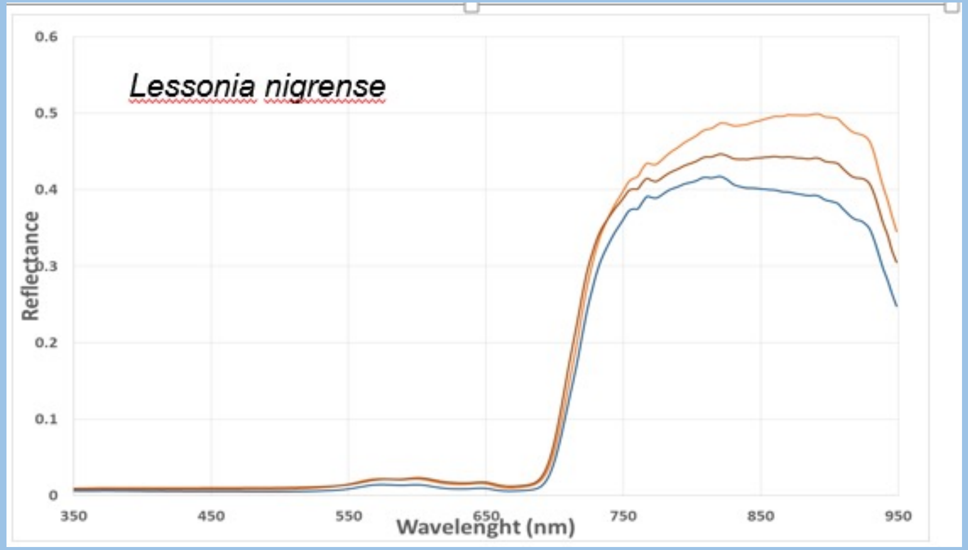


SPECTRAL EQUIPMENT



SPECTRAL SIGNATURE





Sunglint mitigation strategy for upcoming multidisciplinary remote-sensing missions

Poster Number - 136

Sakib Kabir[1,2](sakib.kabir@nasa.gov); **Nima Pahlevan**[1,2]; **Peng-Wang Zhai**[3]; **Akash Ashapure**[1,2]

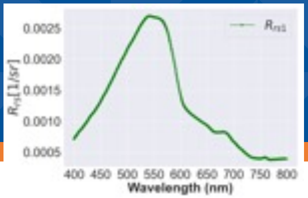
[1]Science Systems and Applications Inc.(SSAI)

[2]NASA Goddard Space Flight Center (GSFC)

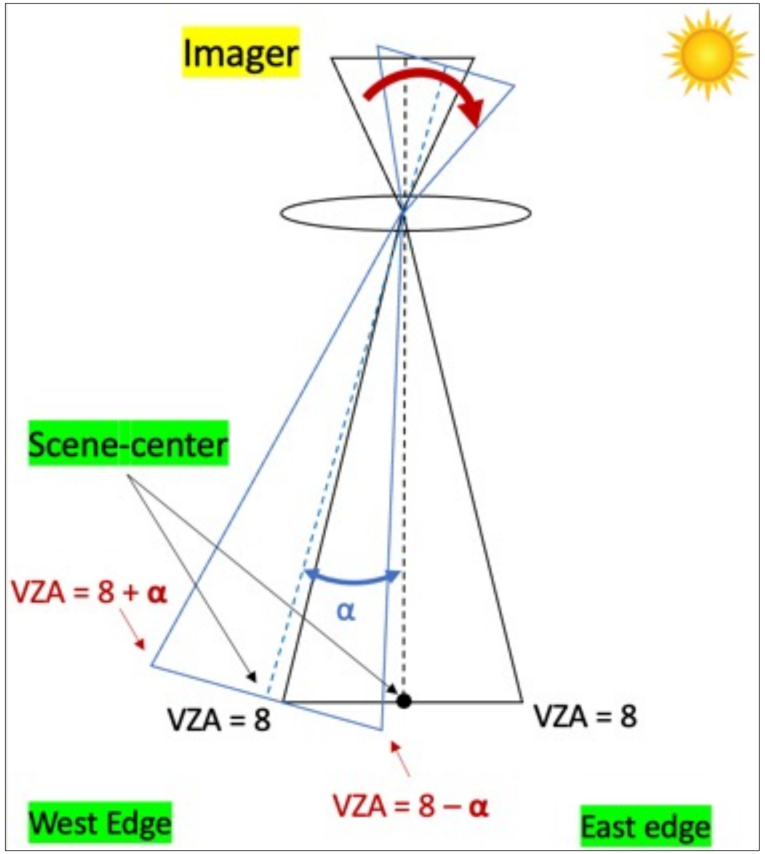
[3]Department of Physics, University of Maryland Baltimore County

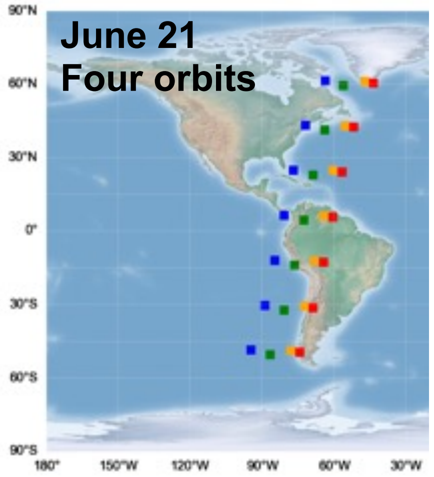
Date: 11/17/2023

Sunglint Mitigation Strategy

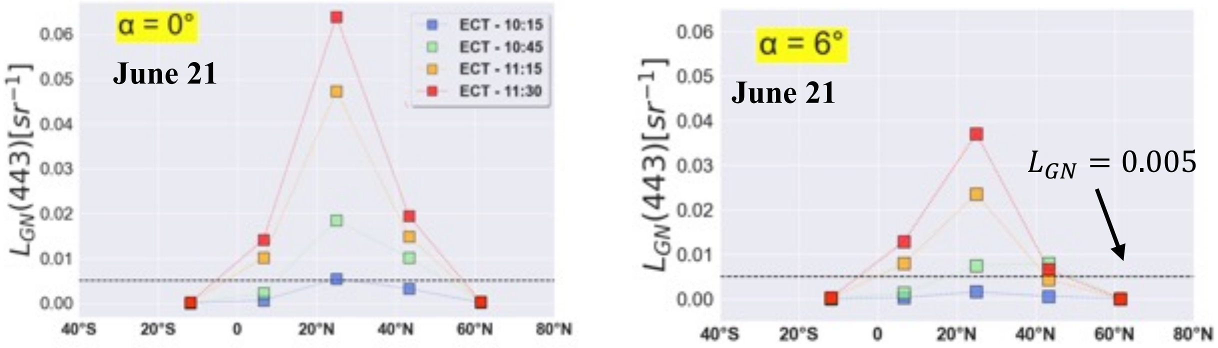


Tilting Strategy

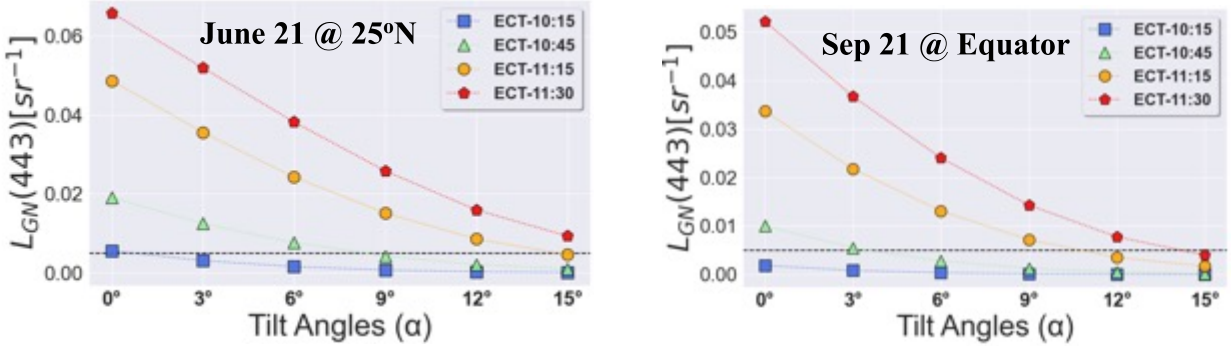




Results



Sunglint coefficient (L_{GN}) when **α = 0°** and **6°**



L_{GN} as a function of α

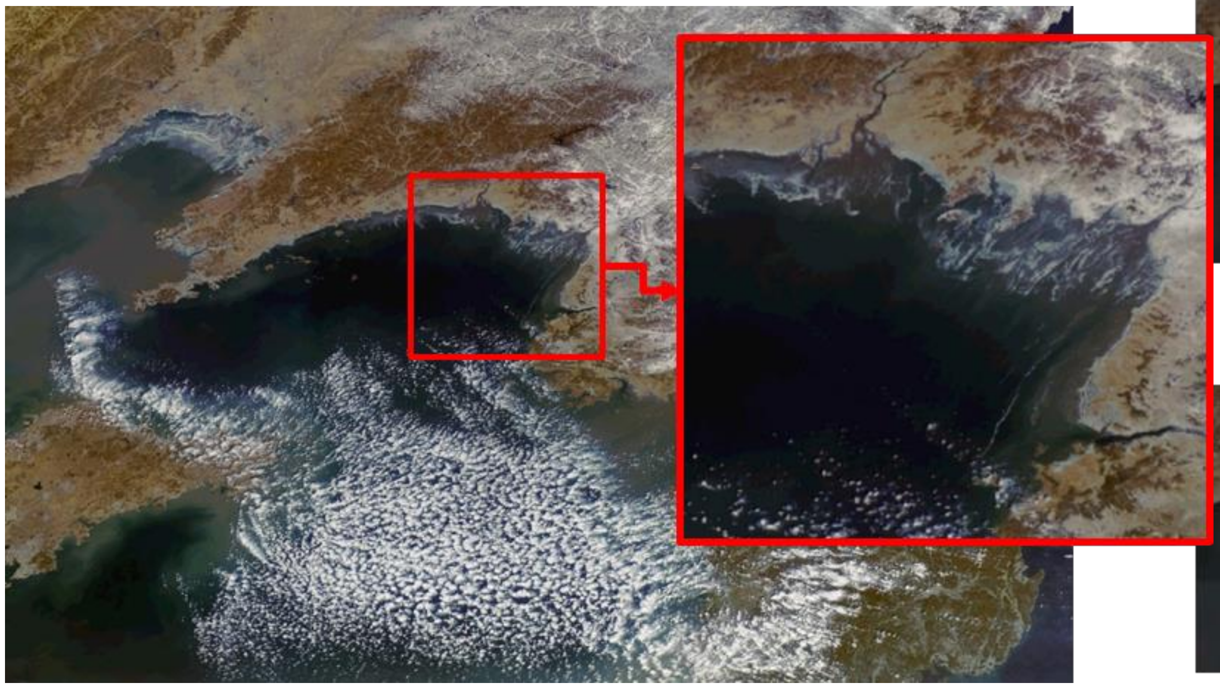
Conclusion:

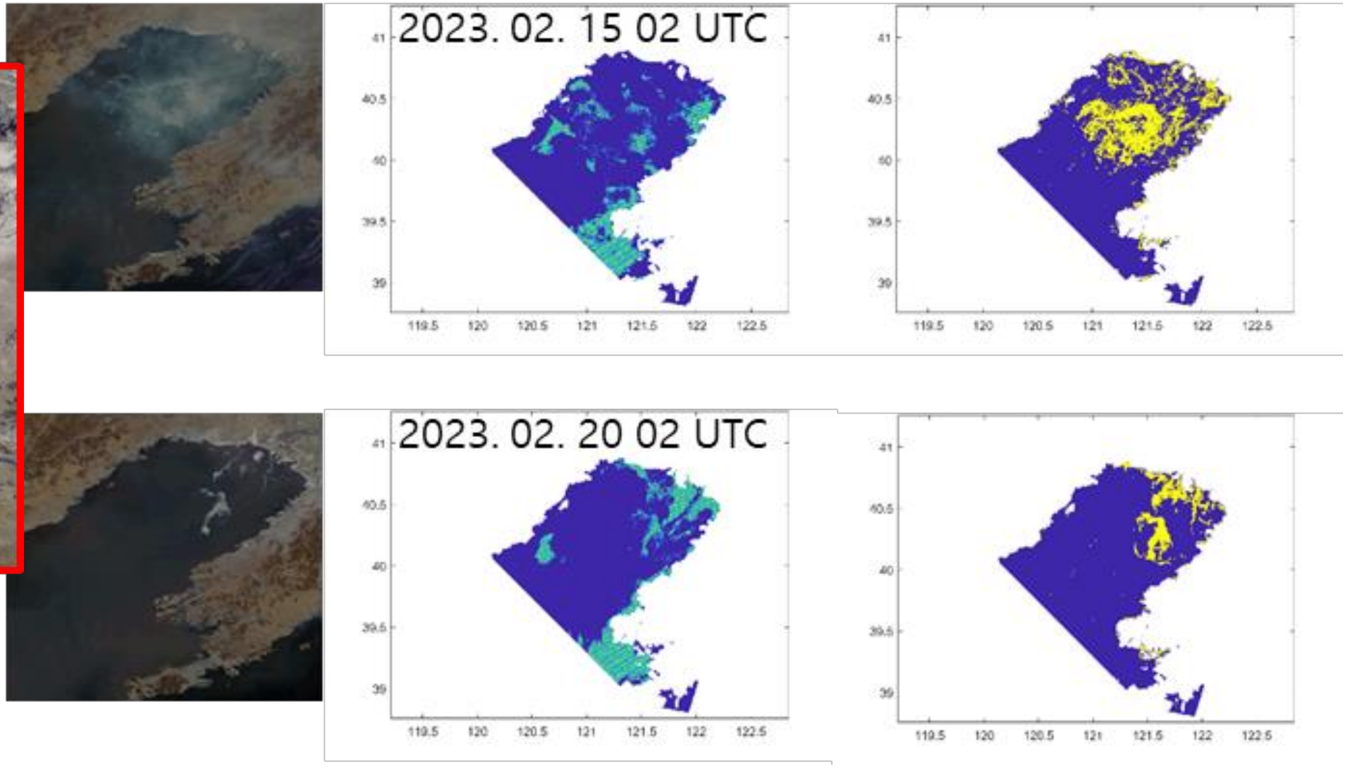
- **>15° tilt** will diminish sunglint substantially for the **summer** observations, whereas **≥12°** will be required for the **fall and winter** observations.

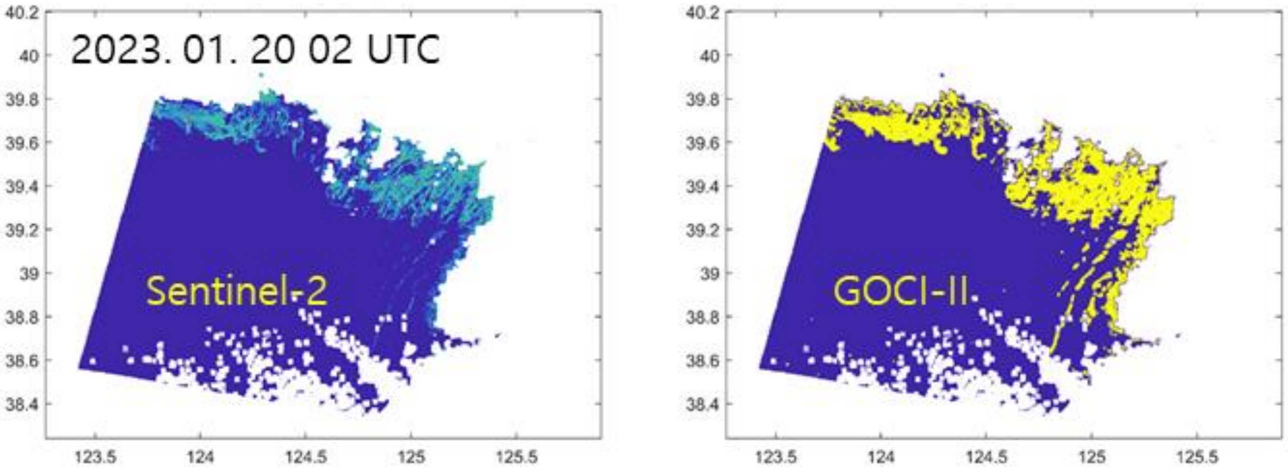
Sea ice detection using GOCI-II (Geostationary Ocean Color Imager – II)

Kwangseok Kim[1], Min-Kyu Kim [1], Young-Je Park[1*]

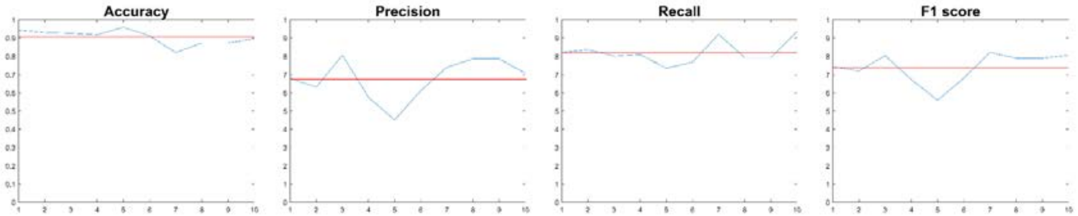
[1]Korea Ocean Satellite Center/KIOST







$Accuracy = \frac{(TP+TN)}{(TP+TN+FN+FP)}$ $Recall = \frac{TP}{(TP+FN)}$ $Precision = \frac{TP}{(TP+FP)}$ $F1\ score = \frac{2 \times Recall \times Precision}{Recall + Precision}$		Actual	
		Positive	Negative
Predicted	Positive	TP	FP
	Negative	FN	TN



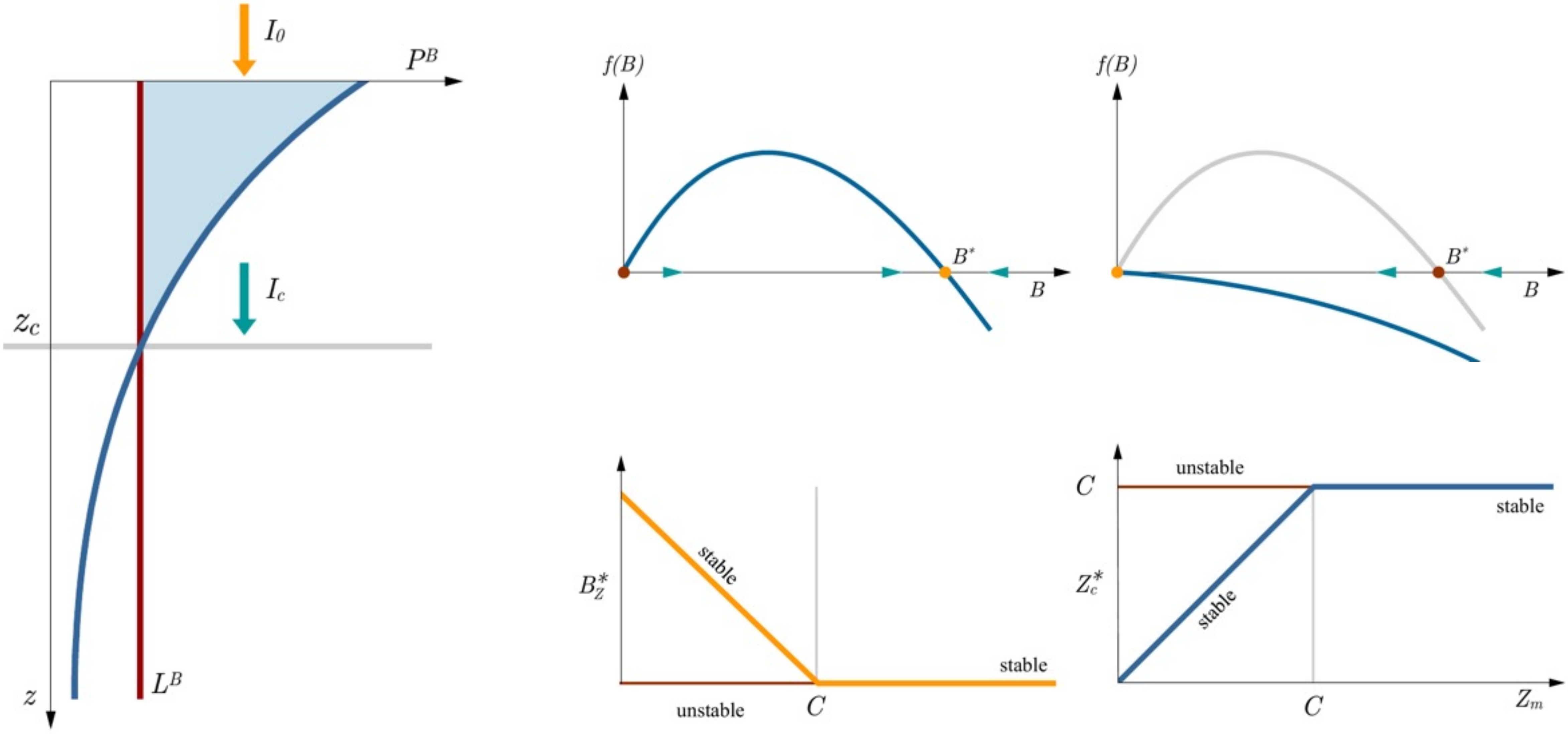
Bio-optical feedback as a mechanism for stability of primary production in the mixed layer

Žarko Kovač[1*], Shubha Sathyendranath[2]

[1] Faculty of Science, University of Split, Ruđera Boškovića 33, 21 000 Split, Croatia *zkovac@pmfst.hr

[2] Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth PL1 3DH, United Kingdom

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



I0
P^B
Ic
zc
z
L^B
f(B)
B*
B
f(B)
B*
B
B*Z
stable
stable
unstable
C
C
unstable
stable
Z*c
stable
C
Zm

Uncertainty Estimates for Satellite-based Computations of Marine Primary Production

Gemma Kulk, Shubha Sathyendranath,
James Dingle, Thomas Jackson

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PML | Plymouth Marine Laboratory

esa

BICEP

cbiomes
Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems

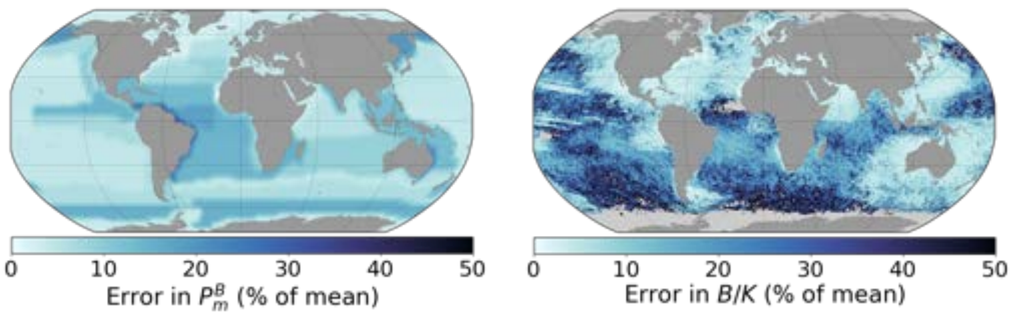
Address uncertainty in satellite-based primary production to improve confidence in products

by following the Guide to expression of Uncertainty in Measurement (GUM):

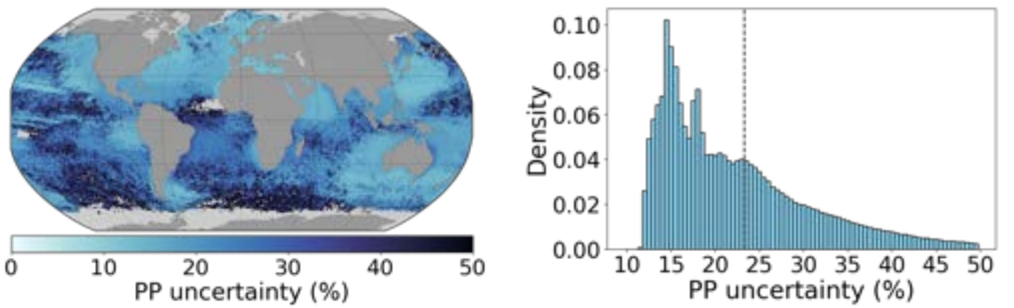
1 Formulate primary production model

$$P = f(P_m^B, B, D, K, I) = \frac{P_m^B B D}{K} f(I_*^m)$$

2 Determine standard error of the mean in model inputs



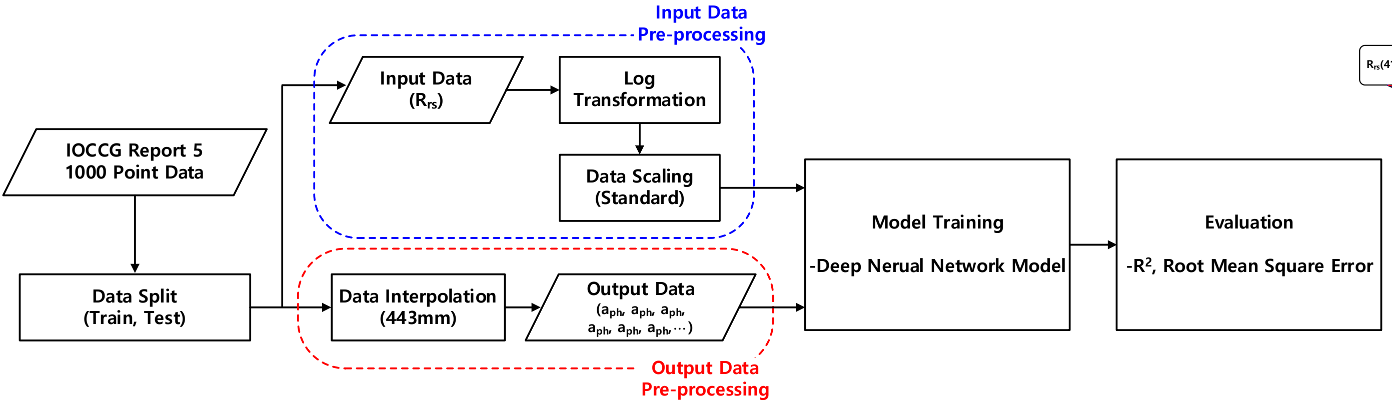
3 Propagate errors to evaluate combined uncertainty



Deep neural networks-based derivation of ocean-color products

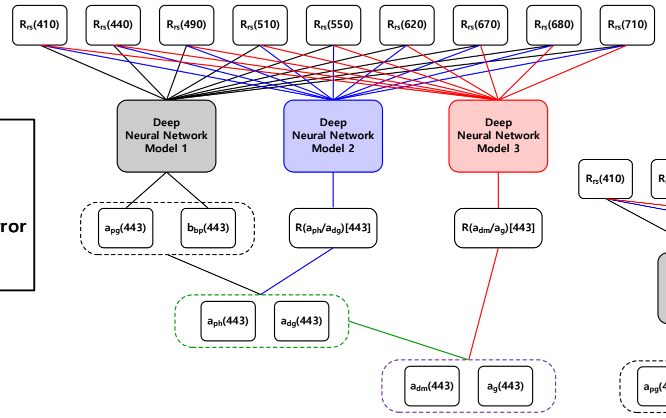
Hyeong-Tak Lee, Hee-Jeong Han, Young-Je Park
Korea Ocean Satellite Center
Korea Institute of Ocean Science & Technology

KOSC

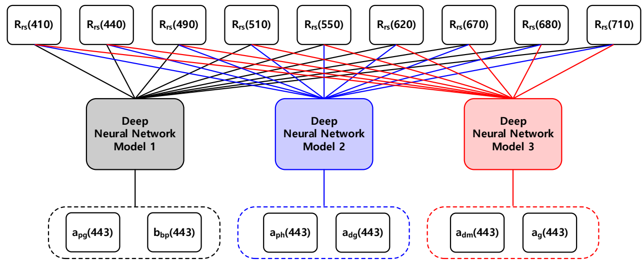


▲ **Flowchart of study**

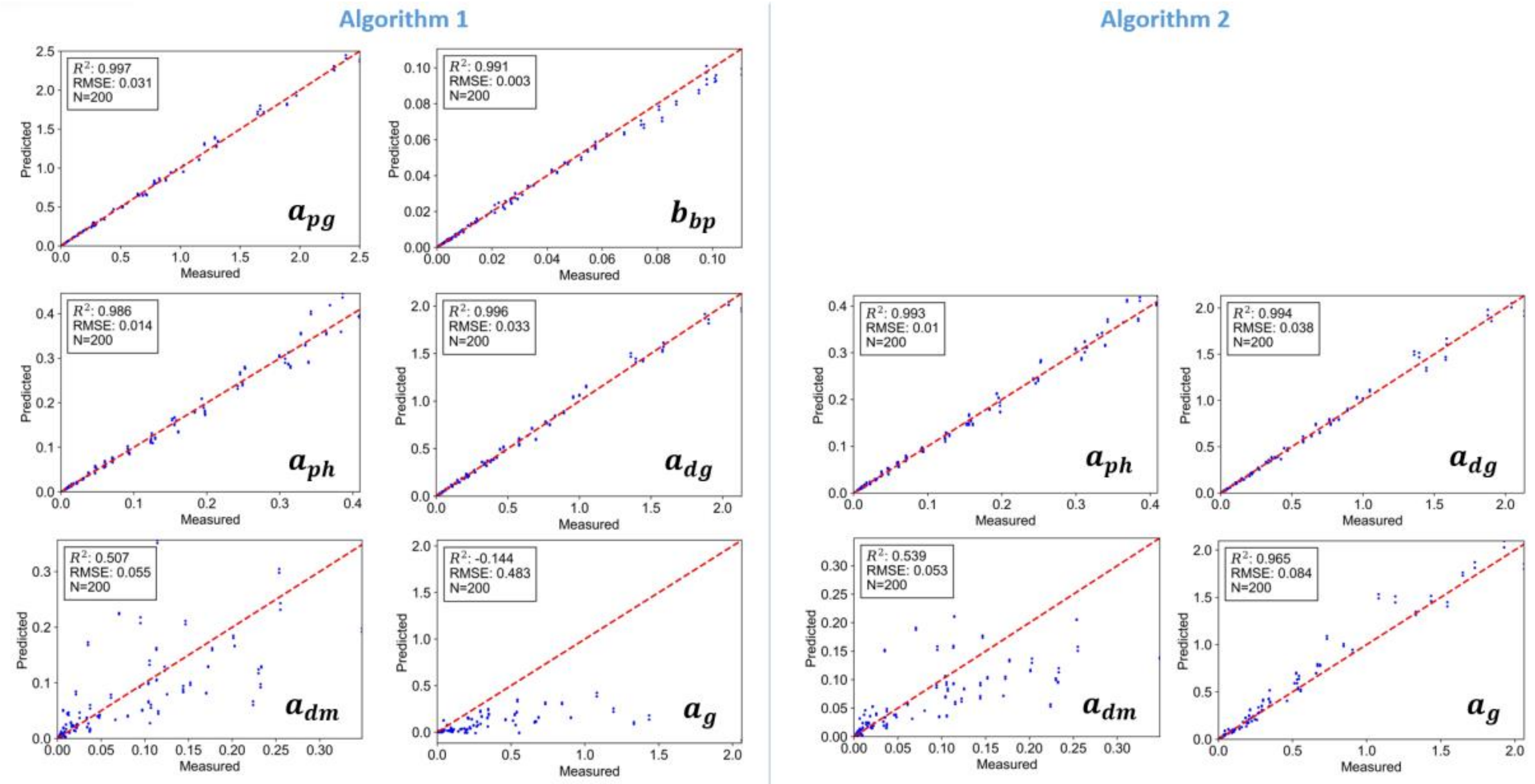
▼ **Previous study**

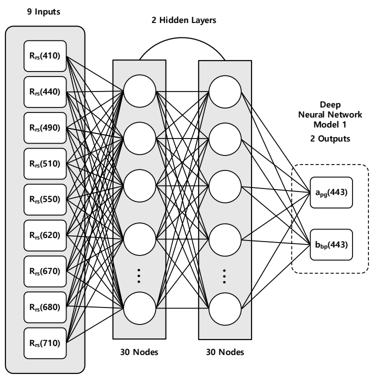


▼ **Our method**



▼ **Results**





◀ **Example of Deep neural networks**

▼ **Comparison table**

Technique	R^2 (RMSE)					
	a_{pg}	b_{bp}	a_{ph}	a_{dg}	a_{dm}	a_g
QAA(2006)	0.958 (0.133)	0.969 (0.005)	0.606 (0.109)	0.879 (0.183)	-	-
QAA(2014)	0.924 (0.214)	0.968 (0.005)	0.472 (0.184)	0.909 (0.176)	-	-
Algorithm 1	0.997 (0.031)	0.991 (0.003)	0.986 (0.014)	0.996 (0.033)	0.507 (0.055)	-0.114 (0.483)
Algorithm 2	0.997 (0.031)	0.991 (0.003)	0.993 (0.010)	0.994 (0.038)	0.539 (0.053)	0.965 (0.084)

Estimation of microphytobenthos biomass using *in situ* and airborne Watersat Imaging Spectrometer Experiment (WISE) hyperspectral imagery

<u>B. Légaré</u> **[1,2], S. Mukherjee [1,2], C. Nozais [1,2], S. Bélanger [1,2]**

[1] Département de Biologie, Chimie et Géographie, Université du Québec à Rimouski, Québec, Canada

[2] Québec-Océan, Pavillon de Alexandre-Vachon, Université Laval, Québec, Canada

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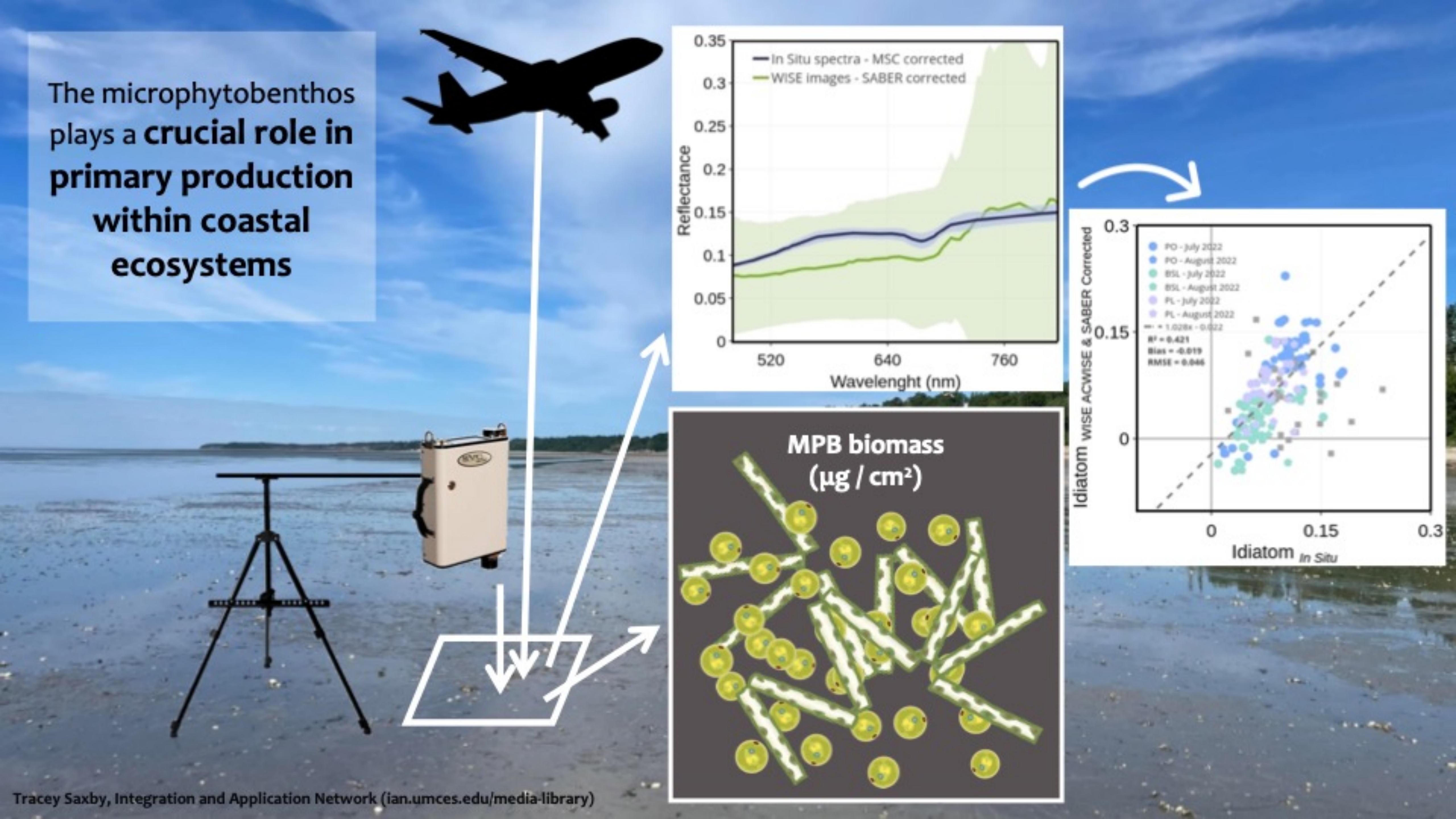

The microphytobenthos plays a **crucial role in primary production within coastal ecosystems**
In Situ spectra - MSC corrected
WISE images - SABER corrected
Reflectance
Wavelenght (nm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
520
640
760
MPB biomass
(µg / cm²)
PO - July 2022
PO - August 2022
BSL - July 2022
BSL - August 2022
PL - July 2022
PL - August 2022
= 1.028x - 0.022
R² = 0.421
Bias = -0.019
RMSE = 0.046
Idiatom WISE ACWISE & SABER Corrected
Idiatom In Situ
0.3
0.15
0
0.15
0.3
Tracey Saxby, Integration and Application Network (ian.umces.edu/media-library)

Poster # 145

Global daily gap-free ocean color products derived from multi-satellite measurements using the DINEOF method

Xiaoming Liu[1] and Menghua Wang[2]

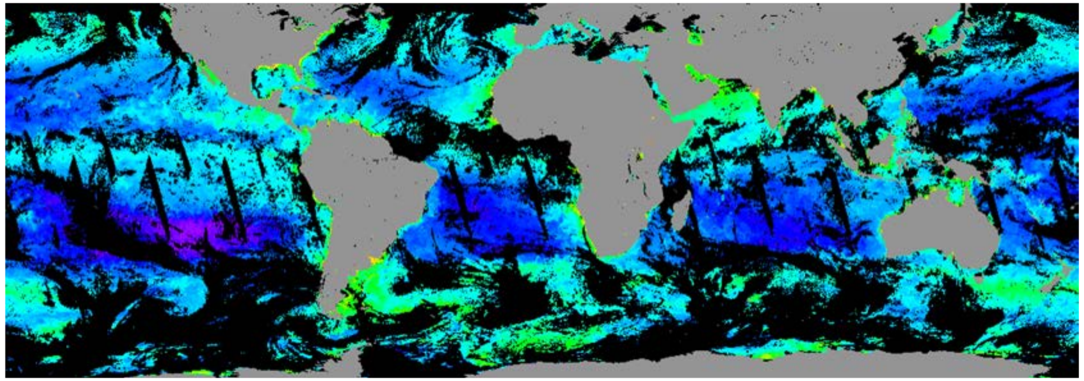
[1]Xiaoming.Liu@noaa.gov

NOAA National Environmental Satellite, Data, and Information Service, Center for Satellite Applications and Research, 5830 University Research Court, College Park, MD 20746, USA

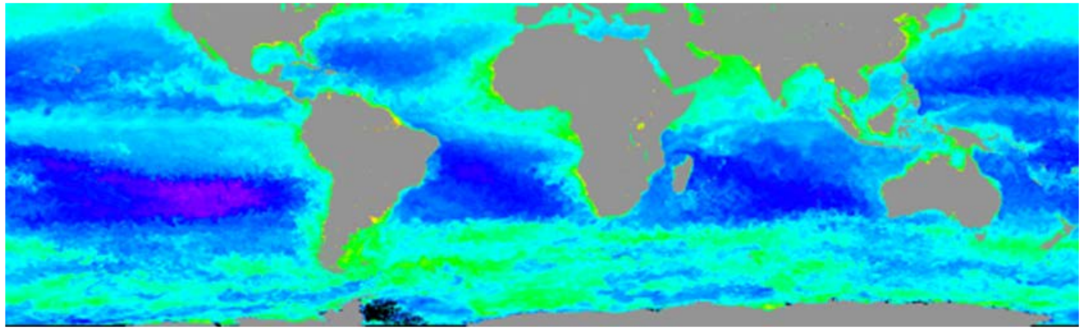
CIRA at Colorado State University, Fort Collins, CO 80523, USA

[2]Menghua.Wang@noaa.gov

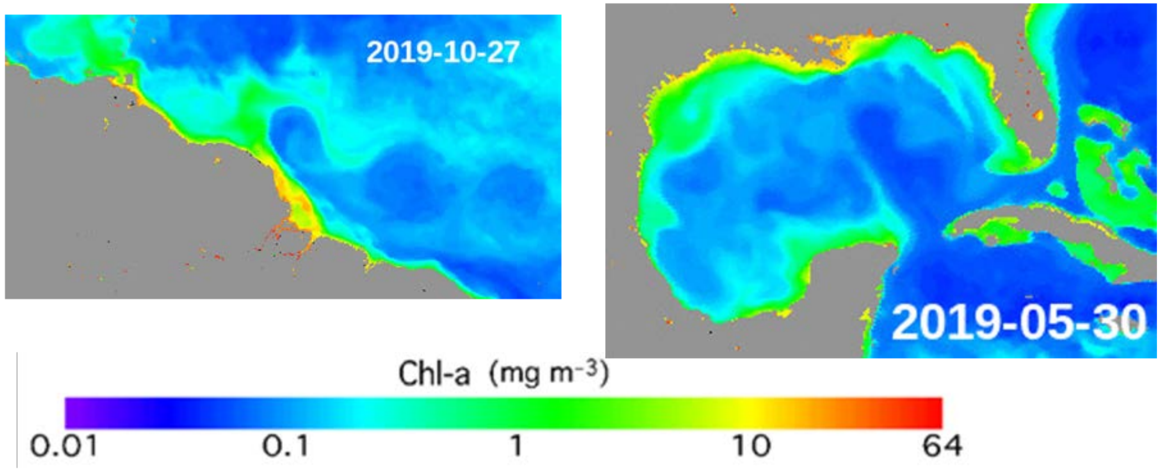
NOAA National Environmental Satellite, Data, and Information Service, Center for Satellite Applications and Research, 5830 University Research Court, College Park, MD 20746, USA

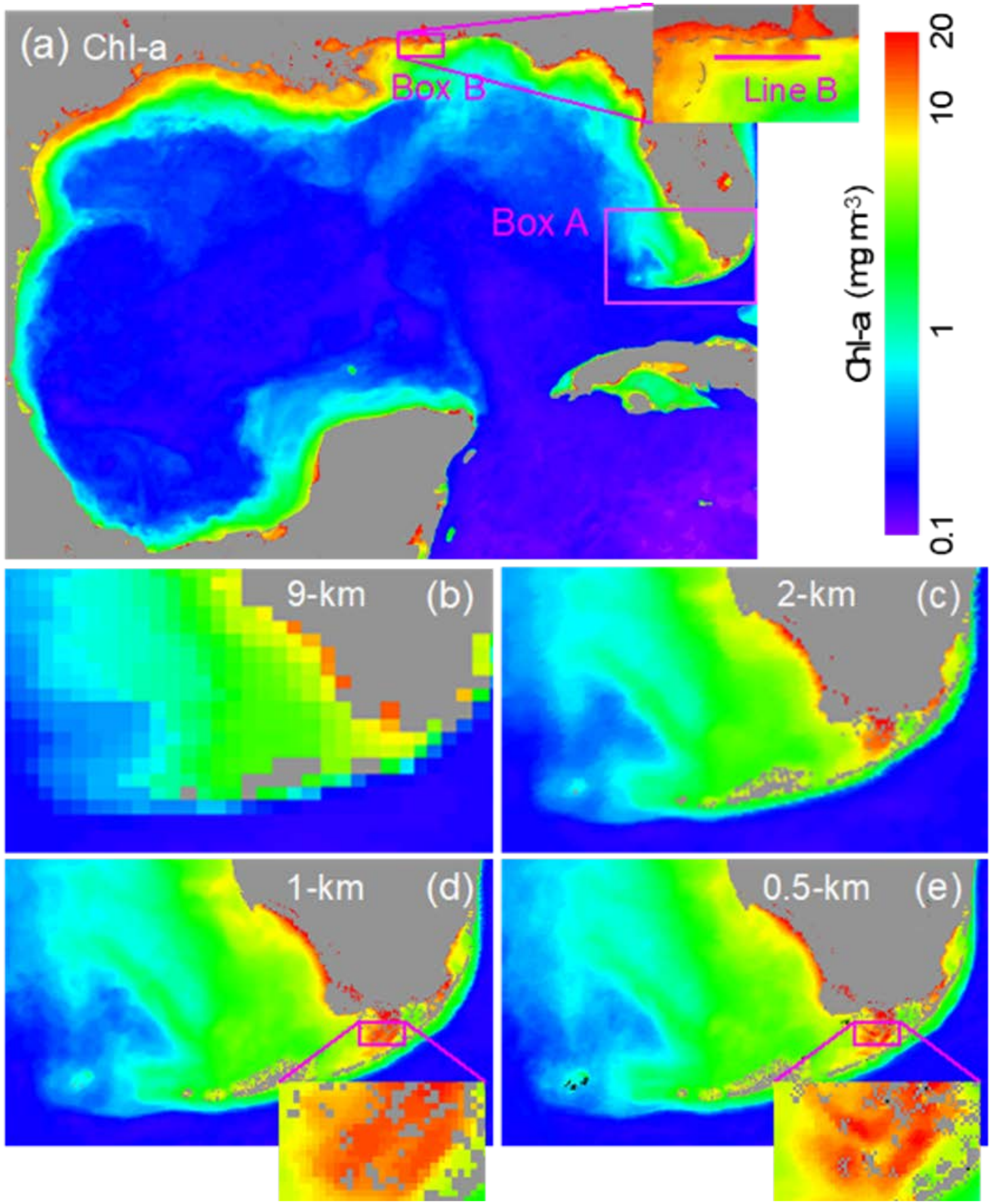


Three-sensor (**VIIRS SNPP**, **NOAA-20**, & **OLCI-S3A**) merged Chl-a image, 1/11/2019



Global daily gap-free image, 1/11/2019





Gap-free images of different spatial resolutions

The importance of temporal variability or seasonality in the relationship between Line Height Absorption and chlorophyll concentration: a case study from the Northern Gulf of Alaska.

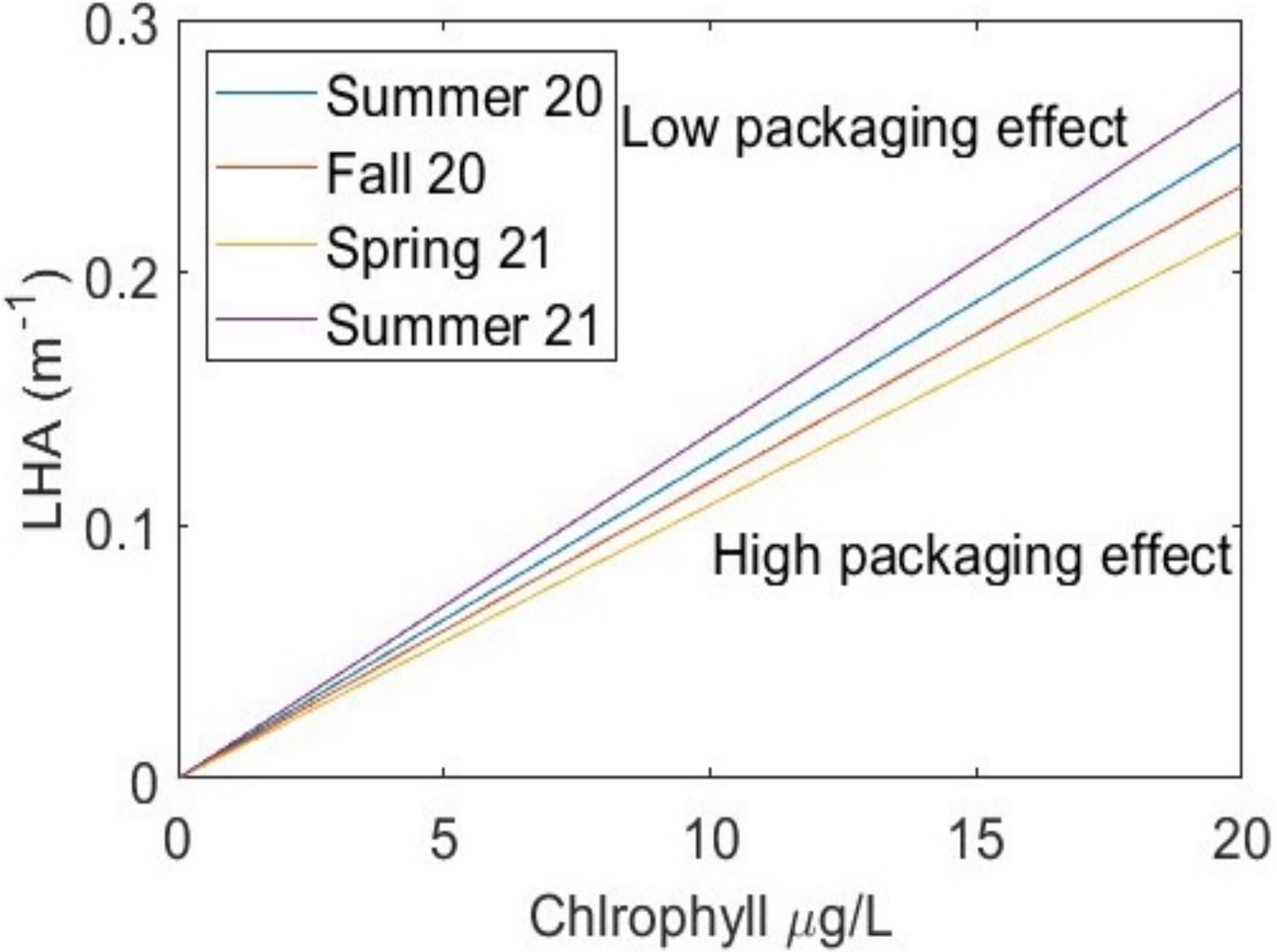
Benjamin Lowin[1], Suzanne Strom[2], Will Burt[3], Thomas Kelly[4] and Sara Rivero-Calle[1]

1- Skidaway Institute of Oceanography and Department of Marine Sciences, University of Georgia

2- Shannon Point Marine Center, Western Washington University

3 -Planetary Technologies, Halifax, Canada

4 -College of Fisheries and Ocean Sciences. University of Alaska Fairbanks



0.3
0.2
0.1
0
LHA (m⁻¹)
0
5
10
15
20
Chlrophyll μg/L
Summer 20
Fall 20
Spring 21
Summer 21
Low packaging effect
High packaging effect

Using Ocean Color Data for Estimation of Spatiotemporal Biogeochemical Model Parameters

Nabir Mamnun[1], Christoph Völker[2,3], Mihalis Vrekoussis[1], Lars Nerger[1]

[1]*Alfred-Wegener-Institut (AWI), Helmholtz Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany*

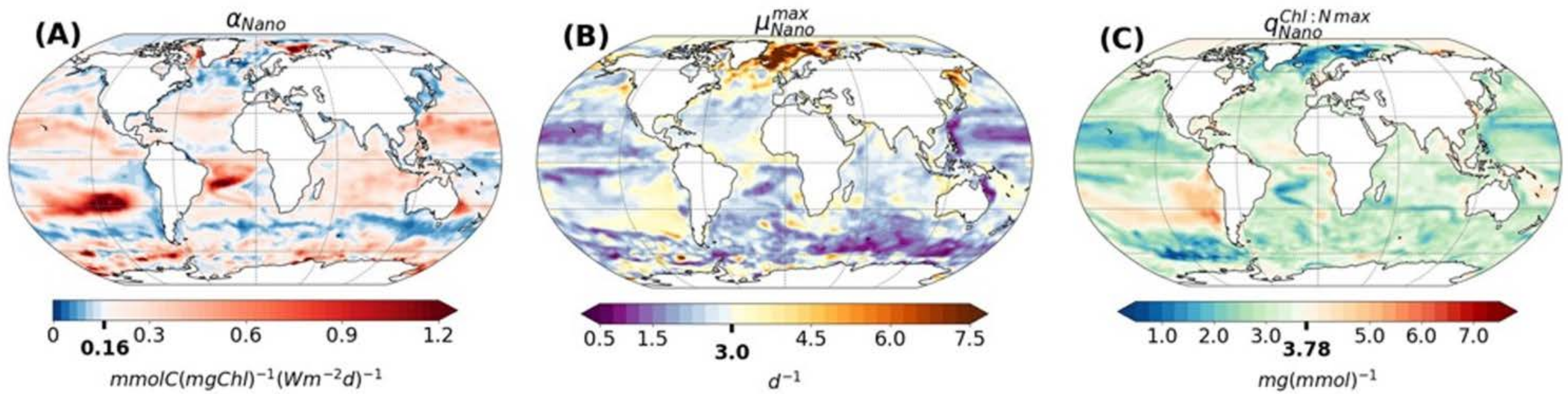
[2]*Institute of Environmental Physics (IUP), University of Bremen, Germany*

[3]*Center of Marine Environmental Sciences (MARUM), University of Bremen, Germany*

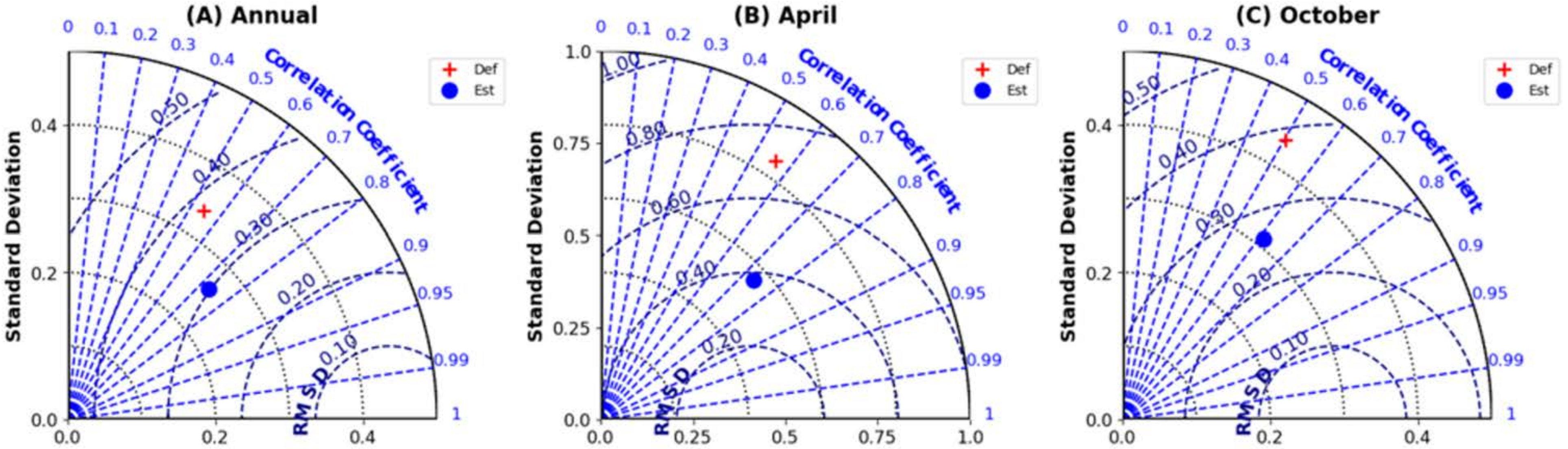
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

Universität
Bremen

Estimated parameters values for (A) Initial slope of the Photosynthesis-irradiance curve; (B) Maximum photosynthesis rate and (C) Maximum chlorophyll to nitrogen ratio of nanophytoplankton



Comparison of surface chlorophyll-a concentration from model simulations with default parameters and estimated parameters against satellite observations for the period 2019-2021.



Poster 149

Poster 150

Recent advances on S3/OLCI Ocean Colour Standard Atmospheric Correction (OC-SAC)

C. Mazeran[1], M. Compiègne[2], M. Moulana[2], D. Ramon[2], F. Steinmetz[2], R. Frouin[3], D. Dessailly[4], J. I. Gossn[4], E. Kwiatkowska[4]

1 solvo

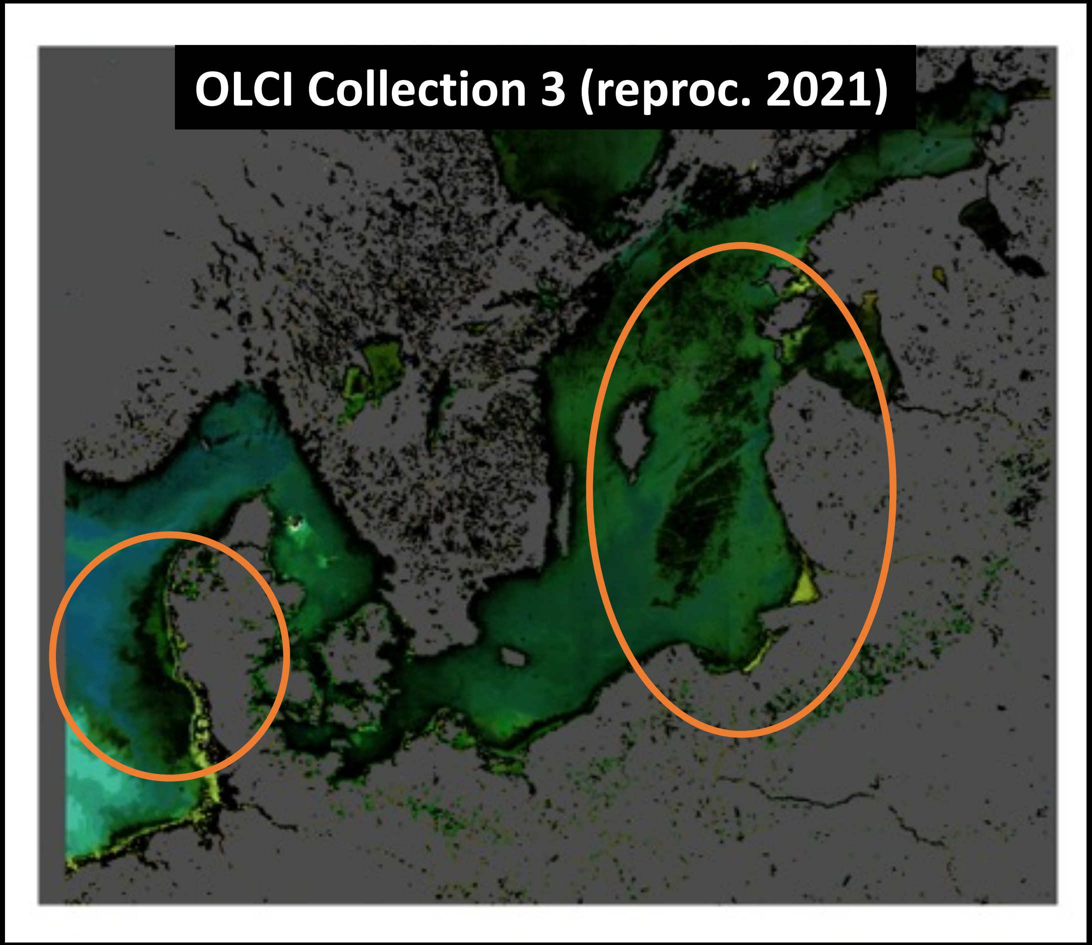
2 HYGEOS

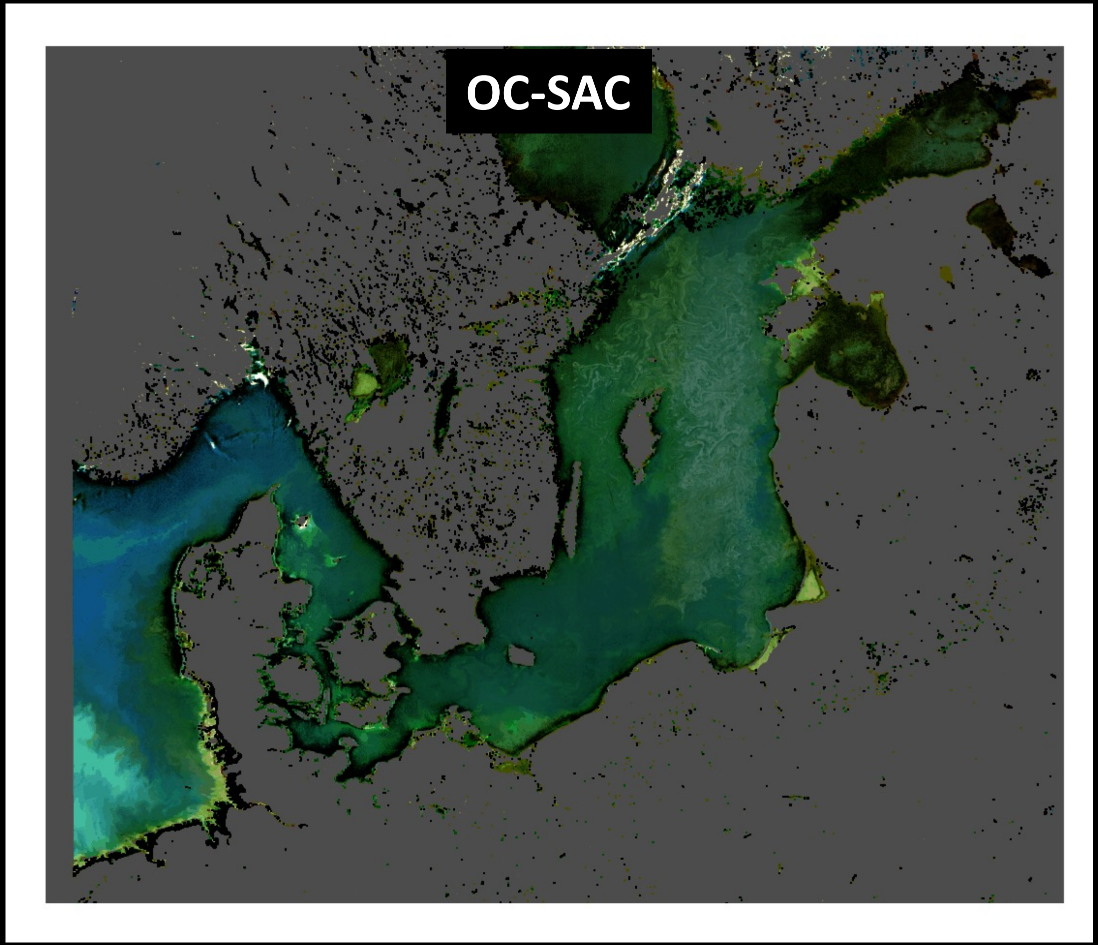
3 SCRIPPS INSTITUTION OF OCEANOGRAPHY

4 European Commission, Copernicus Europe's eyes on Earth, EUMETSAT

Study funded by EUMETSAT contract EUM/CO/21/4600002533/DD

Poster 150 - Ocean Colour Standard Atmospheric Correction (OC-SAC)





- RTM in spherical shell
- LUT grid optimization

- Multiband aerosol detection
- Uncertainty estimates

- ALH with O_2-absorption bands

- Strongly absorbing models: extension of Ahmad et al. (2010) & multiband detection in VIS

- Validation against MOBY, AERONET, AERONET-OC

- Future: collaborate & validate OC-SAC with your in-situ data?

International Ocean Colour Science Meeting 2023

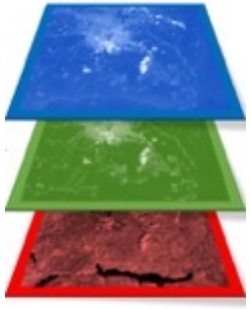
Deep learning for remote sensing-based estimation of water quality parameters

Poster Number: 158

Dinesh Neupane[1], Stephanie Rogers[2]

[1,2] Department of Geosciences, Auburn University, AL

Sentinel-2 Level 2A



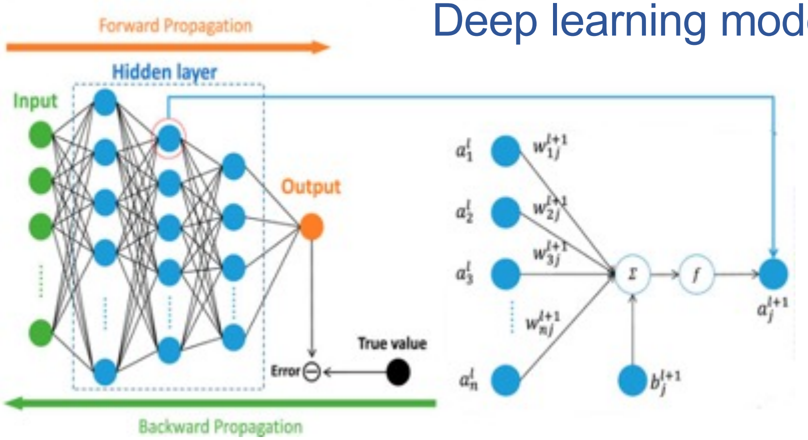
Chl-a	B1, B2, B3, B4, B5, B8, NDCI, NDVI

Turbidity	B2, B4, B5, B8, NDTI

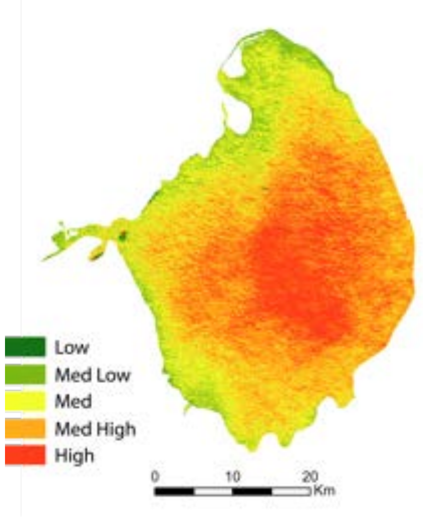
In situ	2017 - 2023, point measurements in mg L^{-1} and NTU

Lake Okeechobee, *in situ* measurements

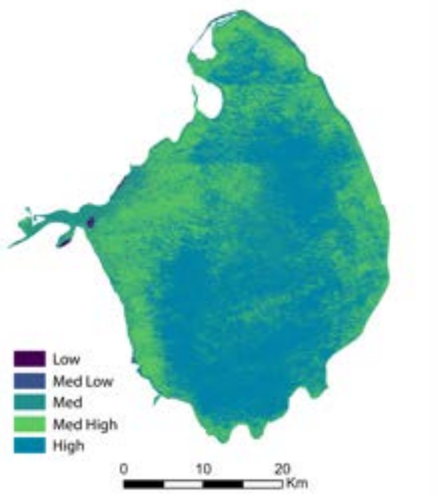
Deep learning model



vs Classical SVR and RF regression



Turbidity



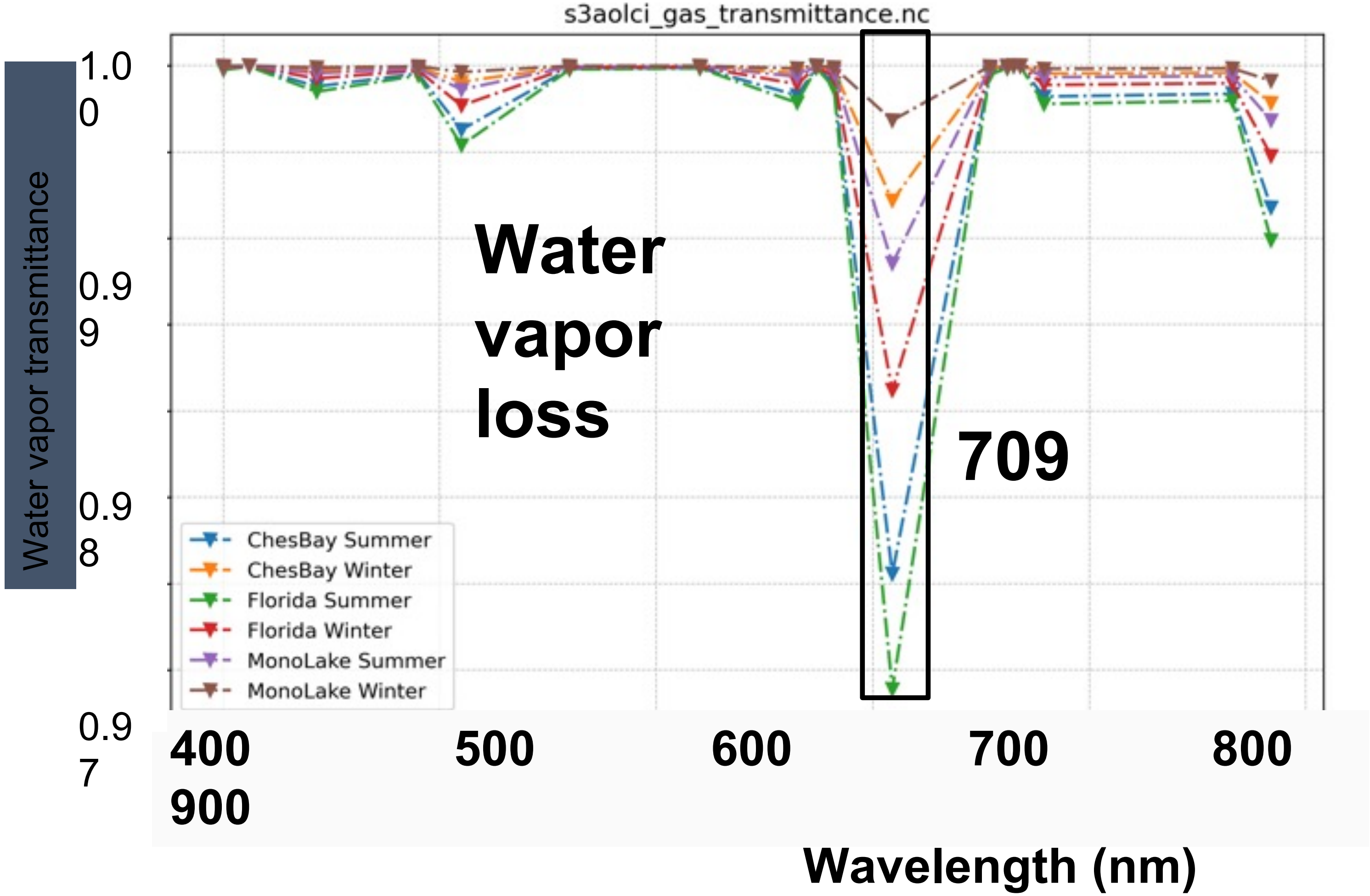
Chl-a

Predicted water quality maps

Examining the OLCI 709 nm Water Vapor Correction on Chlorophyll Algorithms

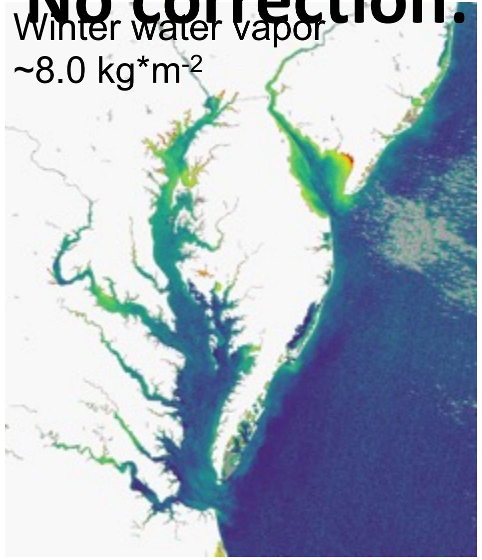
Rick Stumpf, NOAA, Silver Spring, MD, USA
Andrew Meredith, CSS, Charleston, SC, USA

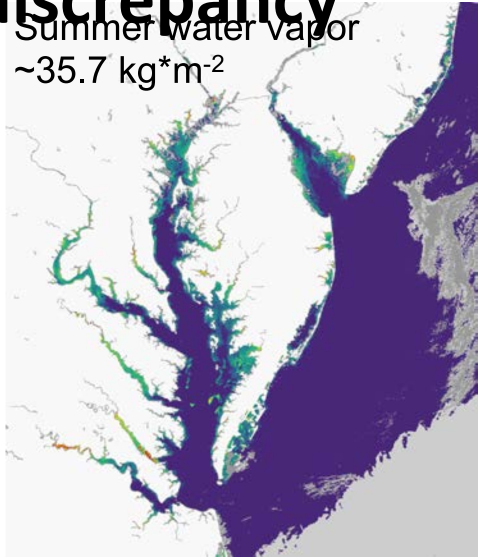
Friday session 6 #163



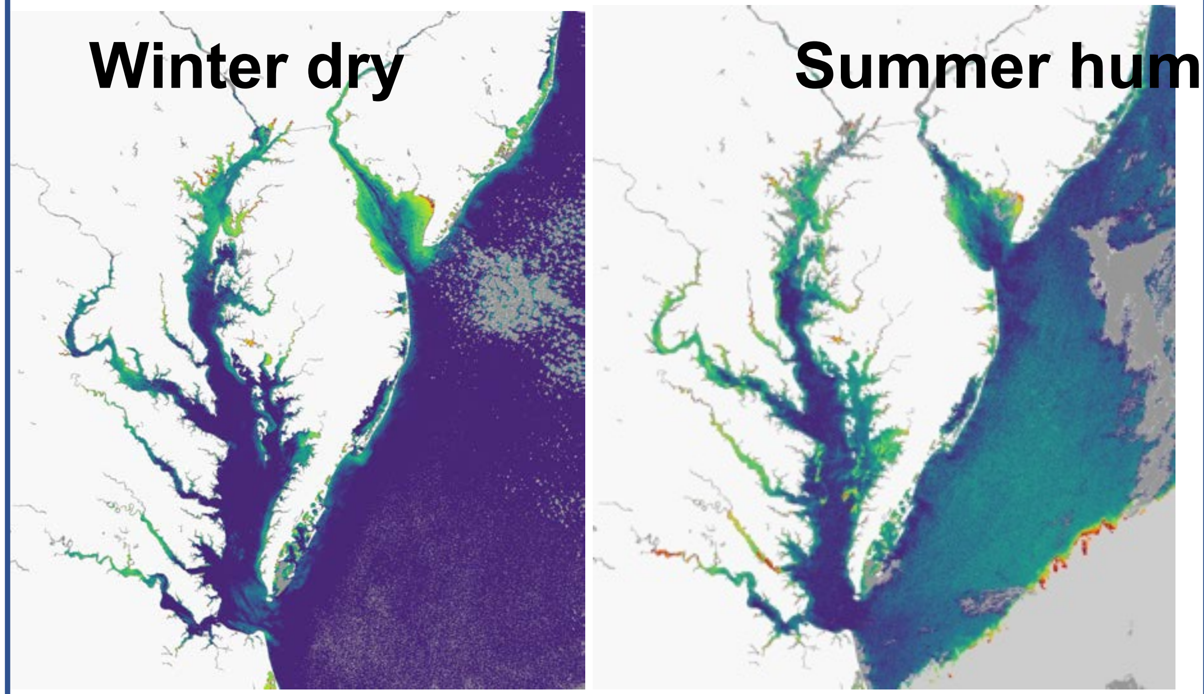
Red edge (709/665) chla

No correction: discrepancy

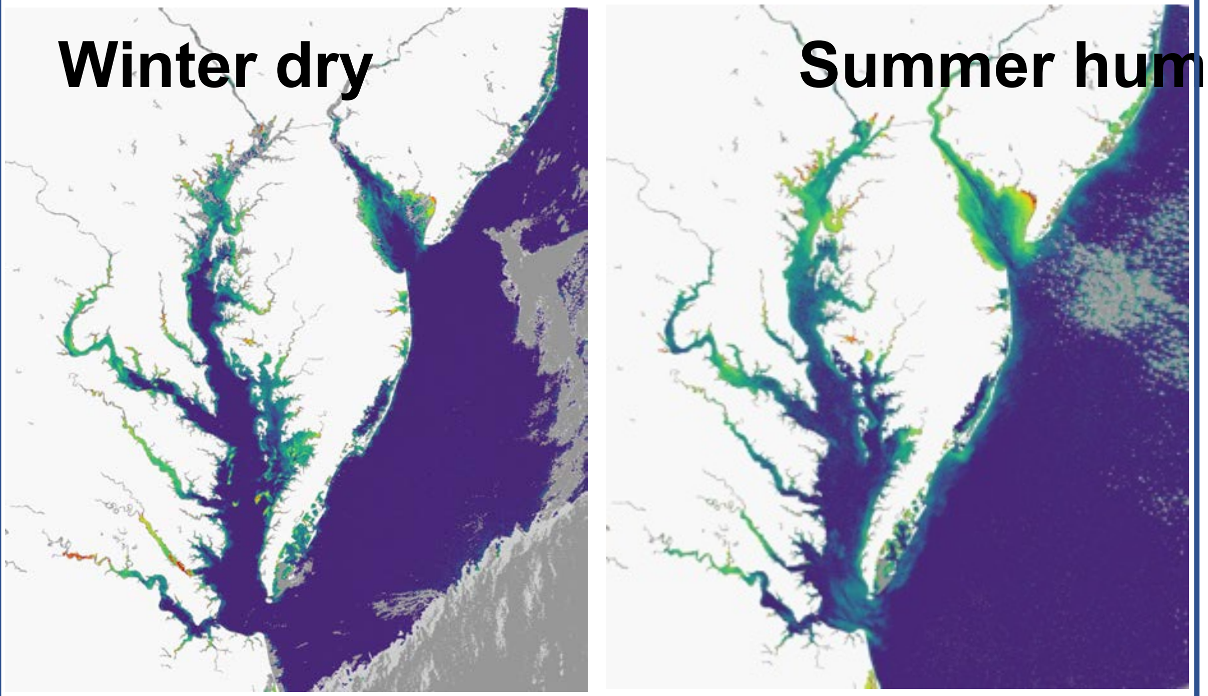




“New” SEADAS R2022



Proposed water vapor



Data derived from Copernicus Sentinel-3

SeaDAS water vapor correction is good but too strong, we propose adjustment

Friday session 6 #163
Stumpf & Meredith

近海海洋环境科学国家重点实验室（厦门大学）
State Key Laboratory of Marine Environmental Science
(Xiamen University)

厦門大學 Optical Oceanography Laboratory

International Ocean Colour Science Meeting 2023

Important contributions of water-leaving irradiance to the parametrization of ocean surface albedo

Xiaolong Yu [1], Zhongping Lee [1], Shaoling Shang [1], Menghua Wang [2], Lide Jiang [2]

[1] State Key Laboratory of Marine Environmental Science, Xiamen University
[2] NOAA Center for Satellite Applications and Research, College Park, MD 20740, USA

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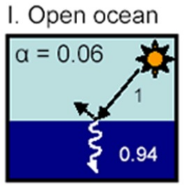
Nov. 13-17, Florida, US

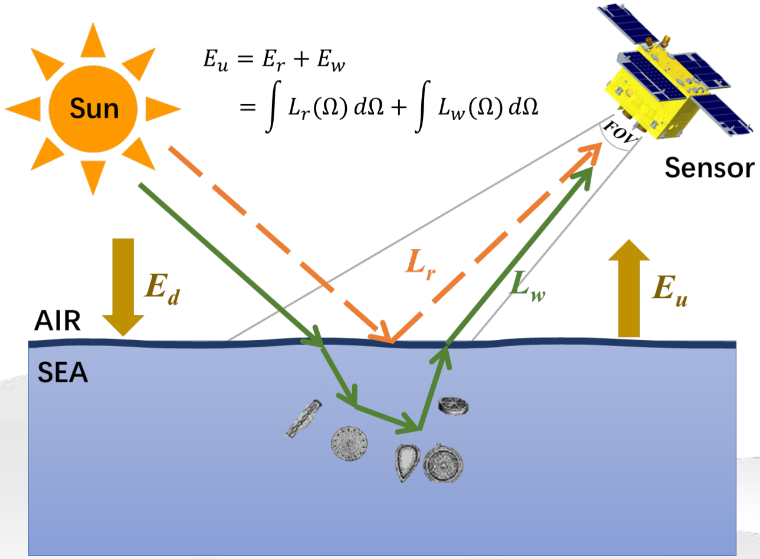
Fri. Section 6
Poster #166

1 Ocean surface albedo (α)



$$\alpha = \frac{E_u}{E_d} = \frac{E_w + E_r}{E_d}$$

Under-represented



2 Water-leaving albedo (α_w)

$$\alpha_w = \frac{E_w}{E_d} = \frac{\iint L_w(\lambda,\Omega)\cos\theta_v \sin\theta_v\, d\theta_v\, d\varphi}{E_d}$$

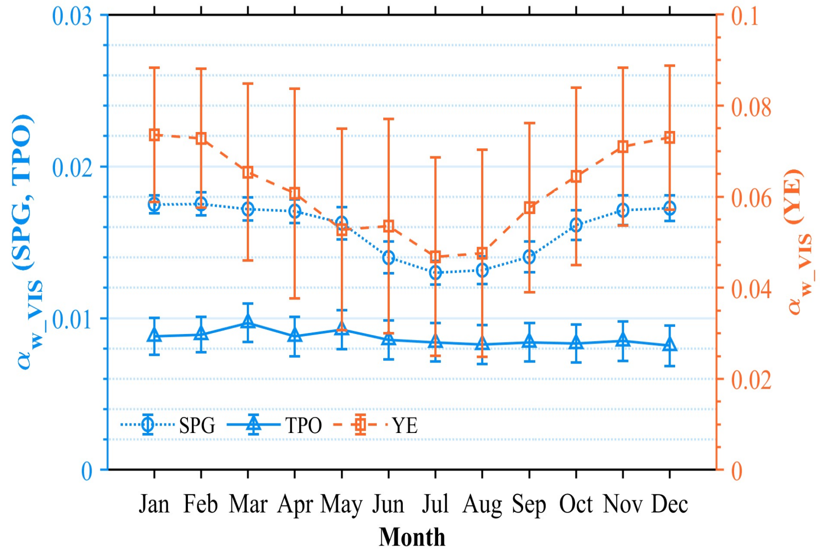
$$R_{rs}(\lambda,\Omega) = \frac{L_w(\lambda,\Omega)}{E_d}$$

Inverse model: IOPs-α_w

$$\alpha_w = \iint R_{rs}(\lambda,\Omega)\cos\theta_v \sin\theta_v\, d\theta_v\, d\varphi$$

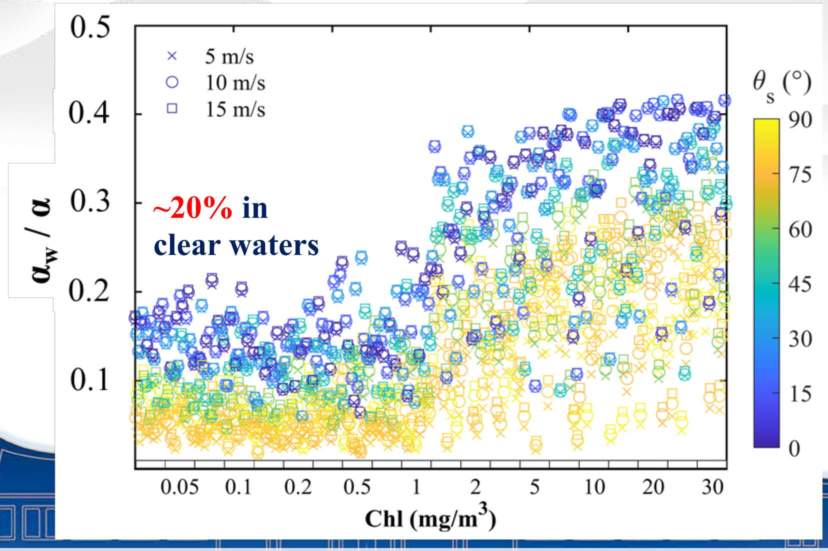
$$R_{rs}(\lambda,\Omega) = \left(G_0^w(\Omega) + G_1^w(\Omega)\frac{b_{bw}(\lambda)}{\kappa(\lambda)}\right)\frac{b_{bw}(\lambda)}{\kappa(\lambda)} + \left(G_0^p(\Omega) + G_1^p(\Omega)\frac{b_{bp}(\lambda)}{\kappa(\lambda)}\right)\frac{b_{bp}(\lambda)}{\kappa(\lambda)}$$

3 Seasonality of α_w



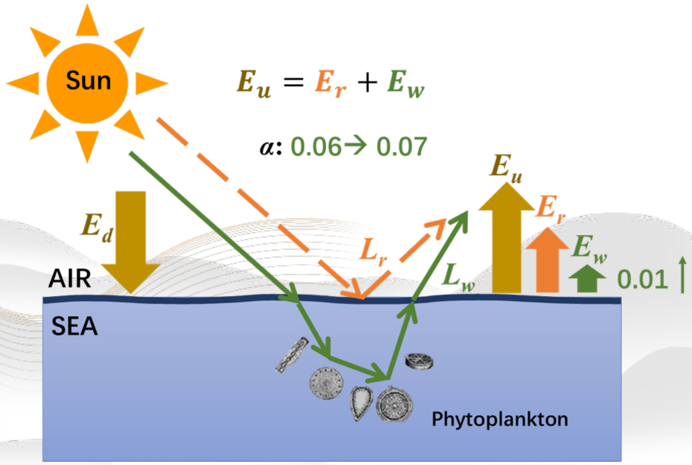
SPG: South Pacific Gyre
TPO: Tropic Pacific Ocean **YE:** Yangtze Estuary

4 Relative contribution of α_w to α



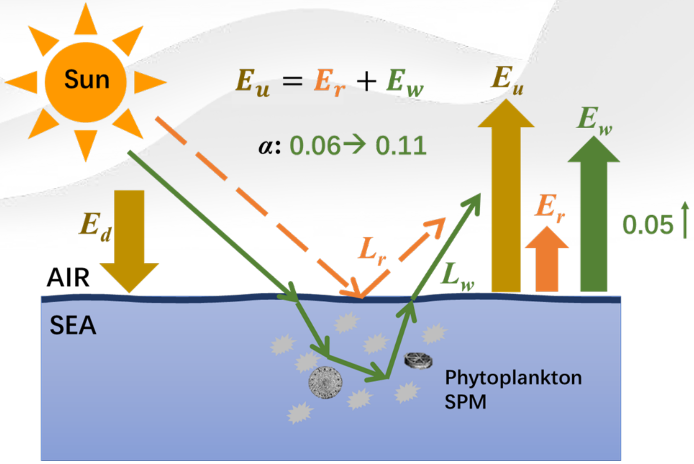
5 Implications

Ocean Gyre (SPG)



Heat flux back to Atmosphere = $f(\alpha)$:
0.06 → 0.07 (> 16%)

Yangtze estuary



Heat flux back to Atmosphere = $f(\alpha)$:
0.06 → 0.11 (> 83%)

Refs: Yu et al. 2022, *Remote Sens. Environ.*; Yu and Lee, 2022, *Opt. Express*

Fri. Section 6 Poster #166

Estimating pixel-level uncertainty in MODIS R_{rs} retrievals

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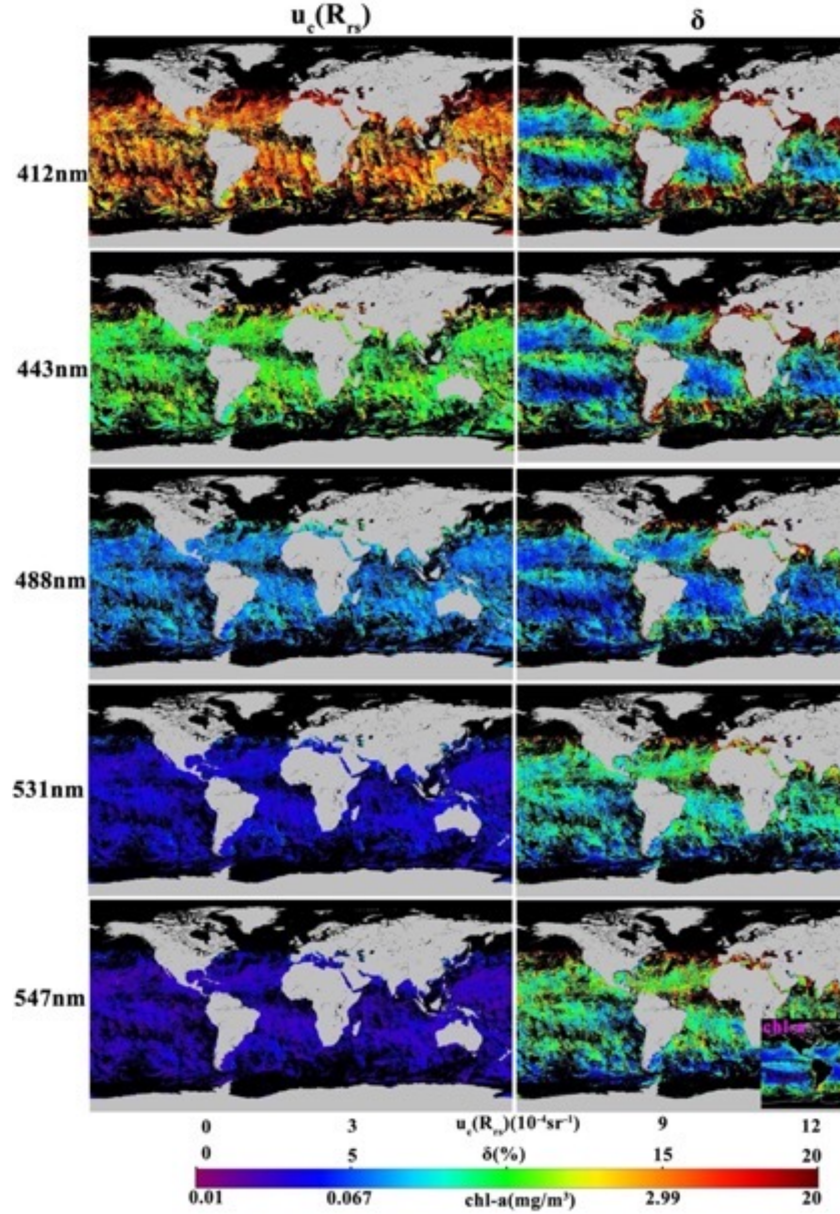
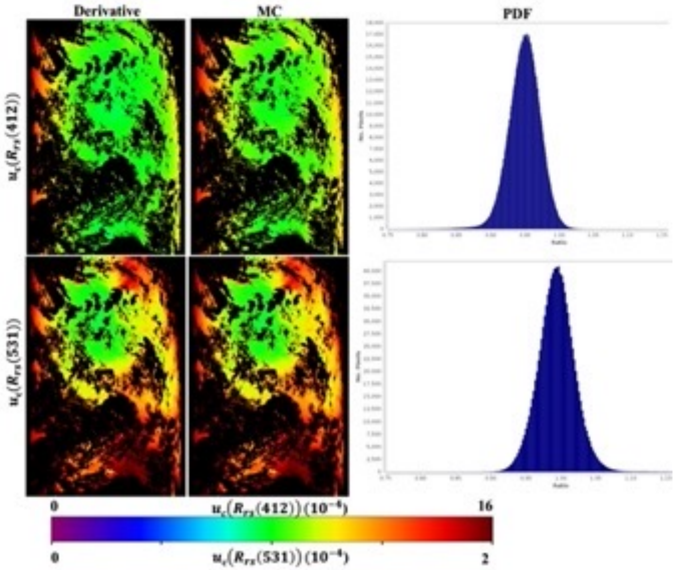
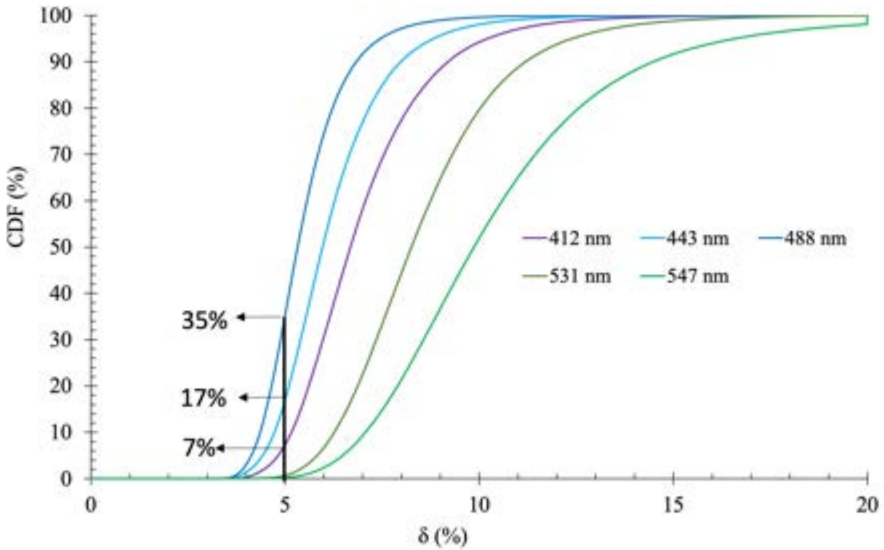

$u_c(R_{rs})$
δ
412nm
443nm
488nm
531nm
547nm
chl-a
0
3
$u_c(R_{rs})(10^{-4}sr^{-1})$
9
12
0
5
δ(%)
15
20
0.01
0.067
chl-a(mg/m³)
2.99
20


Derivative
MC
PDF
$u_c(R_{rs}(412))$
$u_c(R_{rs}(531))$
0
$u_c(R_{rs}(412))(10^{-4})$
16
0
$u_c(R_{rs}(531))(10^{-4})$
2


CDF (%)
δ (%)
412 nm
443 nm
488 nm
531 nm
547 nm
35%
17%
7%
0
5
10
15
20
0
10
20
30
40
50
60
70
80
90
100