A Net Primary Production (NPP) algorithm for application to PACE OCI

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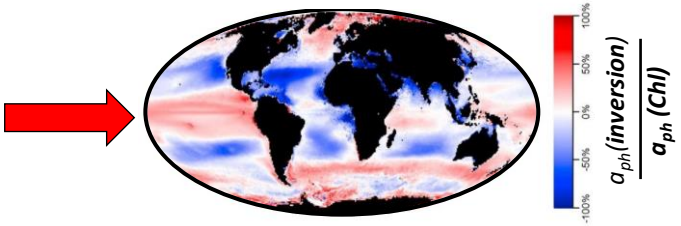
Goal: To deliver a launch-ready NPP algorithm that capitalizes on the hyperspectral retrievals of the PACE Ocean Color Instrument (OCI). Focus on three tasks:

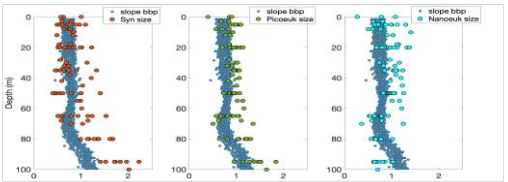
1. Use of retrieved hyperspectral phytoplankton absorption, $a_{ph}(\lambda)$

- absorption >> Chl
- Several inversions for $a_{ph}(\lambda)$ from PACE SAT



2. Use of retrieved hyperspectral particulate backscattering, $b_{bp}(\lambda)$

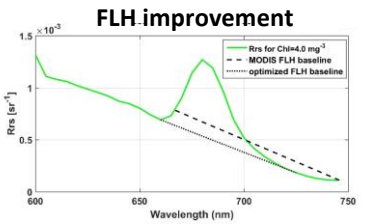
- γ_{bbp} can be related to PSD and PCC
- $b_{bp}(\lambda)$ and γ_{bbp} can be used to estimate C_{phyto}

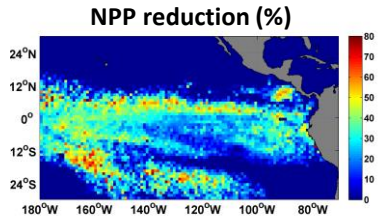


Phyto. size and γ_{bbp}

3. Use of hyperspectral resolution around the chlorophyll fluorescence emission region (~650-750 nm)

- Improve FLH via dynamic baseline correction
- Use FLH to correct for iron stress effect on NPP
- Investigate better ways to quantify fluorescence





* We will also provide estimates of phytoplankton biomass (C_{phyto}) and growth rate (μ)

"PACE-analog" field dataset will be used for algorithm development and validation

Cruise	Region	PACE-analog properties	Other
NAAMES	N. Atlantic (4x)	$a_{ph}(\lambda)^1$, $b_{bp}(\lambda)^2$, $R_{rs}(\lambda)$	NPP, μ^3, $C_{phyto}{}^4$, LISST, CC, IFCB
EXPORTS	N. Pacific/Atlantic	$a_{ph}(\lambda)^1$, $b_{bp}(\lambda)^5$, $R_{rs}(\lambda)$	NPP, μ^3, $C_{phyto}{}^4$, LISST, CC, IFCB
SABOR	N. Atlantic	$a_{ph}(\lambda)^1$, $b_{bp}(\lambda)^2$, $R_{rs}(\lambda)$	NPP, μ^6, $C_{phyto}{}^4$, LISST, CC, IFCB
TAO 2012	Tropical Pacific	$a_{ph}(\lambda)^1$, $b_{bp}(\lambda)^2$, $R_{rs}(\lambda)$	NPP, μ^6, $C_{phyto}{}^4$, CC
AMT-22	N. & S. Atlantic	$a_{ph}(\lambda)^1$, $b_{bp}(\lambda)^2$, $R_{rs}(\lambda)$	NPP, μ^6, $C_{phyto}{}^4$, CC

LISST –Laser In-situ Scattering and Transmission instrument
CC – Beckman Coulter Multisizer 3 (particle counter)
IFCB – Imaging Flow CytoBot
[1] WETLabs AC-S and filter-pad measurements
[2] WETLabs ECO BB3 & WETLabs ECO BB9
[3] From dilution experiments [Landry & Hassett, 1982]
[4] Graff et al. (2015)
[5] WETLabs ECO BB9 & HOBILabs Hydroscat 6
[6] Estimated from cell cycle analysis [Carpenter et al., 1998]