

Initial evaluation of the PACE OCI aerosol products using AERONET

Andrew M. Sayer (UMBC and NASA GSFC)

James Allen, Meng Gao, Chris Proctor, Inia Soto Ramos

on behalf of the PACE Project Science team and many others

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Initial evaluation of PACE data using AERONET

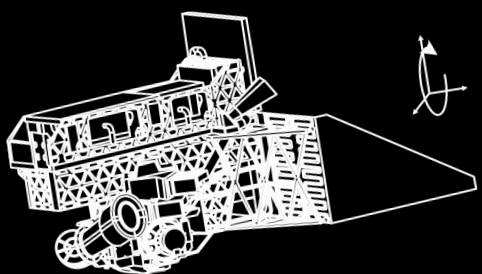
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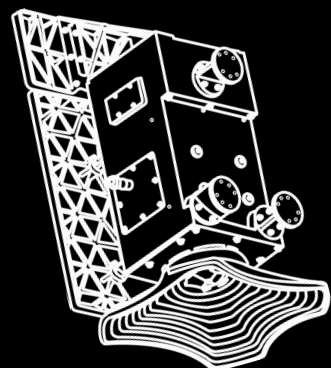
andrew.sayer@nasa.gov

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)



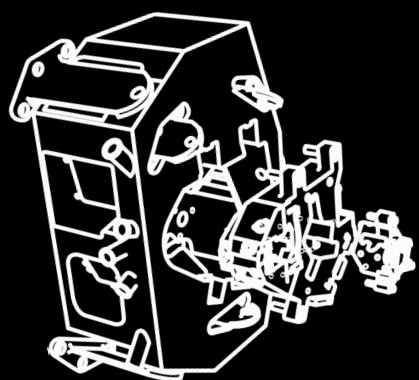
Ocean Color Instrument (OCI)

340-890 nm at 5 nm FWHM in 2.5 nm steps
7 SWIR bands, 940-2260 nm
2600 km swath, 1.2 km nominal pixel size
 $\pm 20^\circ$ tilt



HyperAngular Rainbow Polarimeter 2 (HARP2)

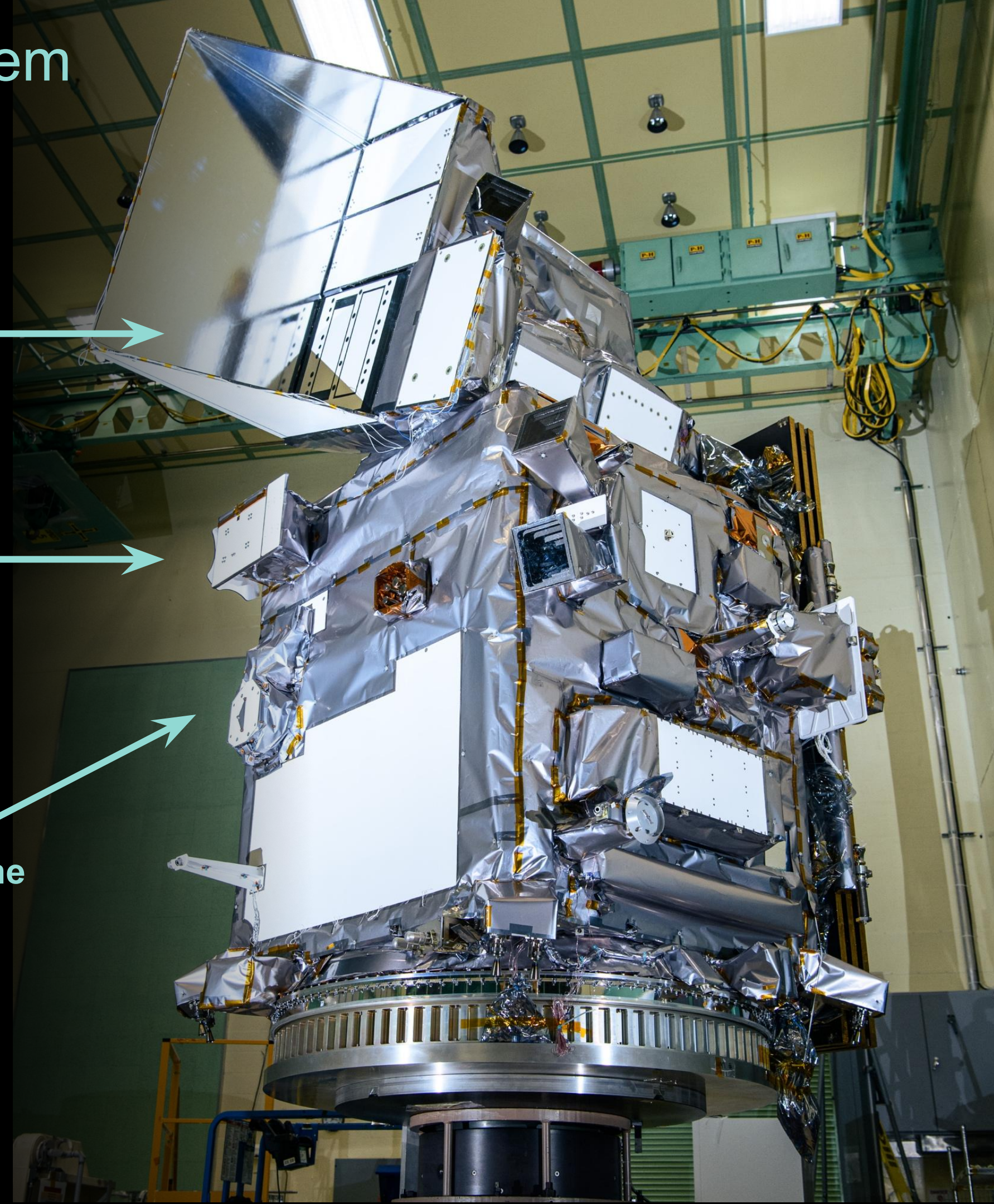
440, 550, 670, 870 nm
10-60 viewing angles
Broad swath
5.2 km level 1C common grid



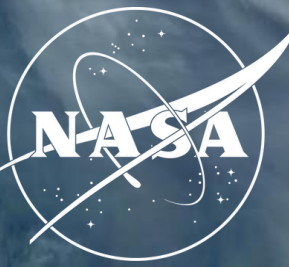
Spectropolarimeter for Planetary Exploration one (SPEXone)

380-770 nm in 2-5 nm steps (I), 10-40 nm (DOLP)
5 viewing angles
Narrow swath (100 km)
5.2 km level 1C common grid

All instruments are daytime only // 1 pm Sun-sync Equatorial orbit

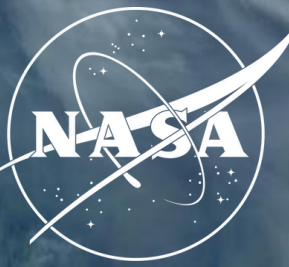


Required atmospheric products from OCI



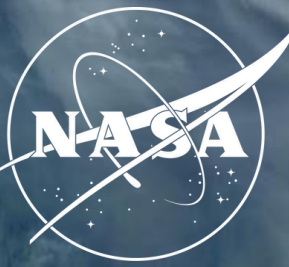
Quantity	Acronym	Typical range	Goal uncertainty
Aerosols			
Aerosol optical depth at 380 nm	AOD	0-5	Max (0.06 or 40%)
Aerosol optical depth at 440, 500, 550, 675 nm	AOD	0-5	Land: Max (0.06 or 20%) Water: Max (0.04 or 15%)
Fine mode AOD fraction at 550 nm (over water)	FMF	0-1	0.25
Clouds			
Cloud mask	-	-	-
Cloud optical thickness	COT	5-100	Liquid: 25%; Ice: 35%
Cloud effective radius	CER	5-50 μm	Liquid: 25%; Ice: 35%
Cloud top pressure (for COT>3)	CTP	100-1000 mb	60 mb
Cloud (liquid/ice) water path	CWP, LWP/IWP	-	-

Required atmospheric products from OCI



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Cloud (liquid/ice) water path	CWP, LWP/IWP	-	-

Where do aerosols fit into PACE?



PACE Ocean Colour Instrument

Dedicated aerosol retrieval algorithms

Remer *et al.* Unified Aerosol Algorithm (UAA)
Lyapustin *et al.* Multiangle Implementation of Atmospheric Correction (MAIAC)

Spectral AOD, fine/coarse split, Ångström exponent, absorption and height
Land and water

Ocean colour atmospheric correction

Ibrahim *et al.* multi-band atmospheric correction (MBAC)
Gordon *et al.* NIR atmospheric correction

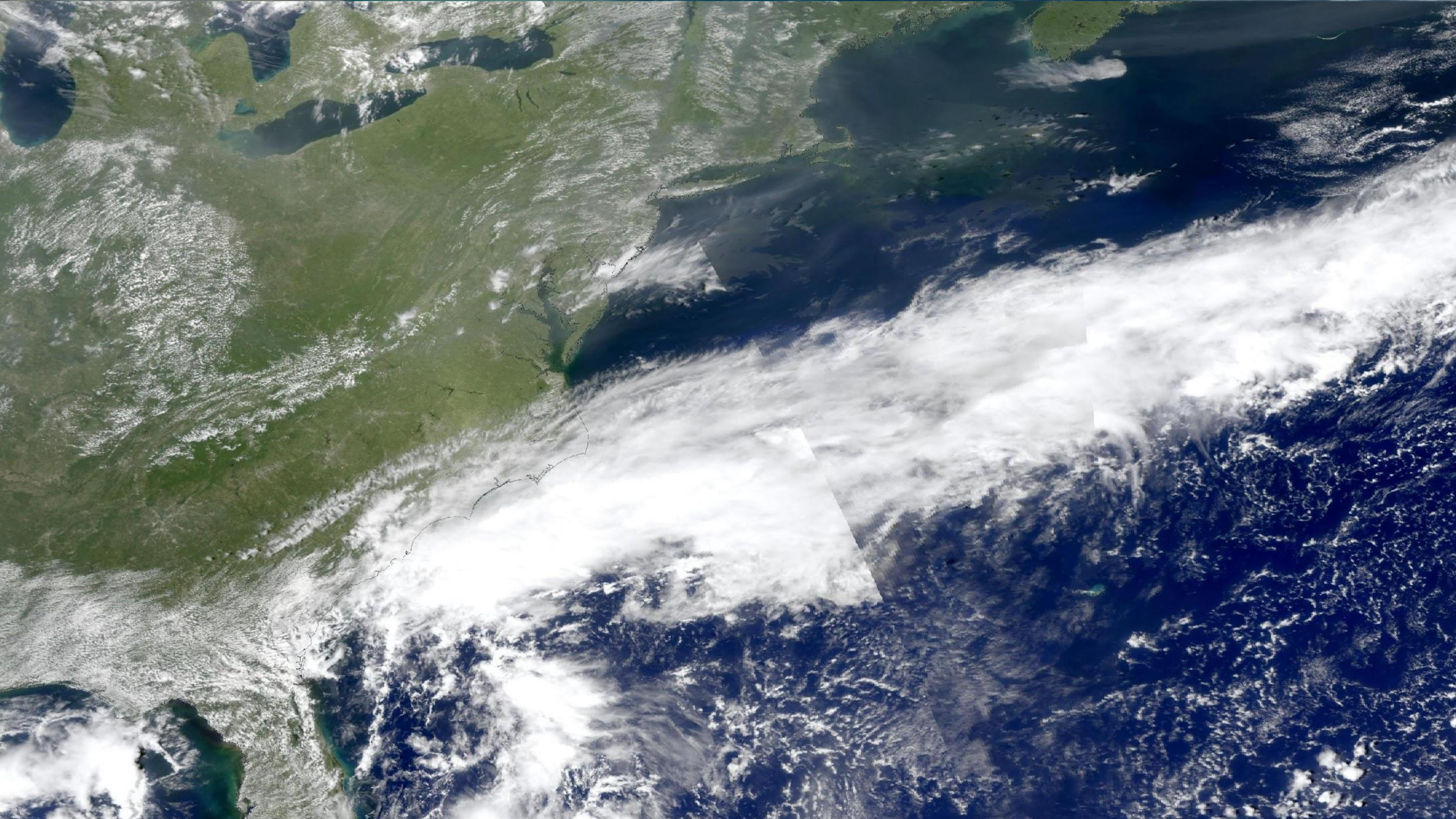
NIR AOD, fine/coarse split, Ångström exponent
Remote sensing reflectance
Water only

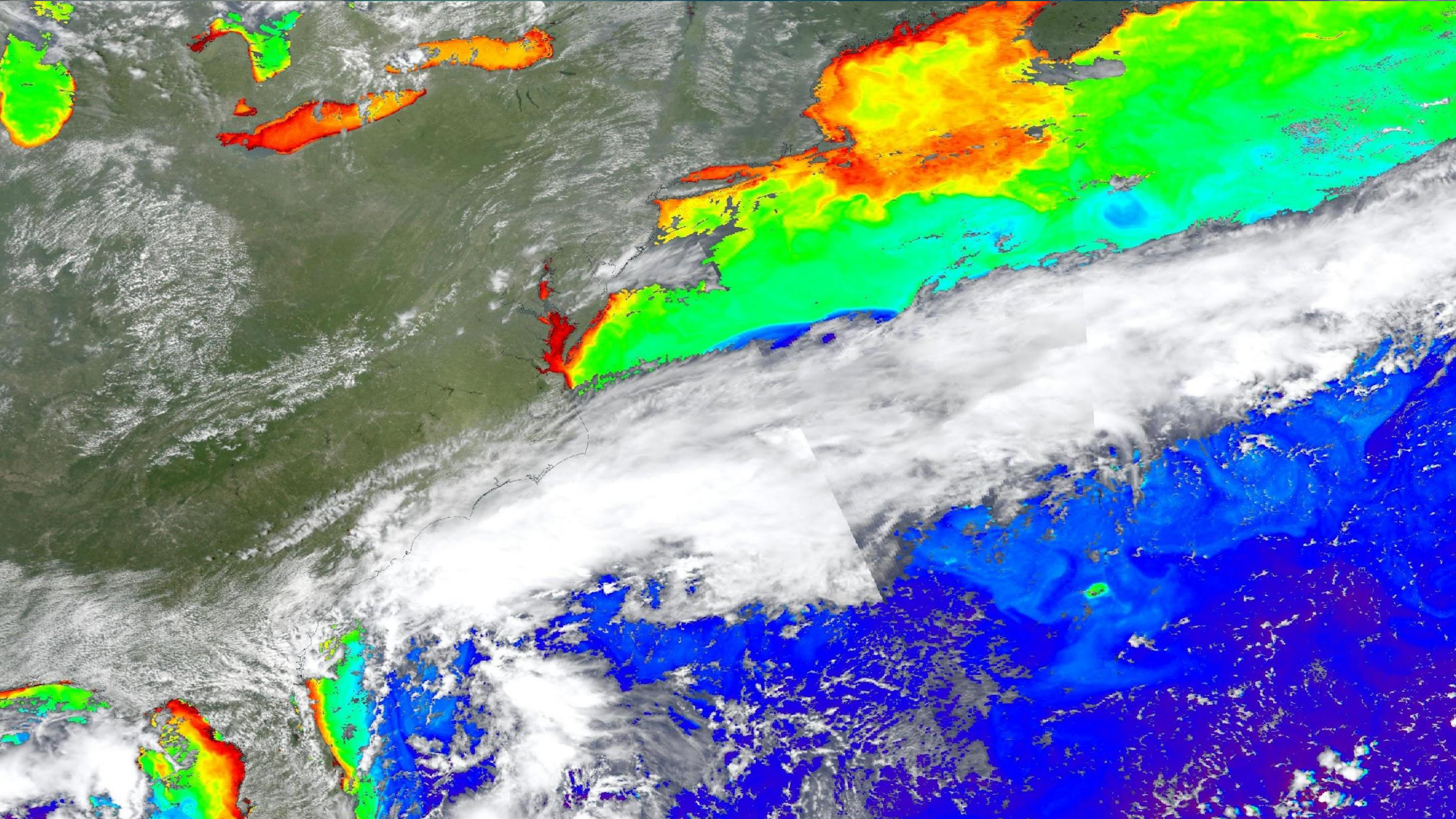
PACE polarimeters

Simultaneous aerosol and surface retrieval algorithms

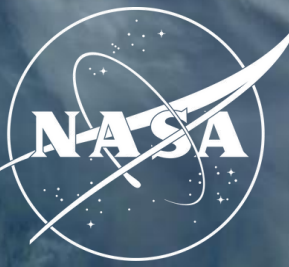
RemoTAP
FastMAPOL
MAPP
GRASP

Detailed aerosol microphysical characterization
Surface BRDF/BPDF



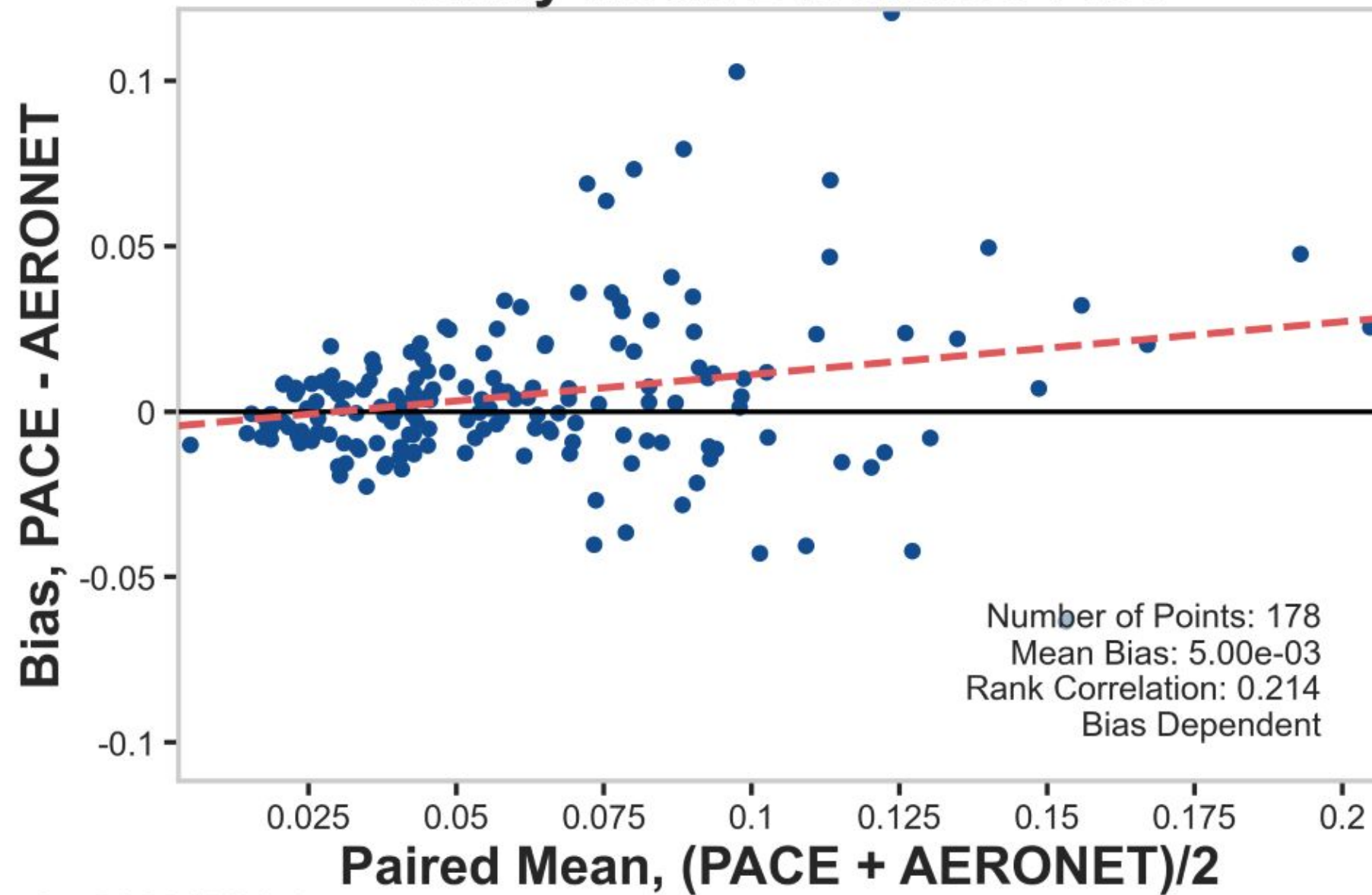


Preliminary OCI ocean colour validation results



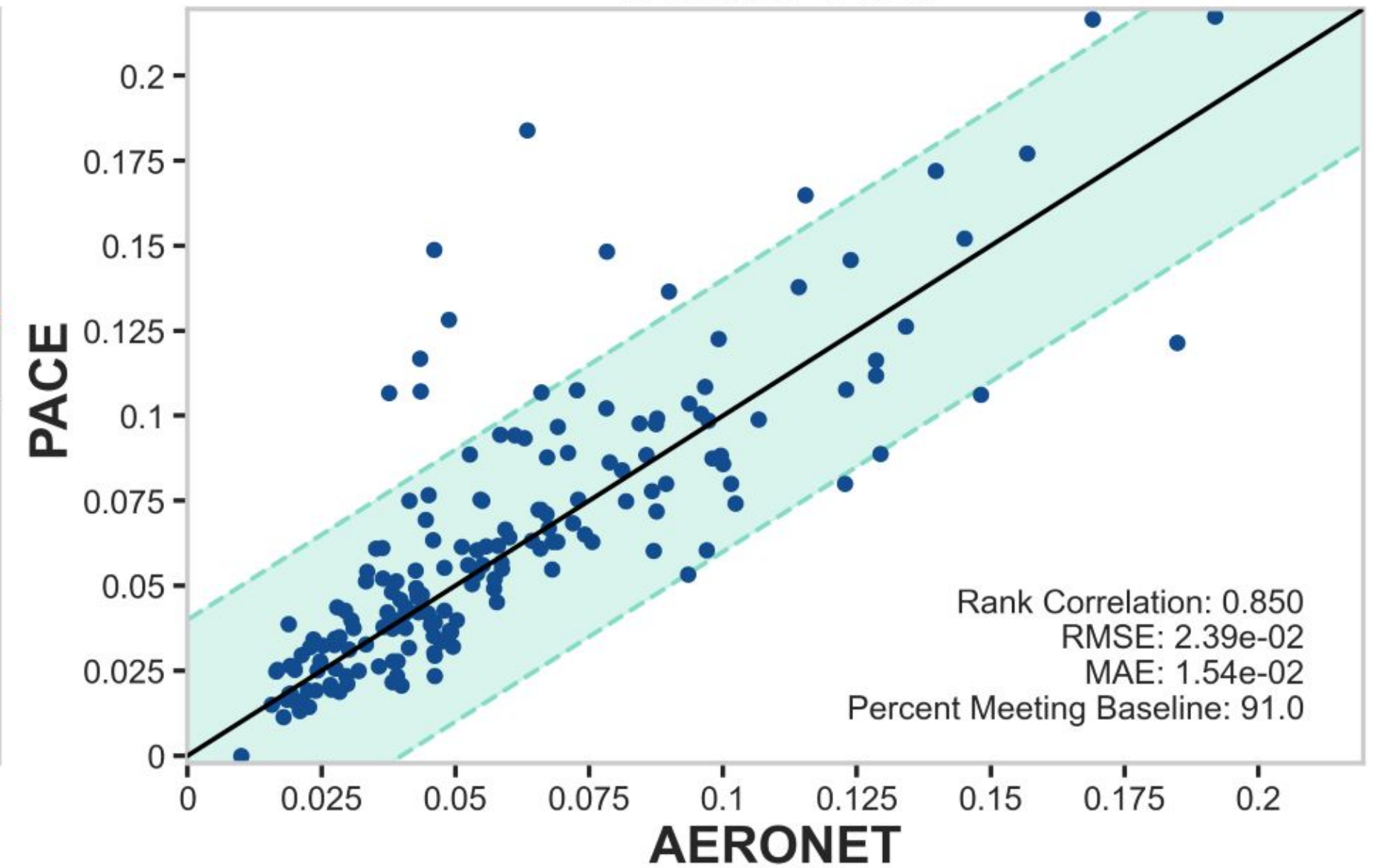
AOT(865)

Tukey Mean-Difference Plot



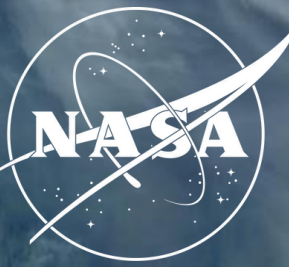
SeaBASS Validation

Scatter Plot



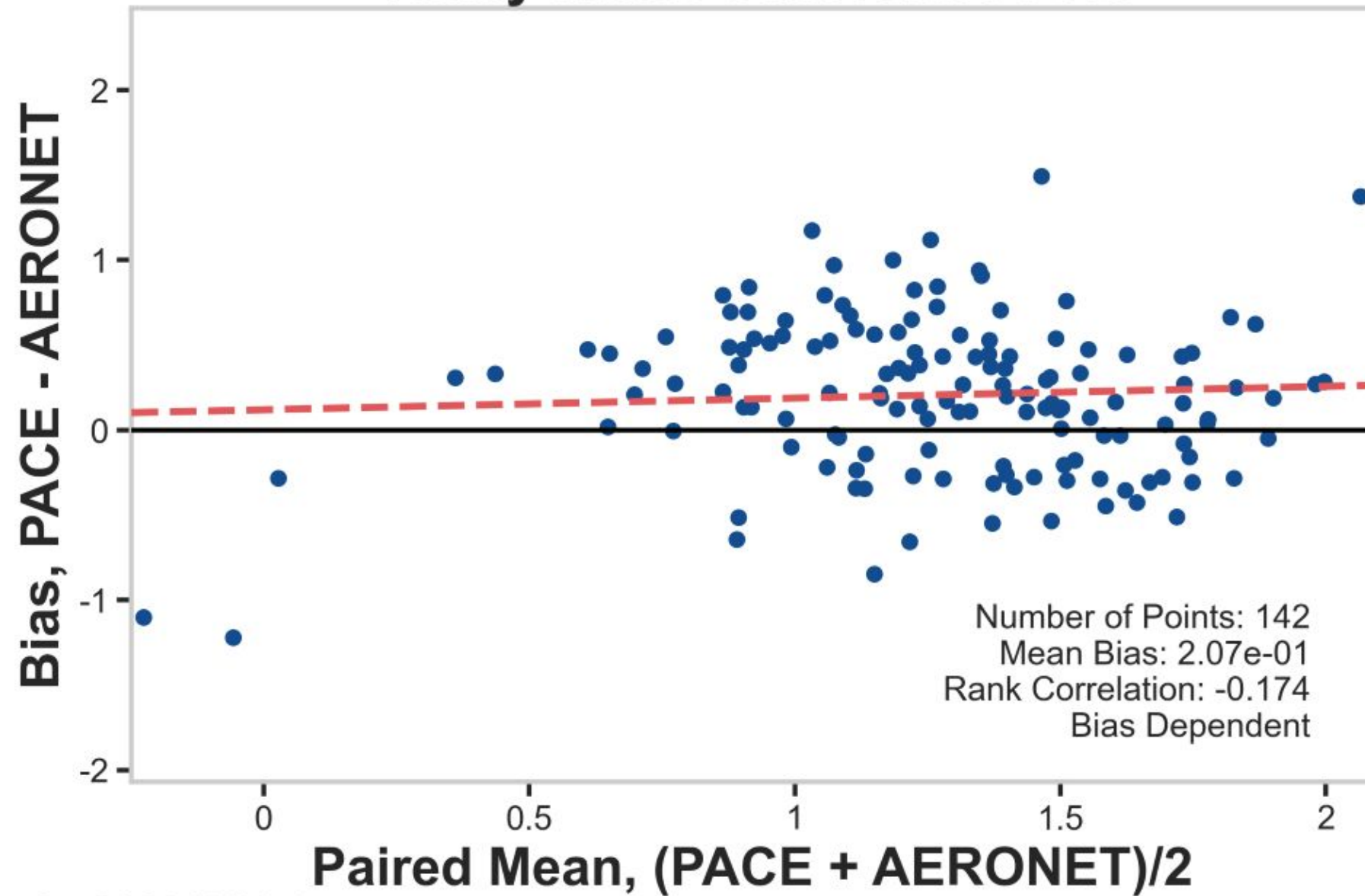
Generated: 12 Sep 2024

Preliminary OCI ocean colour validation results



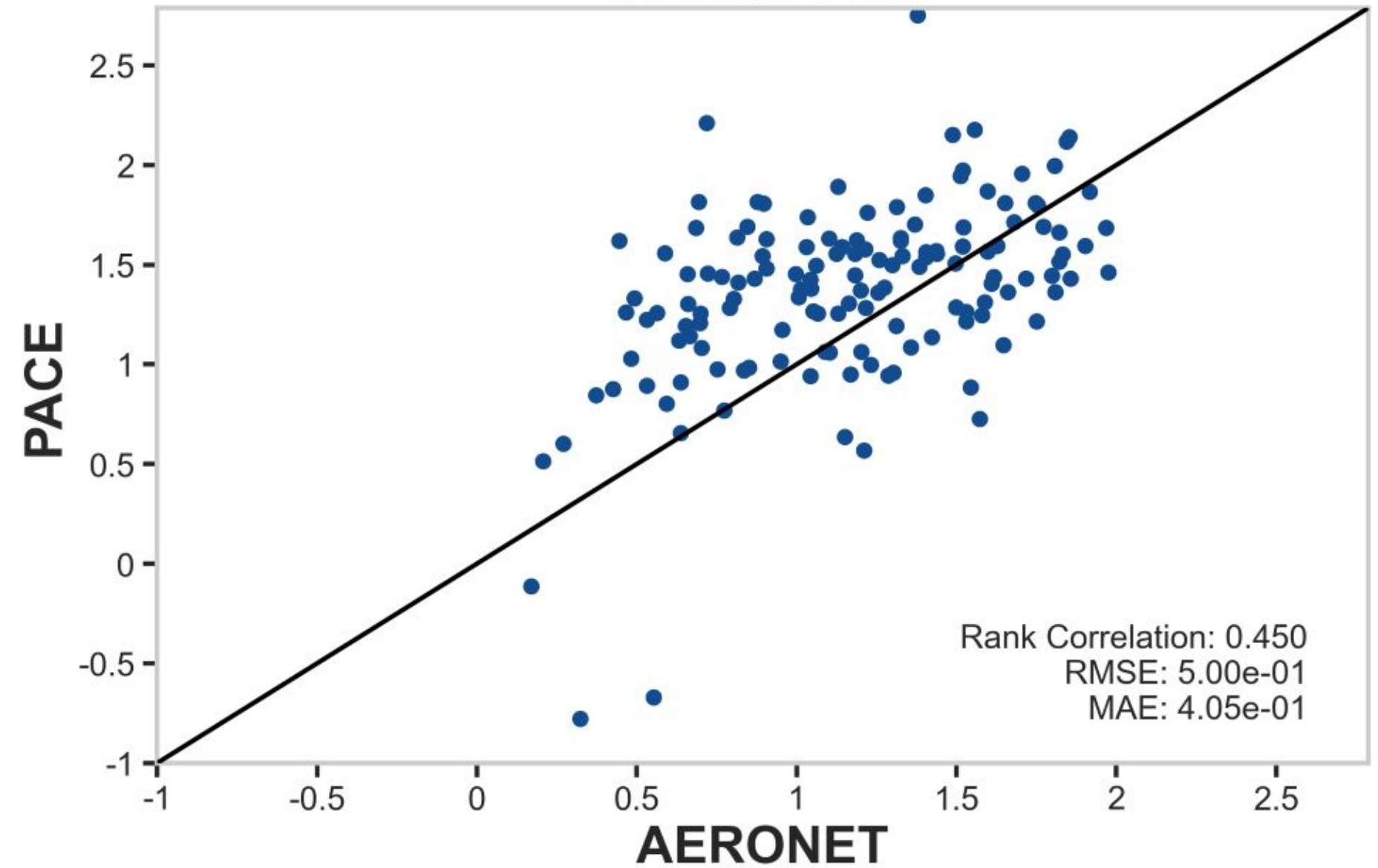
Angstrom

Tukey Mean-Difference Plot



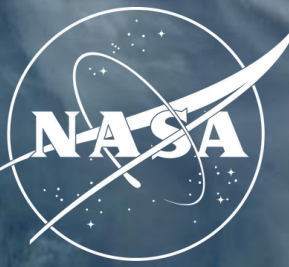
SeaBASS Validation

Scatter Plot



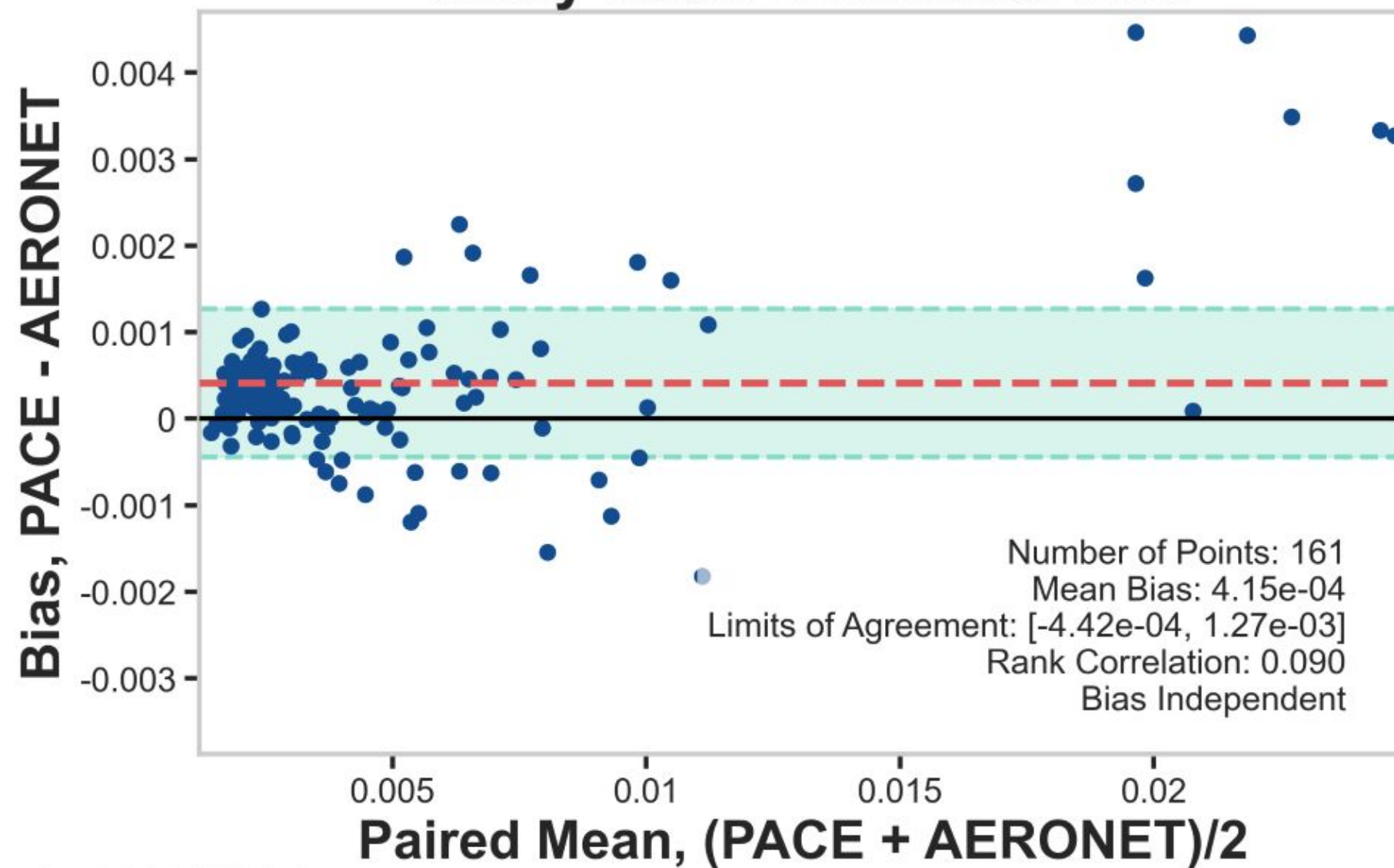
Generated: 13 Sep 2024

Preliminary OCI ocean colour validation results



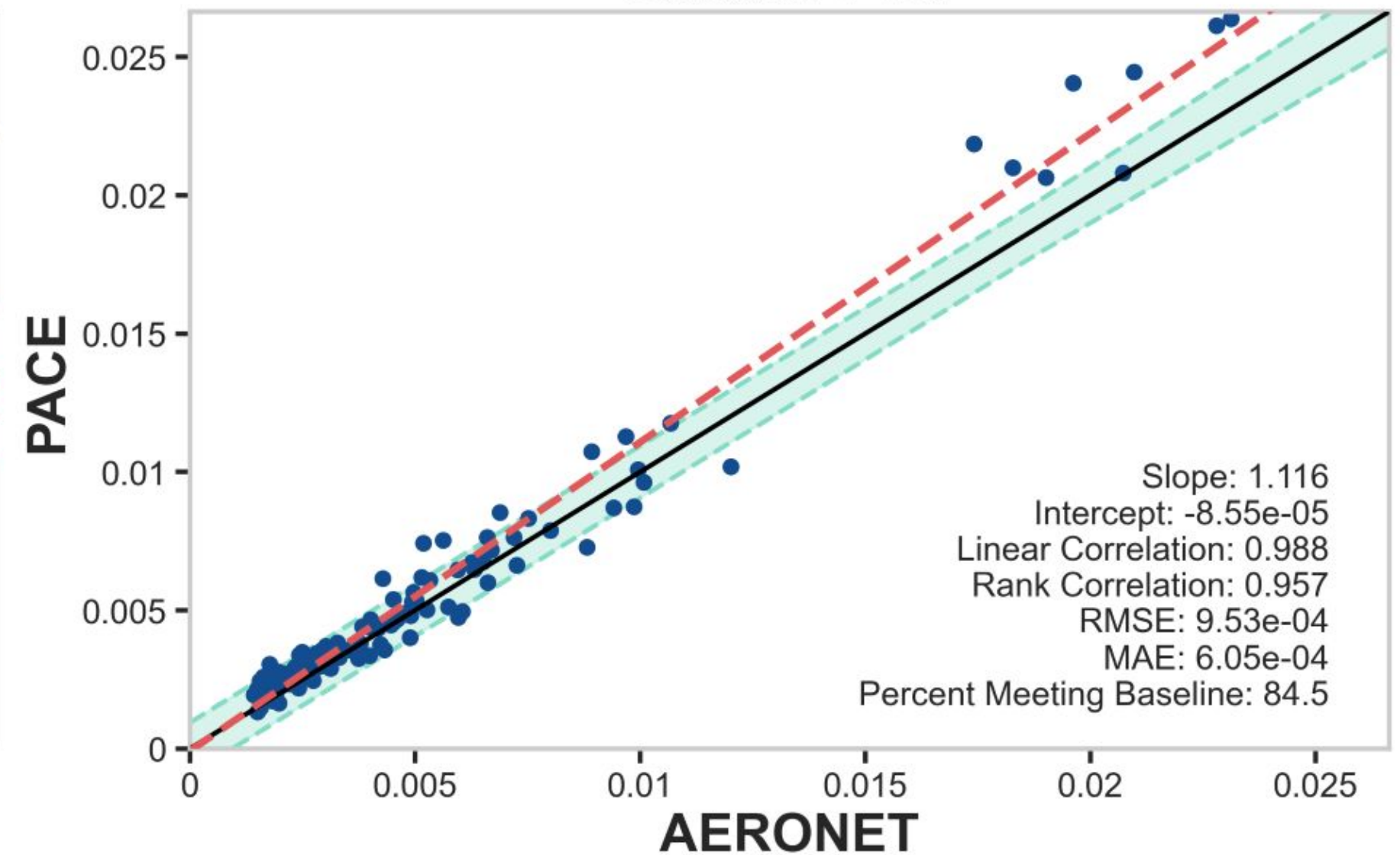
$R_{rs}(560), sr^{-1}$

Tukey Mean-Difference Plot



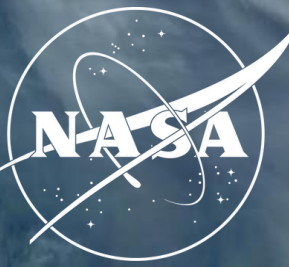
SeaBASS Validation

Scatter Plot

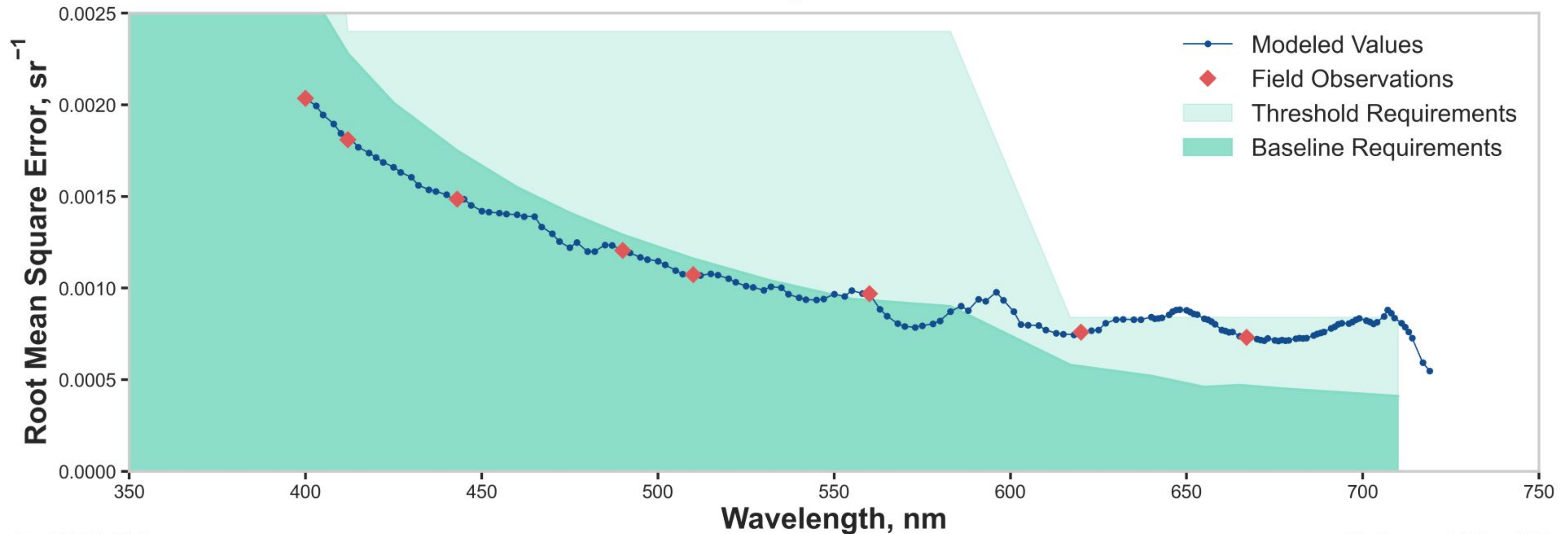


Generated: 12 Sep 2024

Preliminary OCI ocean colour validation results



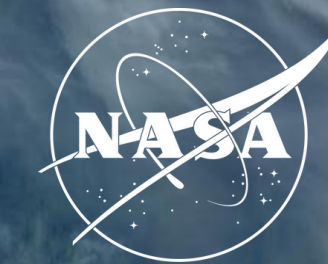
PACE OCI - Rrs Spectral Statistics



SeaBASS Validation

File Generated: 12 Sep 2024

Preliminary polarimetry validation results

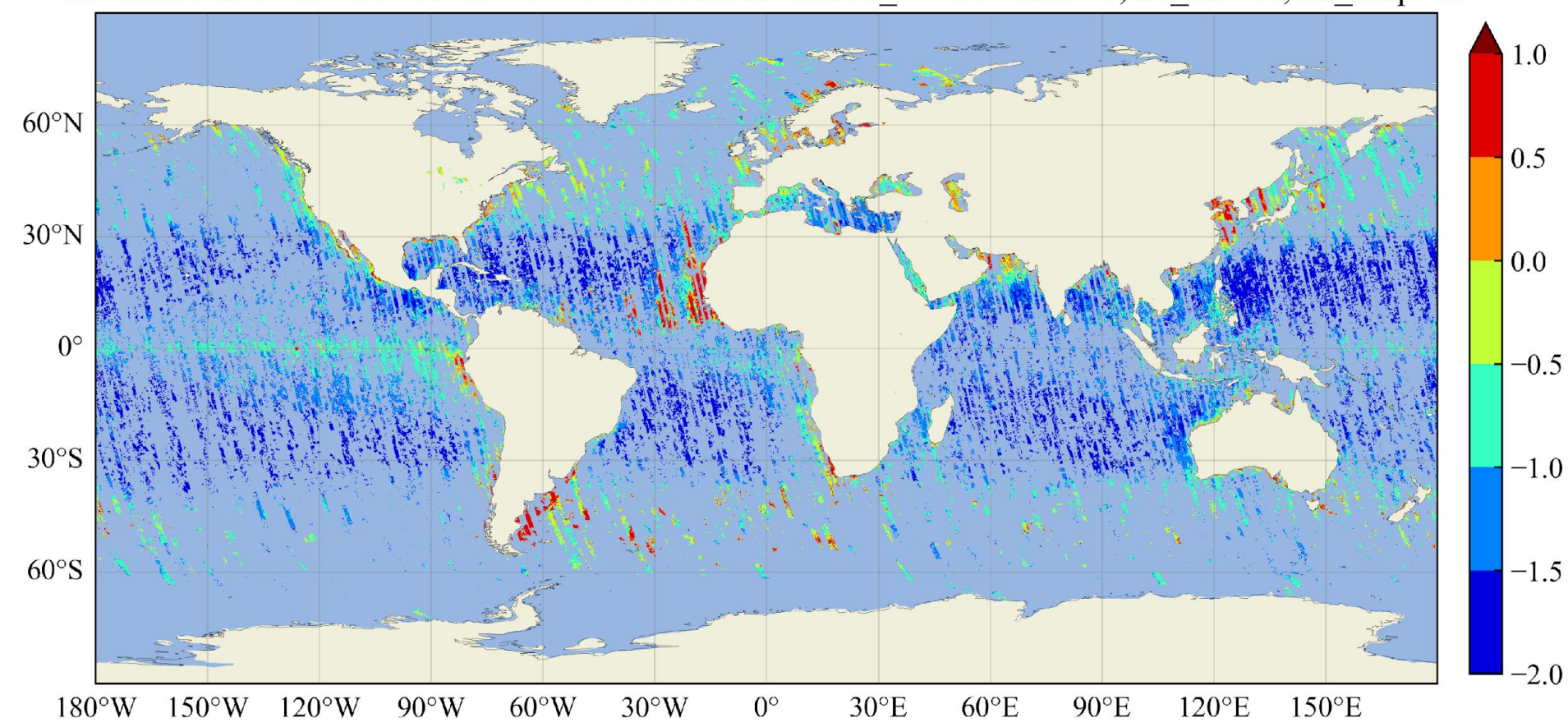
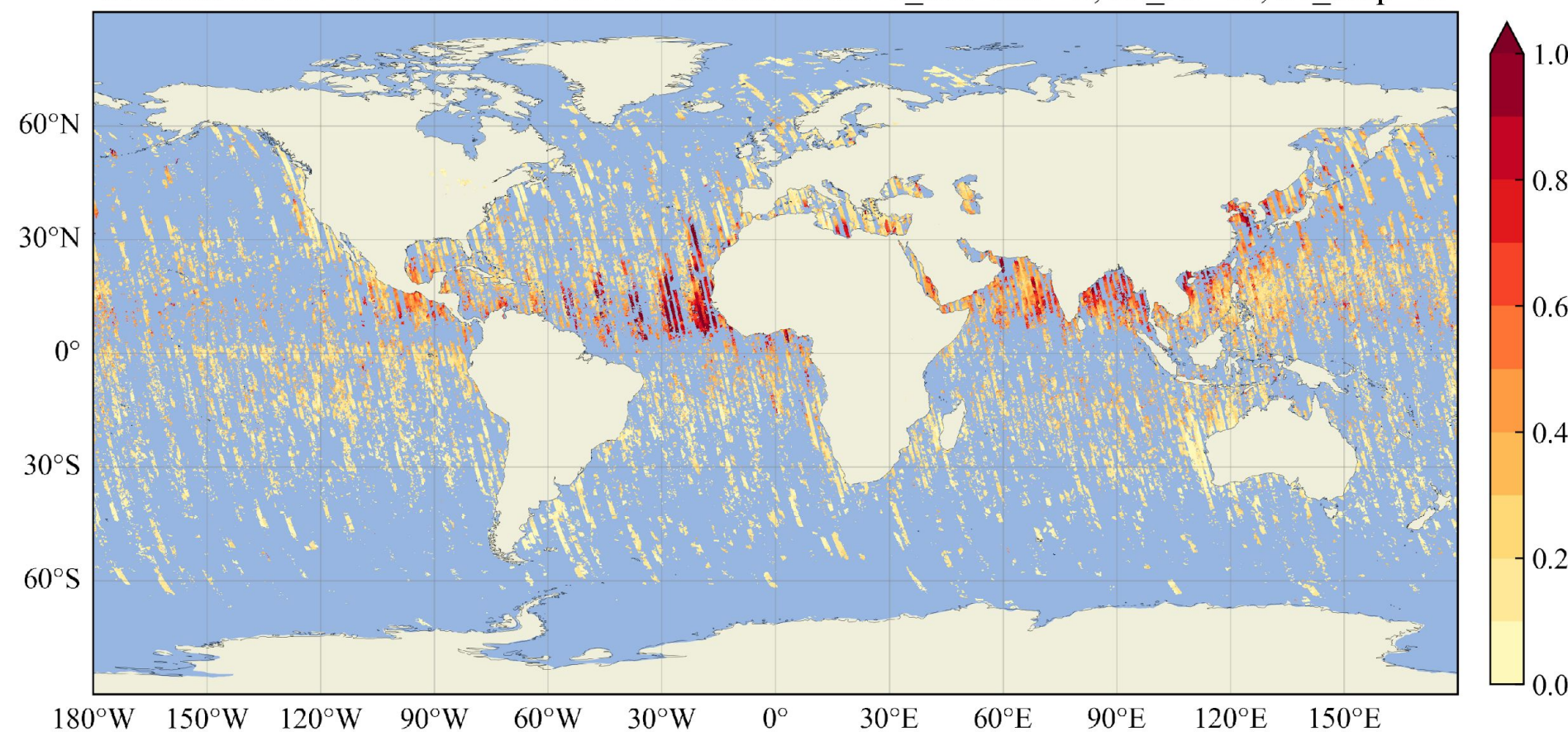


SPEXOne AOD at 550 nm

SPEXOne Chl-a

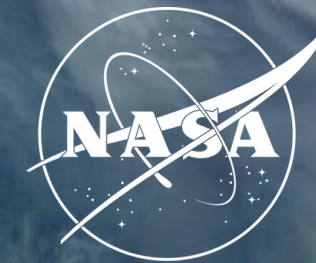
SPEXONE:20240223T210422-20240426T115515 AOT_550 Chi2<3, nv_ref>10, nv_dolp>10

SPEXONE:20240223T210422-20240426T115515 CHLA_LOG10 Chi2<3, nv_ref>10, nv_dolp>10



~2 months of SPEXOne retrievals from the FastMAPOL algorithm composited

Preliminary polarimetry validation results



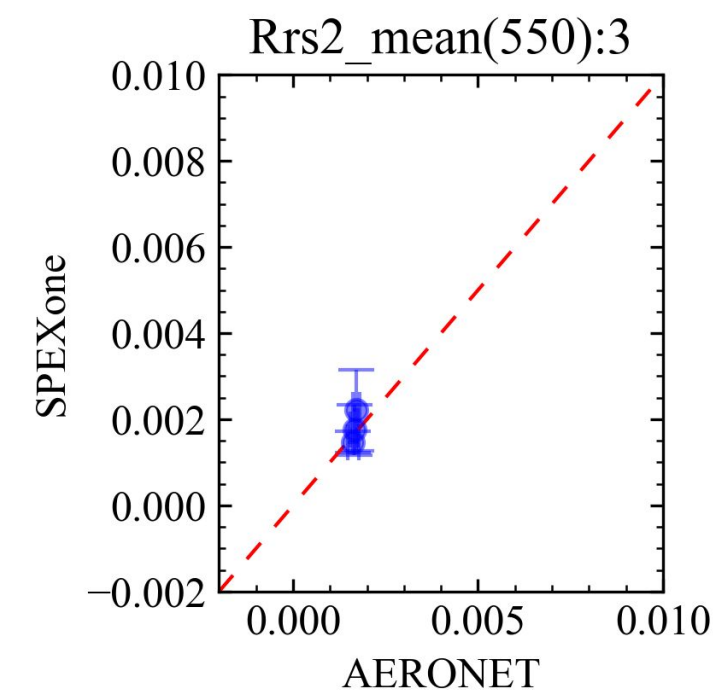
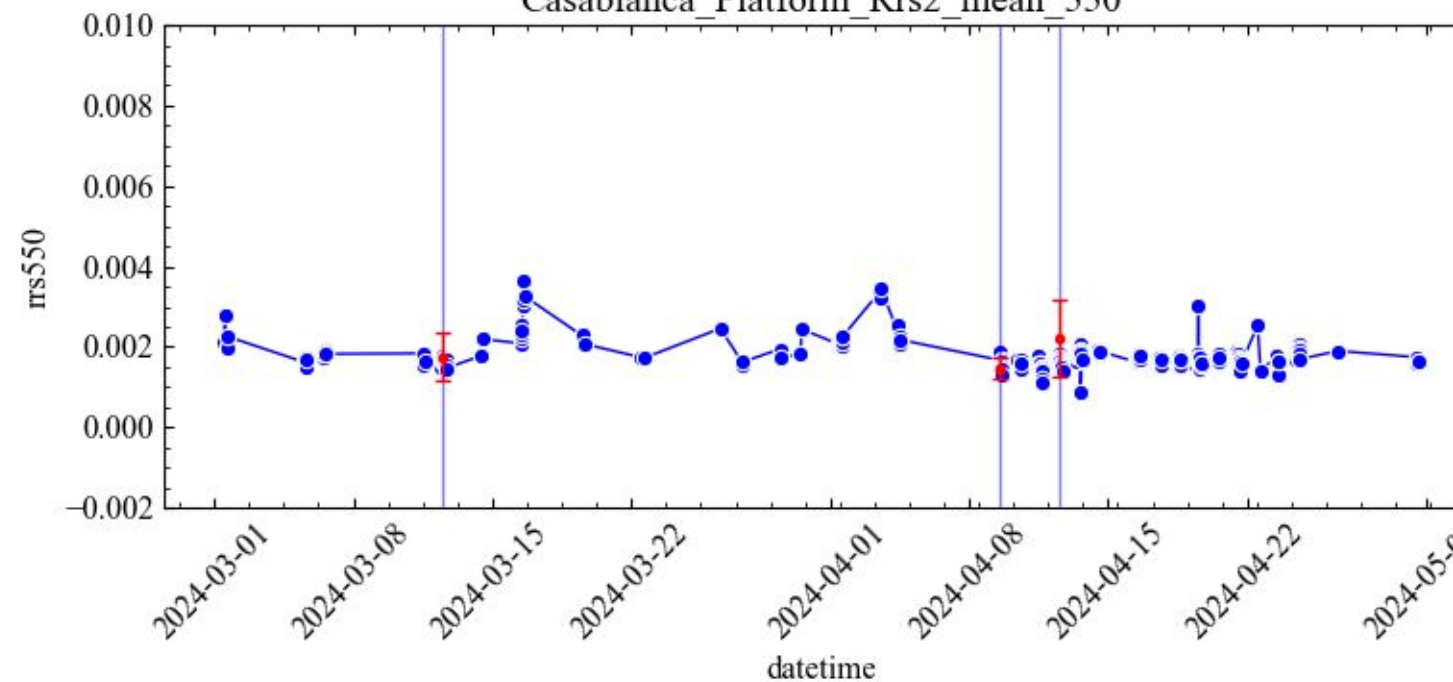
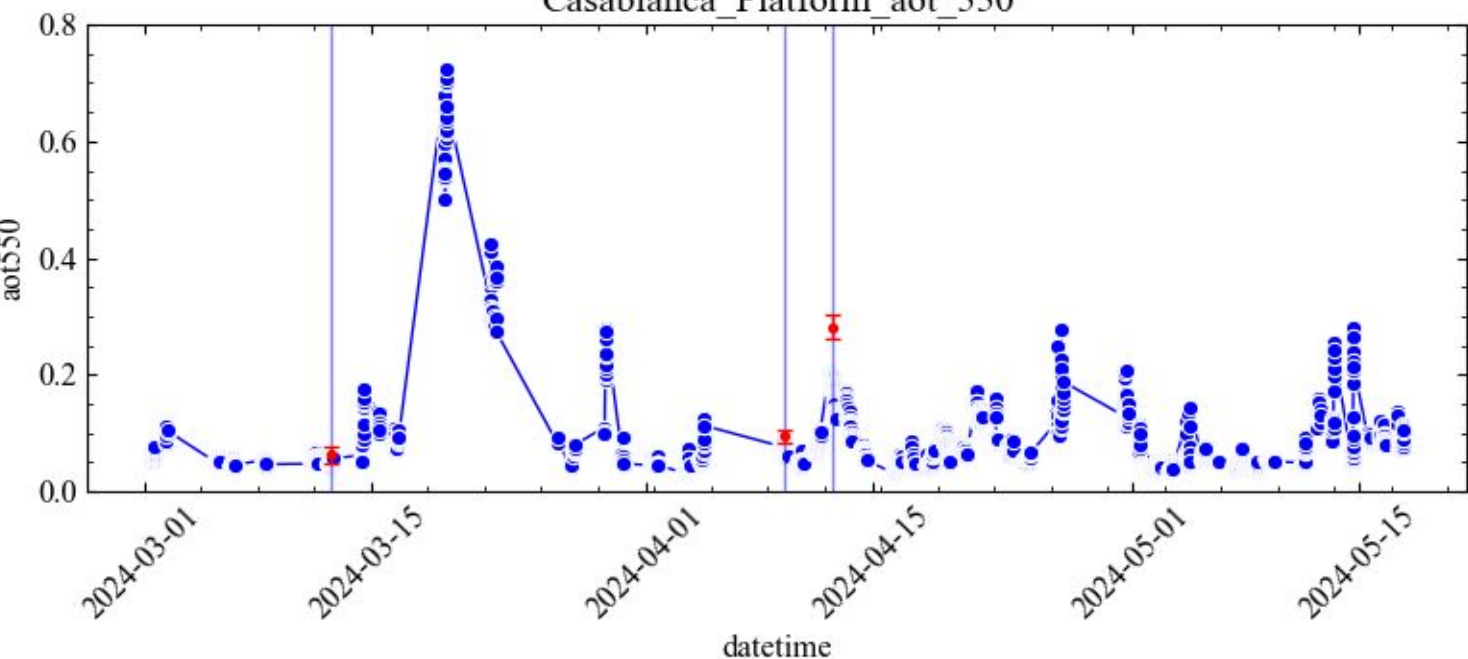
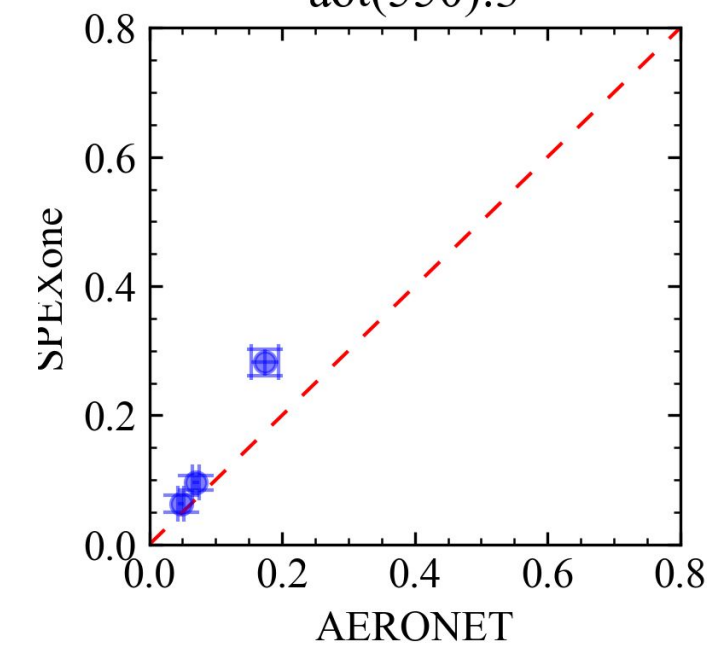
AOD at 550 nm

Rrs at 550 nm

aot(550):3

Casablanca_Platform_aot_550

Casablanca_Platform_Rrs2_mean_550



AERONET

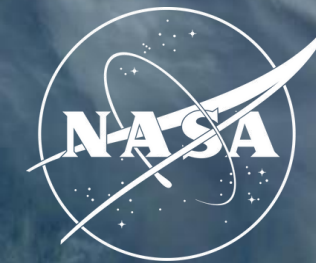
SPEXOne FastMAPOL

Case study at Casablanca – see Meng’s poster!



Analysis and images: Meng Gao

Click or scan to learn more and get started!



PACE data use tutorials

Jupyter notebooks

<https://www.earthdata.nasa.gov/news/new-pace-jupyter-tutorials>



PACE data products table

Data products planned and their status

https://pace.oceansciences.org/data_table.htm



PACE Community of Practice

Join for mission news, webinars, data release notes, and more

https://pace.oceansciences.org/app_community.htm



NASA Earthdata forum

Multi-mission user support forum

<https://forum.earthdata.nasa.gov/viewforum.php?f=7>

