



How the NASA PACE Mission will Advance Water Quality Management

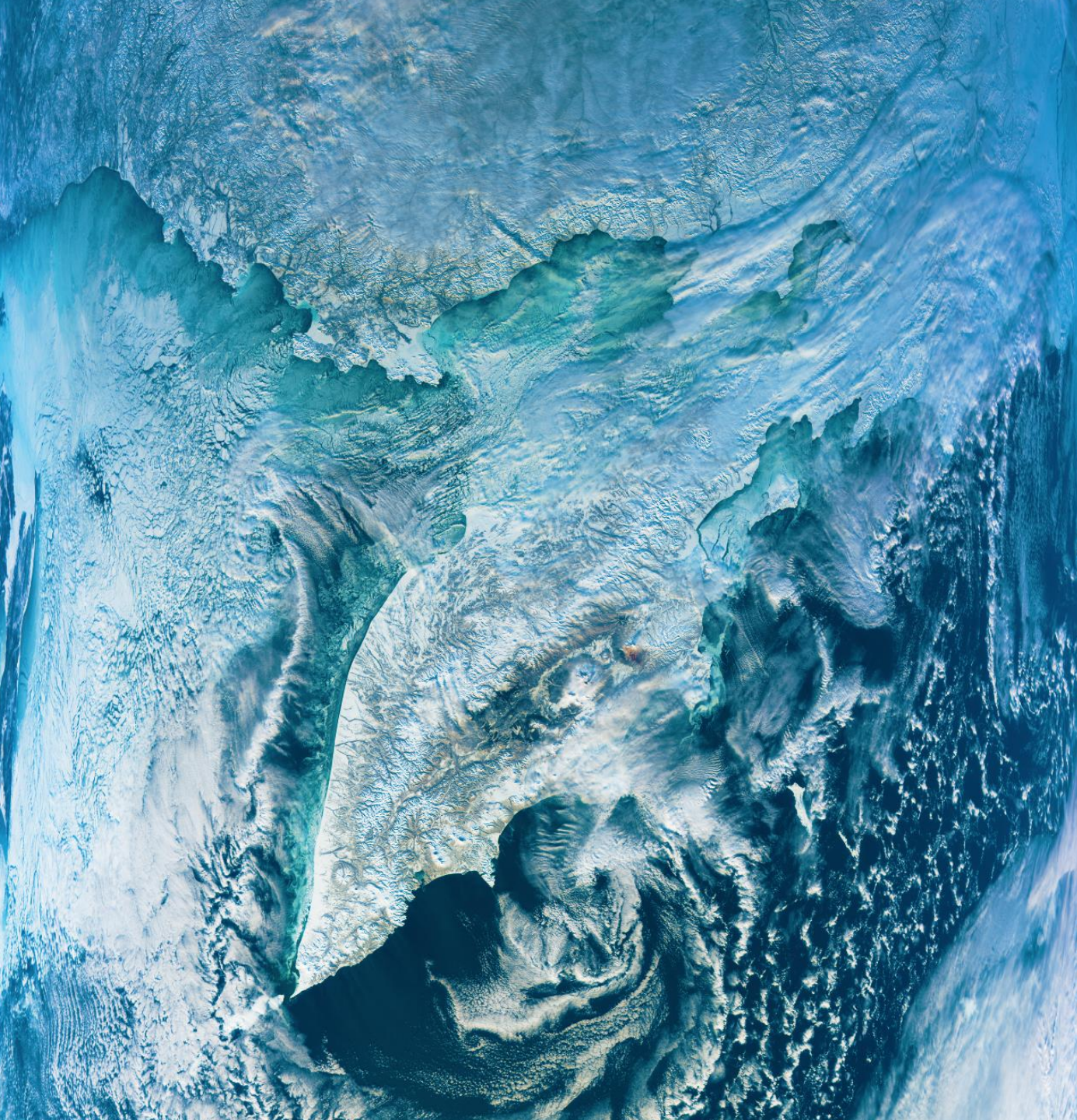
Erin Urquhart, PhD

PACE Program Applications Lead, NASA HQ



*Thanks to Morgaine McKibben for contributed slides





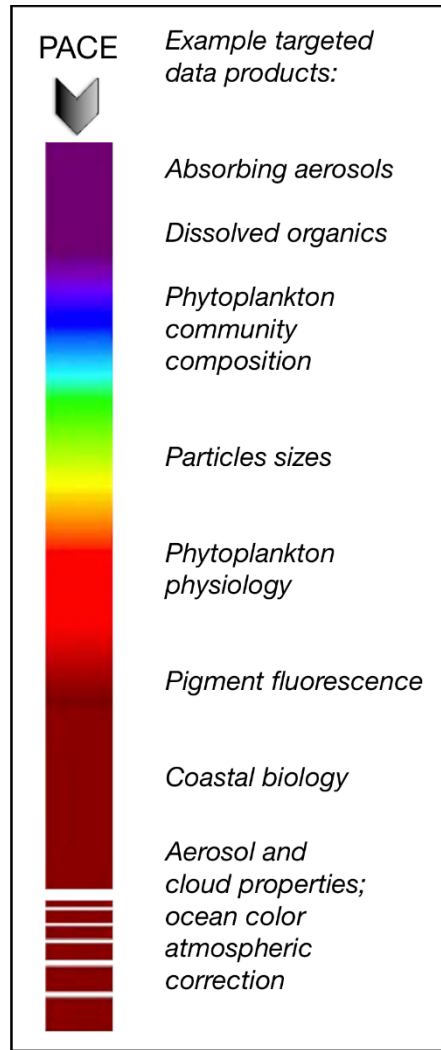
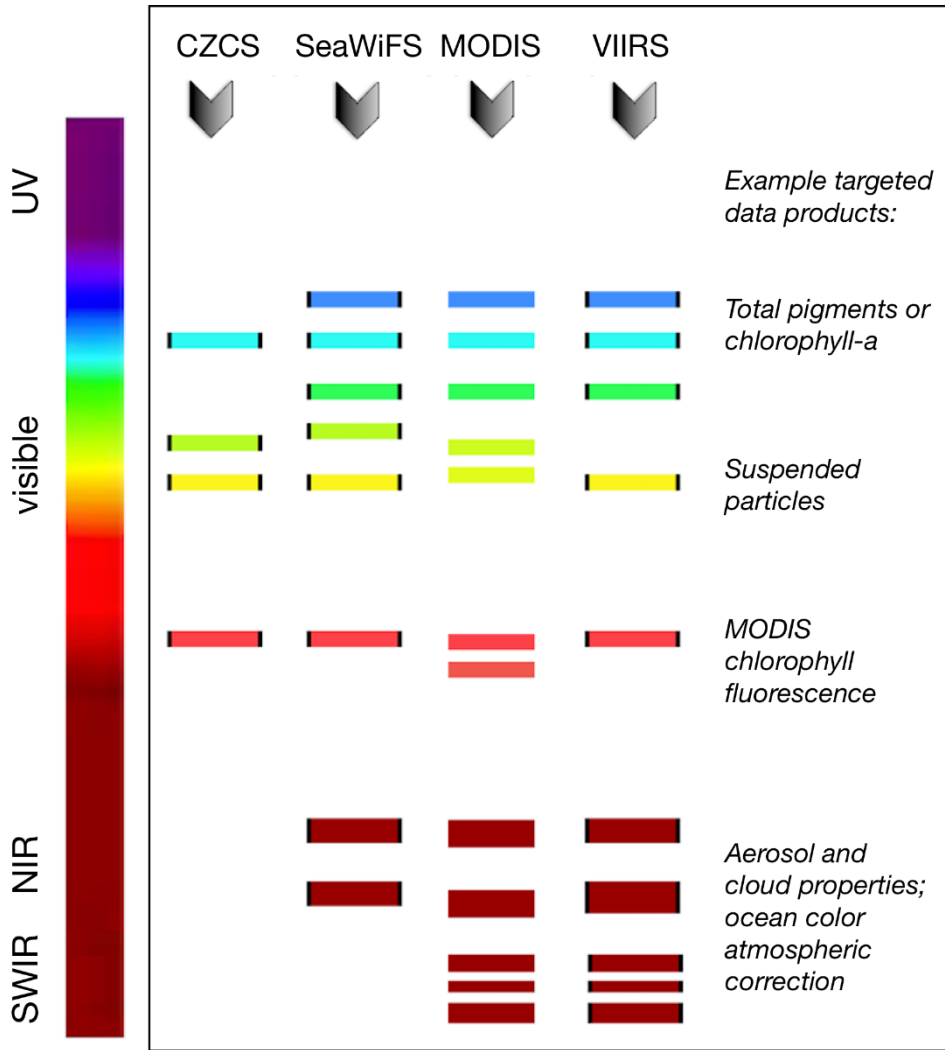
63 days later...

First Light

Initial data products
released
April 11th 2024

Moving from multi-spectral radiometry to spectroscopy

1978-1986 1997-2010 1999-pres. 2012-pres.



Example diatom



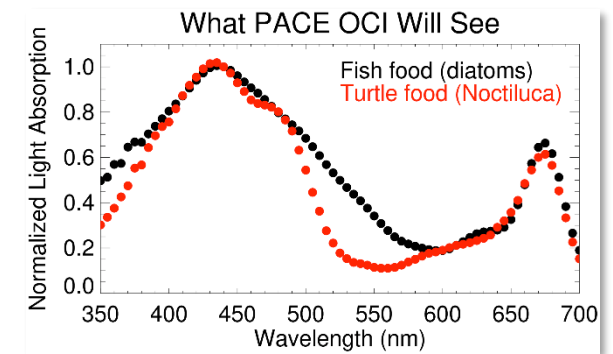
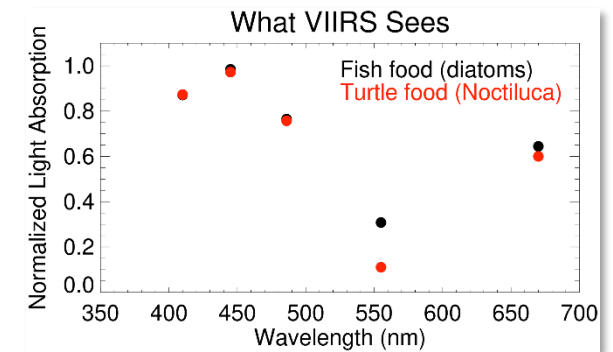
Linda Ambrecht, abc.com.au

Example Noctiluca

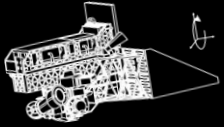


● 1 mm ●
Joaquim Goes, LDEO

Signals from the water are small & differentiating between constituents requires additional information relative to what we have today

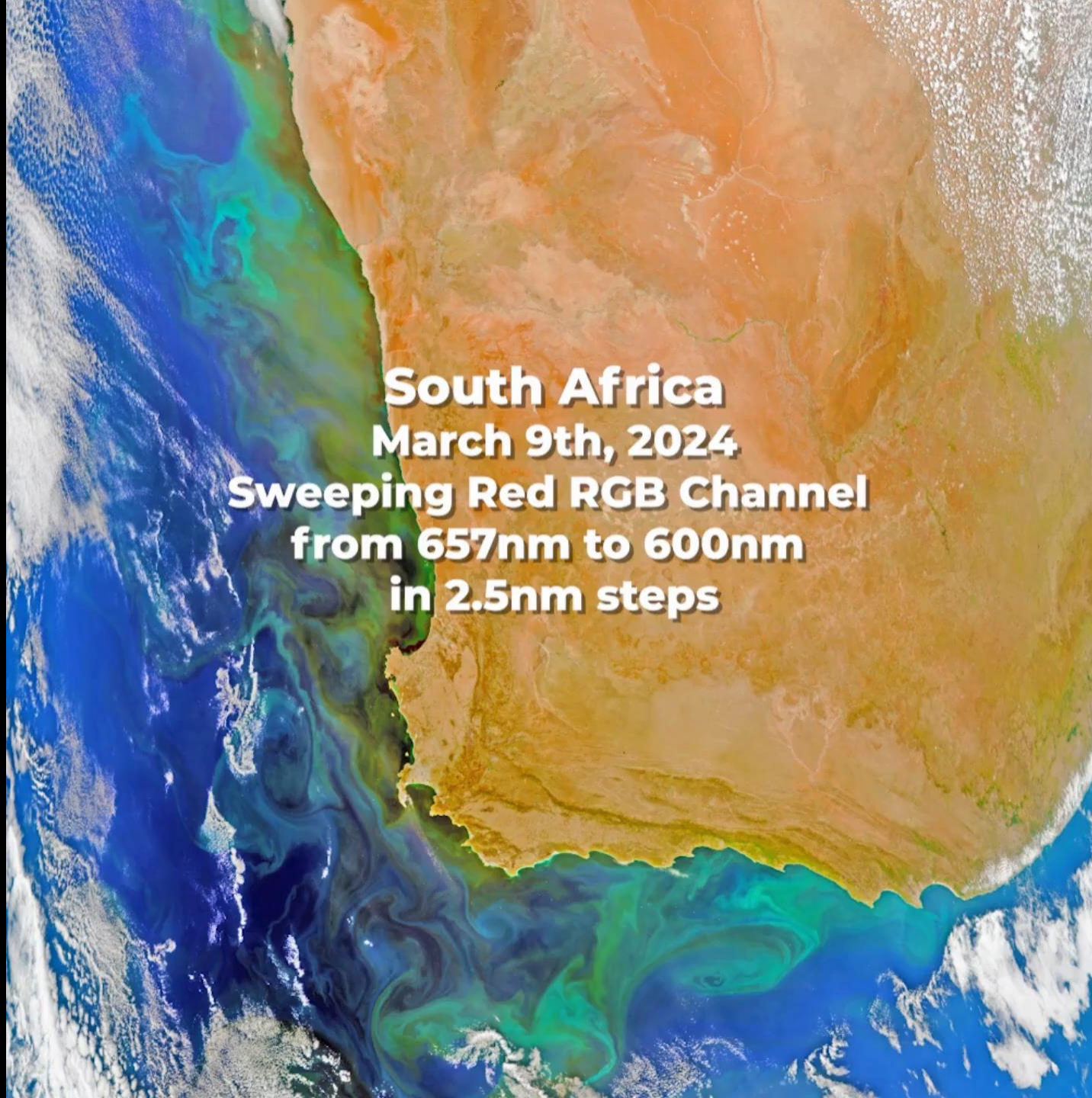


OCI



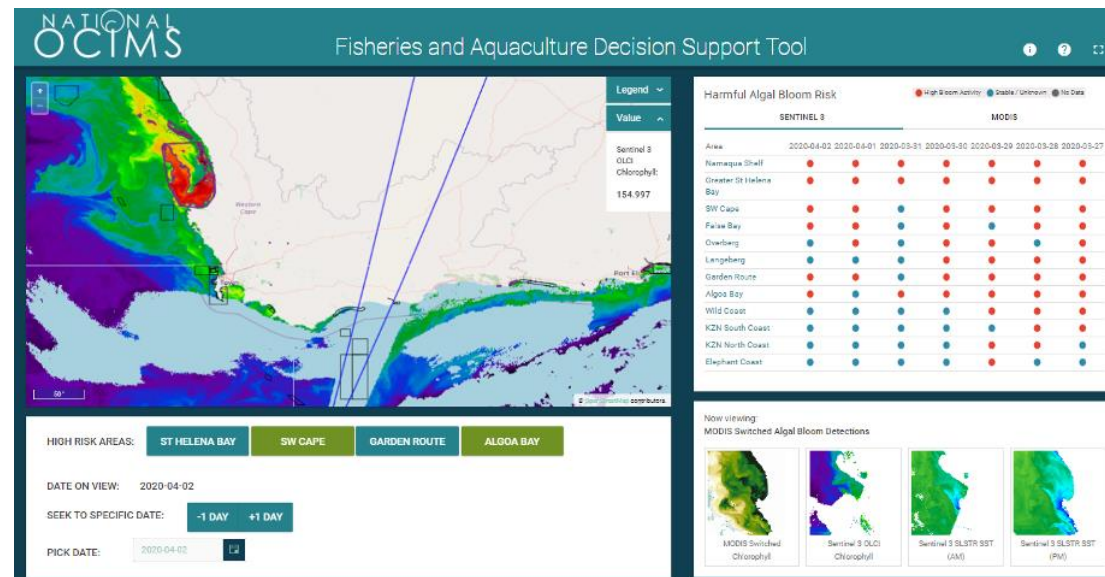
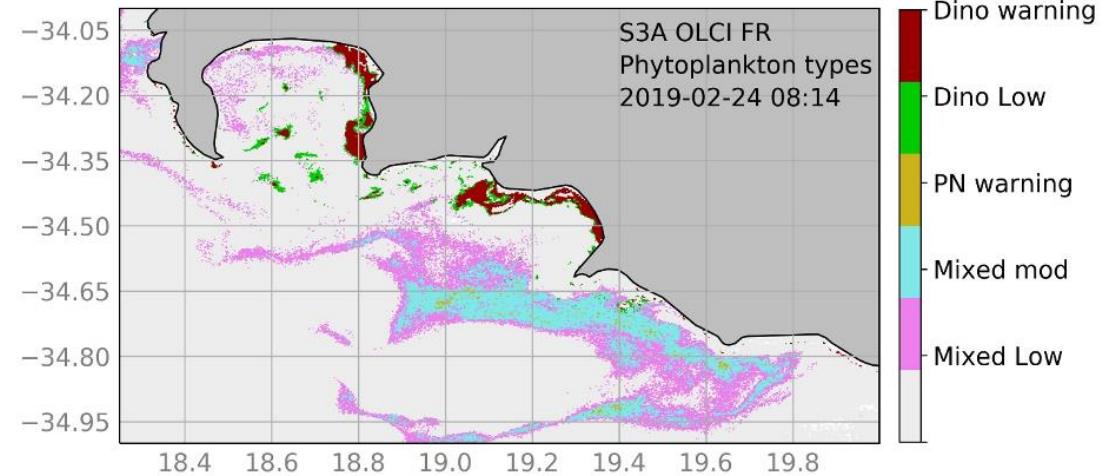
340-890 nm in 2.5 nm steps
7 discrete SWIR, 940-2260 nm
1-2 day coverage $\pm 20^\circ$ tilt, 1km

South Africa
March 9th, 2024
Sweeping Red RGB Channel
from 657nm to 600nm
in 2.5nm steps



PACE will provide hyperspectral chlorophyll data, phytoplankton community composition, and pigment data, contributing to advanced water quality management + understanding aquatic ecosystems, which can benefit and/or inform:

- Identification & tracking of HABs
- Assessing the health of fisheries and aquaculture
- Evaluating & maintaining ecosystem health
- Identify oil spills
- Post-disaster water quality impacts (e.g., floods, fires, hurricanes): particularly regarding suspended solids, harmful algal blooms, and fish kills/hypoxia



Top: Existing phytoplankton type products for potential HAB detection in the southern Benguela will be improved by PACE.

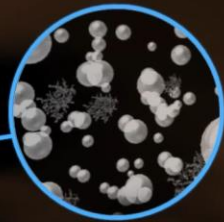
Middle: The National Oceans and Coastal Information Management System (OCIMS) Fisheries and Aquaculture Decision Support Tool will incorporate PCC from PACE.

Left: HAB conditions discolor coastal waters. (Photo courtesy of Wolfgang Volgelbein, VIMS)

PACE DATA PRODUCTS

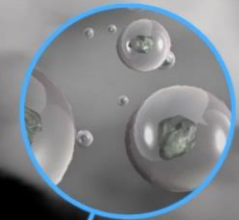
ATMOSPHERIC

Aerosol absorption
Aerosol size distributions
Concentrations of brown/black carbon



Aerosol optical depth
Aerosol heights and layers

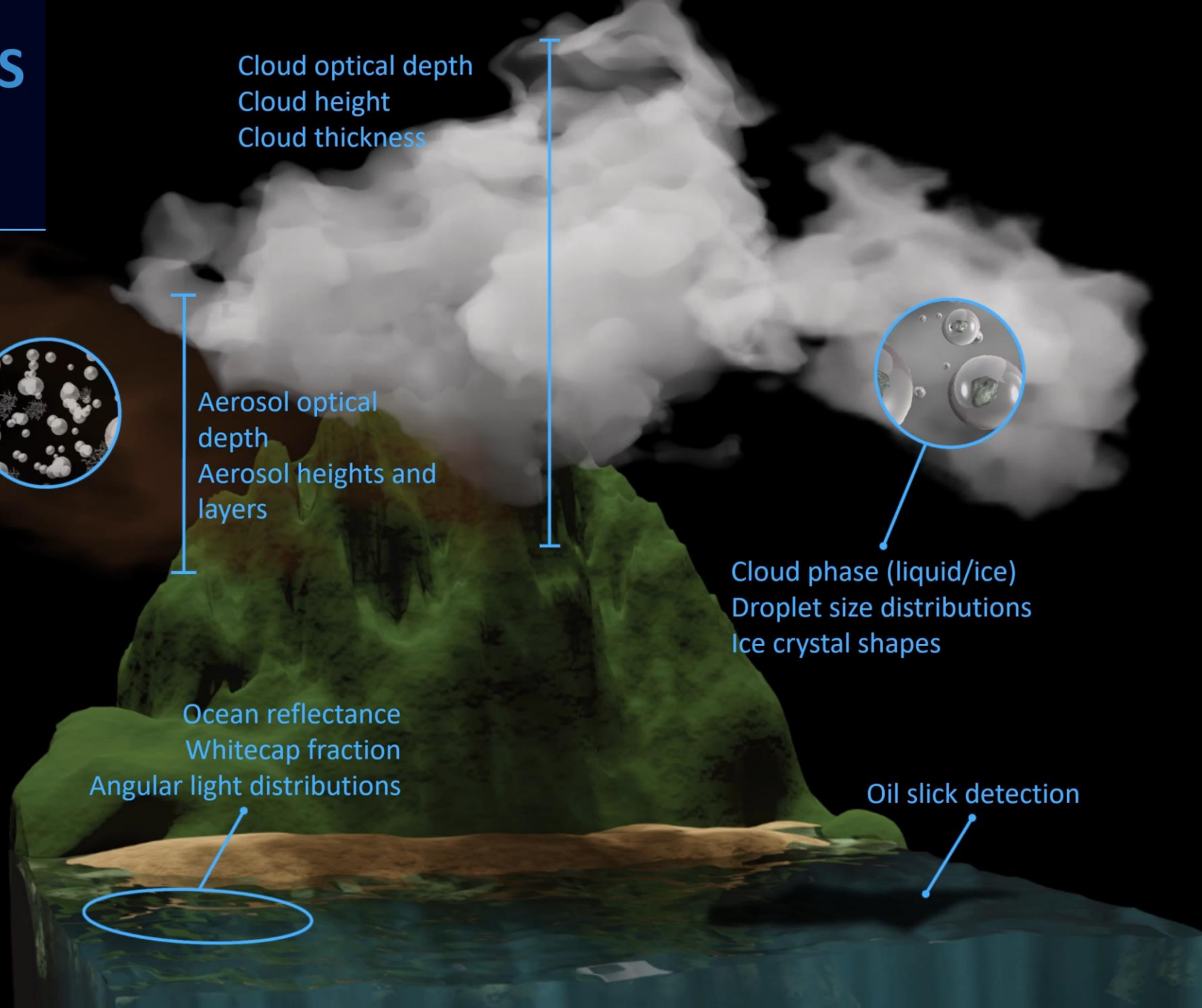
Cloud optical depth
Cloud height
Cloud thickness



Cloud phase (liquid/ice)
Droplet size distributions
Ice crystal shapes

Ocean reflectance
Whitecap fraction
Angular light distributions

Oil slick detection



Fish kill forecasting DST for the coastal waters of Oman



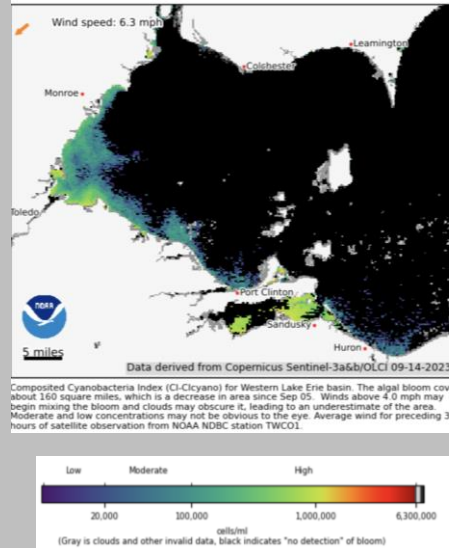
Joaquim Goes
Columbia University, Lamont Doherty Earth Observatory



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Discrimination of Algal Blooms Types in Estuarine & Lake Environments

Rick Stumpf
NOAA- National Centers for Coastal Ocean Science



Left: composited Cyanobacteria Index for Western Lake Erie Basin for 9/14/23, derived from Sentinel 3.



DIS RGB showing oil, with central AVIRIS 05/07/20.

Inland & Coastal Water Resource Management

SWOT – Surface Water and Ocean Topography

For studies of ocean and terrestrial surface waters

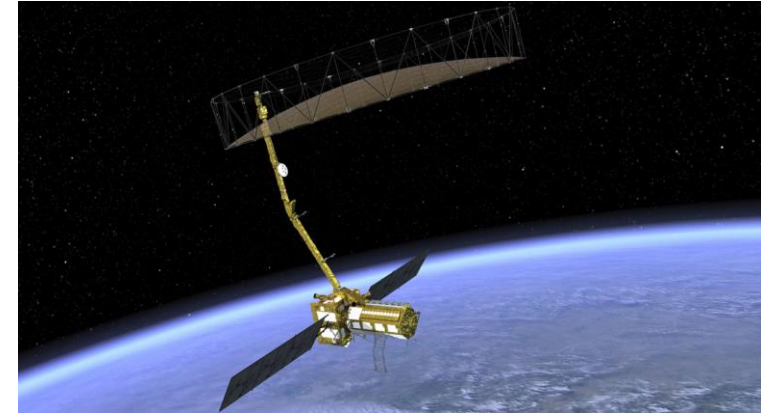
- Launched December 2022
- Global altimetry and Ka-band Radar Interferometer
- Spatial resolution of 10-70m
- 21-day orbit repeat
- Complementary products: cloud mask, sea surface height, water extent and elevation, upwelling



NISAR – Solid Earth, Ecosystems, Cryosphere

For studies of climate, food security, water, urban ecosystems, and hazard response

- Launch late 2024
- Two synthetic aperture radars (SAR) – L-band (24 cm) for global land and sea ice and S-band (10cm) for India's AOIs
- Spatial resolution of 12 meters
- 12-day repeat
- Complementary products: surface water extent, land disturbance, soil moisture, oil spill detection



SBG – Surface Biology & Geology Observable

For studies of terrestrial, inland and coastal aquatic ecosystems

- Launch 2027/2028
- Global hyperspectral observations (380-2500 nm)
- Spatial resolution of 20-60 m (60-100 m for TIR)
- Revisit time better than 16 days
- Complementary products: vegetation and marine biomass, terrestrial and aquatic primary producers



PACE CoP & Data Telecon 5/16. Join CoP to learn more!



Learn more about the
 PACE mission



Join the  PACE CoP and/or
Early Adopter Program



Thank you!

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