



National Aeronautics and
Space Administration

NASA Ocean Physics 2025-2026

Nadya Vinogradova Shiffer

NASA Science Mission Directorate, Earth Science

ECCO Annual Meeting · May 28, 2026



ECCO at Piccadilly Circus, London
Earth Day April 22, 2026

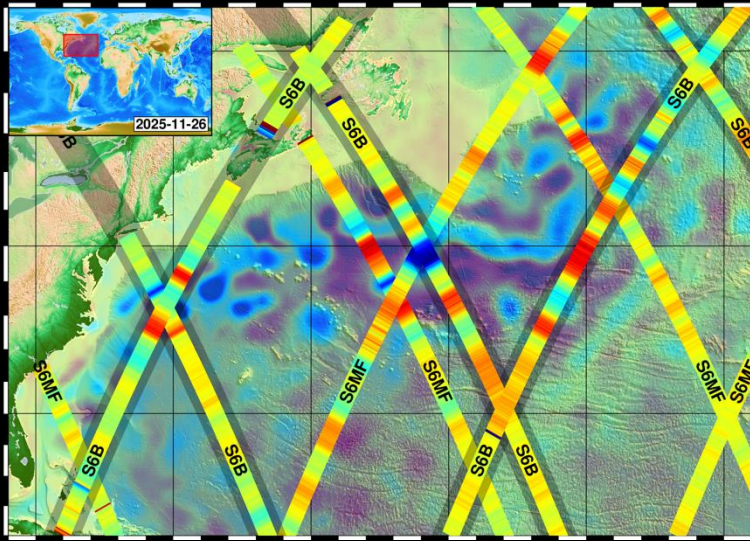


Sentinel-6B

Type Orbiter
Target Earth
Status Current
Launch Nov 16, 2026

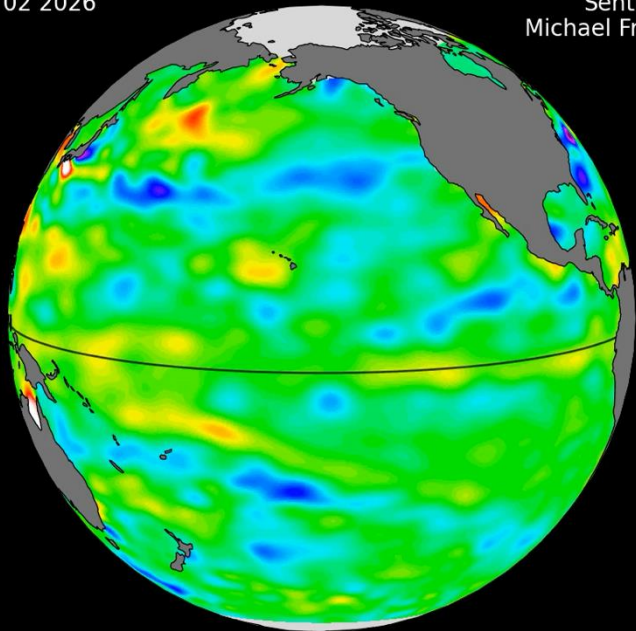


S6B First Light



MAR 02 2026

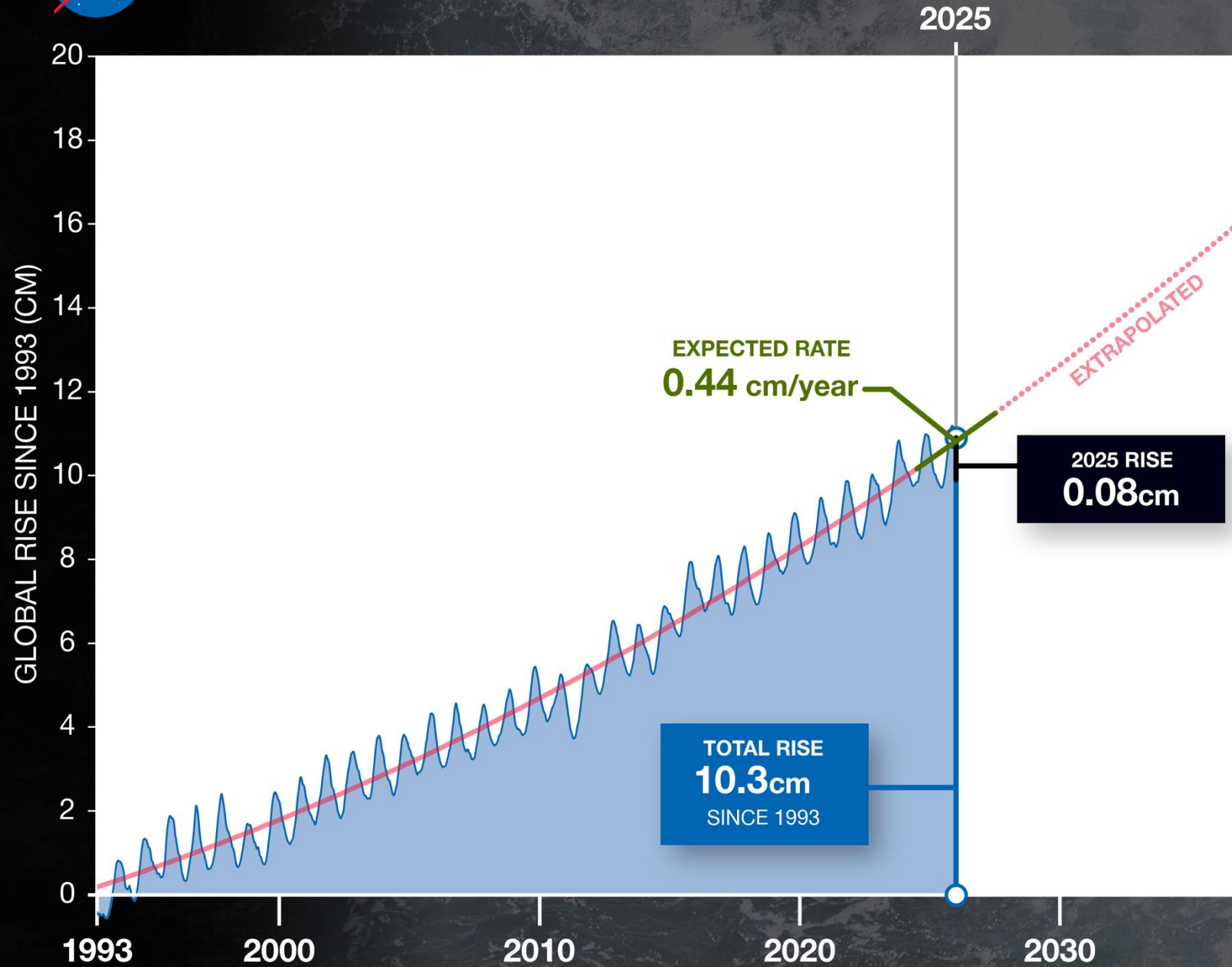
Sentinel-6
Michael Freilich



El Nino Watch



Satellite Record of Sea Level Rise



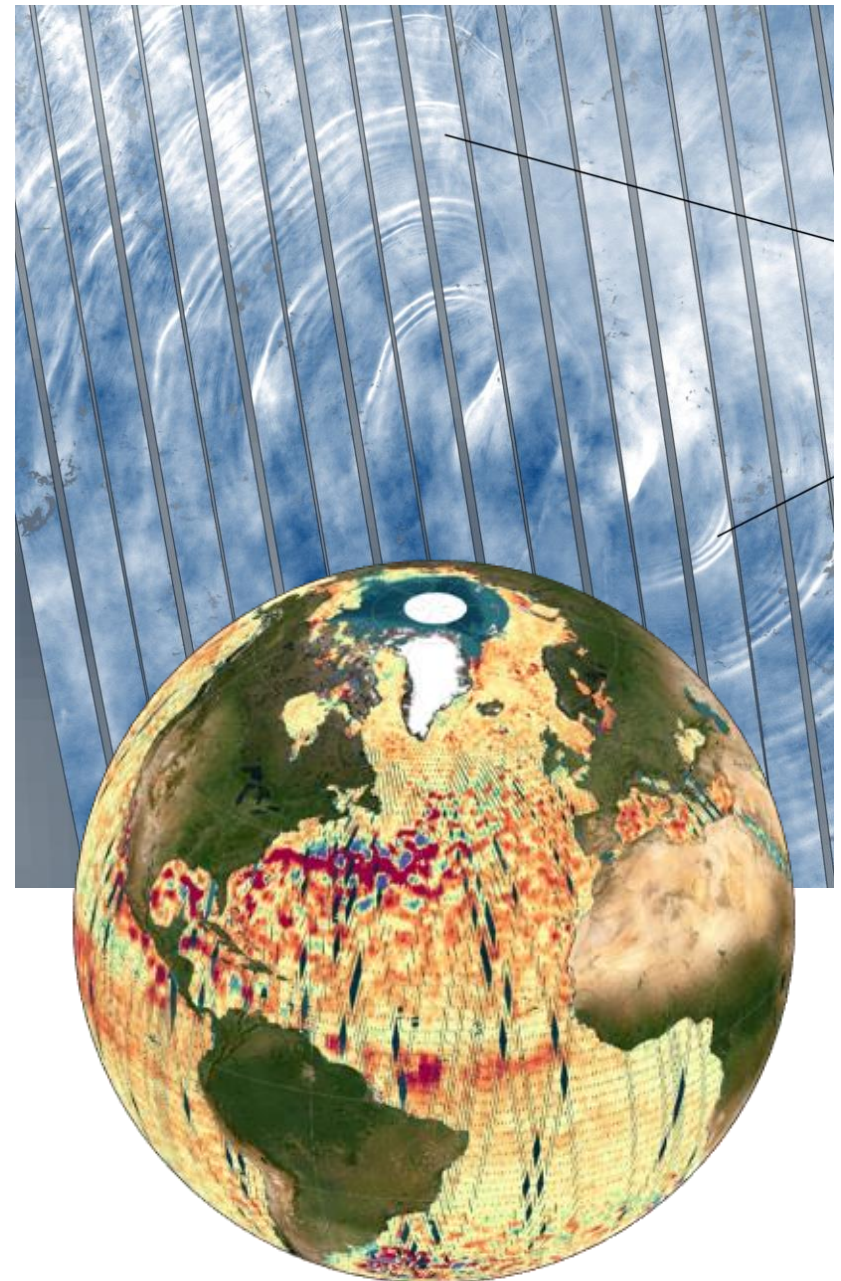
Surface Water and
Ocean Topography
(SWOT) Satellite Pas
Over Hurricane
Melissa

Jamaica

October 26th
14:20 UTC

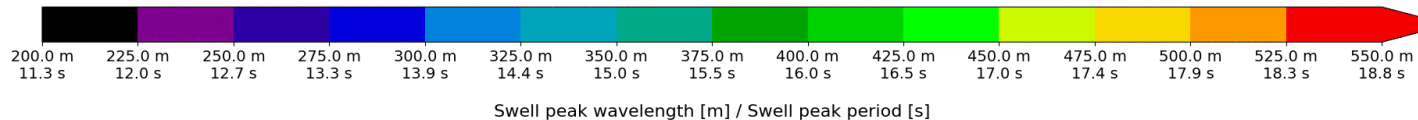
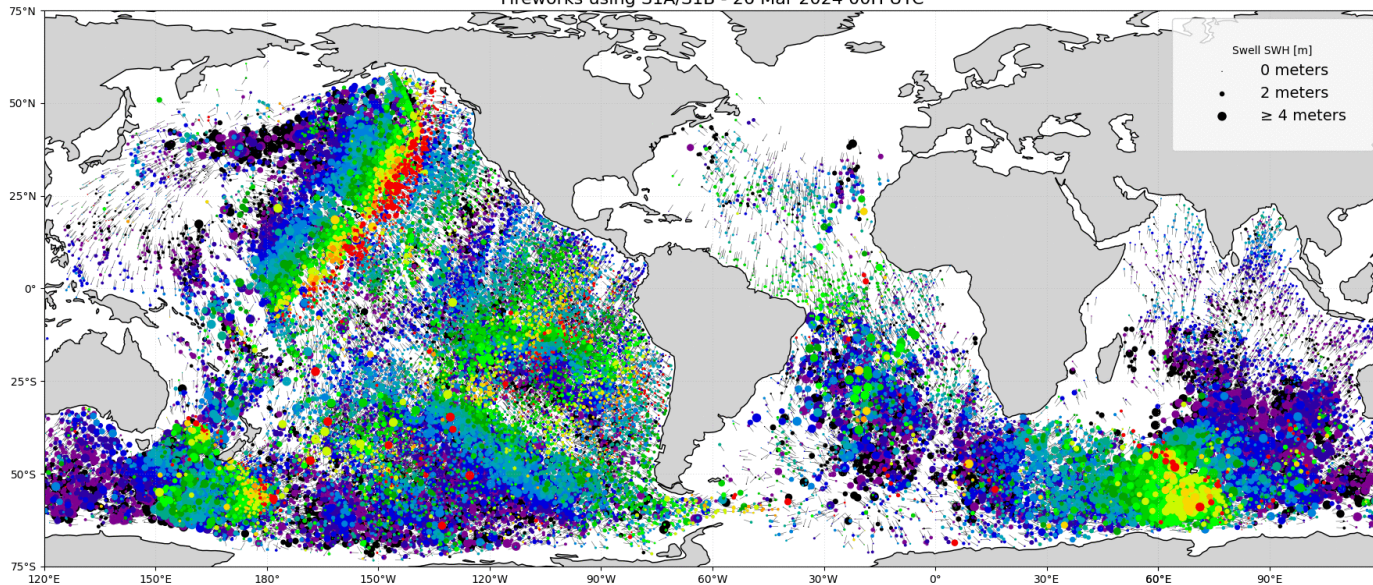
0-01
Pass 264 Karin/SWOT

15.0 17.5 20.0
Sigma 0 (dB)



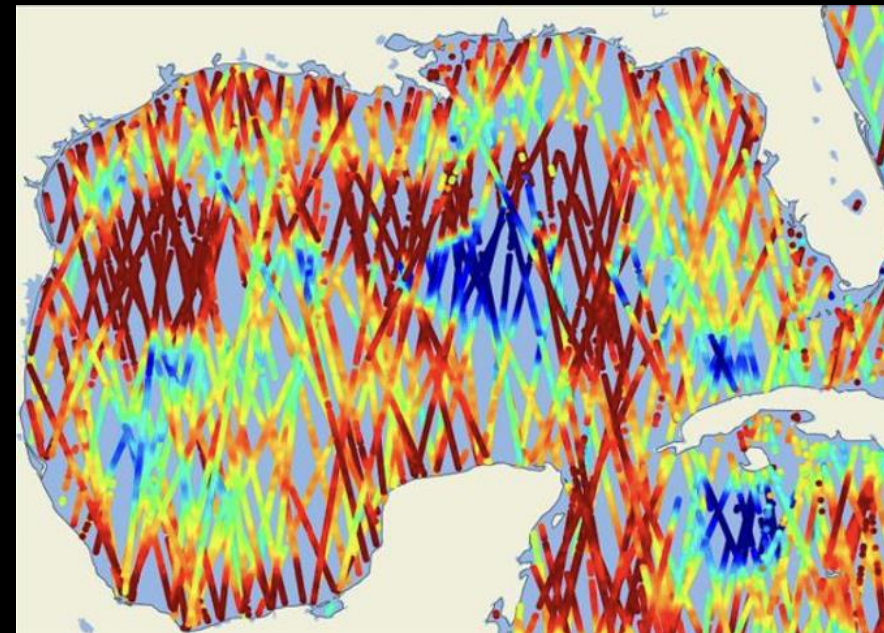
**Global, repeated SAR + Interferograms =
High-resolution, high-precision SSH**

Fireworks using S1A/S1B - 26 Mar 2024 00H UTC

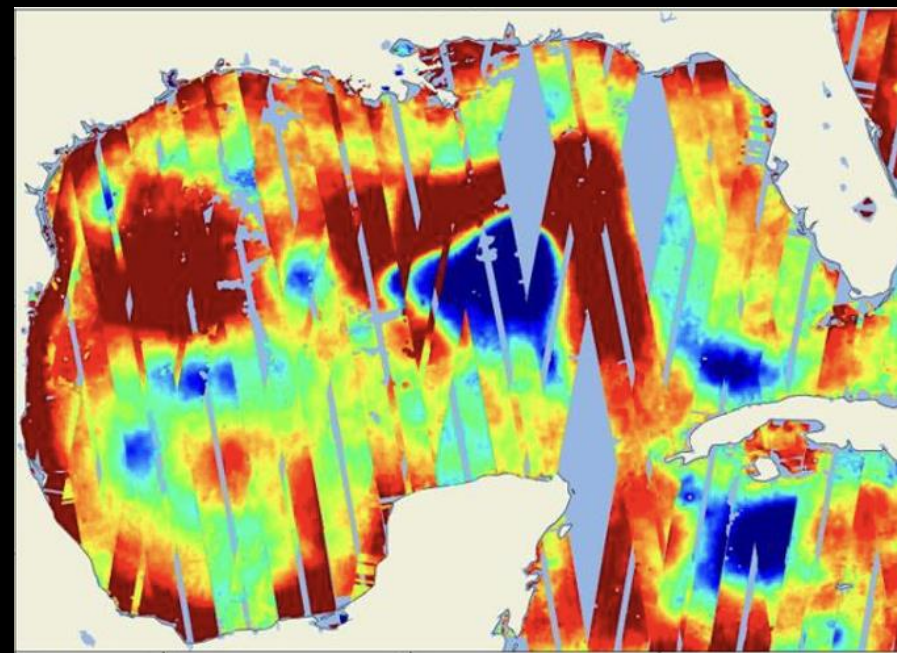


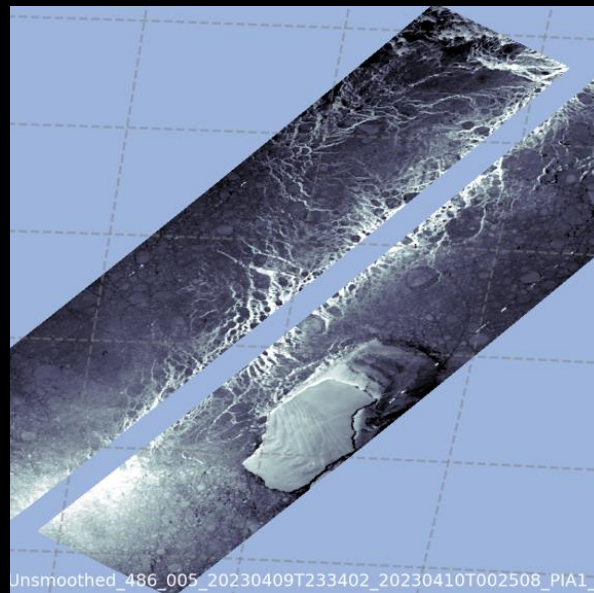
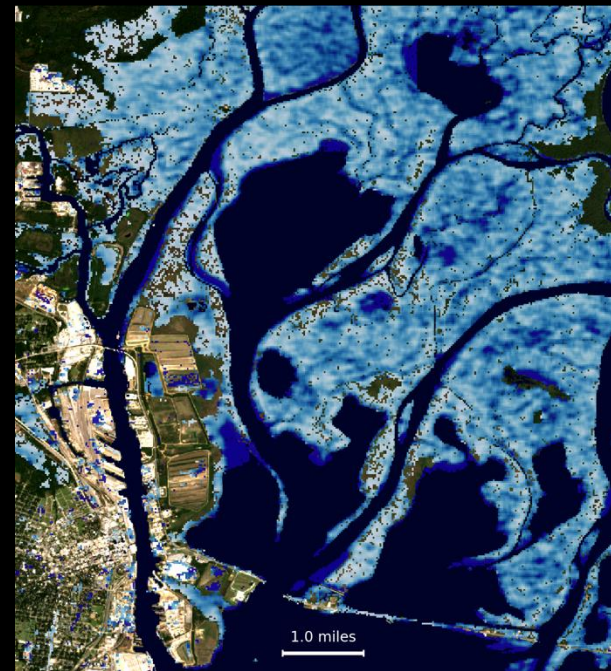
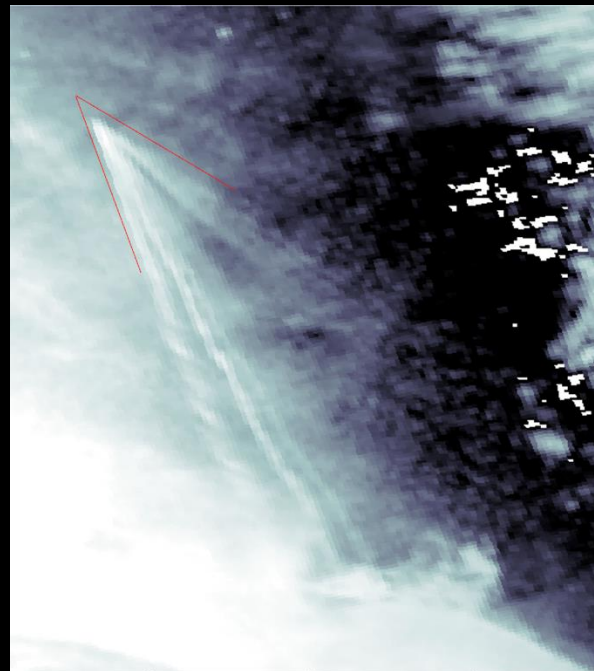
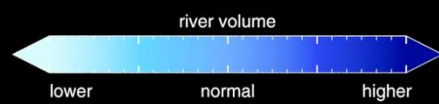
Example: Swell and wave forecast

Operational Modeling with SWOT

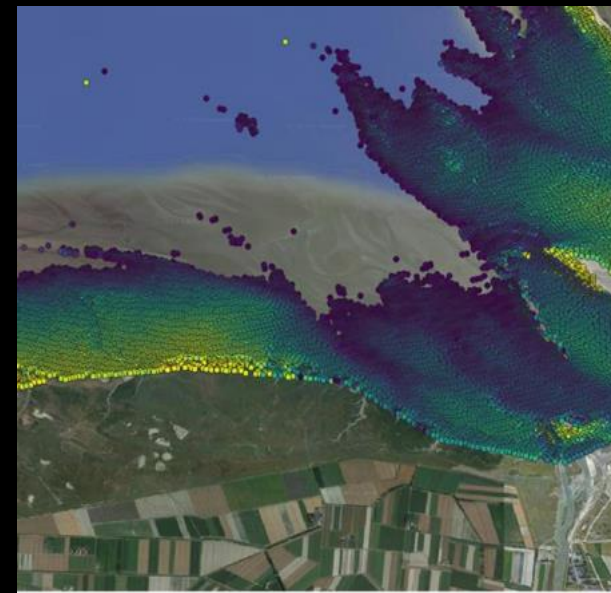


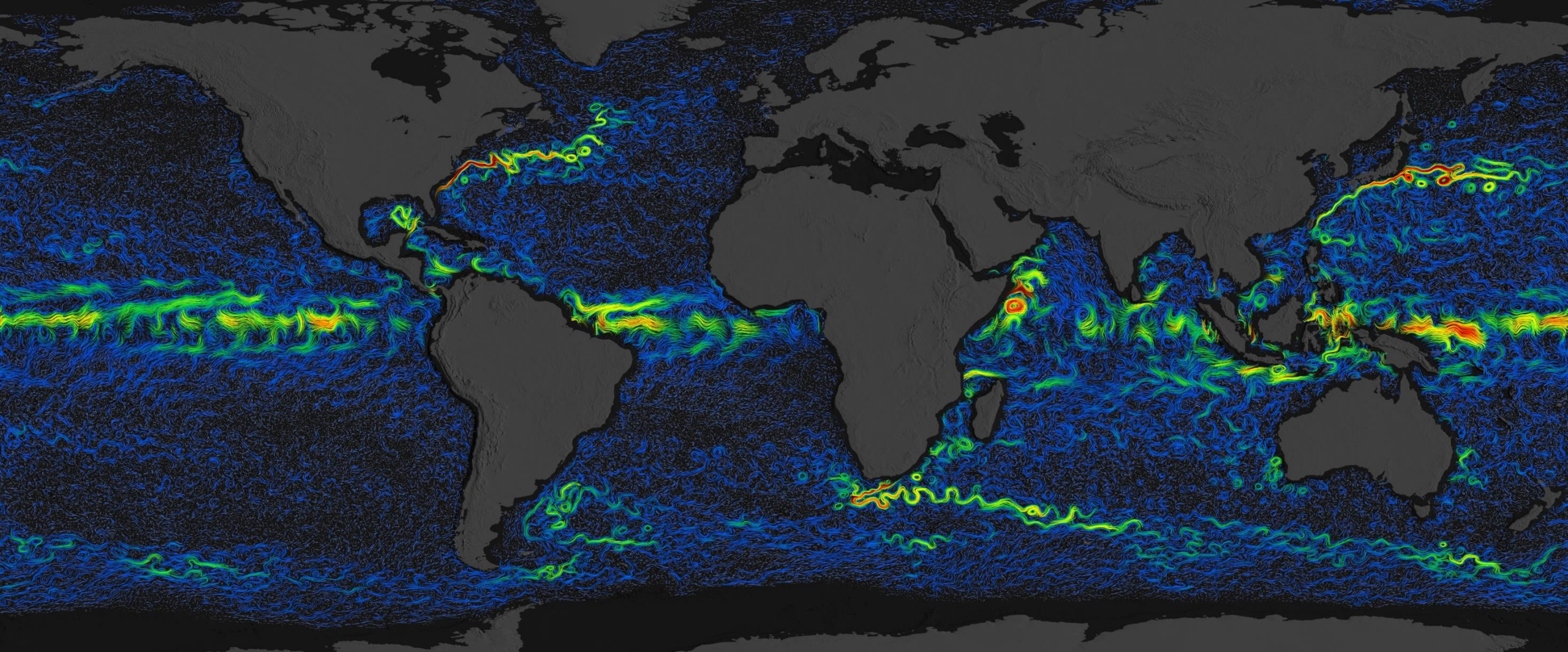
Example: SSH from 6 nadir altimeters vs SWOT





Unsmoothed_486_005_20230409T233402_20230410T002508_PIA1_0





~~Van Gogh~~ OSCAR
Ocean surface currents derived from satellite altimetry

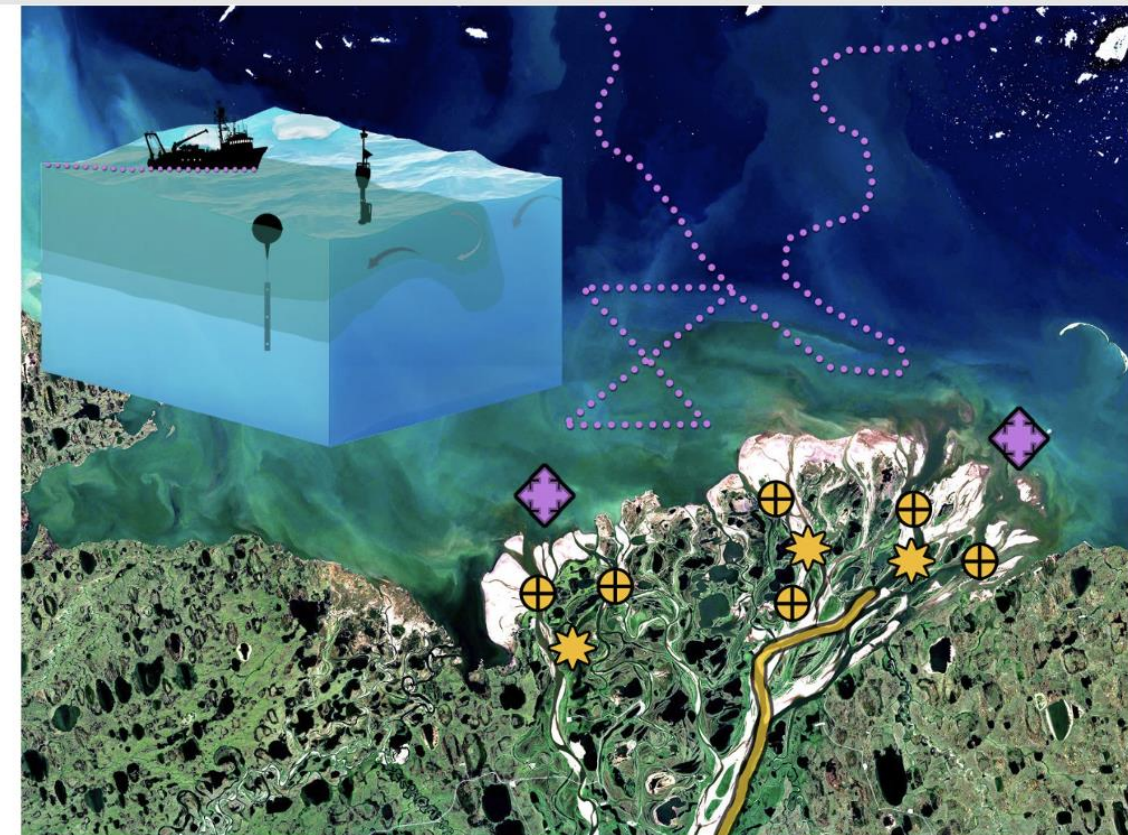
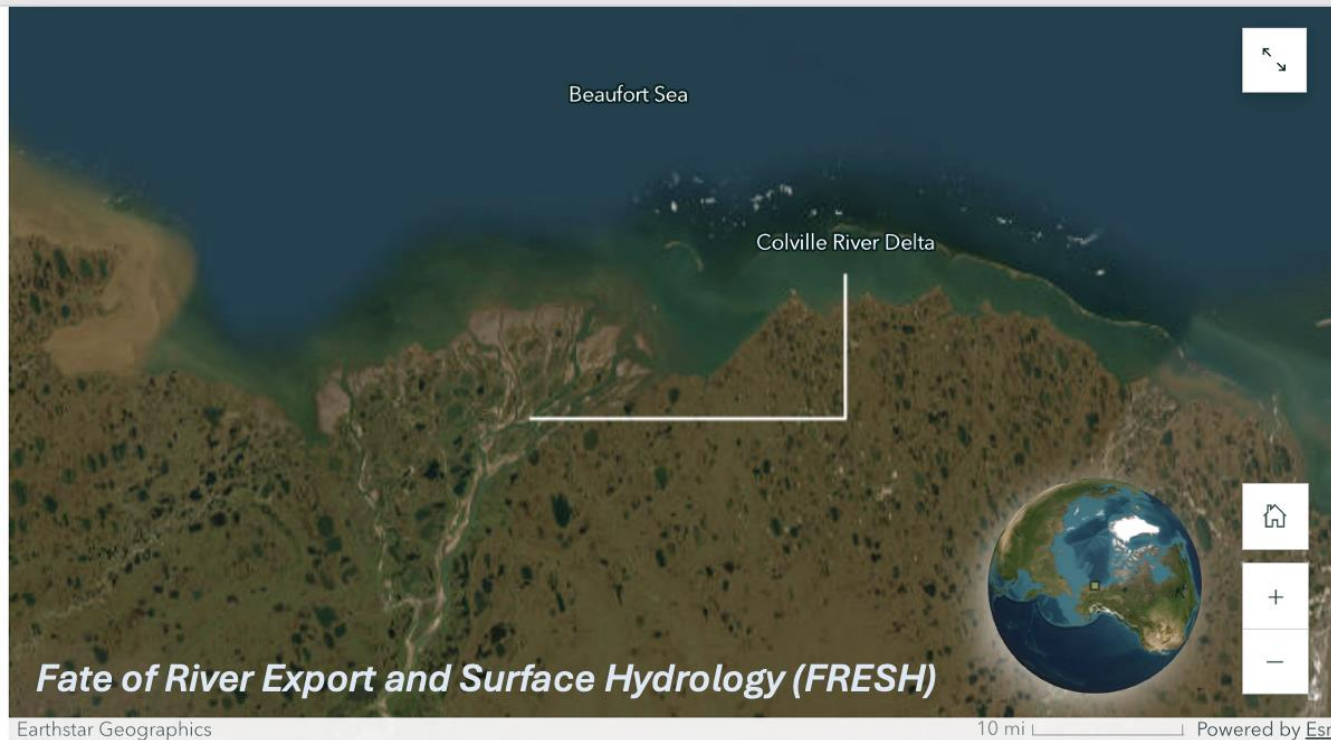
 **ODYSEA**
Ocean Dynamics and Surface
Exchange with the Atmosphere
An Earth System Explorers' Proposal
AO NNH12ZD0019D



FRESH Arctic

Tracking water from land to delta to our ocean





Schematic representation of the FRESH Arctic integrated land-river-ocean field study. Hydrology targets are shown in gold: circles show pressure sensors, stars show current profilers, and the thick line indicates a bathymetry and water elevation survey. Oceanography targets are shown in purple: the dotted line shows the track of the research vessel, diamonds show mooring positions, and 3d inset shows example drifter arrays.

Colville River delta (Alaska) is the central location of a NASA integrated water field campaign.

How does freshwater move through the land-delta-ocean system and ultimately control the pathways that dictate the fate of freshwater in the Beaufort Sea?

Land to Delta

Hypothesis 1 - Discharge in the Colville River Basin varies on daily, monthly, and annual scales that affect the timing and magnitude of freshwater reaching the delta.

Delta to Ocean

Hypothesis 2 - Processes and connectivity within the delta control the land-ocean branch of the water cycle (e.g., the timing, magnitude, and partitioning of freshwater to the ocean).

Ocean & Sea Ice

Hypothesis 3 - Complex ocean pathways (e.g., mixing, spreading, stratification, landfast ice damming, and freezing) control the fate of freshwater in the Beaufort Sea.

U.S. Sea Level Change

Rising Seas, Changing Coasts

This site provides federally supported data visualizations coupled with explanations and science education to help communities prepare for challenges that will affect our coastal environments. By showing how sea levels are changing regionally, the site provides a foundation to inform decision-making related to coastal planning, resource management, and emergency operations.



A coordinated effort

SEA LEVEL 101 NATIONAL SEA LEVEL EXPLORER

earth.gov/sealevel/us

NATIONAL SEA LEVEL EXPLORER

Texas

In Texas, sea level rose **33** centimeters from 1970 to present.

In Texas, under the Intermediate Scenario, sea level is expected to rise **30** centimeters from 2020 to 2050.

There was **1** minor high tide flood days between 1970 and 1980 and **35** between 2010 and 2020.

In 2050 under the Intermediate Scenario, Texas is projected to average **121** minor high tide flood days per year, per location.

AI4Ocean

Elevate NASA ocean science & applications through AI





Organizational and Other Updates

(new) Earth Venture Orbital Program

ROSES-25 (open)

ROSES-26 (upcoming)

Spherical Decomposition, MIO, IMVI, FO, SET

ECCO

Understanding the physics of
the Earth's ocean



1. Production

- Scheduled production & delivery
- Other milestones (latency, resolution, coupling, integration)
- Increased robustness of central estimate
- New data? SWOT?
- Impact and success metrics?

3. NASA missions

- Involvement in future mission planning
- OSSEs for NASA PO-related cal/val and field campaigns

2. R&D

- Interpreting ongoing changes
- Get ready to resolve future ocean
- Ocean's integrated role?
- Advanced modeling, adjoint capabilities, AI/ML & prediction?

4. Engagement

- Continue providing open-source tools and training
- Userbase expansion
- Annual state of the ocean update and analysis
- Serve as the science and informational foundation for decision-making



National Aeronautics and
Space Administration

Thank you!

nadya@nasa.gov

