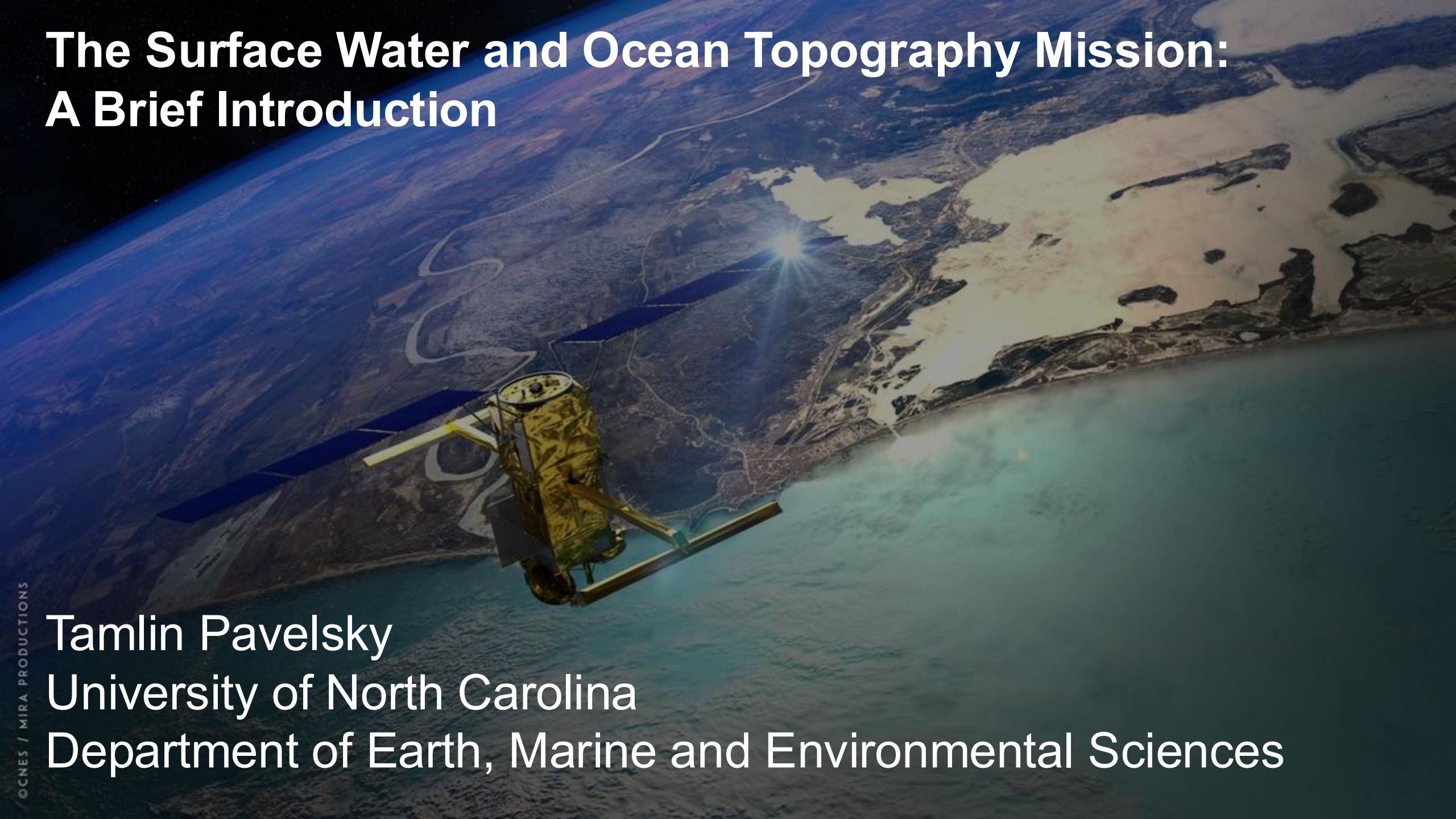
The Surface Water and Ocean Topography Mission: A Brief Introduction



Tamlin Pavelsky
University of North Carolina
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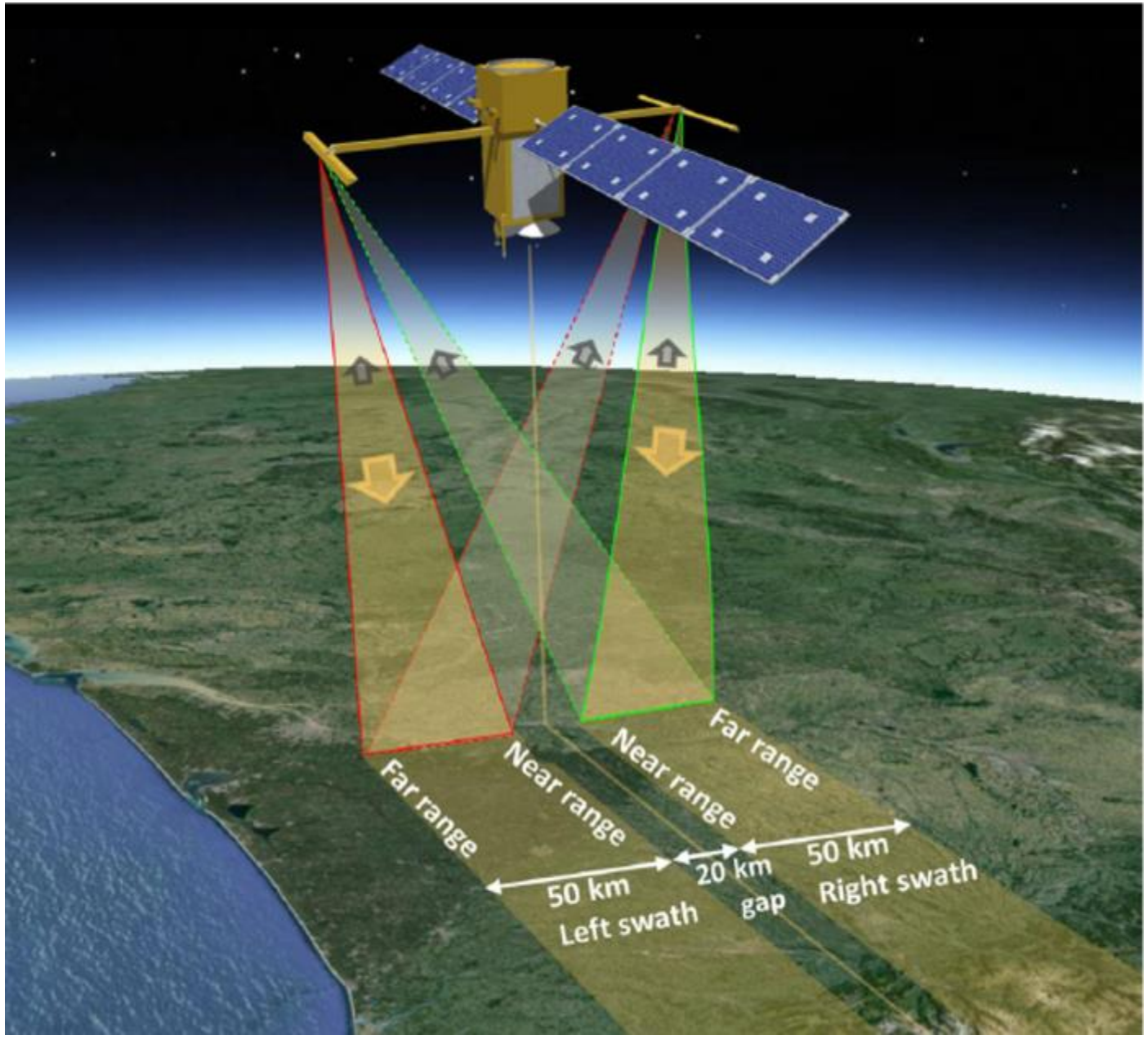
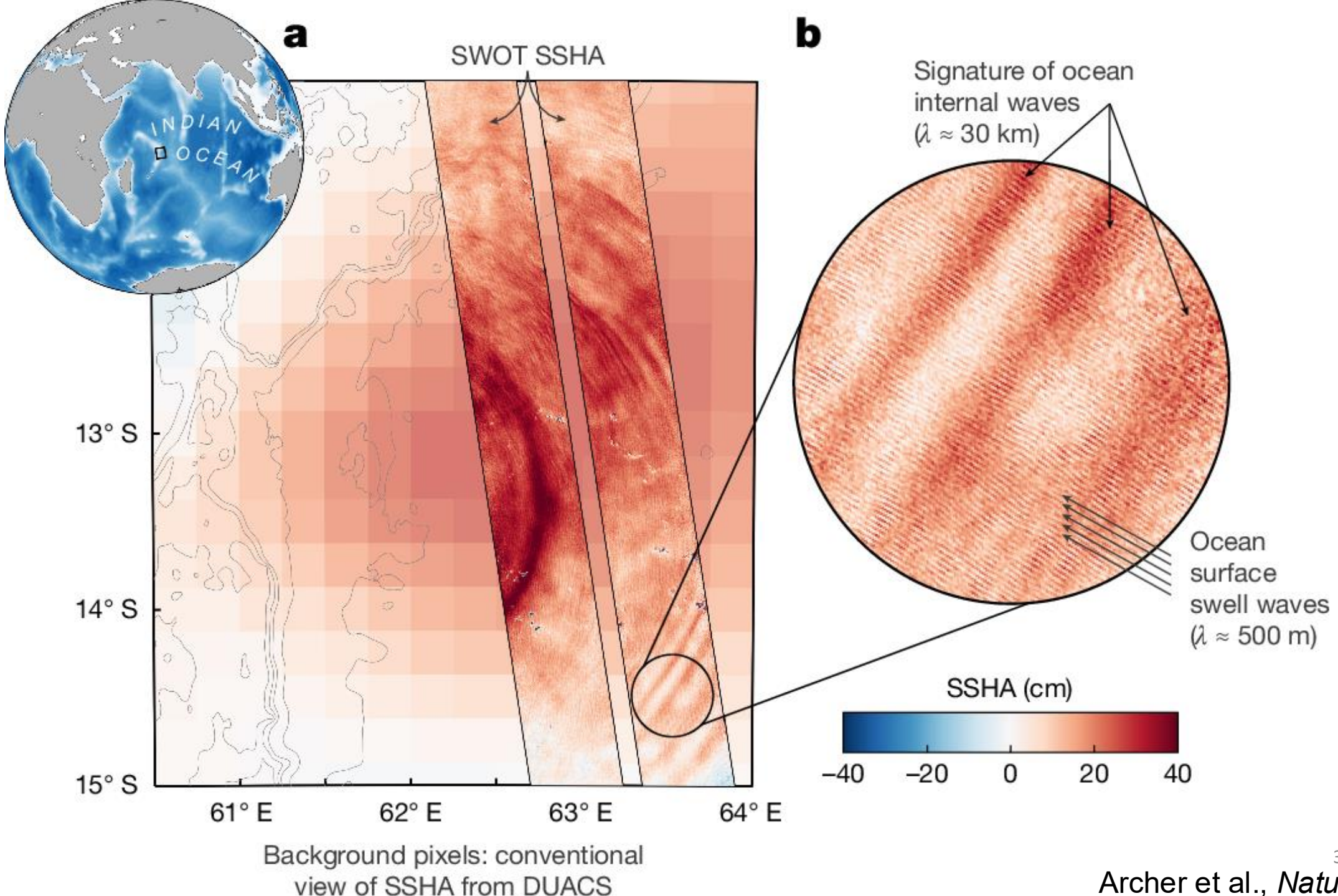
The Surface Water and Ocean Topography Mission

The principal payload on SWOT is a Ka-band radar interferometer (KaRIn) at 8.6 mm wavelength with twin 50 km swaths pointing 1-4.5° off nadir.

- Launched Dec. 16, 2022
- Simultaneous observations of water surface elevation and inundation extent in rivers, lakes, oceans
- Observations every 10 days, on average
- Covers 78°N to 78°S
- Data latency goal of <3 days
- Partnership between NASA, CNES (France), Canadian Space Agency, and UK Space Agency



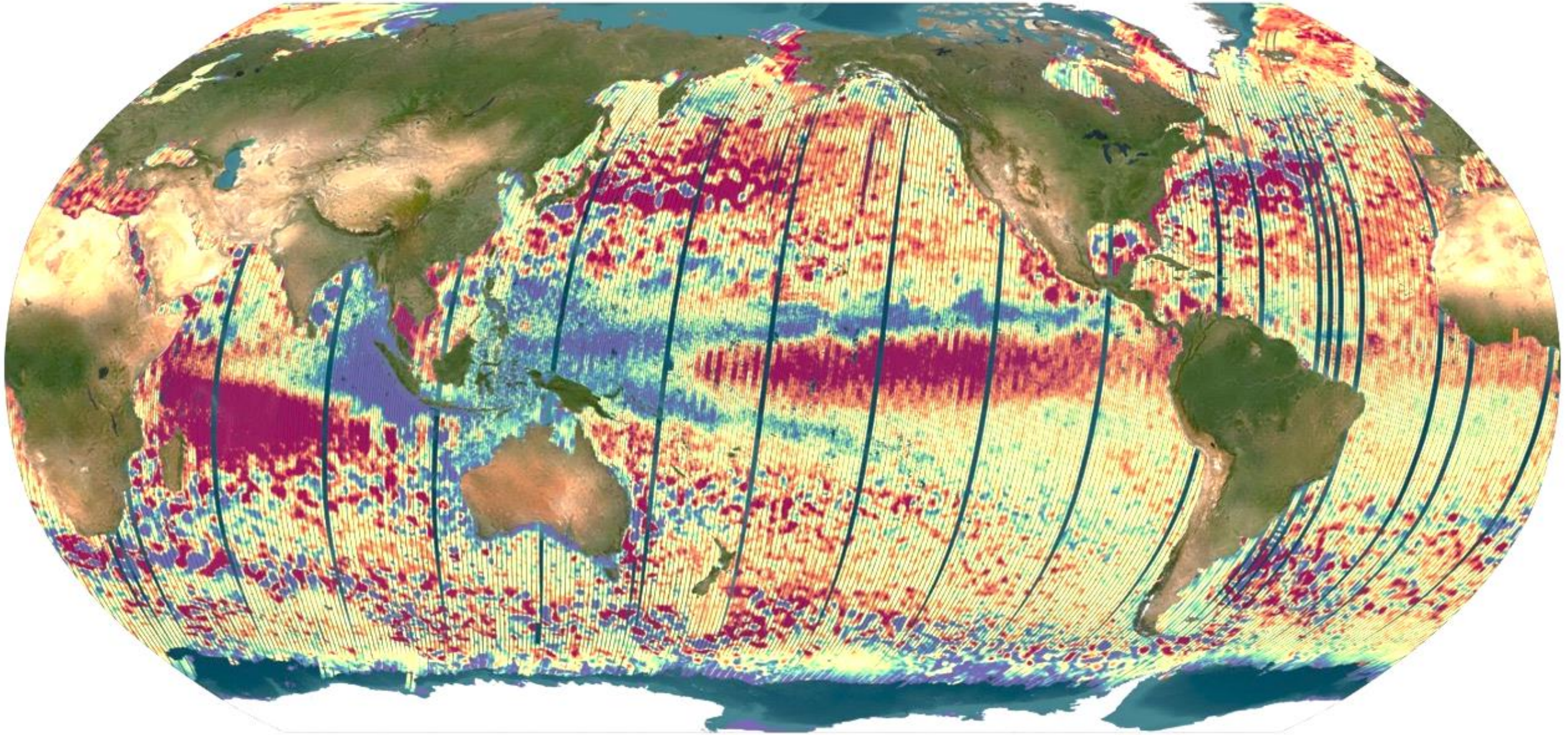
Biancamaria, Lettenmaier, and Pavelsky, *SoG*, 2016



Archer et al., *Nature*, 2025

A Global View of Earth's Oceans from SWOT

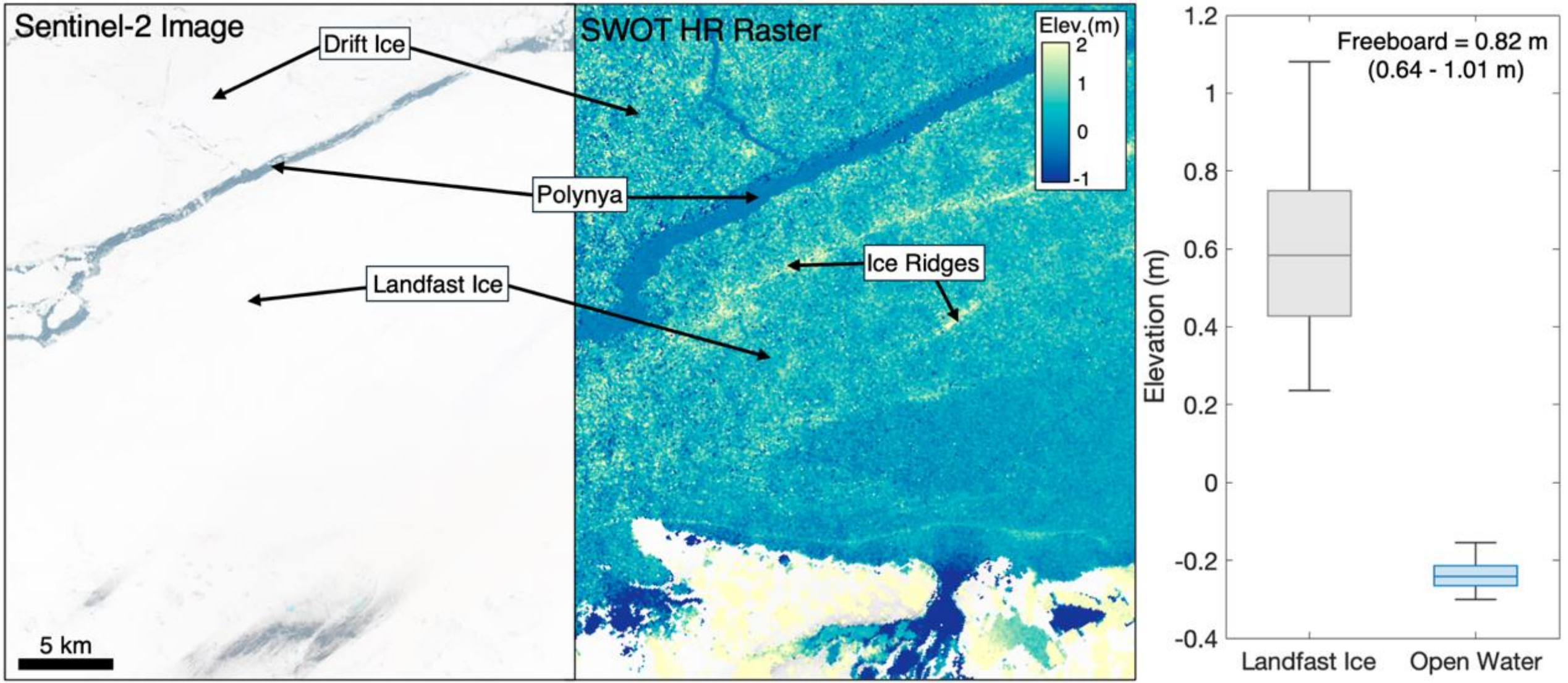
Ten days worth of Level-3 SWOT SSHA in November 2023



Credits: CLS/CNES

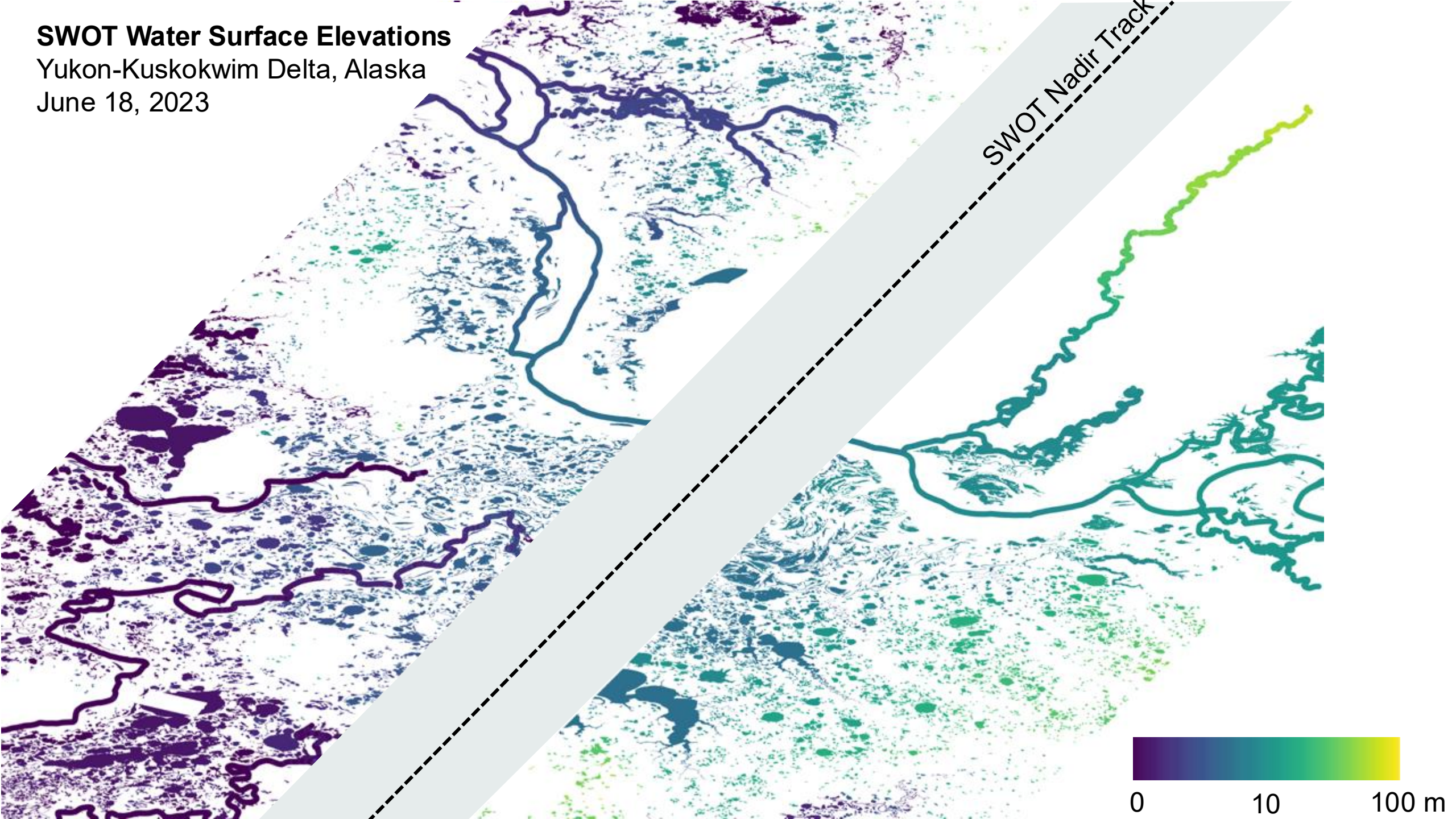
-15cm ▶ +15cm

SWOT Capabilities Over Sea Ice

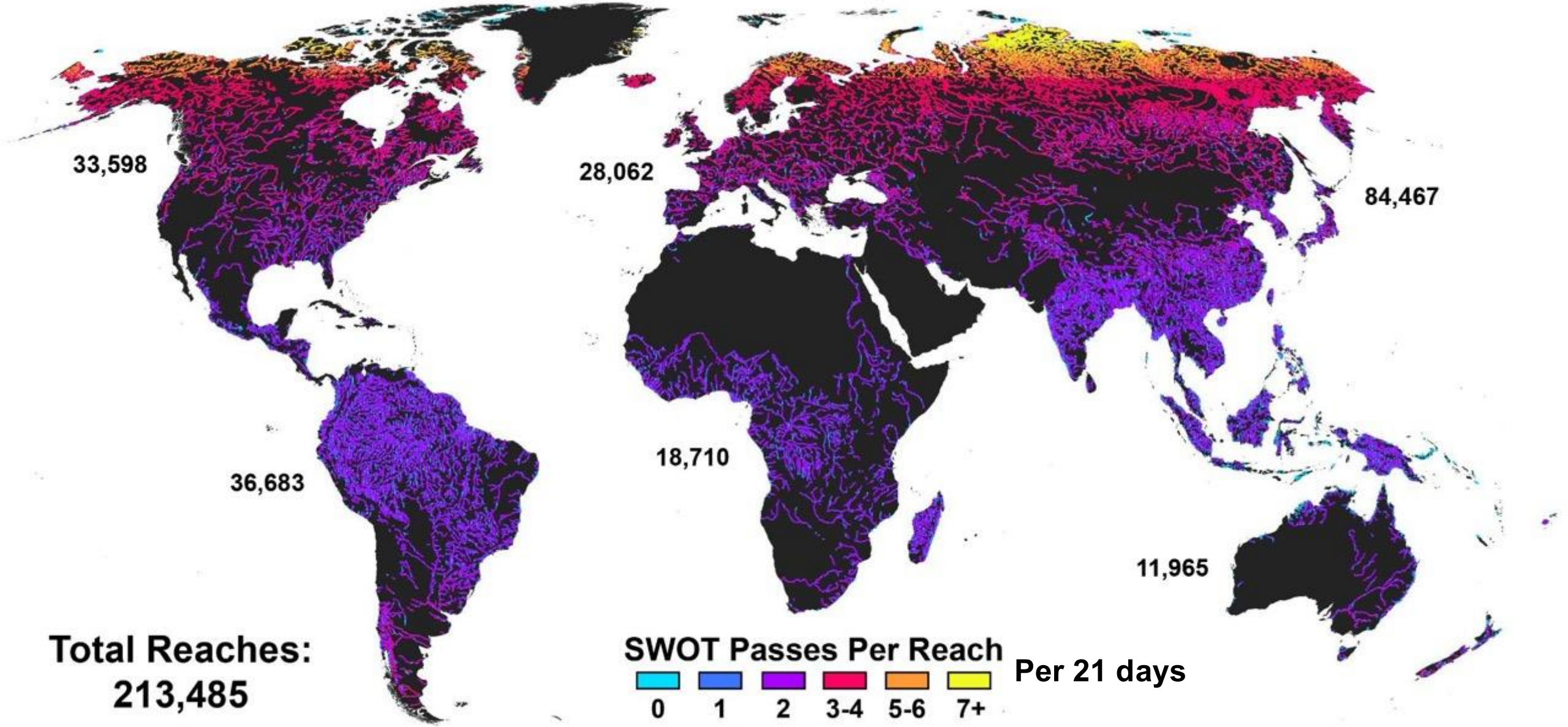


Courtesy Sarah Cooley, Duke U.

SWOT Water Surface Elevations
Yukon-Kuskokwim Delta, Alaska
June 18, 2023

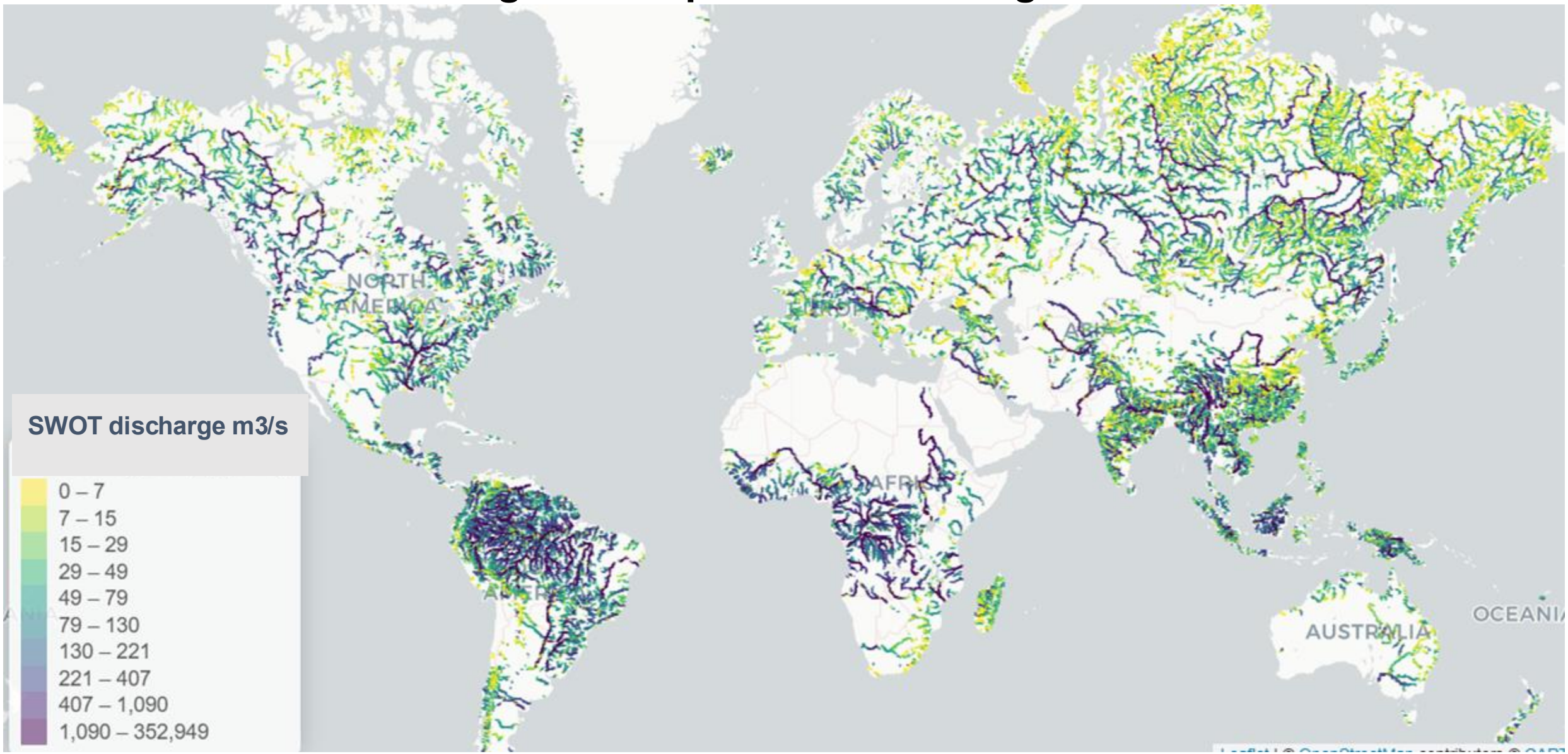


The SWOT River Database (SWORD)



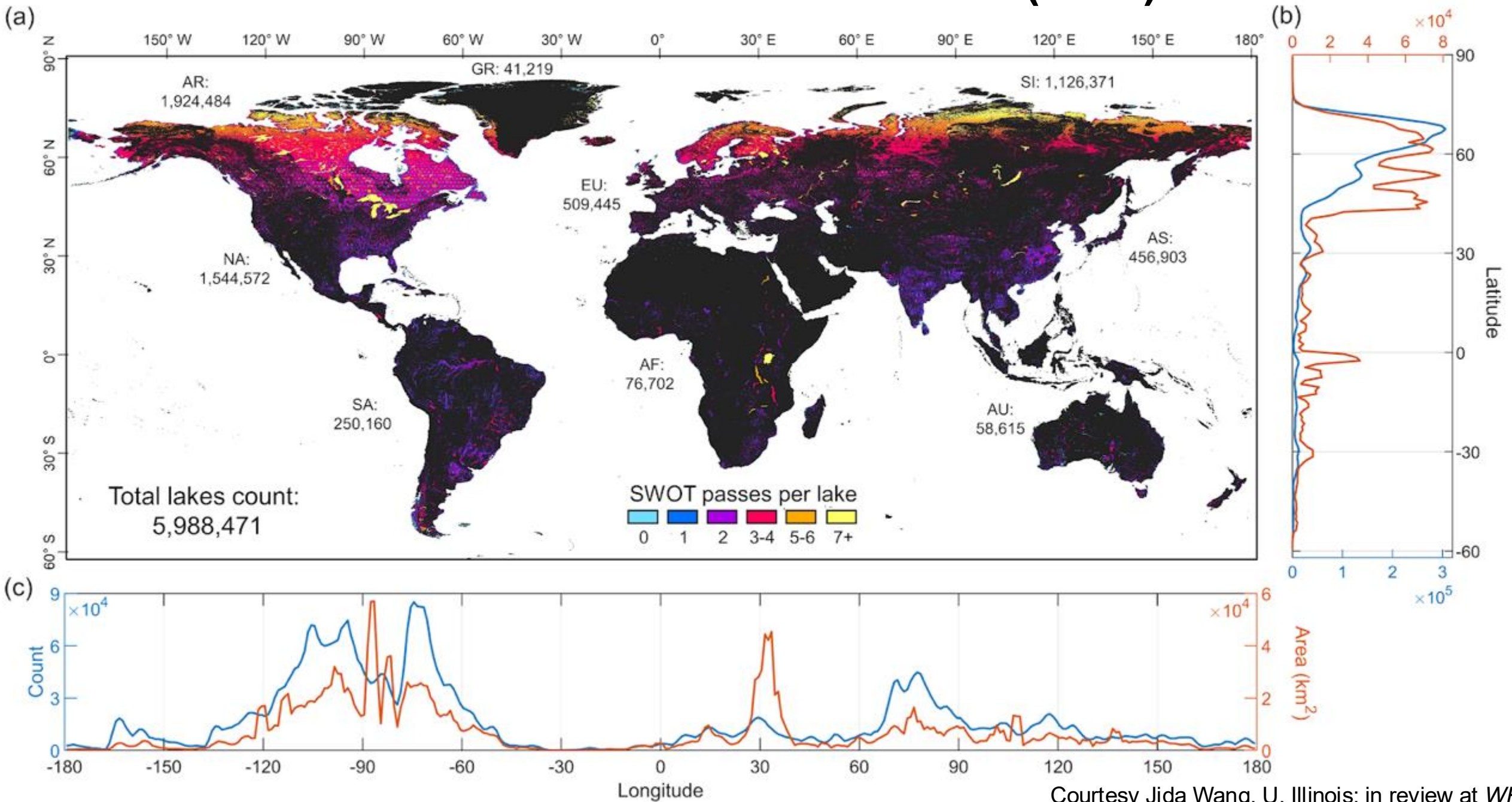
Altenau et al., *WRR*, 2021

The SWOT Discharge Working Group has Produced the first SWOT-based global map of river discharge



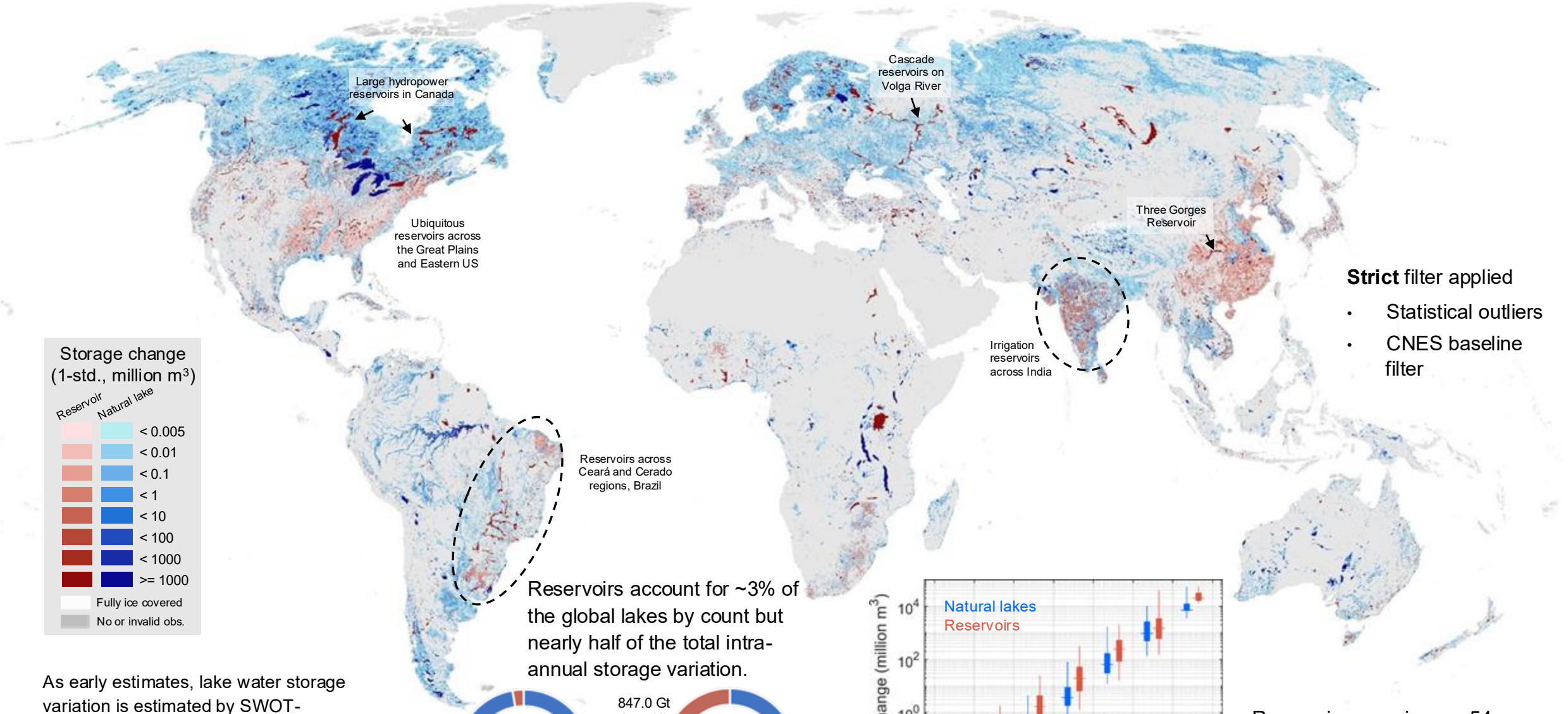
Courtesy Colin Gleason, UMass

SWOT Prior Lake Database (PLD)



Courtesy Jida Wang, U. Illinois; in review at *WR*

SWOT's first intra-annual variability in **global lake storage change** (07/21/2023 to 11/11/2024)



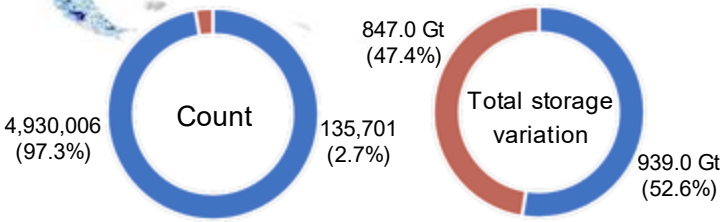
Strict filter applied

- Statistical outliers
- CNES baseline filter

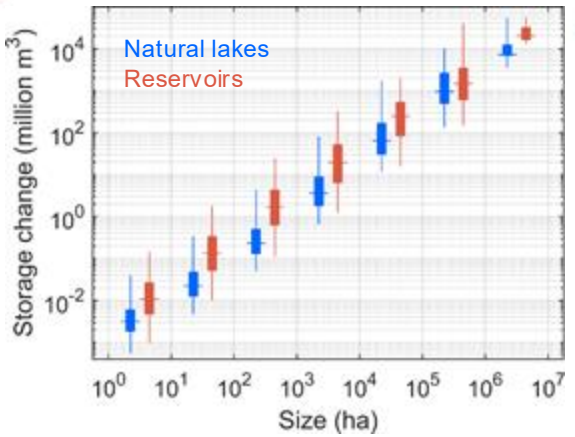
As early estimates, lake water storage variation is estimated by SWOT-measured WSE variation multiplied by the static prior lake area.

More accurate, realistic results will become available with the accumulation of SWOT data.

Reservoirs account for ~3% of the global lakes by count but nearly half of the total intra-annual storage variation.



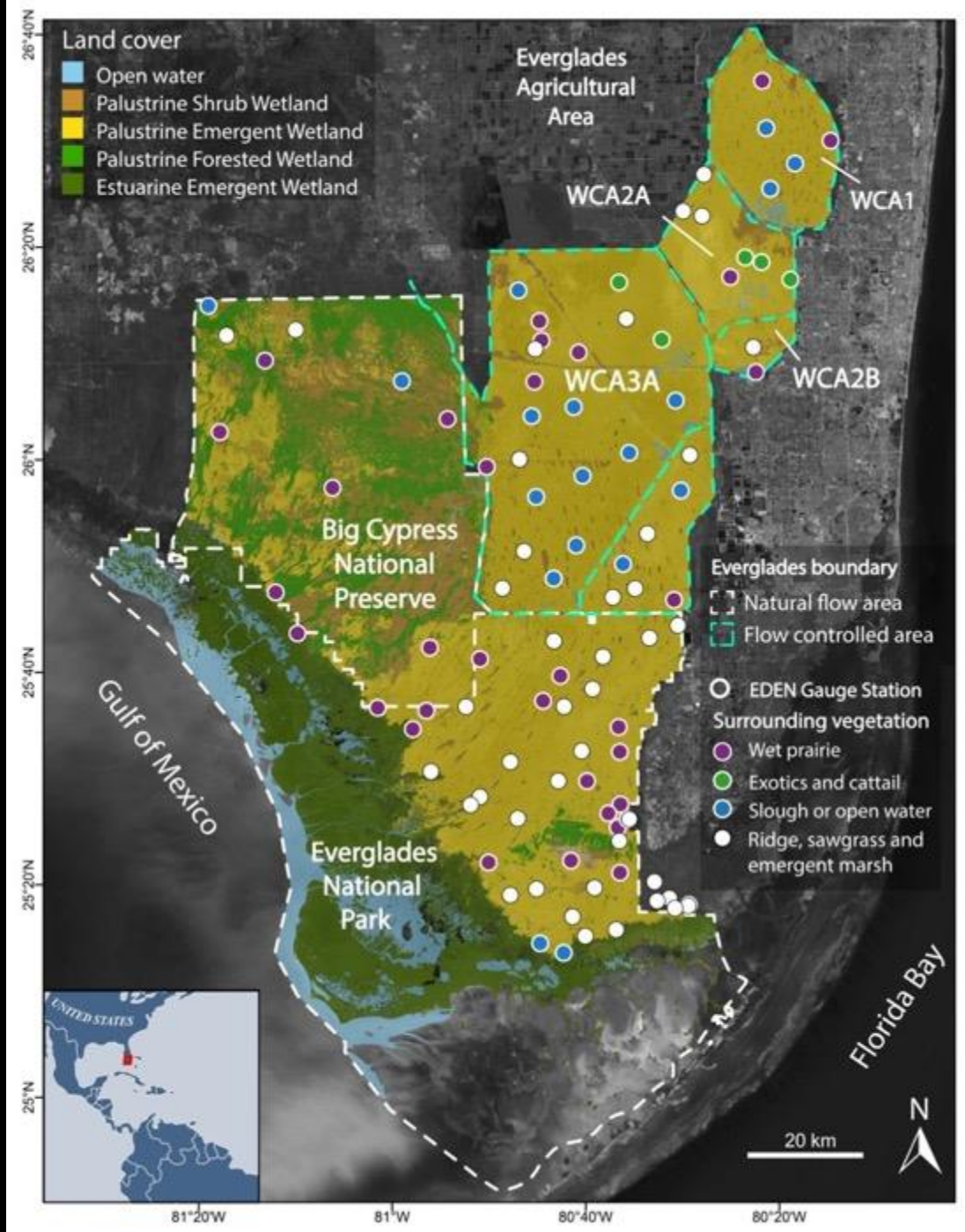
Lakes with only one measurement are excluded from change statistics.



Reservoirs experience ~54–620% **more intra-annual storage variation** than natural lakes due to direct human water management.

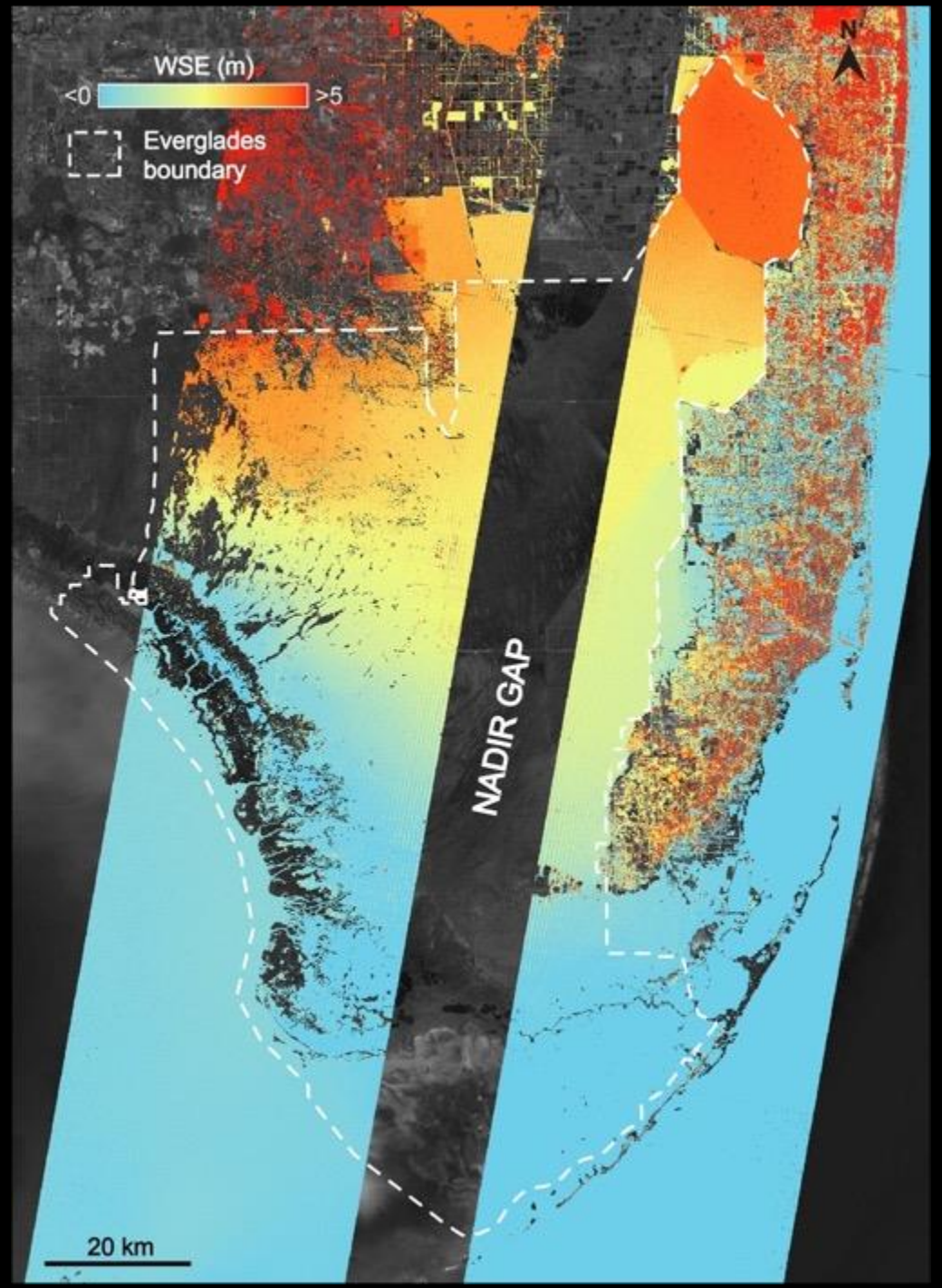
What About Vegetated Wetlands?

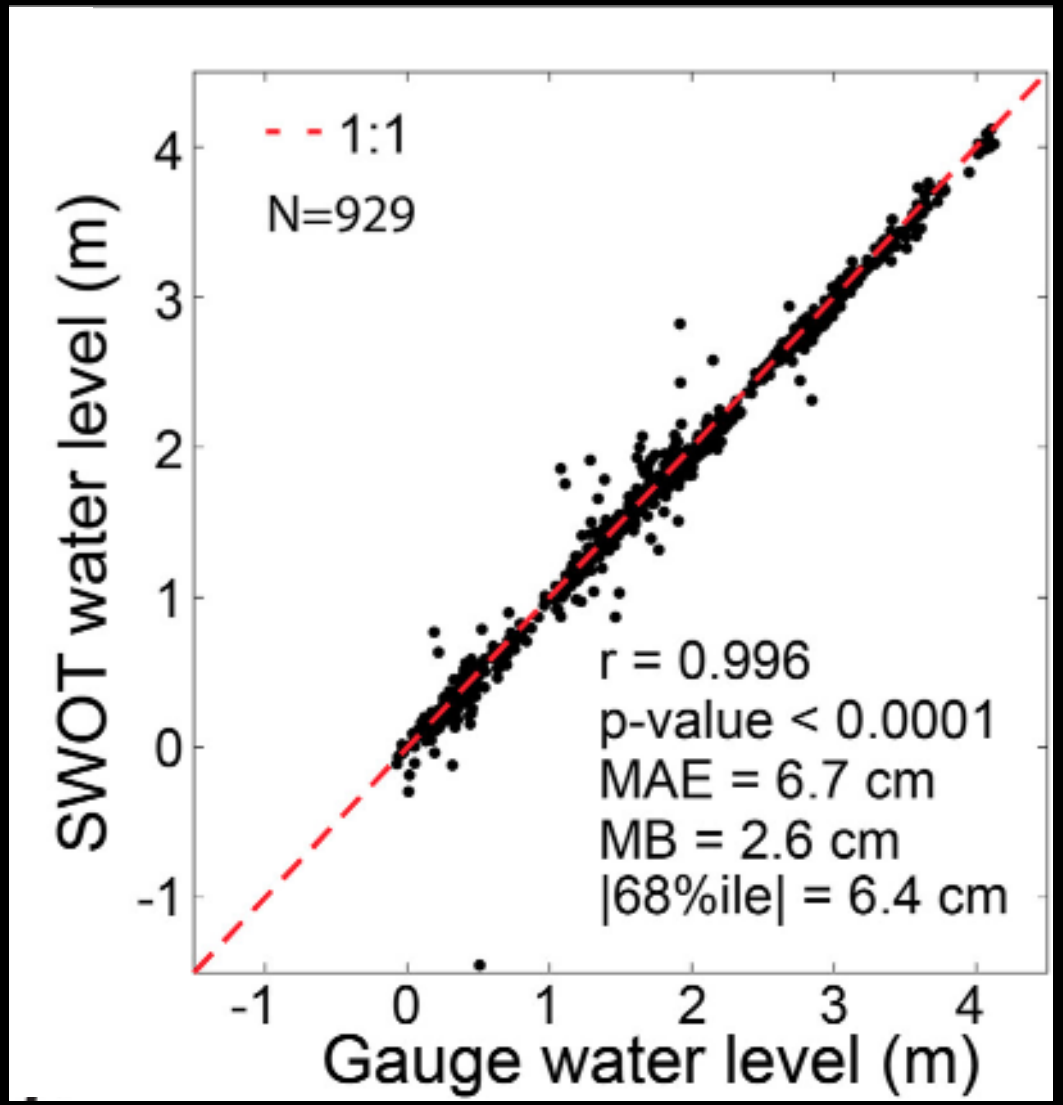
- First experiment in the Everglades, Florida



Kica et al., *GRL*, 2025

Example of SWOT Water Surface Elevation Data over the Everglades.



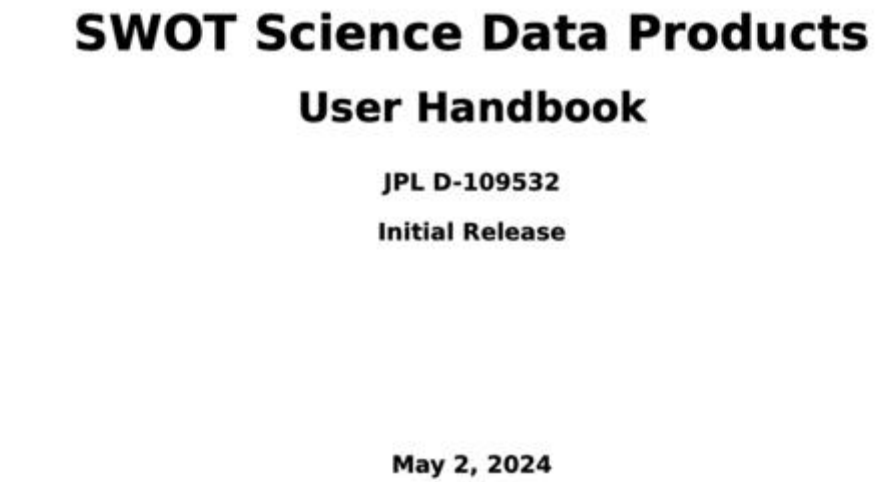


Kica et al., *GRL*, 2025

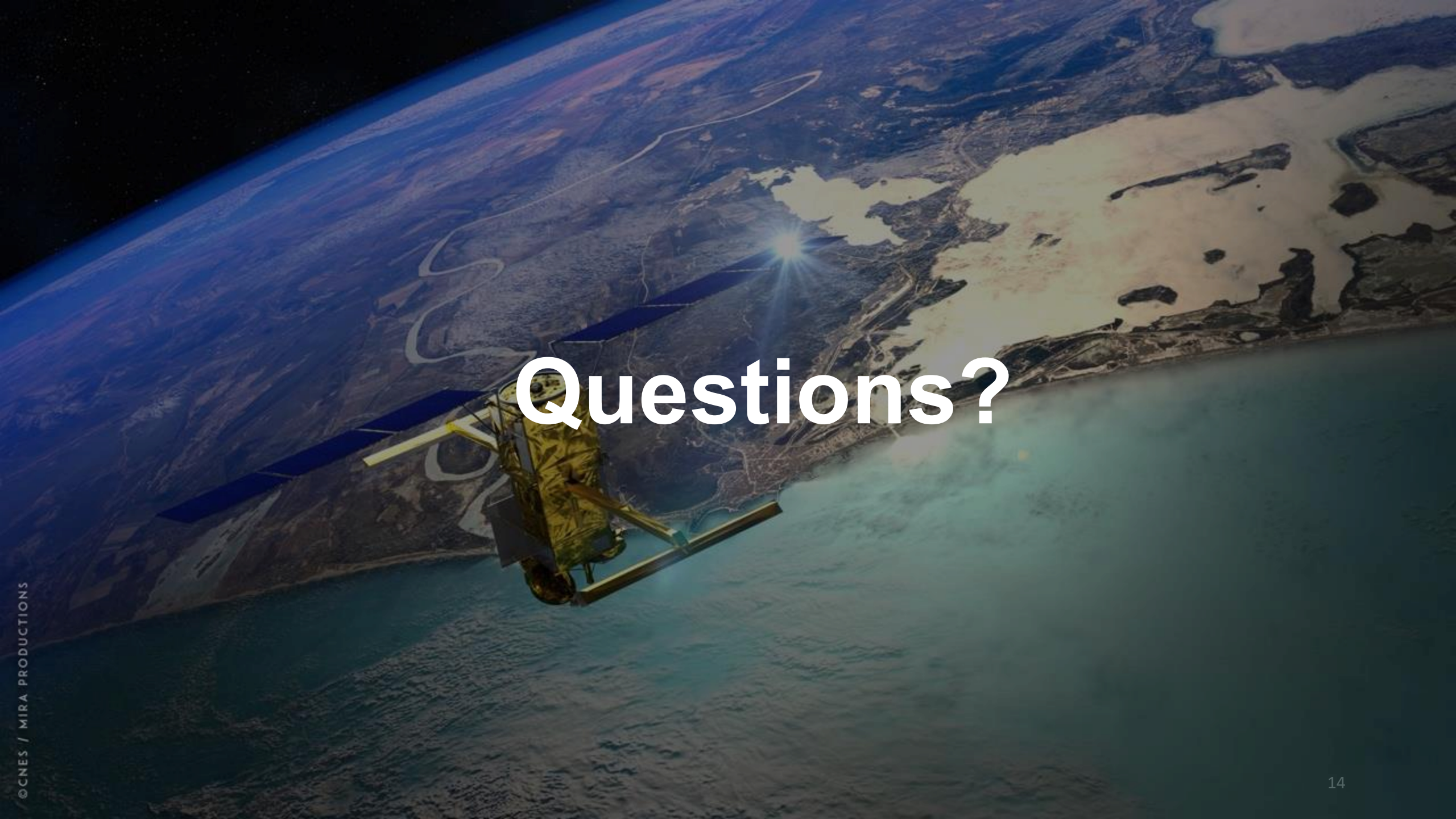
Using SWOT Data: Where should I start?

Read the SWOT User's Handbook!

- Gives a fantastic overview of how the mission works.
- Will solve many, many problems for you before you have them.
- Everyone who uses SWOT data should read it.



https://archive.podaac.earthdata.nasa.gov/podaac-ops-cumulus-docs/web-misc/swot_mission_docs/D-109532_SWOT_UserHandbook_20240502.pdf


Questions?
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