

Peter Gaube

Applied Physics Laboratory



The role of freshwater in the Beaufort Sea

Sep 1984



NASA Scientific
Visualization Studio

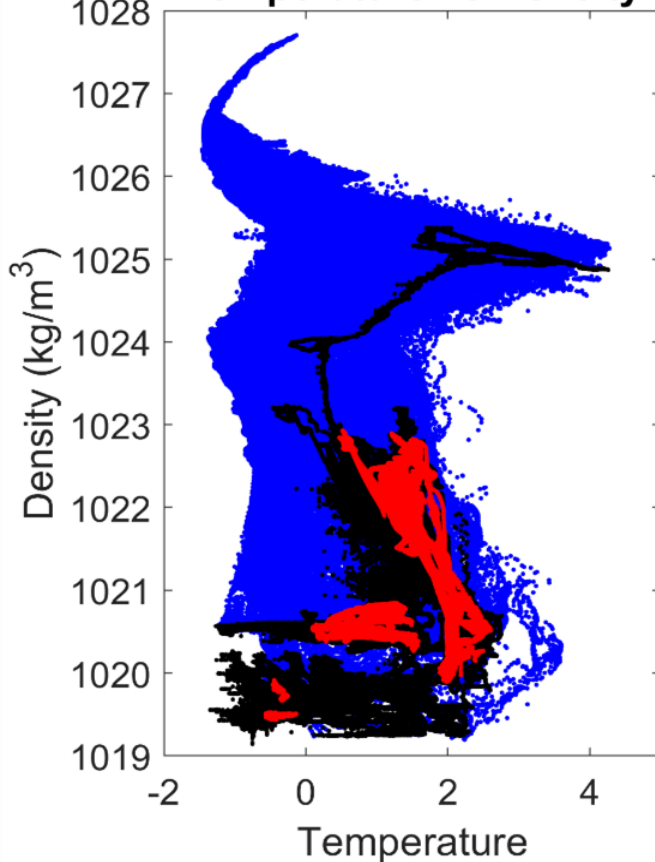
Sep 2016



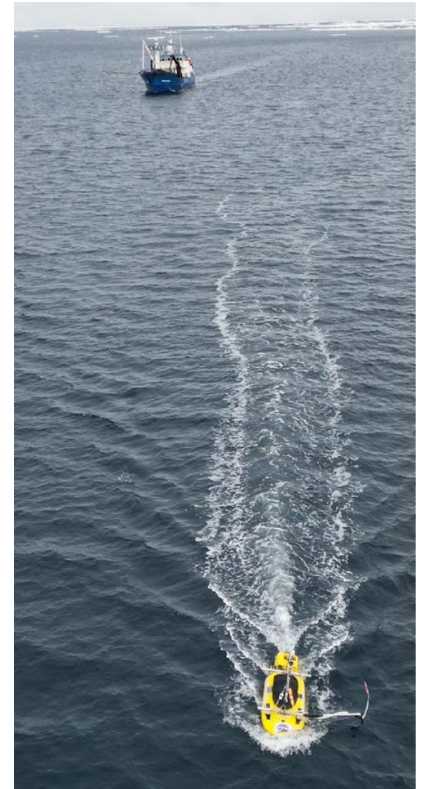
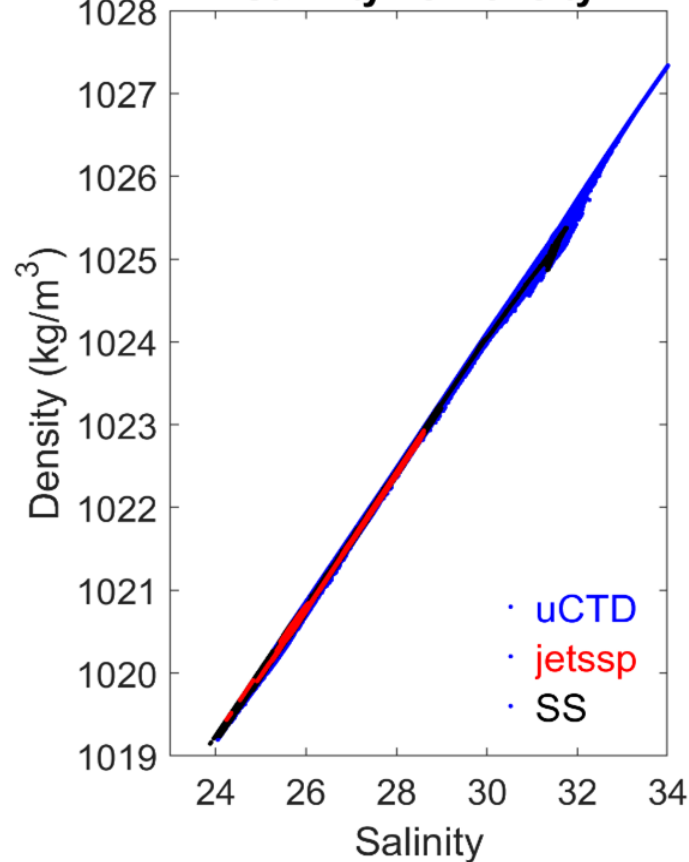
NASA Scientific
Visualization Studio

Stratification in the Arctic is determined by salinity.

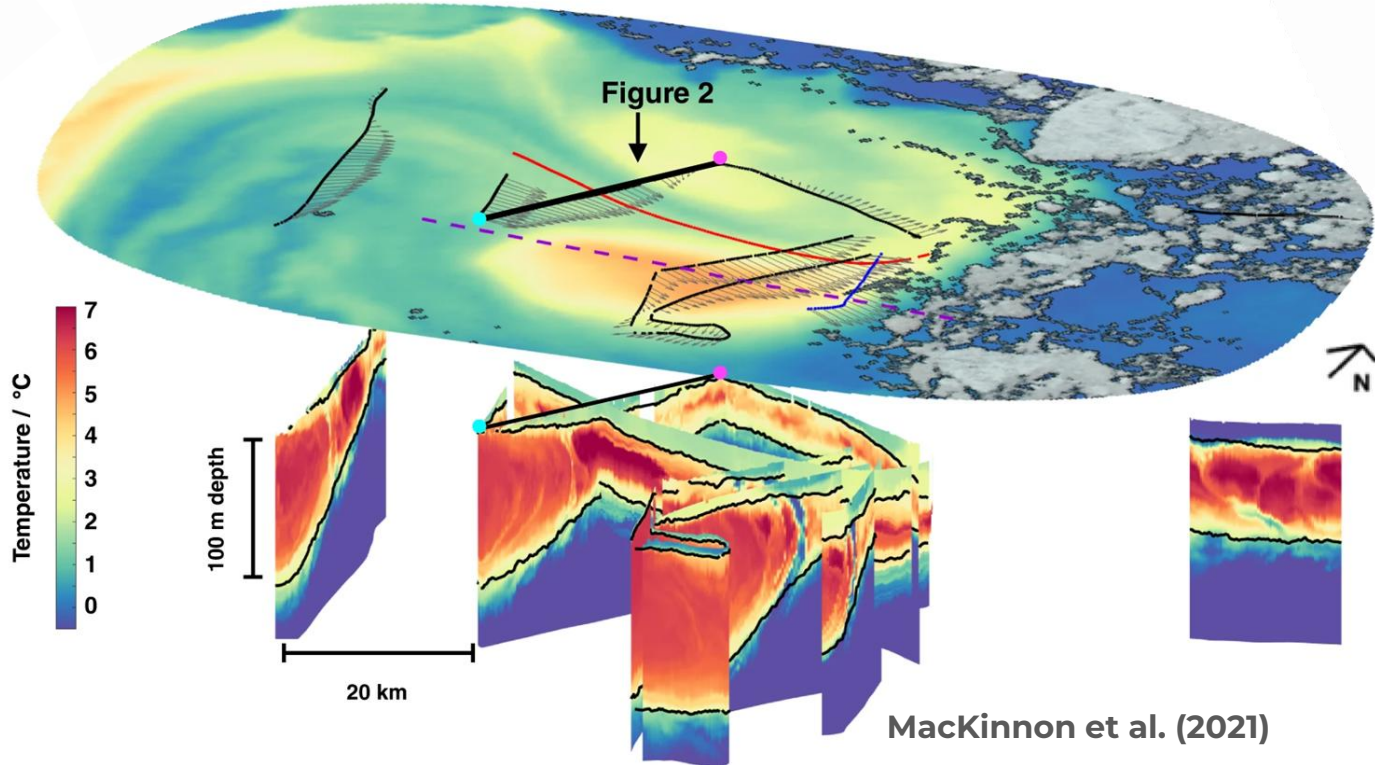
Temperature vs Density



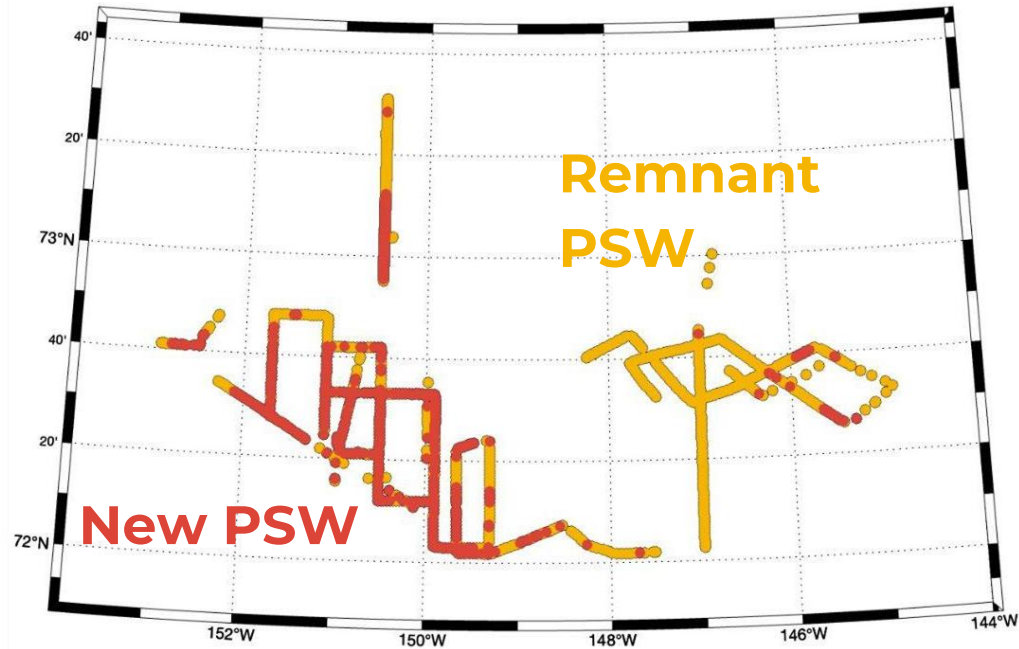
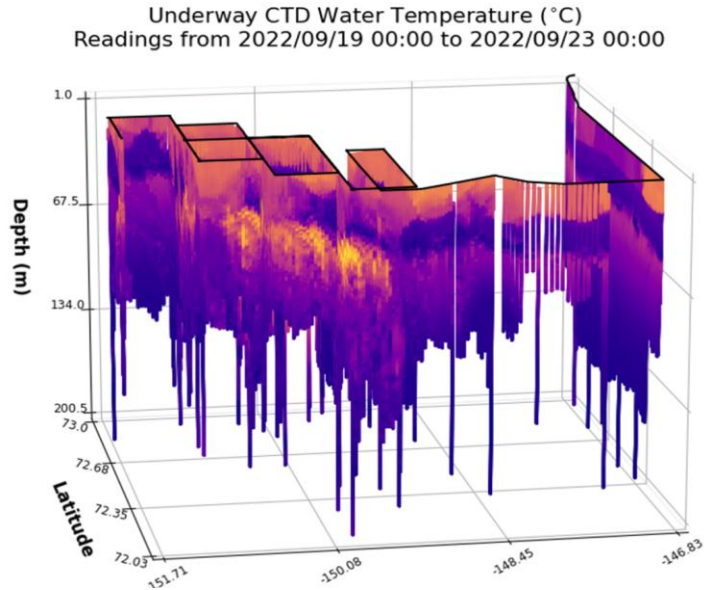
Salinity vs Density



Surface salinity stratification keeps warm water below the surface

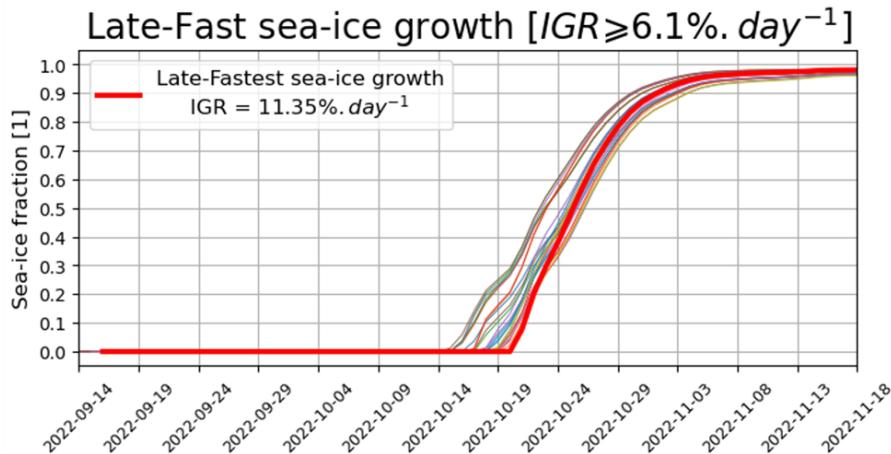
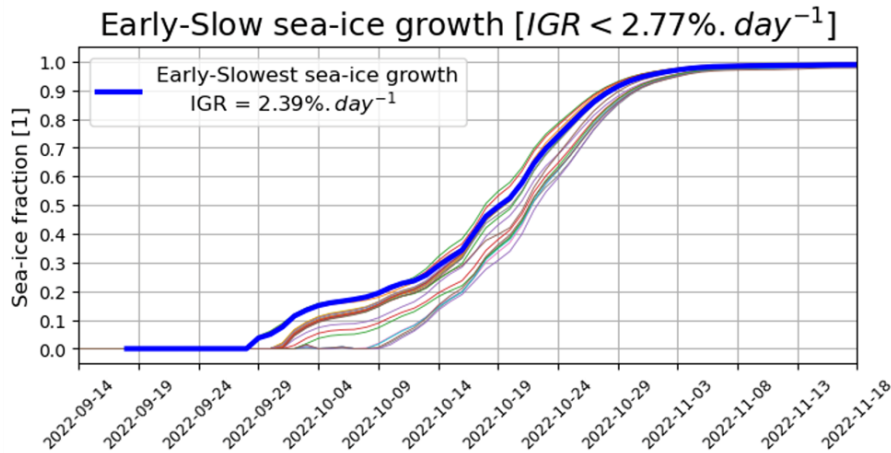
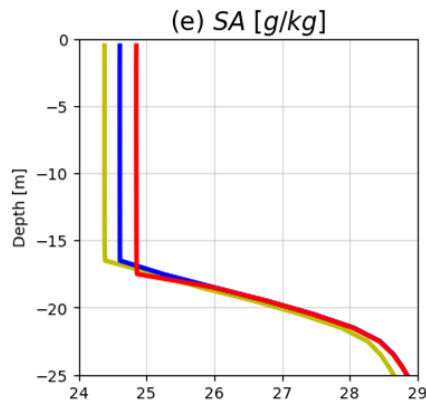
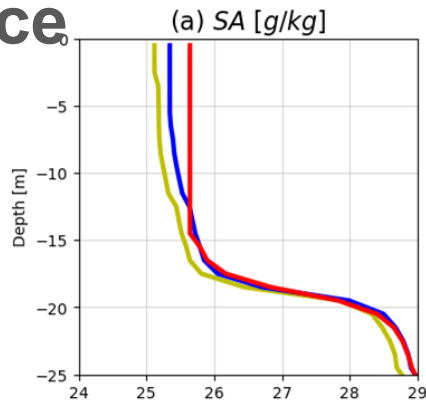


Pacific Summer Water cools and freshens below the surface



Schmidgall et al (in prep)

Pacific Summer Water cools and freshens below the surface



Houndegnonto
et al., 2025



The Arctic Ocean holds only 1% of world's oceanic volume, yet it receives 15% of global river discharge

The FRESH Team



Taylor Rowley (Hydrology Team Lead)

Peter Gaube (Ocean Team Lead)

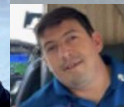
Séverine Fournier (Integration Lead)

HYDRO: Colin Gleason, Dongmei Feng, Wayana Dolan, Anastasia Piliouras

OCEAN: Mike Steele, Julian Schanze, Jim Thomson, Andrey Shcherbina, Ben Kopec, Dimitris Menemenlis, Carlyn Schmidgall, Marie Zahn, Ali Chase

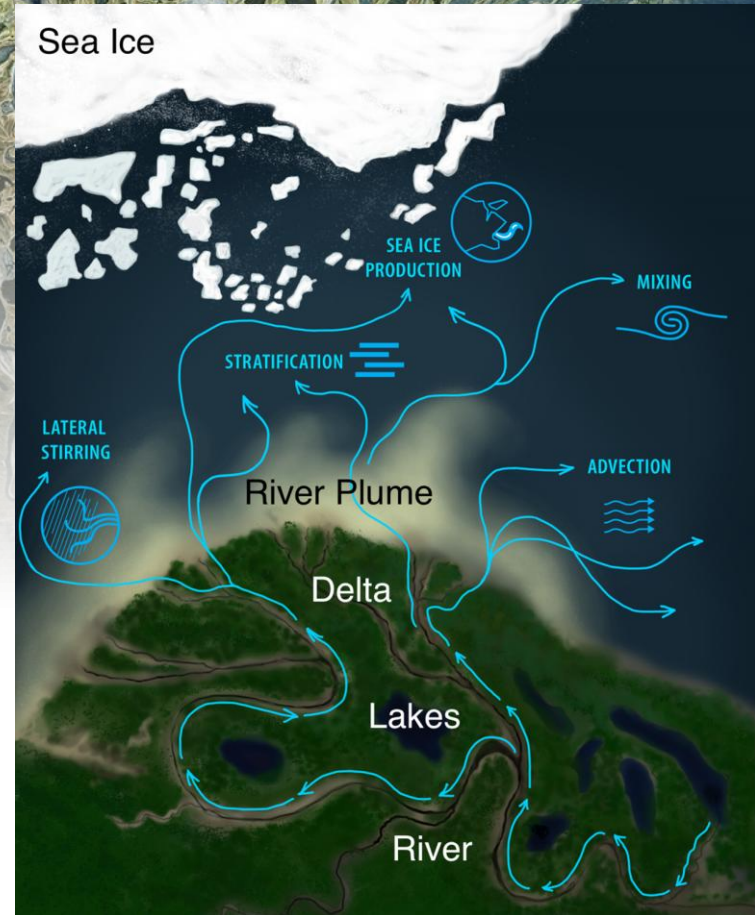
AIR: Alex Wineteer, Hector Torres

DATA: Annette deCharon, Fred Bingham

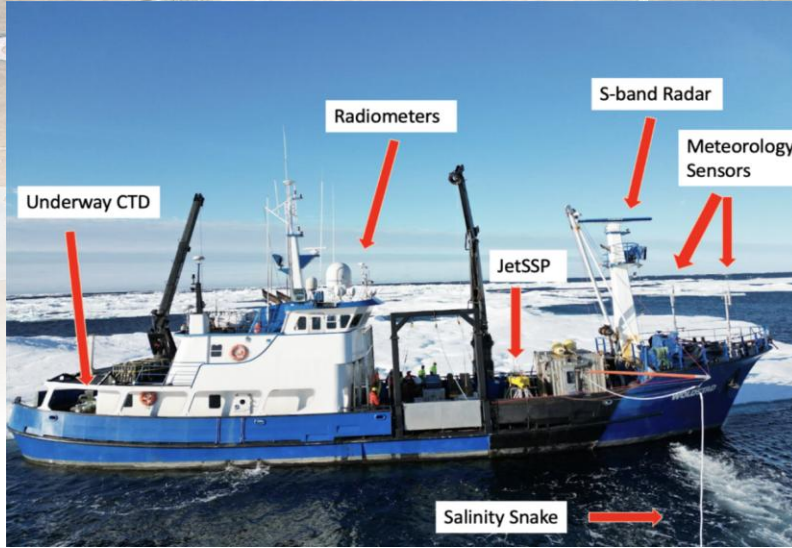


Key Questions

1. How does freshwater move through the land-delta-ocean system (pathways)
2. How do these pathways dictate the fate of freshwater in the Beaufort Sea?



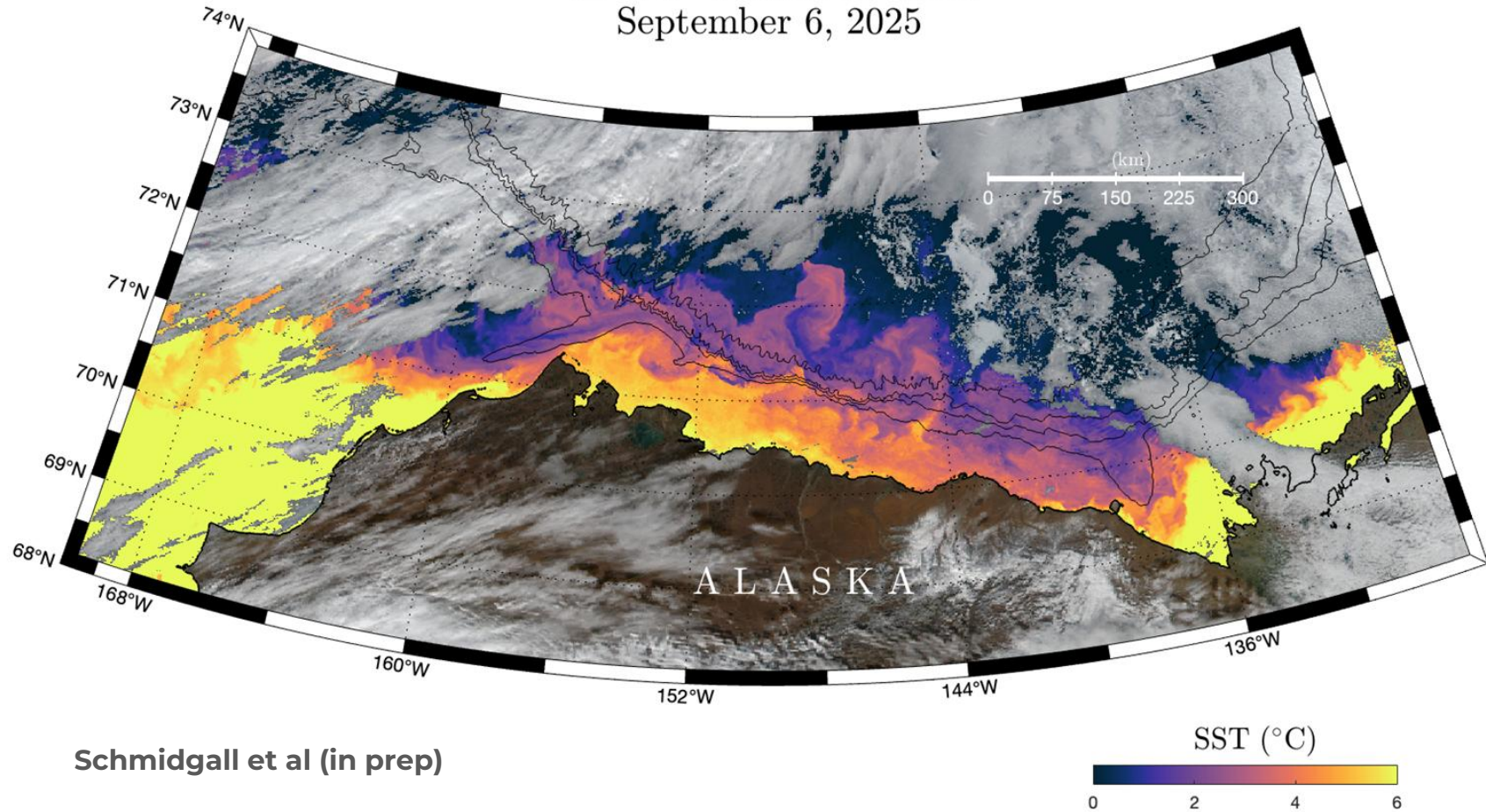
Measurements and models



FRESH observations will be used together with a data-assimilating land-ocean-ice model (ECCO) to determine the pathways of freshwater in the Arctic.

SNPP-VIIRS L2 SST

September 6, 2025



FRESH Airborne - Dopplerscatt

Ka-Band Pencil Beam Doppler
Scatterometer

Measurements:

- Vector ocean surface currents
- Vector ocean surface winds
- Radar brightness maps (sensitive to ice/water)

Mapping capabilities: 25 km swath
maps 200km x 100km area in about 4 hours

Performance characteristics:

Current Velocity: 5-15 cm/s

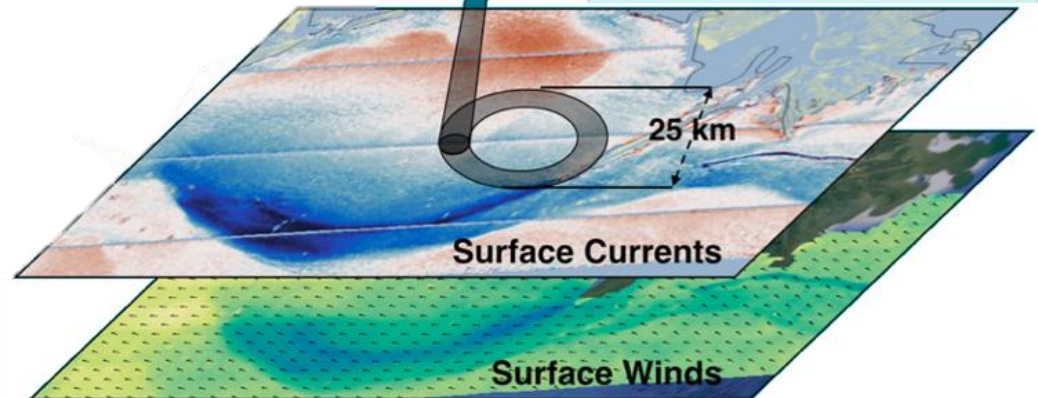
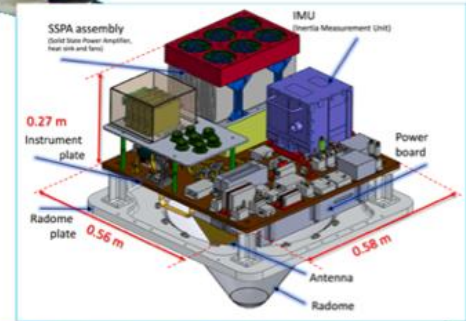
Wind speed: 1 m/s for 3-20 m/s

Wind direction: 15 degrees

Spatial resolution: 200 m



NASA
DopplerScatt



FRESH Outreach



Goals:

- Science collaboration
- Art/science integration
- Local observer to join expedition

Please join us for SOUP & SCIENCE : NASA FRESH Project



Everyone is welcome!

Researchers with the NASA FRESH (Fate of River Export and Surface Hydrology) project will be in the community to share plans for their 2026 field research in and around the Colville River and the Beaufort Sea.

What will happen to the coast and bay as river flow changes in time?

We will be discussing

- How freshwater moves through the landscape and into coastal waters
- What happens to river water as it reaches the Beaufort Sea
- How freshwater carries materials such as nutrients and carbon from the land to the ocean
- What we hope to learn from our 2026 fieldwork
- The instruments and observations we will use in the field

This will be an informal opportunity to meet the research team, hear about our plans, ask questions, and share your thoughts.



Severine Fournier
(Caltech/JPL-NASA)



Taylor Rowley
(UMass)



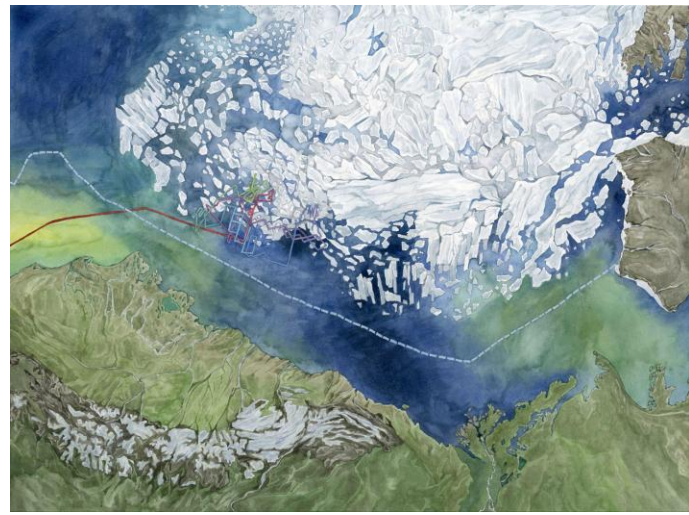
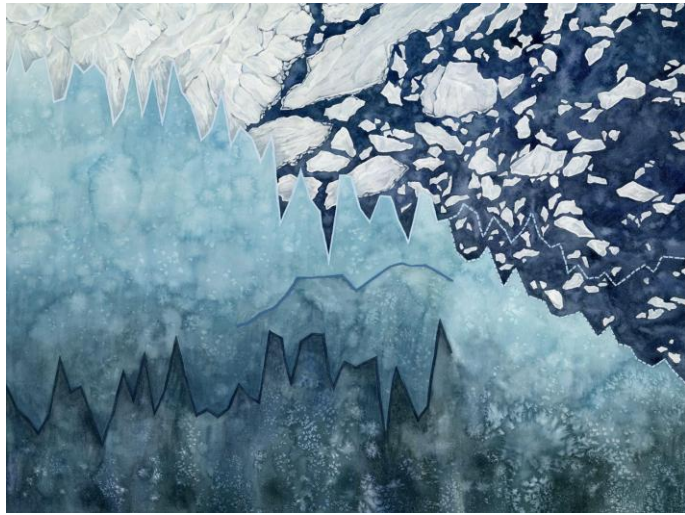
Marie Zahn
(JPL-NASA)



**Thursday, September 17th
6:00pm – 7:30pm
Kisik Community Center,
Nuiqsut Alaska**

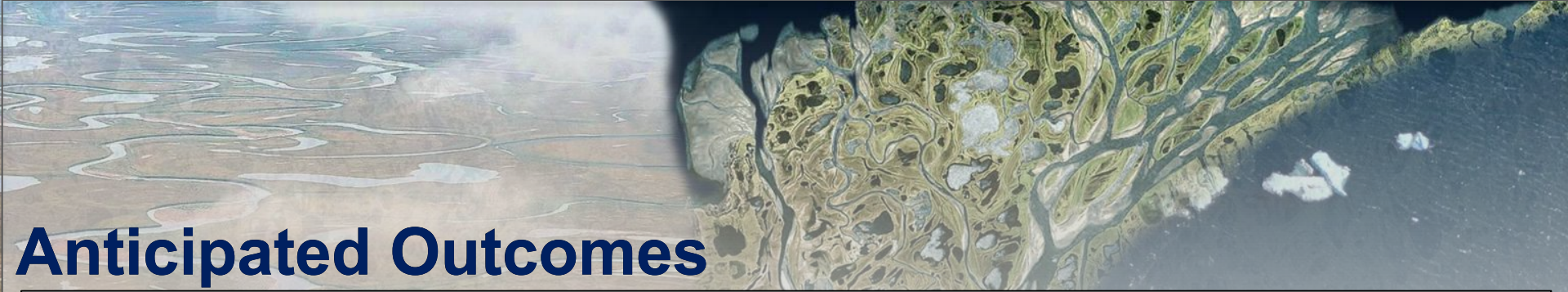
SASSIE

Art+Science



Link to StoryMap on
NASA Salinity Website





Anticipated Outcomes

- The most accurate quantification of Colville River **daily river discharge**
- The most realistic **model of delta channel connectivity** and partitioning of water discharge into the ocean (i.e., how water is divided across different pathways within the delta)
- Direct observation of freshwater transport from the delta over the inner shelf and into the basin
- Realistic observationally-validate freshwater spreading function to model river input into ocean circulation simulations.