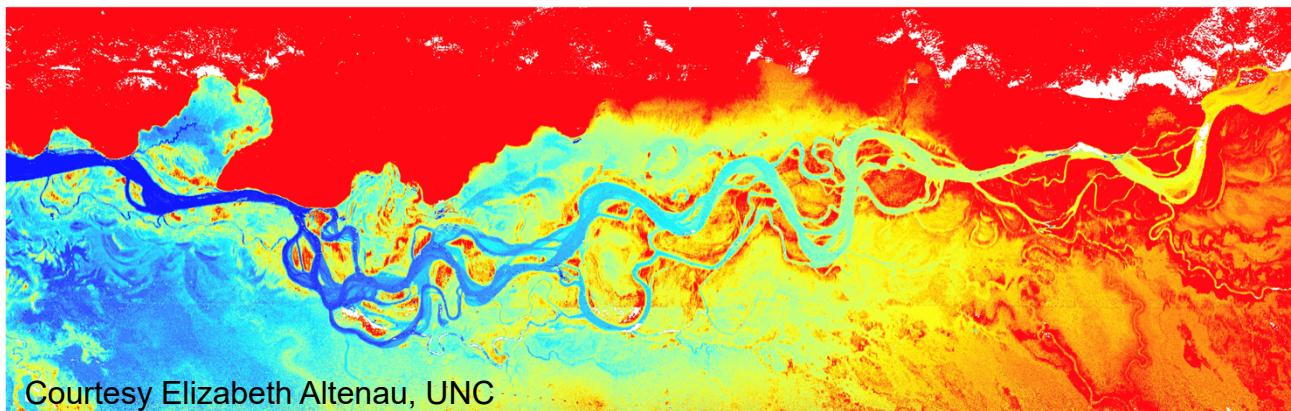


Airborne Observations of Surface Water

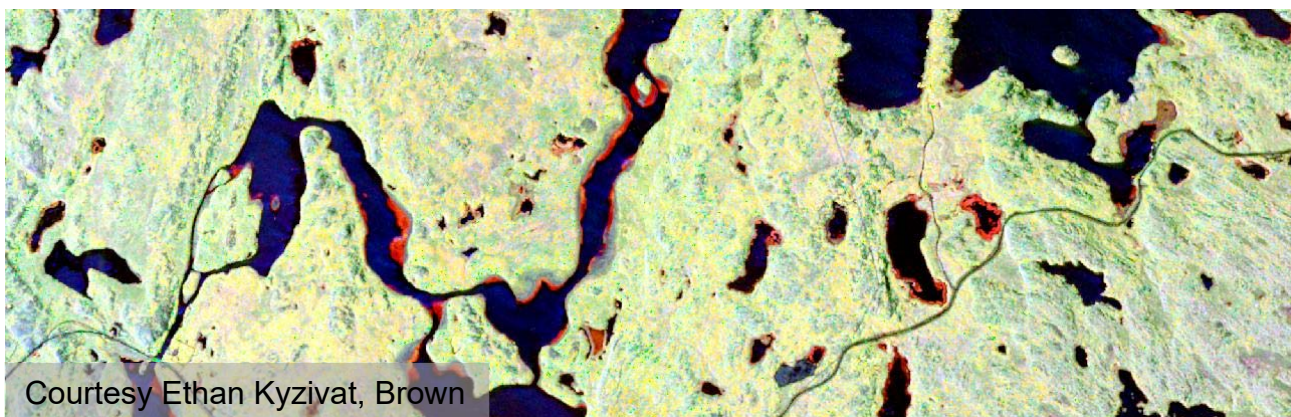


Courtesy Elizabeth Altenau, UNC

AirSWOT

Ka-band Interferometer
KingAir B200

Water Surface Elevations
River Slope & Discharge

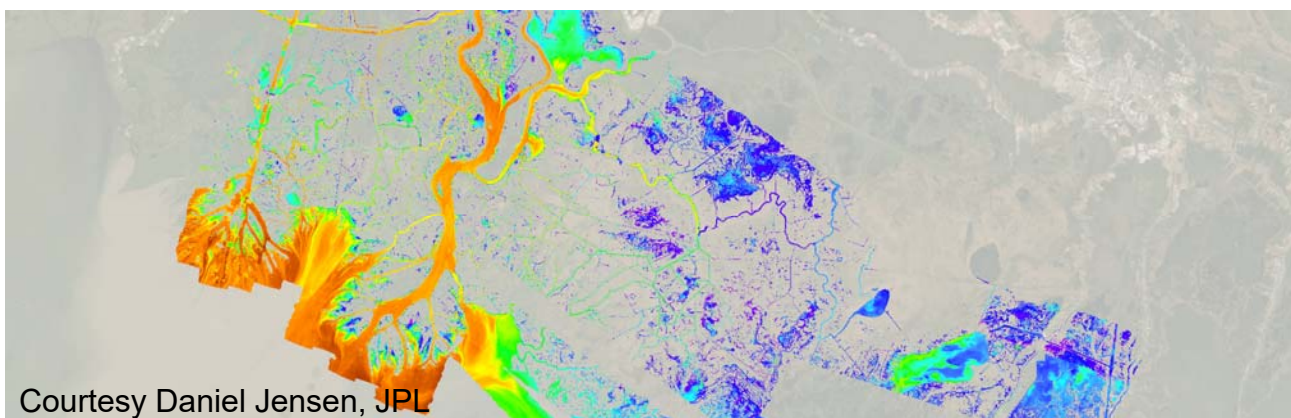


Courtesy Ethan Kyzivat, Brown

UAVSAR

L-band radar
Gulfstream III

Inundation Extent
Elevation in Wetlands



Courtesy Daniel Jensen, JPL

AVIRIS-NG

Hyperspectral Imager
Twin Otter, ER-2

Susp. Sediment Conc.
Chlorophyll Conc.

Airborne Science for Rivers, Lakes, and Wetlands

Major Scientific Airborne Campaigns

- **Arctic Boreal Vulnerability Experiment (ABoVE)**: data collection over multiple summers using many instruments. Focuses on lake and wetland science as it relates to permafrost, methane emissions, and ecology.
- **Delta-X**: new Earth Ventures Suborbital project focused on understanding the role of sediment transport in the fate of river deltas. Uses AirSWOT, UAVSAR, AVIRIS-NG to measure flow of water and sediment.

Instrument-specific Science and Applications

- UAVSAR imaging of flooding after hurricane Florence in North Carolina
- AVIRIS-NG study of harmful algal blooms over the great lakes
- AirSWOT river discharge estimates on the Willamette River

Preparation for and Calibration/Validation of Satellites

- UAVSAR will be a key validation tool for NISAR, SWOT
- AirSWOT has been used to prepare for SWOT, will be used for validation studies
- Hyperspectral imagers (AVIRIS-NG, PRISM) are providing key testbeds for science and technology related to a planned Surface Biology and Geology mission (that has uses in aquatic sciences).

Perspectives and Future Directions

Critical Applications

- Rapid events that require high-resolution, cloud/night penetration, short repeat time.
 - Floods
 - Harmful Algal Blooms
- Questions requiring multiple measurements simultaneously
 - e.g. AirSWOT for in-channel elevation change, UAVSAR for floodplain.
- Testbeds for new scientific measurements (e.g. AirSWOT -> SWOT)

Lessons Learned:

- Instrument and aircraft reliability is a big problem and real limitation of current airborne platforms and (some) instruments
- Airborne data collection can be so expensive that it becomes either the overwhelming focus or is removed in favor of other data collection mechanisms.

Need for a Large Aircraft

- Has not been a major limitation up to this point.
- Could be useful for very long data collection (e.g. AirSWOT over the entire Mississippi River).
- We care more about long time series than we do about very long data collections.