

# Sensitivity of Arctic-Boreal surface water to permafrost state

PI Laurence C. Smith (UCLA)

## Science Objectives

**O1:** Can permafrost presence and/or disturbance be identified from remote sensing of surface water lake and wetland ecosystems?

Hypothesis 1): Over non-bedrock (geologically permeable) substrates, thawing permafrost leads to spatially variable lake/wetland water surface elevations (WSEs)

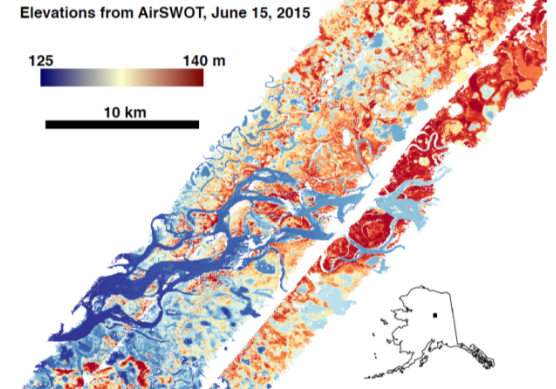
Hypothesis 2: Over geologically permeable substrates and after accounting for regional water balance, lakes/ponds/wetlands in stable permafrost display smaller changes in WSE ( $\Delta$ WSE) than those in thawing or permafrost-free areas

## Sensor/Platform Summary

NASA AirSWOT

Ka-band interferometric radar to estimate free water surface elevations (WSEs)

Sample 2015 data from Yukon River Flats, Alaska



## Impacts on ABoVE Science:

Tier 2 Science Questions addressed:

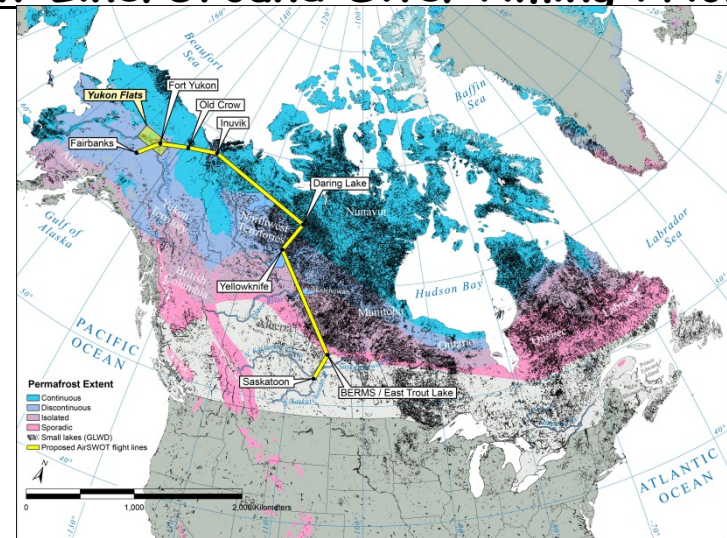
*What are the causes and consequences of changes in the hydrologic system, particularly the amount, temporal distribution, and discharge of surface and subsurface water driving these changes? What processes are contributing to changes in disturbance regimes and what are the impacts of these changes? What processes are controlling changes in the distribution and properties of permafrost and what are the impacts of these changes?*

Crosscutting themes:

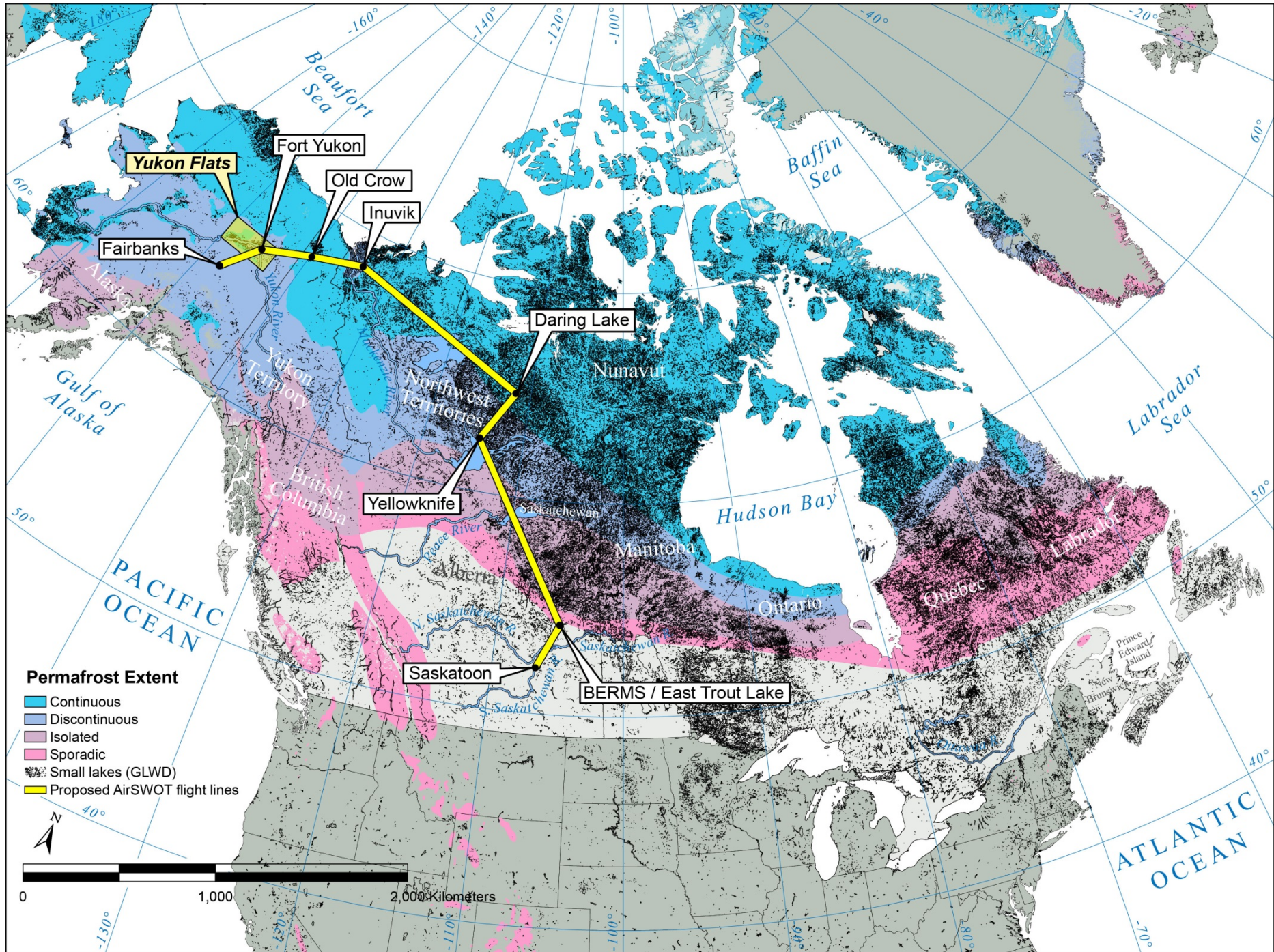
Wetlands, Yukon Flats, community outreach

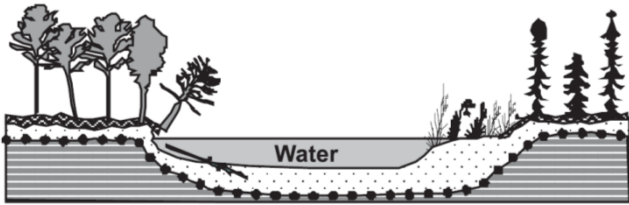
**CoIs:** Tamlin Pavelsky (UNC-Chapel Hill), Dennis Lettenmaier (UCLA)

## Flight Line/Ground Site/Timing Priorities

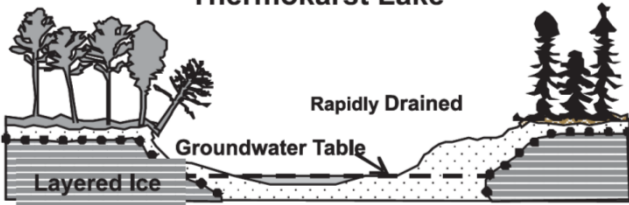








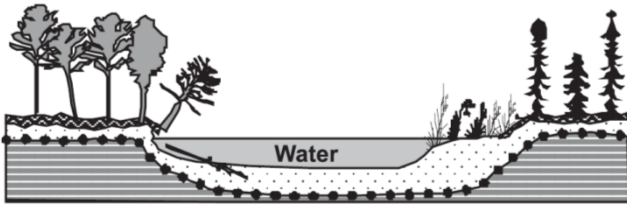
**Thermokarst Lake**



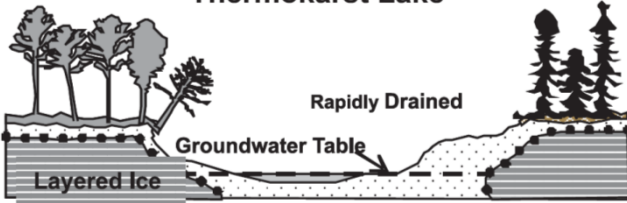
**Thaw Sink**

(Jorgenson and Osterkamp, 2005)





Thermokarst Lake



Thaw Sink

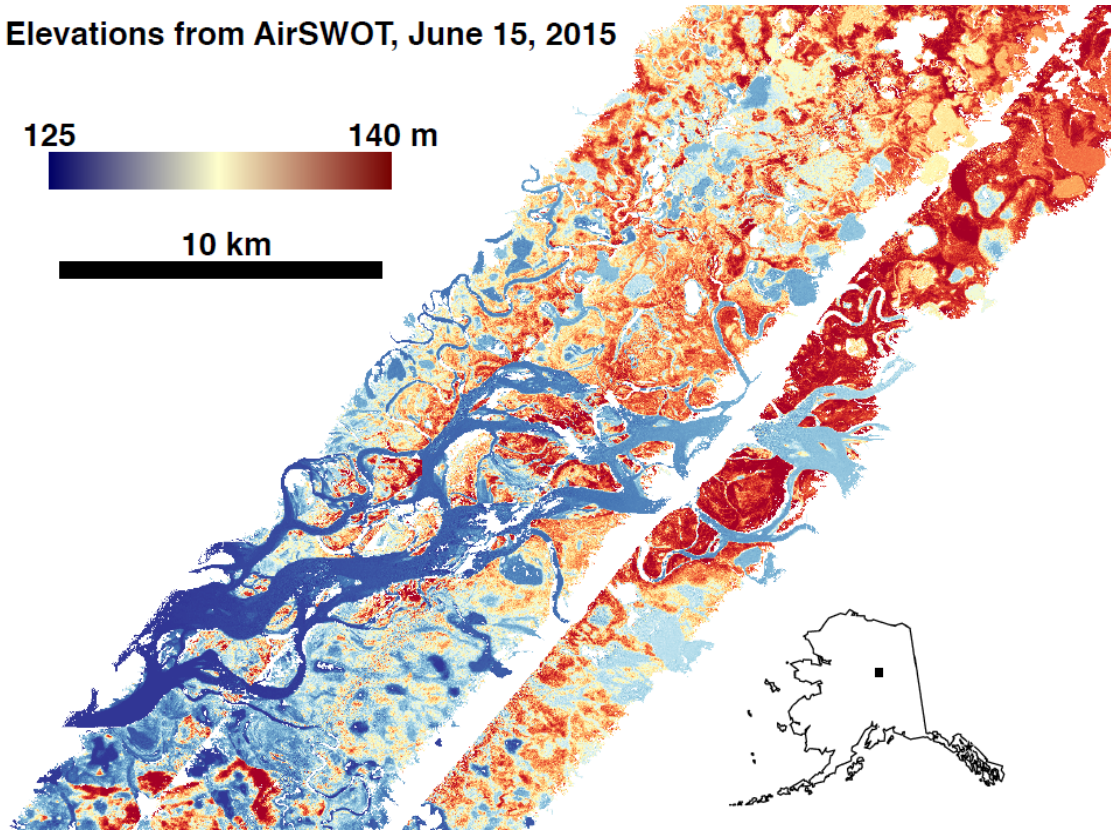
(Jorgenson and Osterkamp, 2005)

Elevations from AirSWOT, June 15, 2015

125 140 m

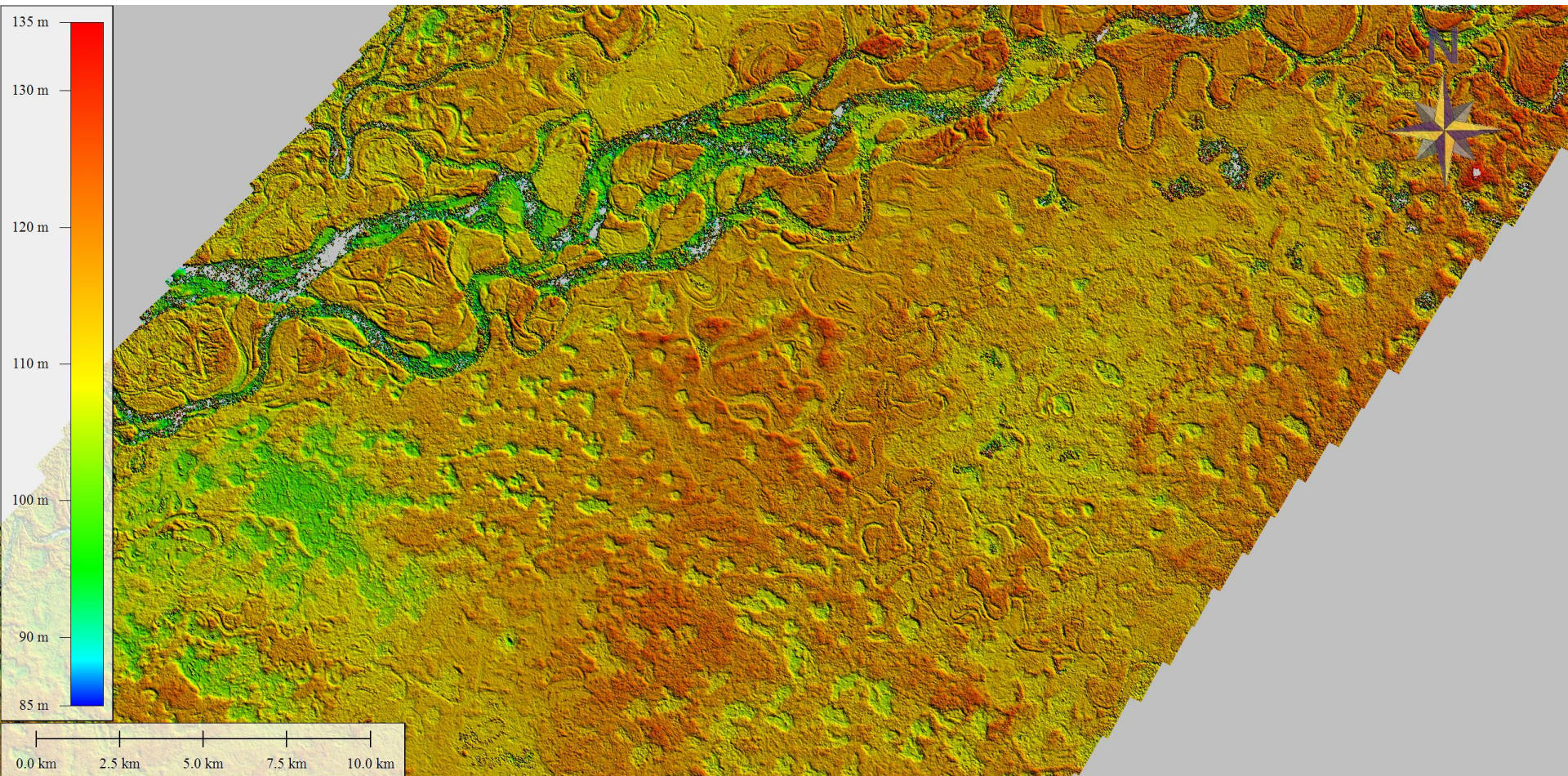


10 km



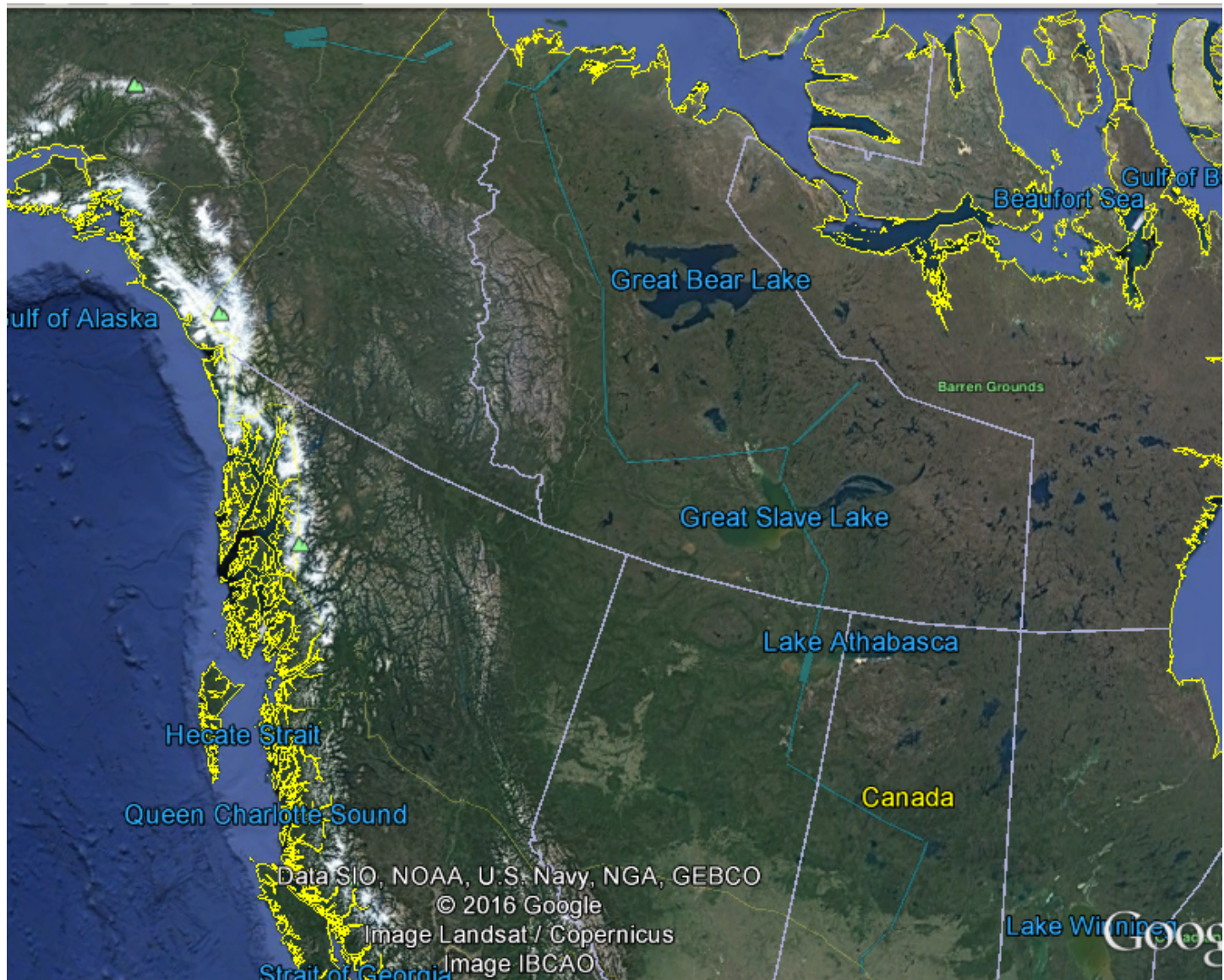
(June 15, 2015 AirSWOT over Yukon Flats, AK)





2015 Yukon Flats DEM from Cirrus camera system on AirSWOT (courtesy John Arvesen)





Latest AirSWOT flight plan: Nominal dates July 8 and August 17, 2017  
Top synergy goals: LVIS (contemporaneous), UAVSAR (contemporaneous), AirMOSS