AirSWOT: Measuring the Sensitivity of Arctic-Boreal Surface Water to Permafrost Extent

Laurence C. Smith, UCLA, PI
Tamlin M. Pavelsky, UNC
Dennis P. Lettenmaier, UCLA

Graduate Students: Lincoln Pitcher, Sarah Cooley, Ethan Kyzivat, Simon Topp, Ted Langhorst, Merritt Harland

Collaborators from: Environment and Climate Change Canada (ECCC); Government of the N.W.T., Canada (GNWT); Colorado University (CU); US Geological Survey (USGS); University of Massachusetts, Amherst (UMass-Amherst); U.S. Army Cold Regions Research and Engineering Laboratory (CRREL); Brock University (Brock U.); Wilfrid Laurier University (Laurier); Laboratoire d’Etudes en Géophysique et Océanographie Spatiales, France (LEGOS); Companhia de Pesquisa de Recursos Minerais, Geological Survey of Brasil (CPRM)
Arctic and boreal environments have millions of lakes that are essential to understanding the hydrology, biogeochemistry, and ecology of the region.

We know that the lakes and the environments around them are changing. . .

Can permafrost presence and/or disturbance be identified from remote sensing of surface water lake and wetland ecosystems?
Uncalibrated Reference Channel Power
Complex Interferogram

brightness = interferometric coherence

color = wrapped phase flattened with reference DEM

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Results from the AirSWOT DCIS color infrared camera show that it can be used to successfully classify lake areas with high accuracy.

This data will be critical for calculating lake height and lake water storage variations from AirSWOT radar data.
Capabilities of AirSWOT Radar in the Yukon Flats

Poster: Lincoln Pitcher et al., Thursday, #87

AirSWOT Can resolve heights in >1400 lakes in the Yukon Flats. Results from 2015 data suggest that lakes heights in areas with high permafrost likelihood are more variable.

AirSWOT resolves lake levels with RMSE 21 cm

n = 1439 lakes
Seasonal Variability of Surface Water Extent

Poster: Sarah Cooley et al., Thursday, #83

Daily optical imagery from Planet shows that patterns of seasonal lake area variations are partly controlled by permafrost.
The Canadian Shield has hundreds of thousands of lakes that make up a substantial fraction of its surface area. A common assumption is that these lakes are primarily bedrock-controlled...

Science Questions:
1. What portion of Canadian Shield lakes are controlled by permafrost?
2. Do permafrost-controlled lakes behave differently from bedrock-controlled lakes?
3. How vulnerable are permafrost-controlled lakes to permafrost degradation?