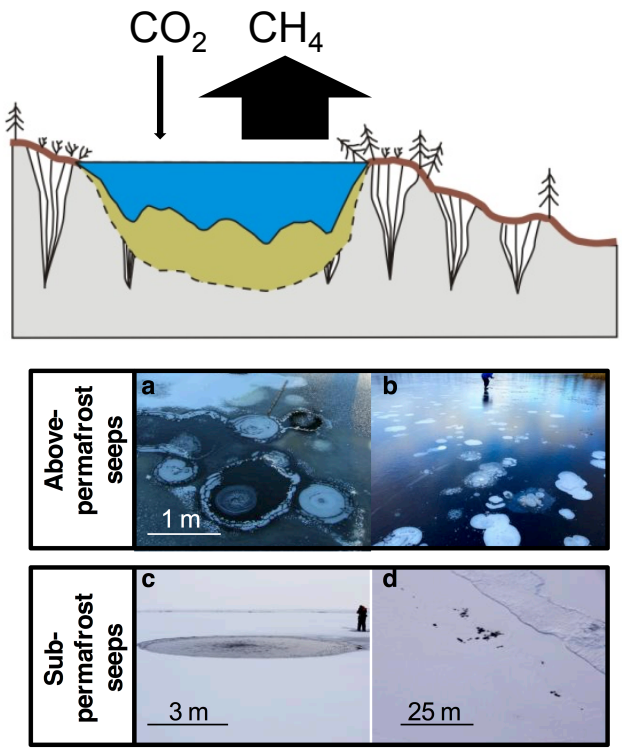
Imaging Arctic Methane Plumes

C. Miller, K Walter Anthony, D. Thompson, A. Thorpe



Objectives

We will retrieve high-resolution CH_4 plume images from AVIRIS-NG data acquired during the 2017 ABoVE airborne campaign.

We will conduct ground-truth field sampling of select sources to validate AVIRIS-NG CH_4 fluxes and source processes.

These data will transform our understanding of the spatial distribution and intensity of CH_4 sources in Arctic-boreal ecosystems, provide improved constraints on regional CH_4 budgets, and test whether CH_4 emissions from geologic sources contribute significantly to the permafrost carbon feedback.

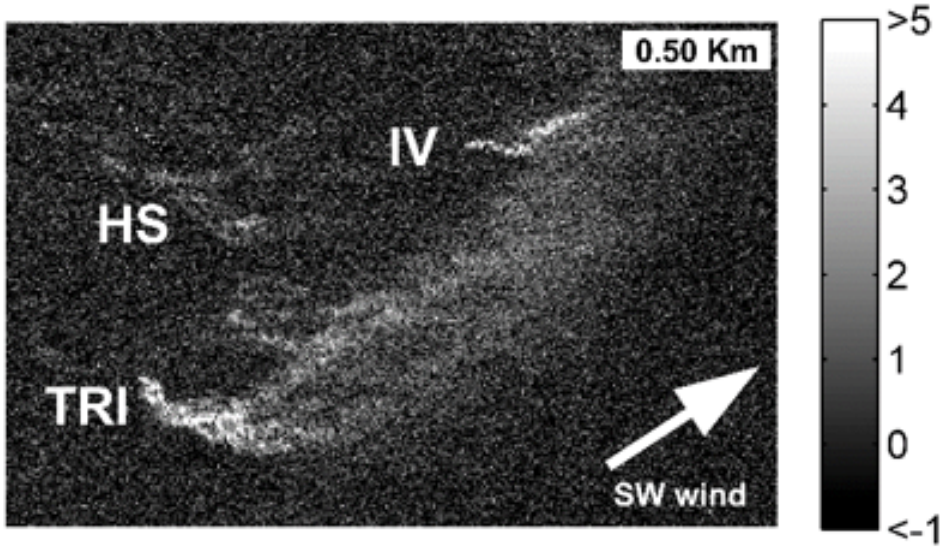
Janelle Sharp, a NANA Regional Corporation Shareholder, will participate in the investigation as part of her graduate studies at UAF.

Objectives

O1: Retrieve high-resolution CH_4 source plume images from AVIRIS-NG data collected during the 2017 ABoVE airborne campaign

O2: Conduct ground-truth field measurements on select CH_4 plume sources in yedoma-rich ecosystems of the Kotzebue-Noorvik-Selawik region and on the Yukon-Kuskokwim Delta

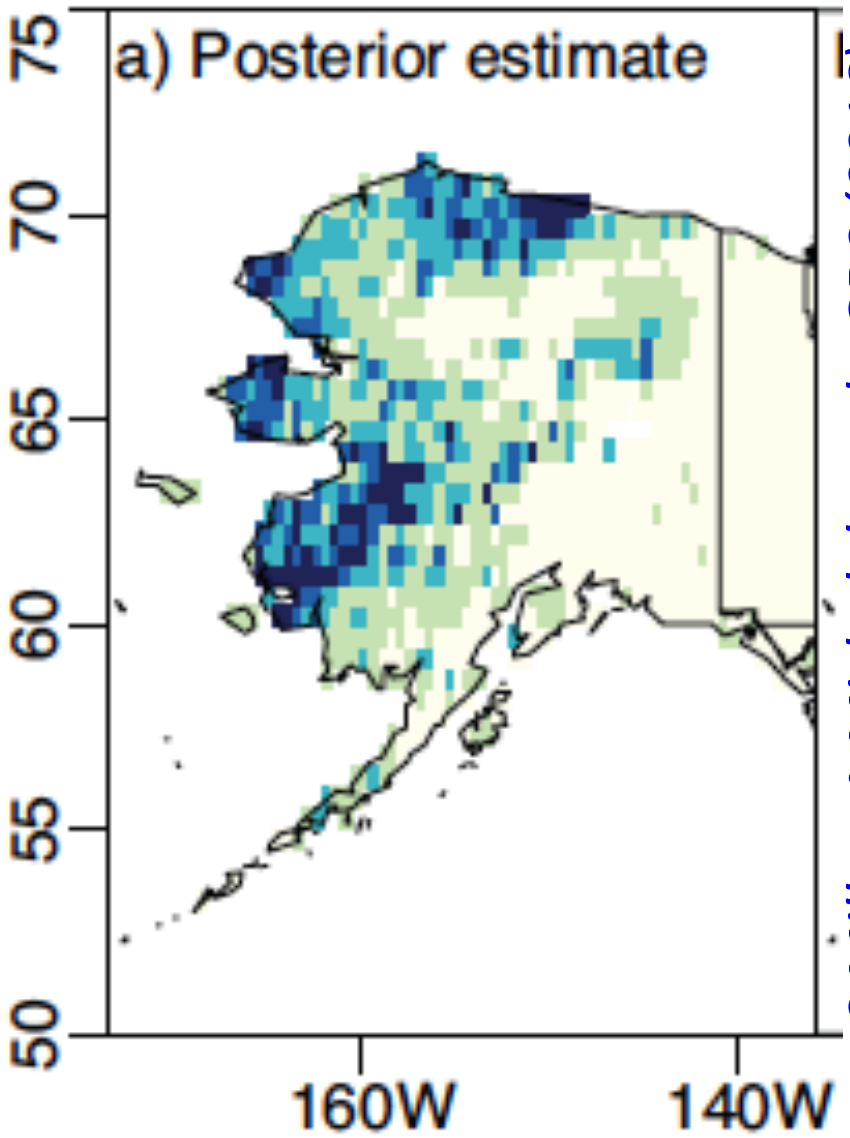
O3: Deliver maps of all thermokarst thaw lake ebullition seeps derived from high-resolution optical and SAR imagery around our ground-truth study areas



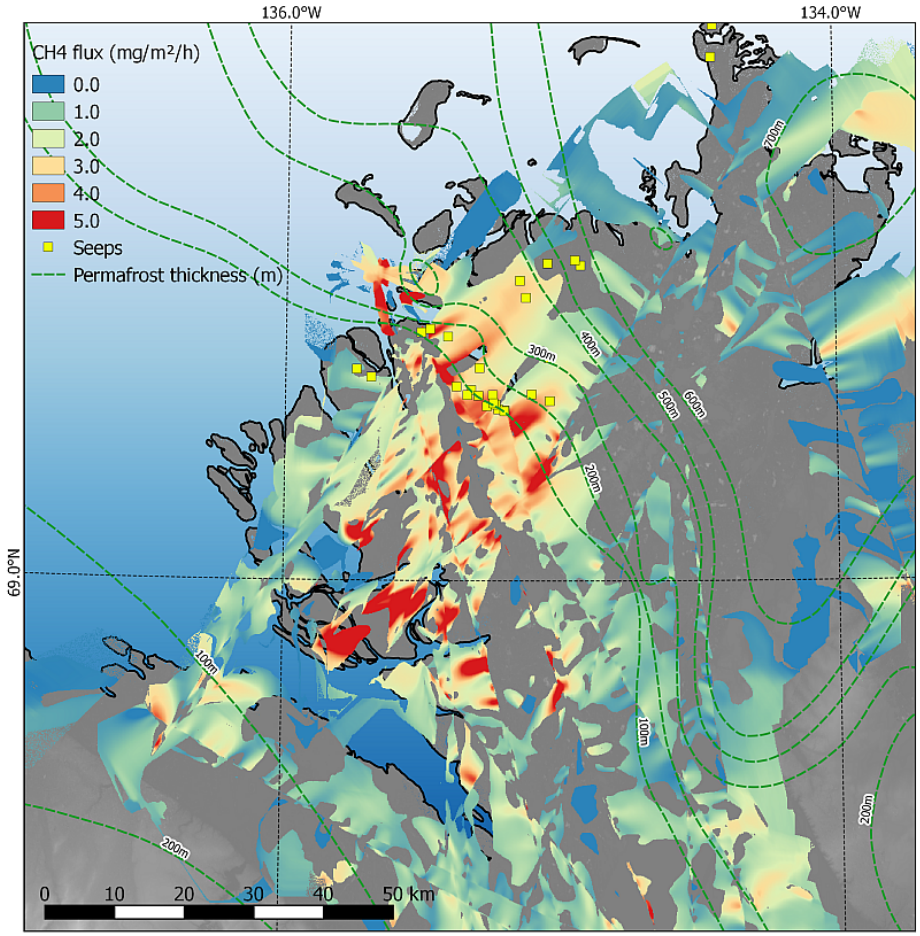
AVIRIS imagery of methane plumes from sub-oceanic seeps off the coast of Santa Barbara CA demonstrate the sensitivity of the instrument to detect methane emissions diffusing through ~10 meters of water

Plumes are resolved to ~3 meters for both shape and origin

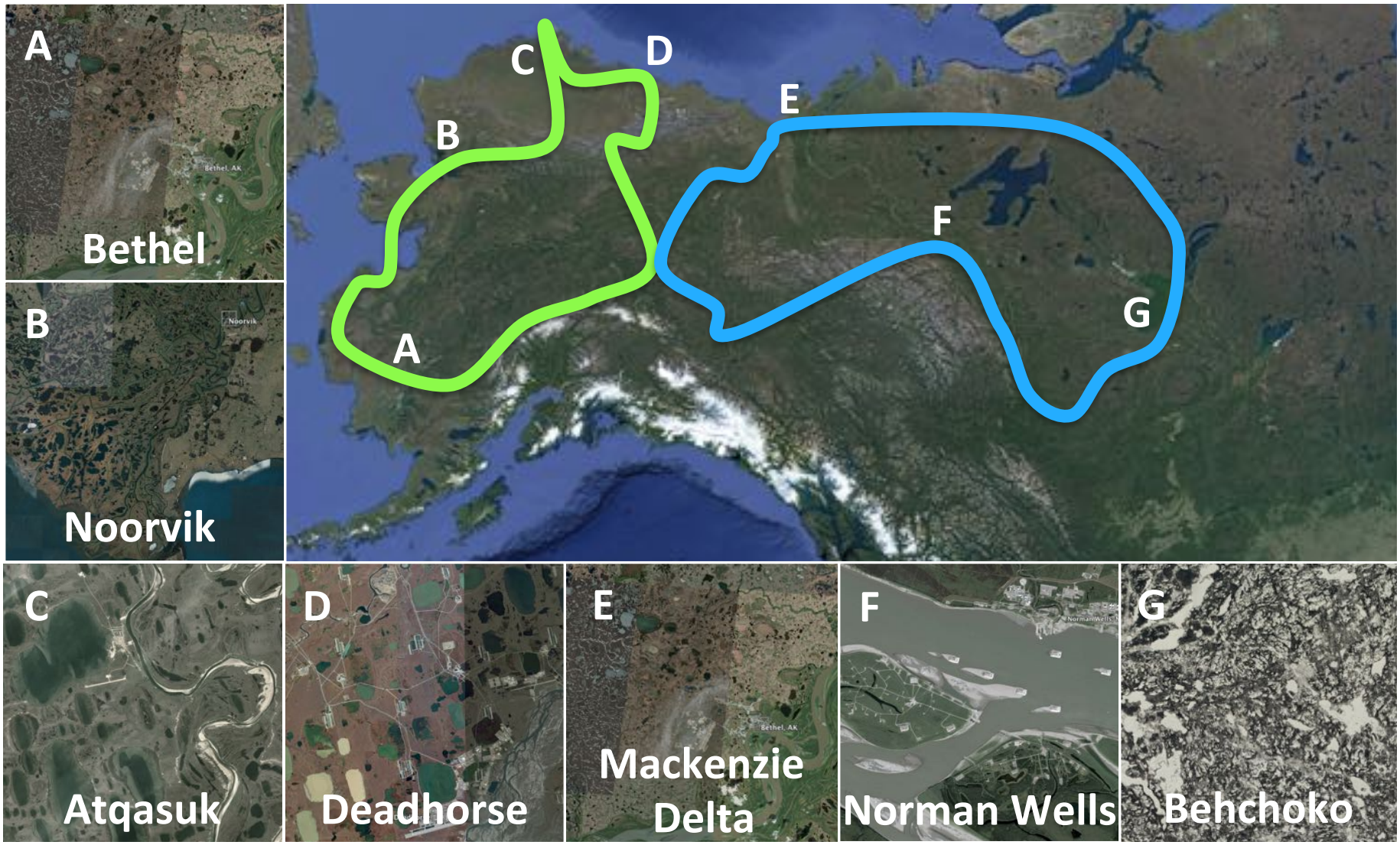
Methane Emissions in the ABoVE Domain



S Miller, A Michalak et al., GBC (2016)



High Methane Emissions Areas



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PI: Charles Miller, Jet Propulsion Laboratory, California Institute of Technology

Science Objectives

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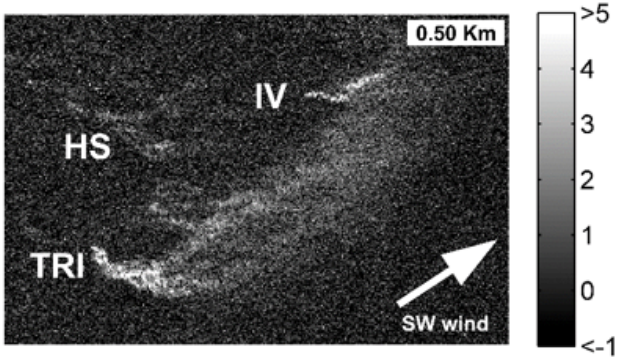
Sensor/Platform Summary

AVIRIS-NG – retrieve CH4 plume imagery from all flight lines

Ground truth field measurements near Koetzebue and Bethel



Impacts on ABoVE Science:

Tier 2 Science Questions addressed:

How are the magnitudes, fates, and land-atmosphere exchanges of carbon pools responding to environmental change, and what are the biogeochemical mechanisms driving these changes?

Crosscutting themes:

Separate geologic and energy sector CH_4 sources from ecologic sources, providing critical insight into the CH_4 component of the permafrost carbon feedback

Energy security for native Alaskans & collaboration with NANA Regional Corporation

CoIs: D Thompson (JPL), A Thorpe (JPL), K Walter-Anthony (UAF)

Flight Line/Ground Site/Timing Priorities