Post-K&C – First Report

L-band Sensitivity to Biomass and Landcover Structure in the ABoVE domain

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Post-KC Science Team meeting #1
Tokyo, Japan, January 20-24, 2020

Project outline and objectives

To study biomass and landcover structure sensitivity to environmental factors, such as soil moisture, permafrost and seasonal dynamics, in the 0 – 100 tons/ha biomass regime. This is in line with NISAR goals, needs for NASA's ABoVE program, and is an important region for ALOS-2 and ALOS-4 biomass mapping.

Project area(s) – Boreal Ecosystems, especially in Canada and Alaska

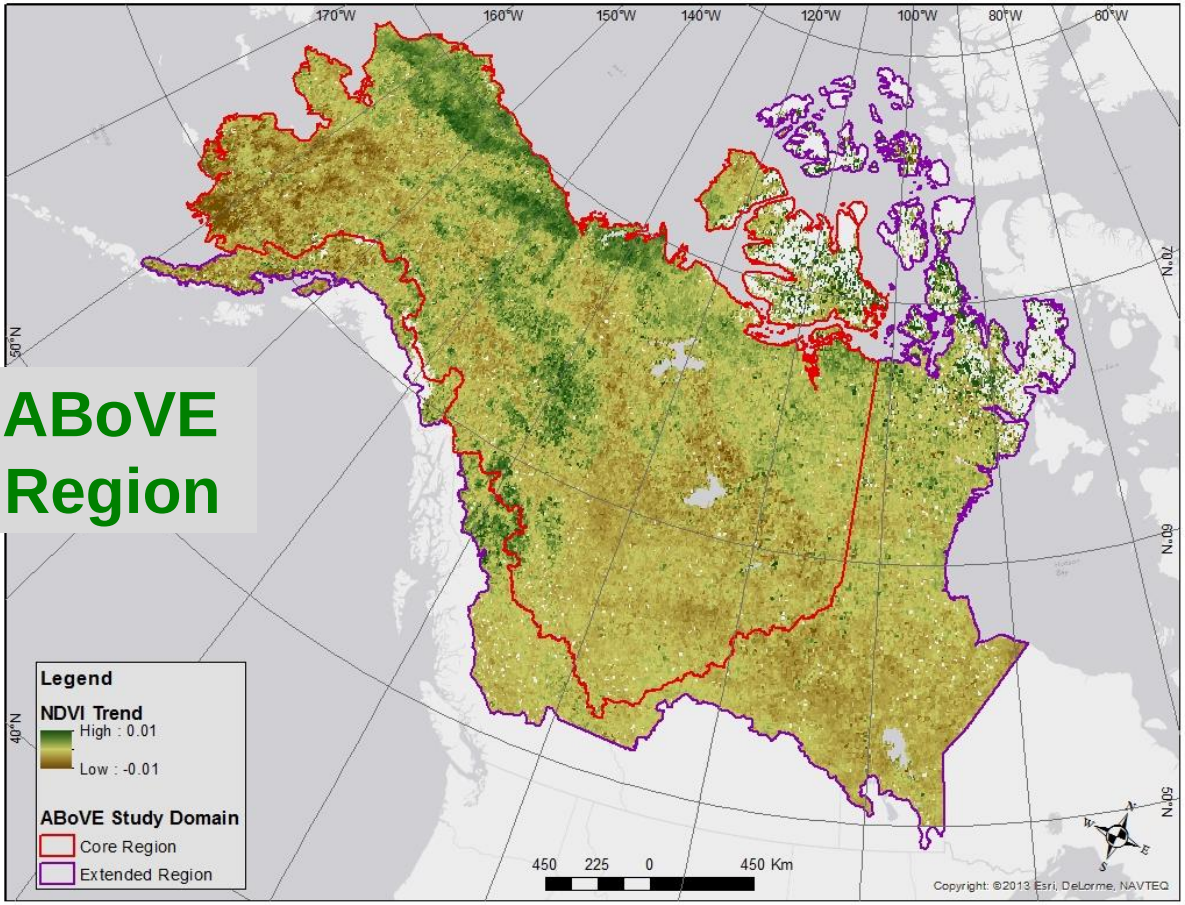
ALOS

K&C Initiative

An international science collaboration led by JAXA

- **ABoVE: Arctic Boreal Vulnerability Experiment**

NASA ABoVE Study Region

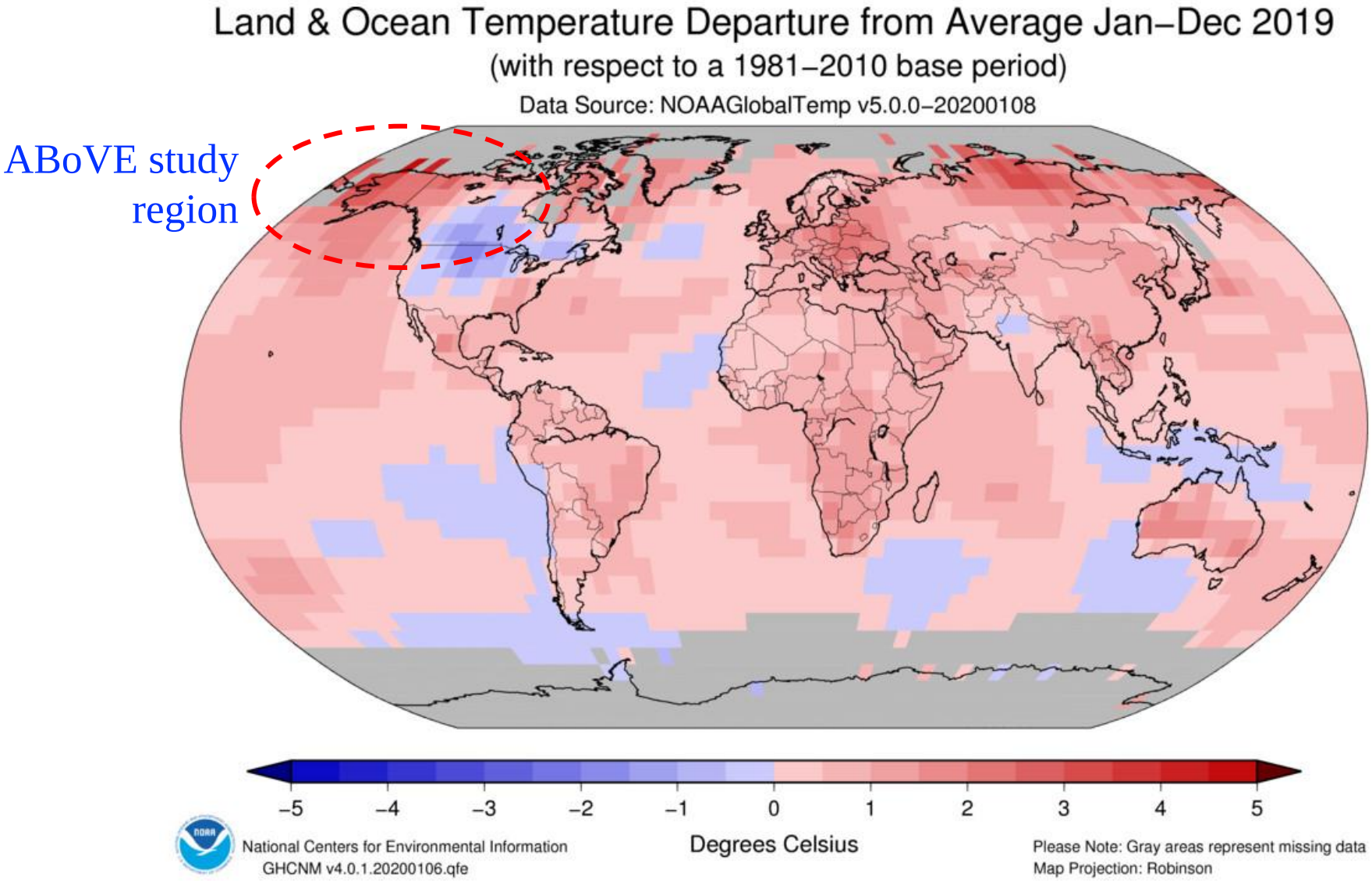


Project aims to support K&C thematic drivers

- **C**arbon cycle science: Through its extensive peatlands, the Boreal ecosystem is a significant source of carbon storage. Release of methane, through a melting permafrost and extended summer season is a significant carbon source.

- **C**limate Change: With changes in permafrost, wetland dynamics and recent advent of megafires, in a global context, the boreal region is experiencing some of the most drastic changes due to climate change.

- Environmental **C**onservation: Identification of wetlands and forest structure are critical for characterizing plant and animal habitats in an abbreviated growing season.


Land & Ocean Temperature Departure from Average Jan–Dec 2019
(with respect to a 1981–2010 base period)
Data Source: NOAAGlobalTemp v5.0.0–20200108
ABoVE study region
−5
−4
−3
−2
−1
0
1
2
3
4
5
Degrees Celsius
National Centers for Environmental Information
GHCNM v4.0.1.20200106.qfe
Please Note: Gray areas represent missing data
Map Projection: Robinson

ALOS

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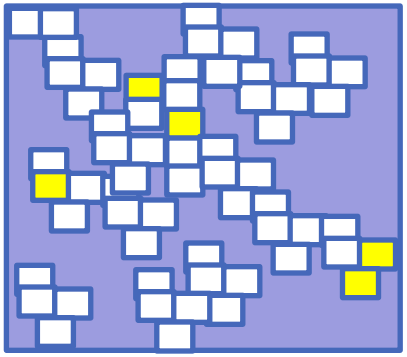
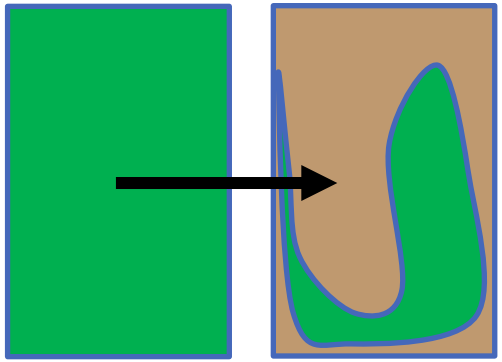
NISAR Ecosystem Requirements Illustrated

Active agricultural crop area



Accuracy: 80% at 1 ha resolution every 3 months

Detection of Forest disturbance

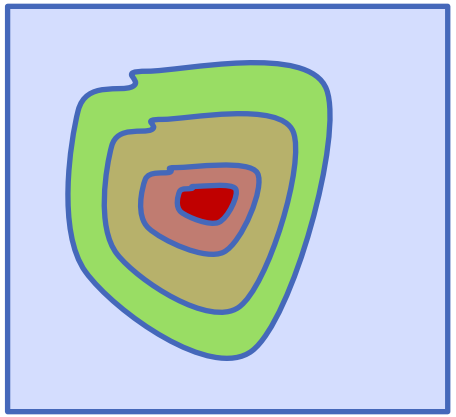


Accuracy: > 50% disturbance at ha scale annually

Wetland inundation Extent

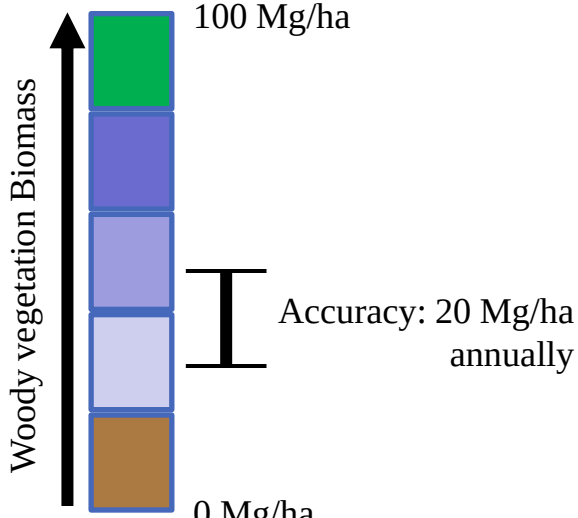
Accuracy: 80% at 1 ha resolution every 12 days

Permafrost



Accuracy: 5.2 mm @ 100m, 16 mm @ 10 km, semi-monthly

Biomass



ALOS

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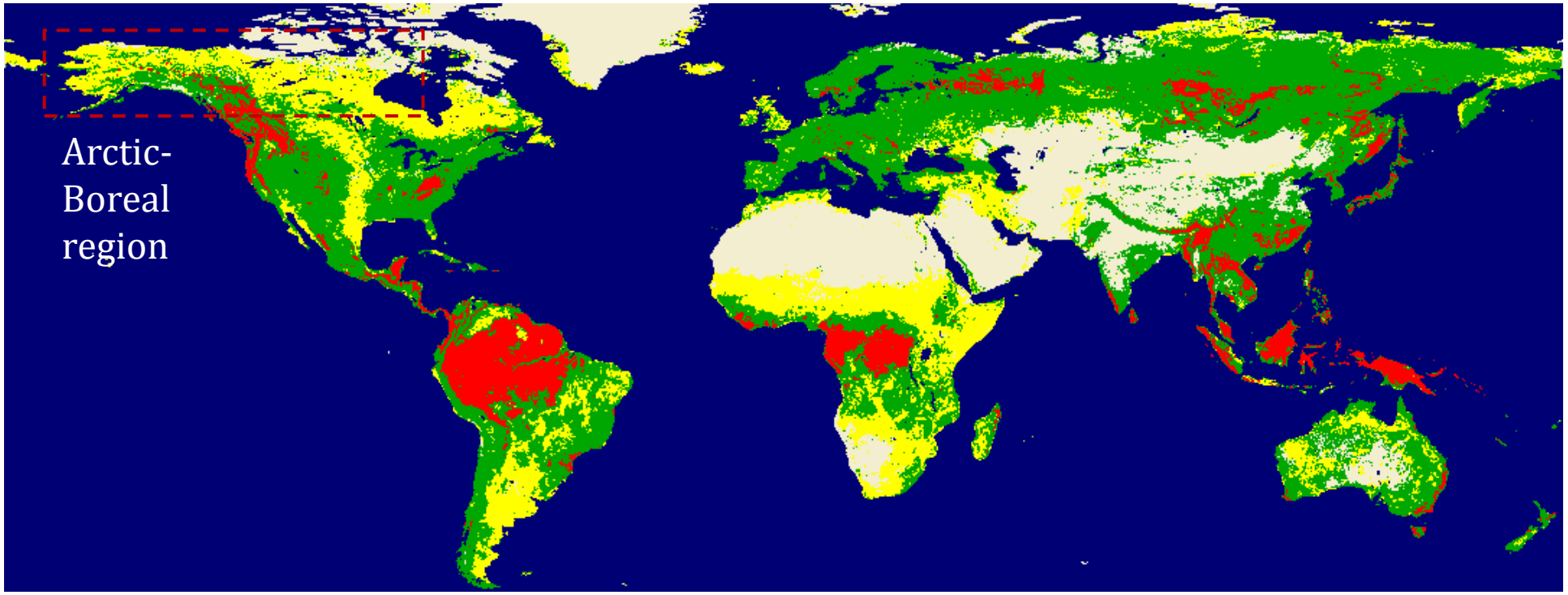


The global distribution of regions dominated by with woody biomass < 100 Mg/ha

Regions with AGB < 100 Mg/ha 50% of area

Regions with AGB > 100 Mg/ha 50% of area

Regions with AGB < 20 Mg/ha 50% of area

Regions with No woody vegetation

Open Water

Results and significant findings

For use of ALOS data, we are in the early stages of analysis

- Time variability
- Ground validation (Wetland, forest, and forest regrowth sites)

Low biomass (< 100 t/ha) and strong inundation dynamics make the region ideal for a focused time-series collection

Region has not been the focus of ScanSAR time series or consistent FBD collection

This makes it a good candidate for one of the “super super sites”

Deliverables and other output

Describe planned output of your project.

- Project deliverables
- Peer-reviewed publications
- Non-peer-reviewed publications (conference papers, reports etc.)
- Other results

PKC & ABoVE

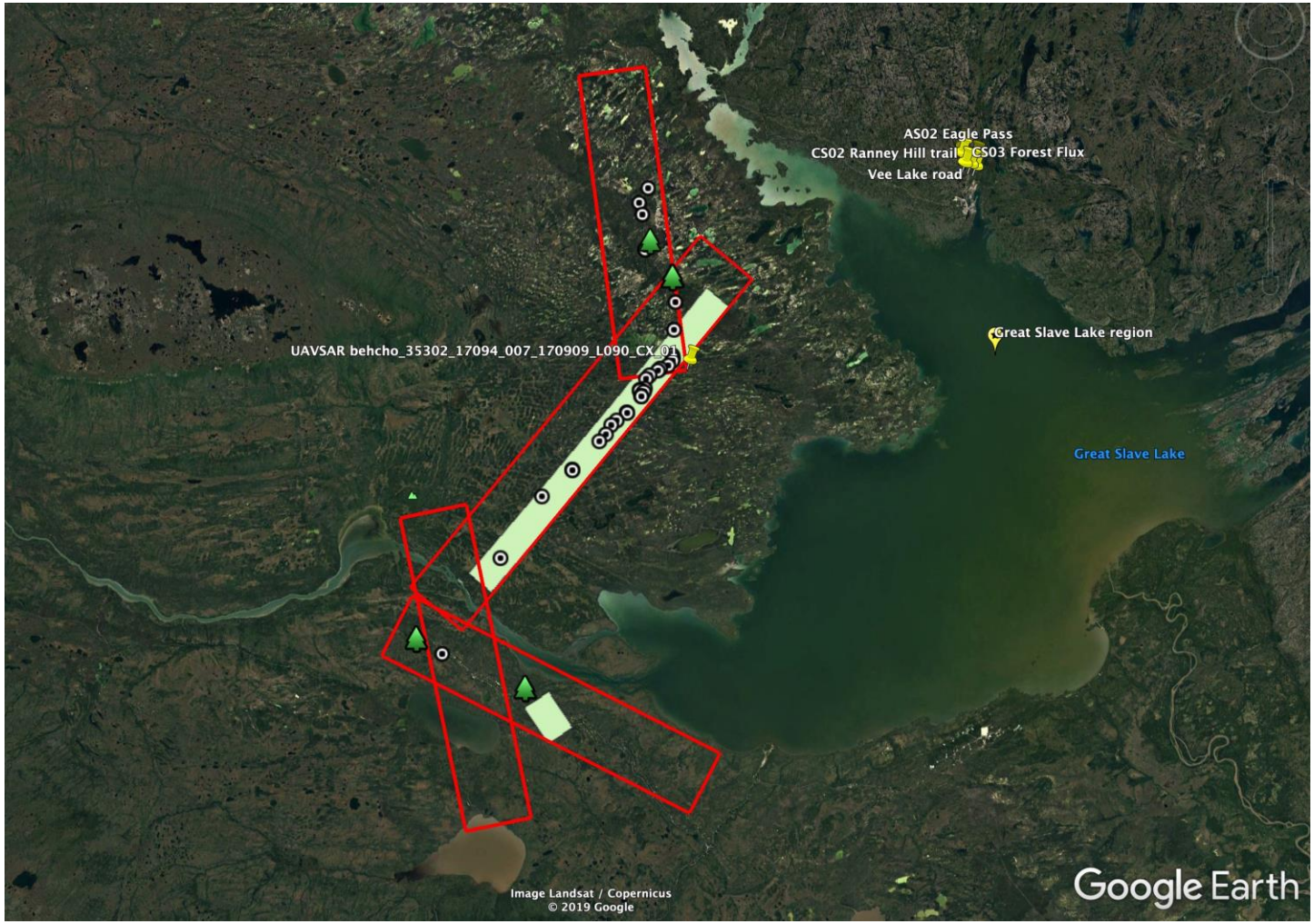
0 < biomass < 100 t/ha

strong inundation dynamics

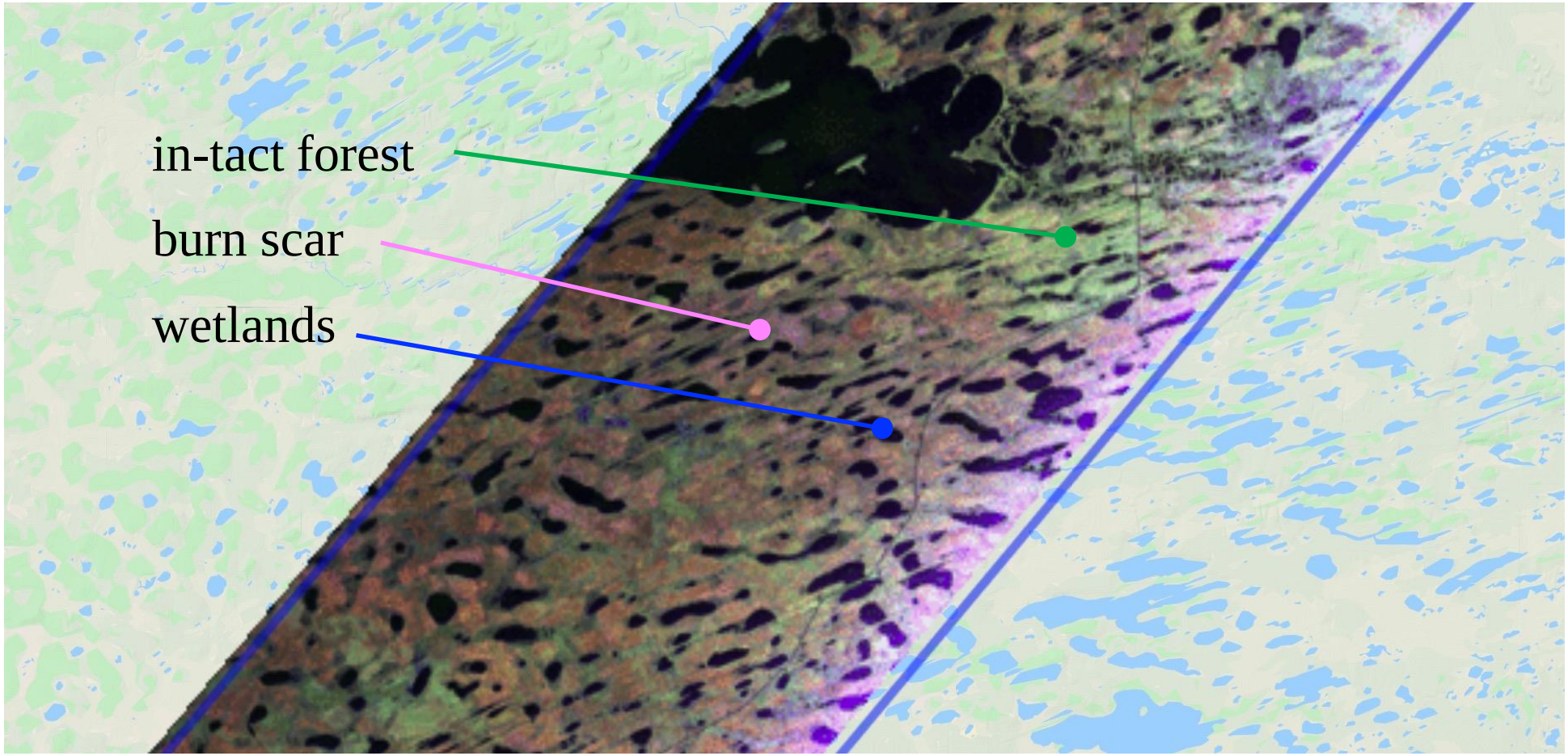
disturbance

permafrost monitoring

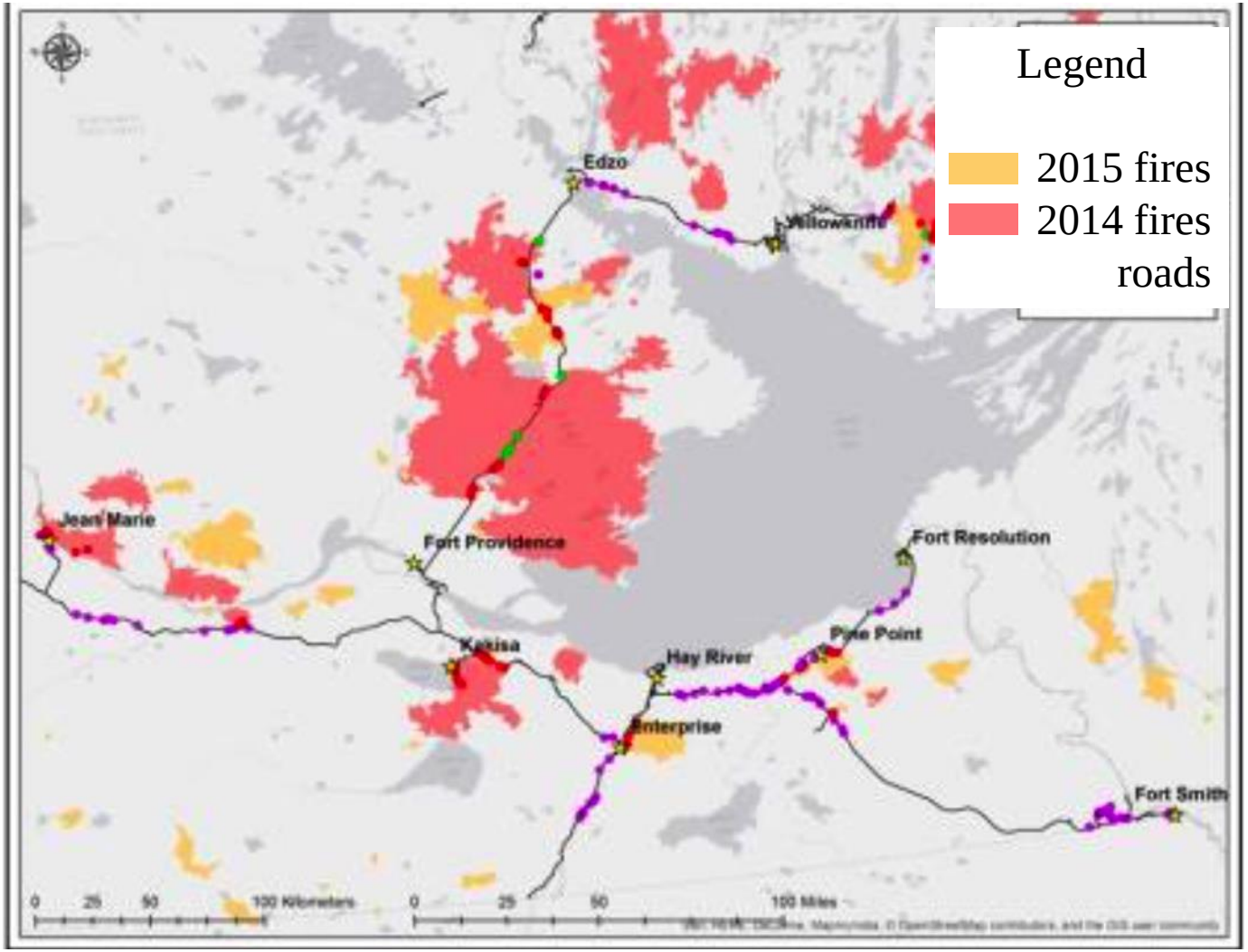
Great Slave Lake Region



Heterogenous Landscape



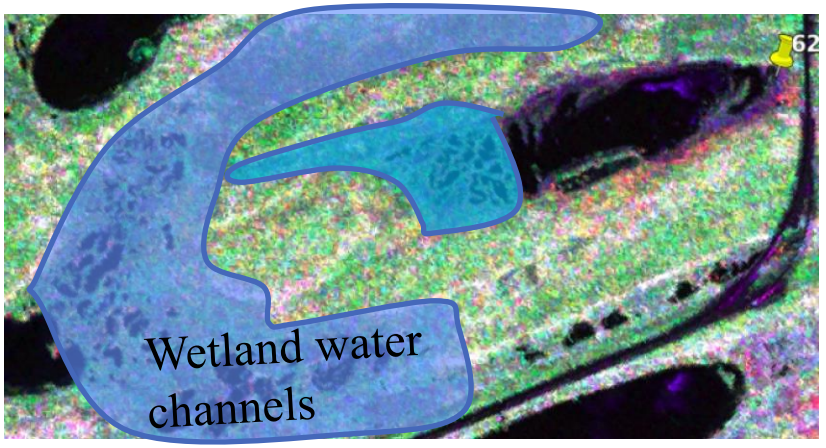
Large-scale fires

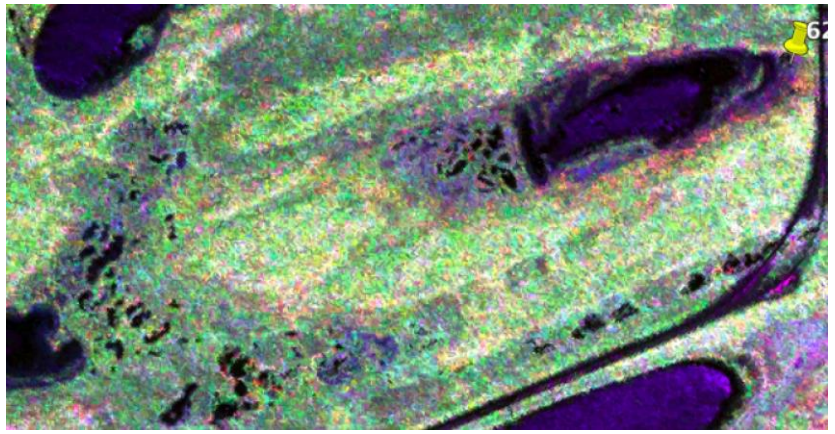


The combined effect of remote sensing and ABoVE

- Different land-use histories (i.e. burn history and severity) and soil type governs the forest cover
- Permafrost depth, soil moisture and biomass provide a means for understanding how the past effects the current state, and how things will change in the future

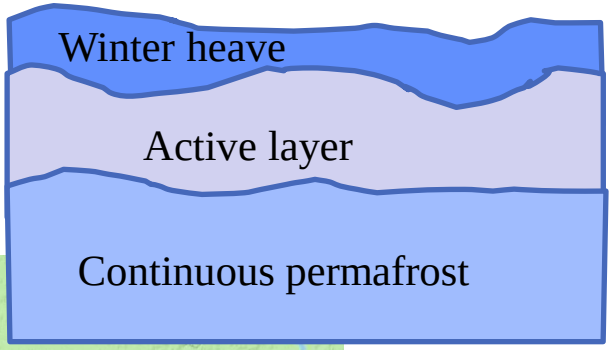
The ABoVE Landscape
Strong inundation dynamics

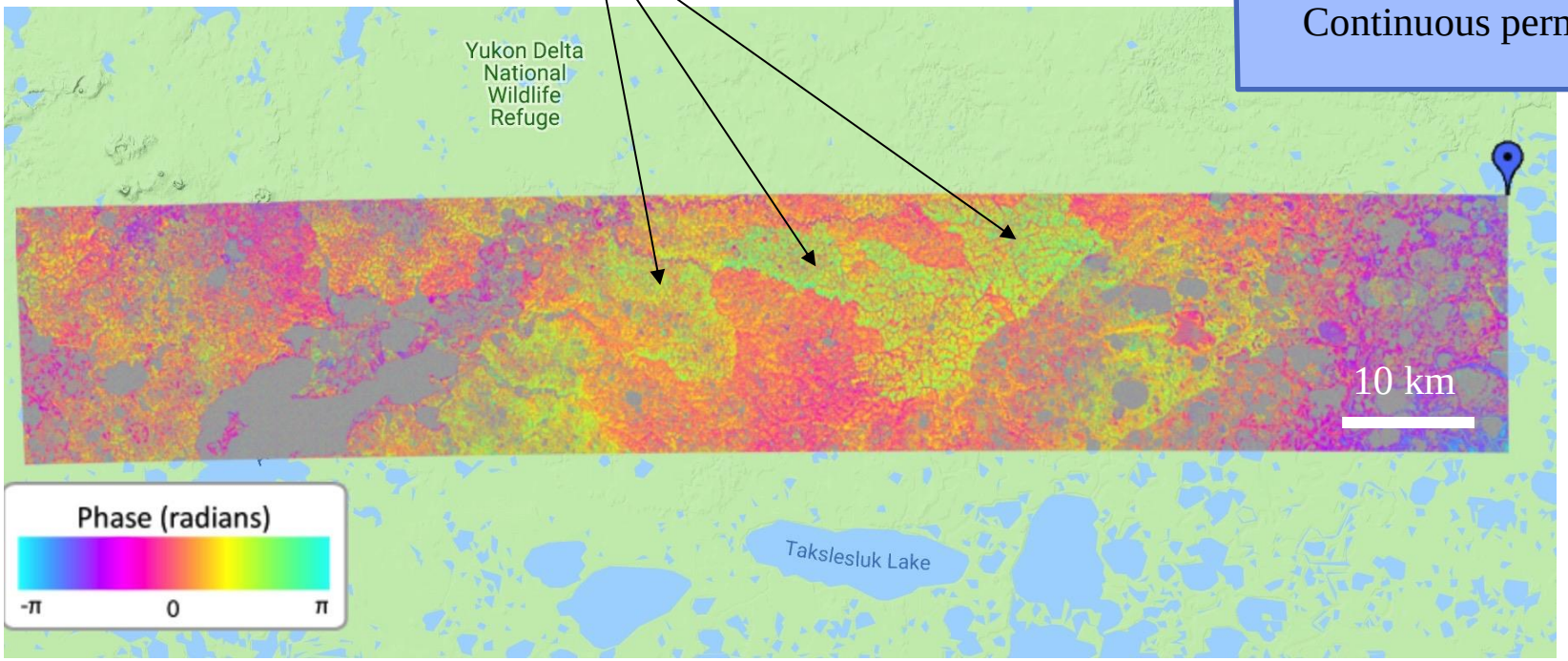


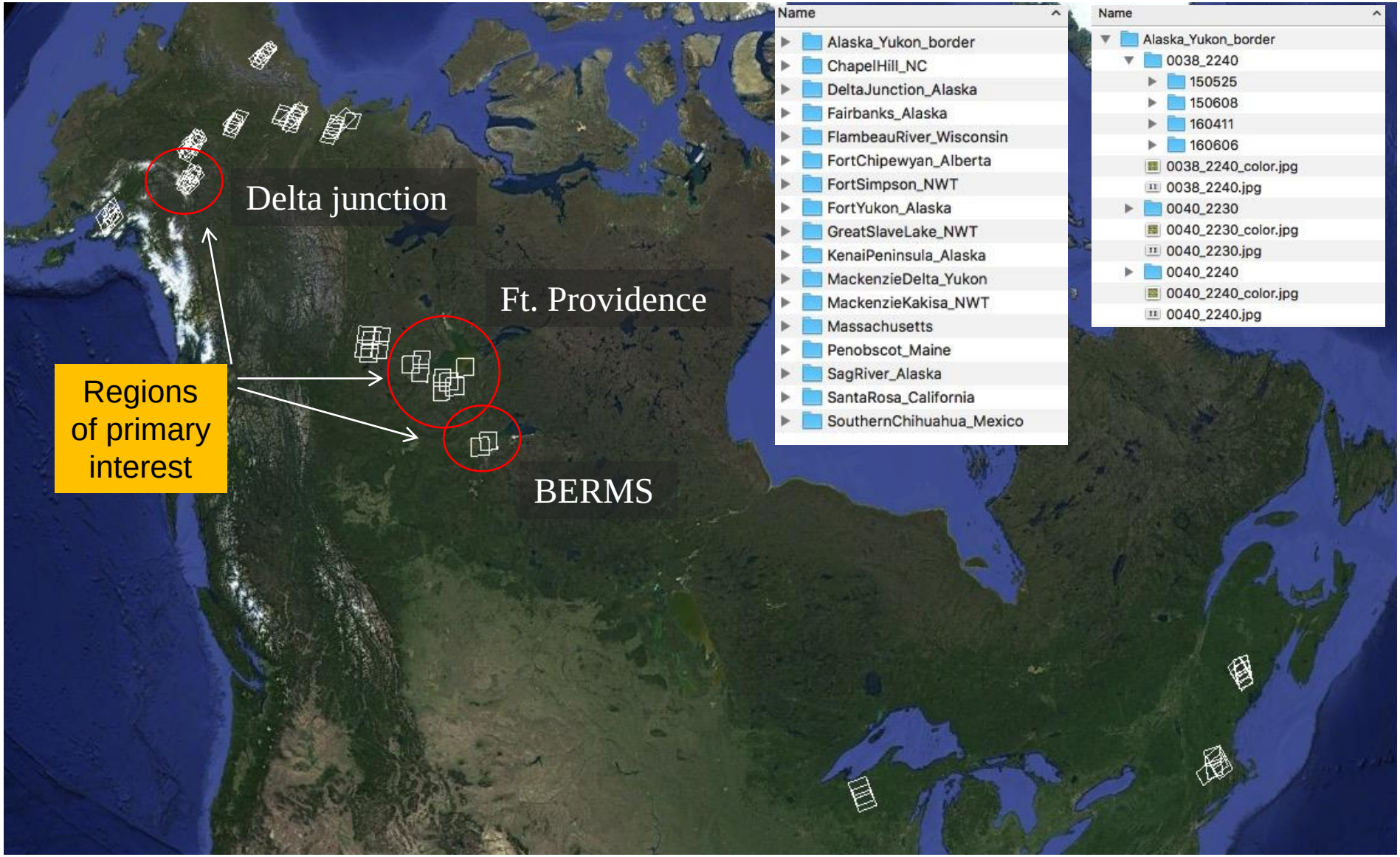


The ABoVE Landscape
Changing Permafrost Dynamics

UAVSAR Repeat-pass Interferometry from June & Sept 2017 indicate deformation in locations of the 2015 Yukon-Kuskokwin Delta fire (from Schaefer et al., 2018)






Delta junction
Ft. Providence
BERMS
Regions of primary interest
Name
Alaska_Yukon_border
ChapelHill_NC
DeltaJunction_Alaska
Fairbanks_Alaska
FlambeauRiver_Wisconsin
FortChipewyan_Alberta
FortSimpson_NWT
FortYukon_Alaska
GreatSlaveLake_NWT
KenaiPeninsula_Alaska
MackenzieDelta_Yukon
MackenzieKakisa_NWT
Massachusetts
Penobscot_Maine
SagRiver_Alaska
SantaRosa_California
SouthernChihuahua_Mexico
Name
Alaska_Yukon_border
0038_2240
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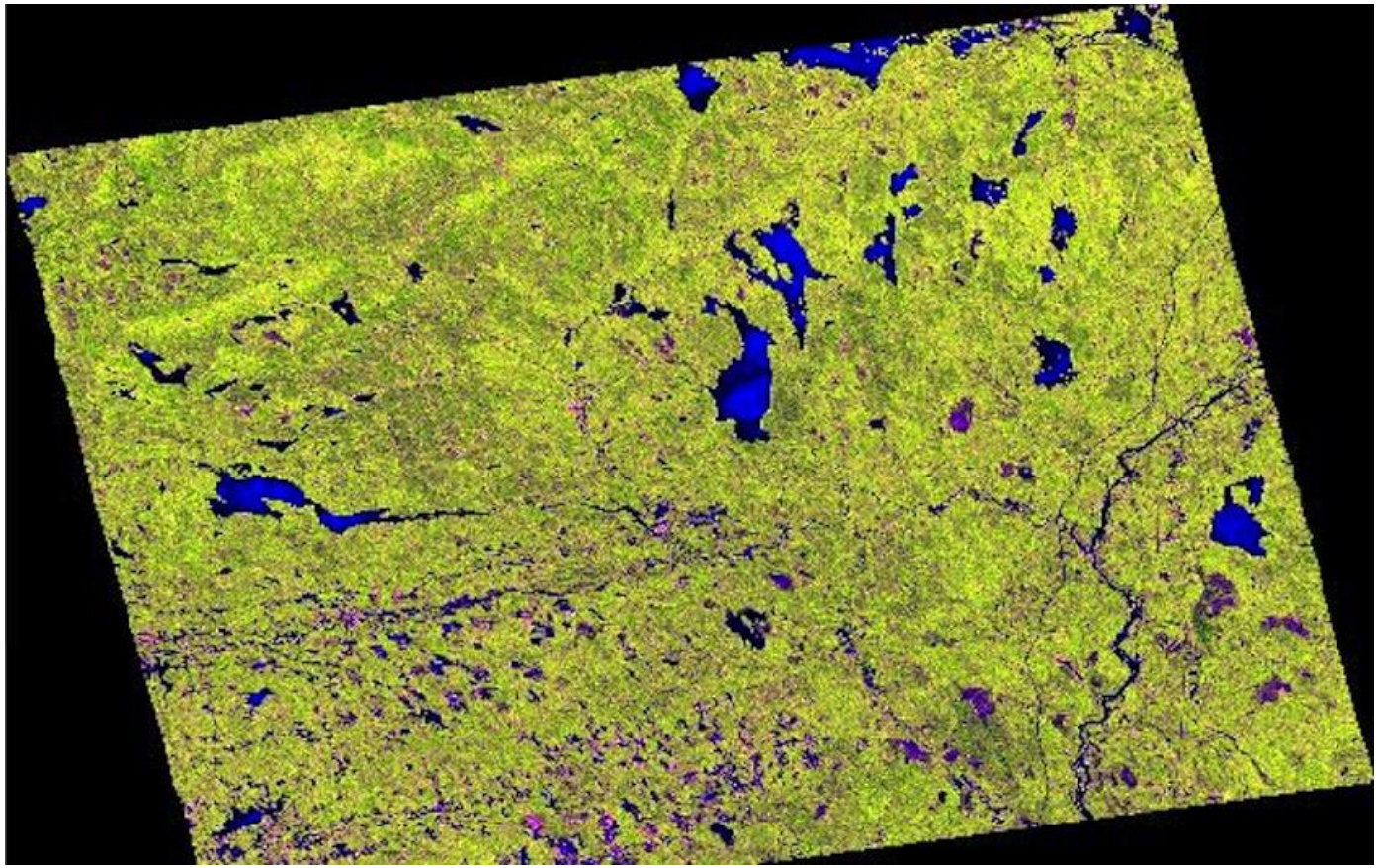
150608
160411
160606
0038_2240_color.jpg
0038_2240.jpg
0040_2230
0040_2230_color.jpg
0040_2230.jpg
0040_2240
0040_2240_color.jpg
0040_2240.jpg

Early Time Series Analysis

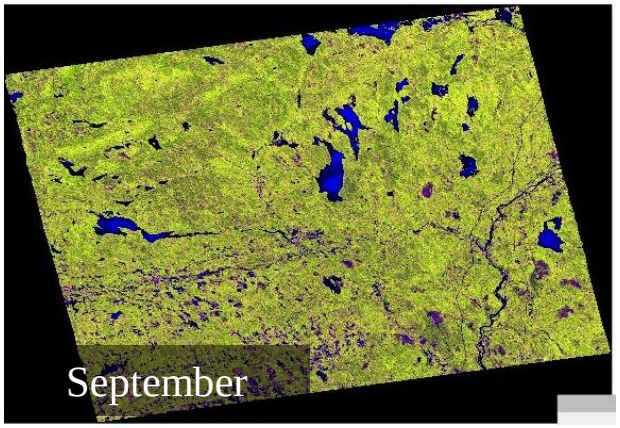
HH, HV, HH/HV

- Vegetation is green (HV – Volume scattering)
- Water is blue (HH/HV – smooth surfaces are very bright)

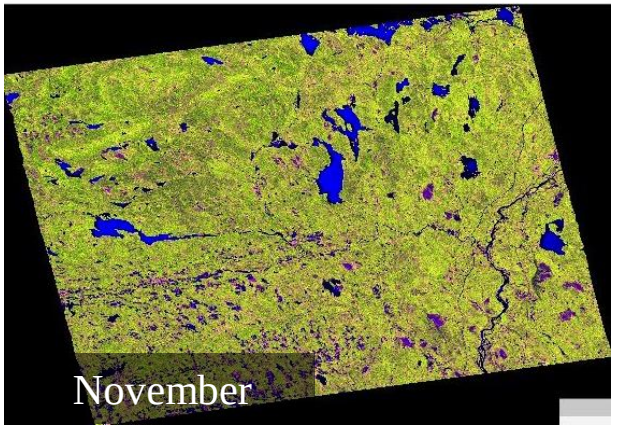


L-band Time Series

140917



141126



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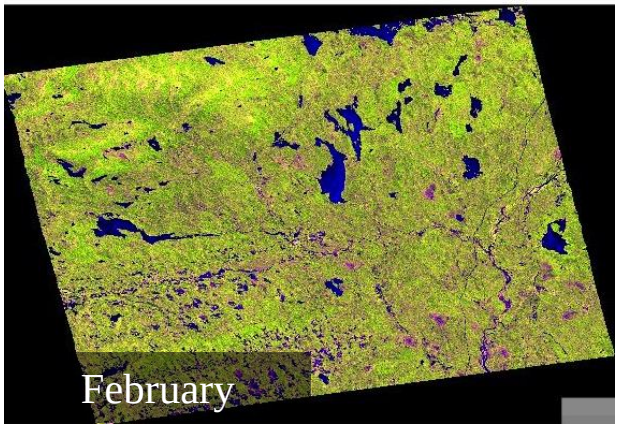

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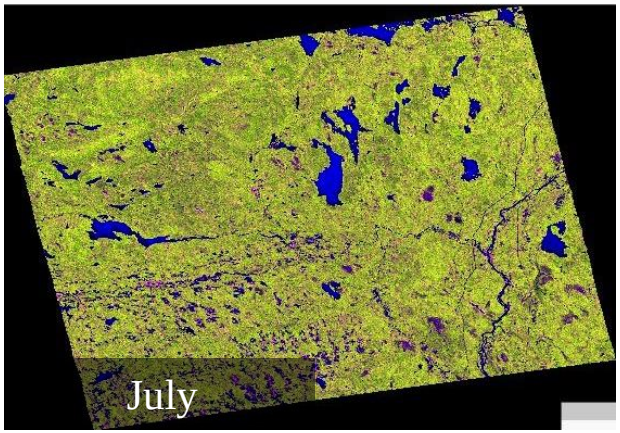

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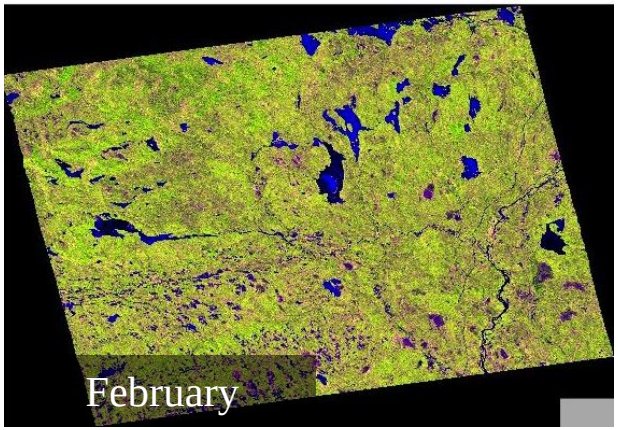
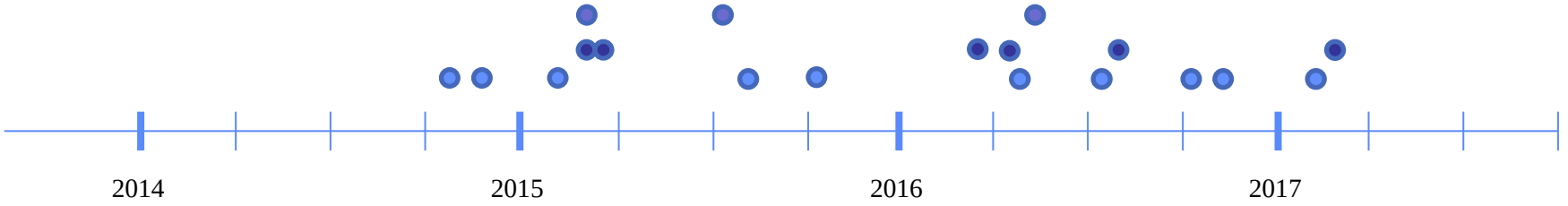
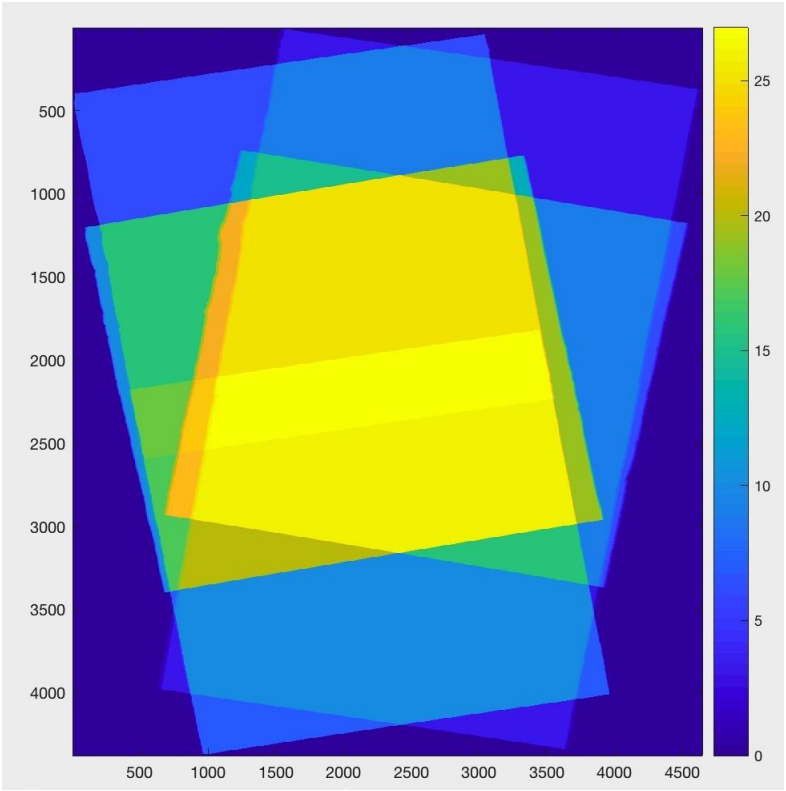
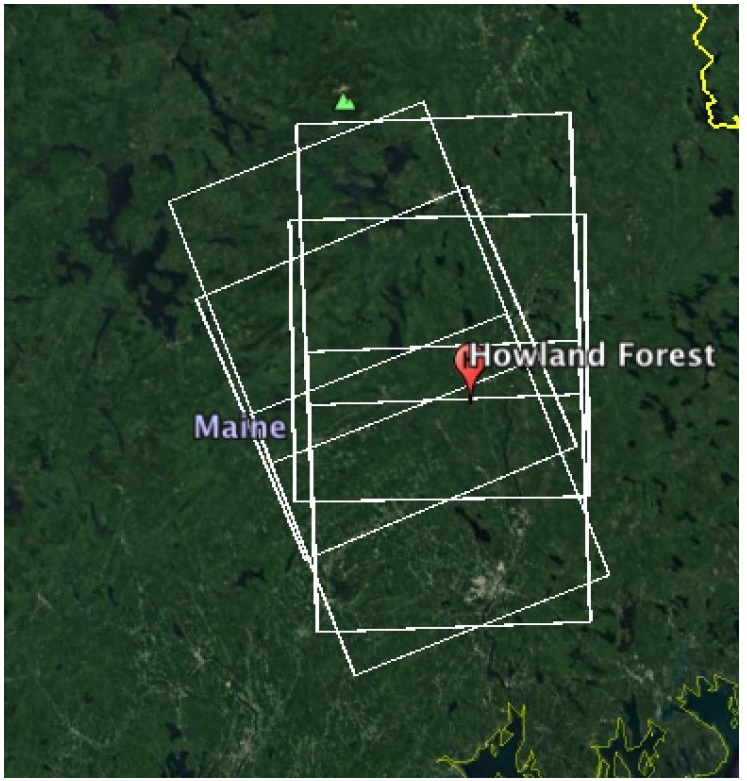


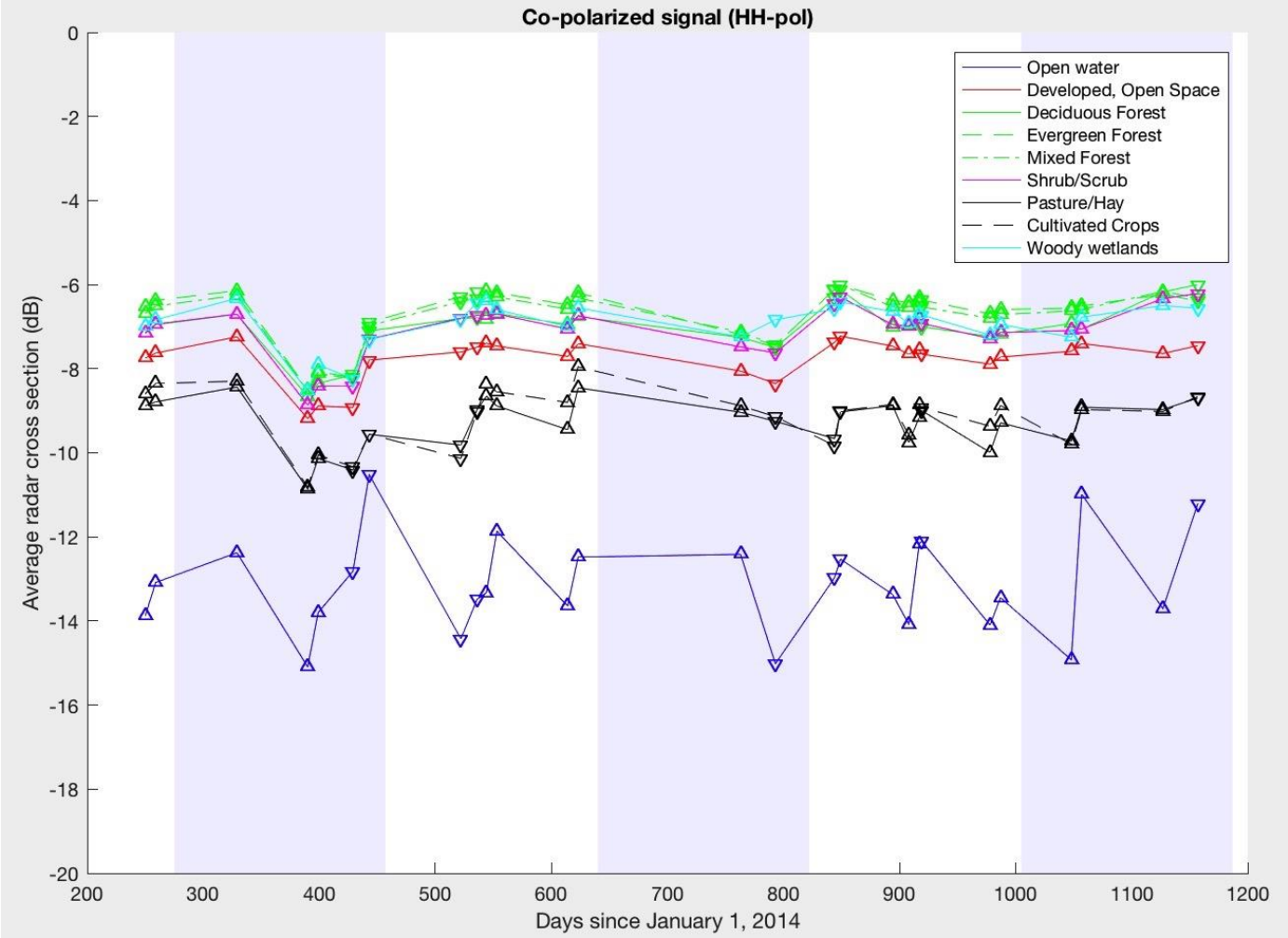
ALOS-2 Time Series







Compare HH and HV RCS for different landcovers



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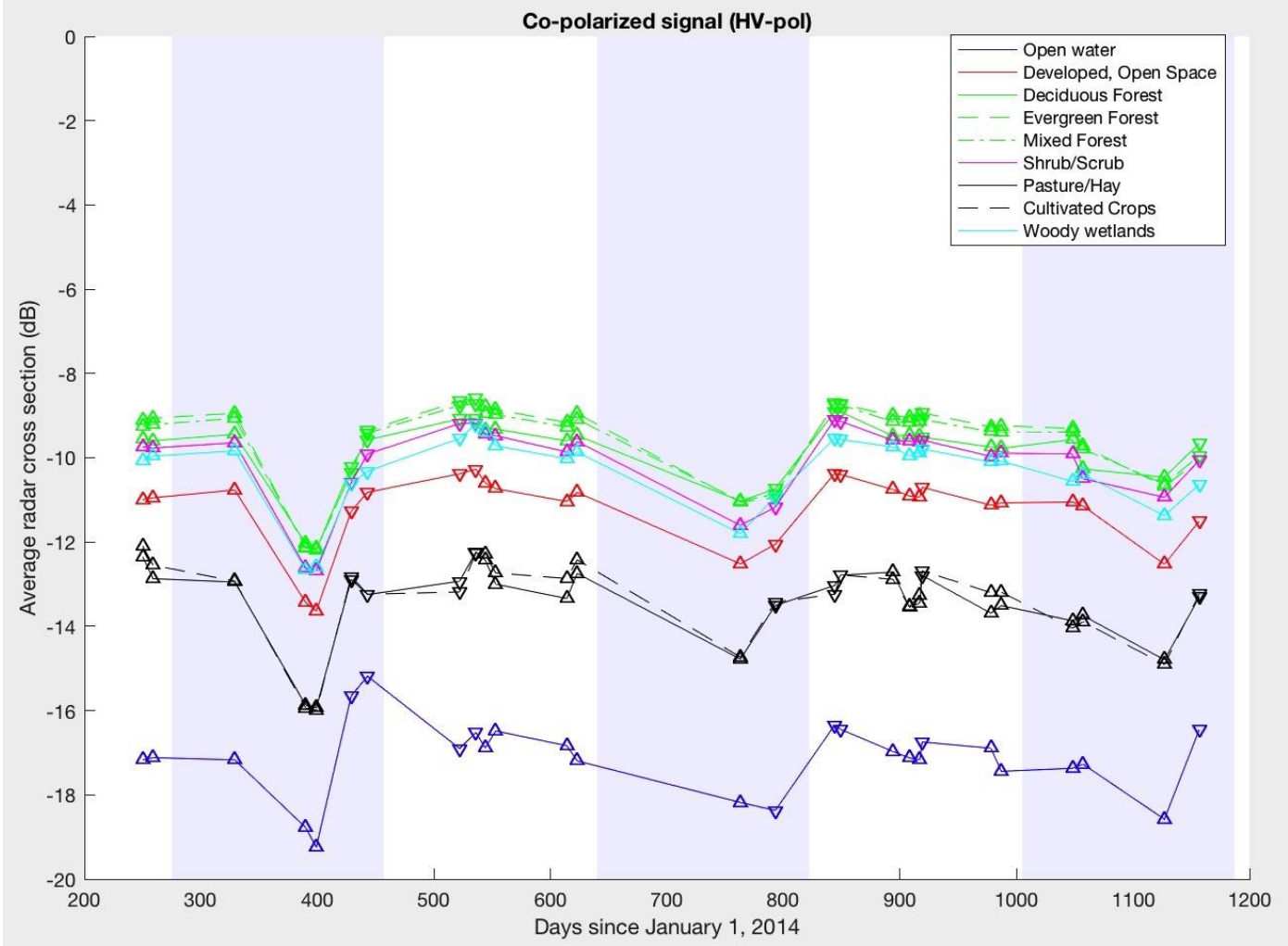

PALSAR/PALSAR-2 data access

Please list the PALSAR/PALSAR-2 data you have

(1)Requested: just finished completing PI-agreement

(2)Obtained: N/A

Screenshots from JAL