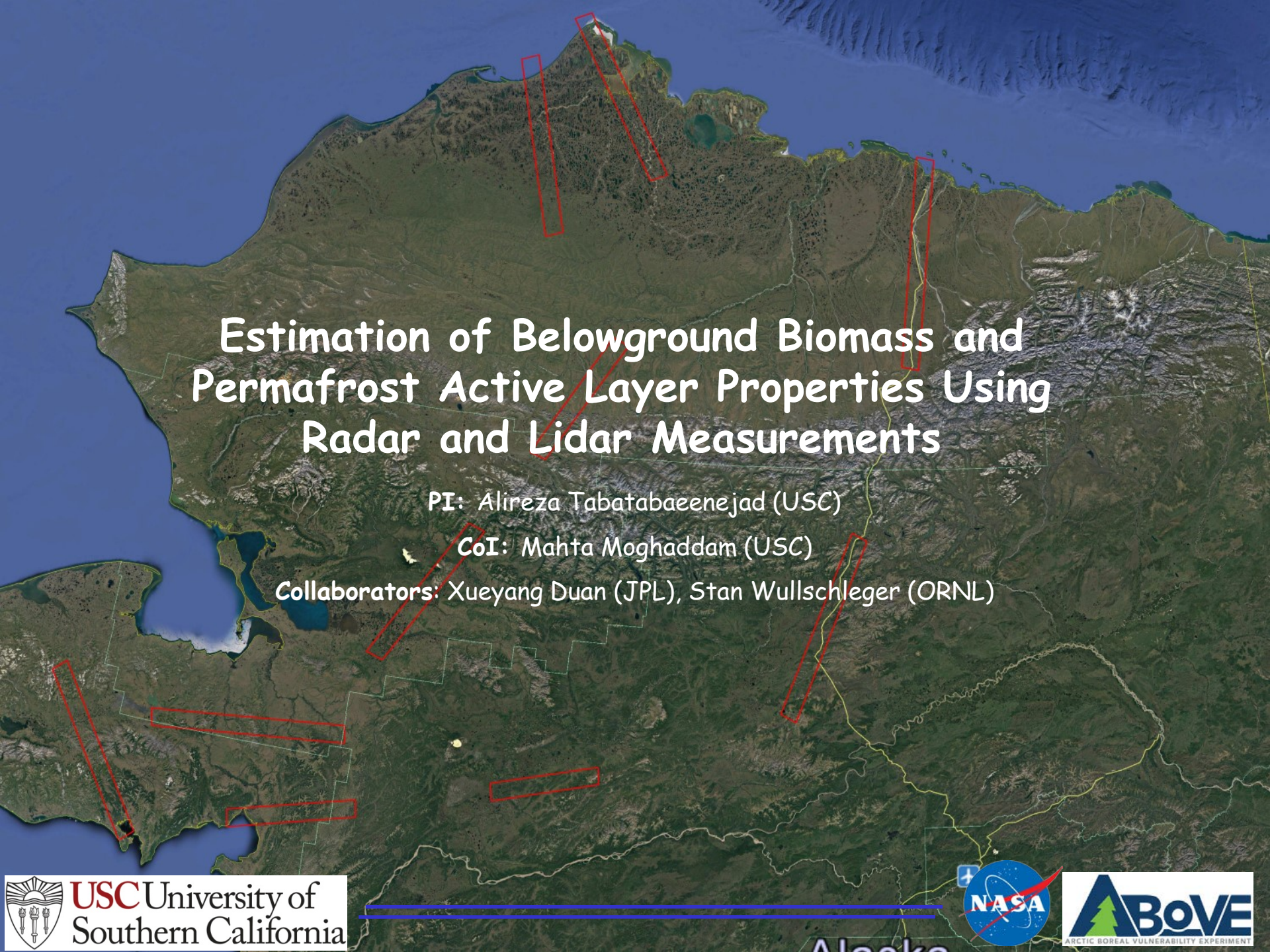

Estimation of Belowground Biomass and Permafrost Active Layer Properties Using Radar and Lidar Measurements

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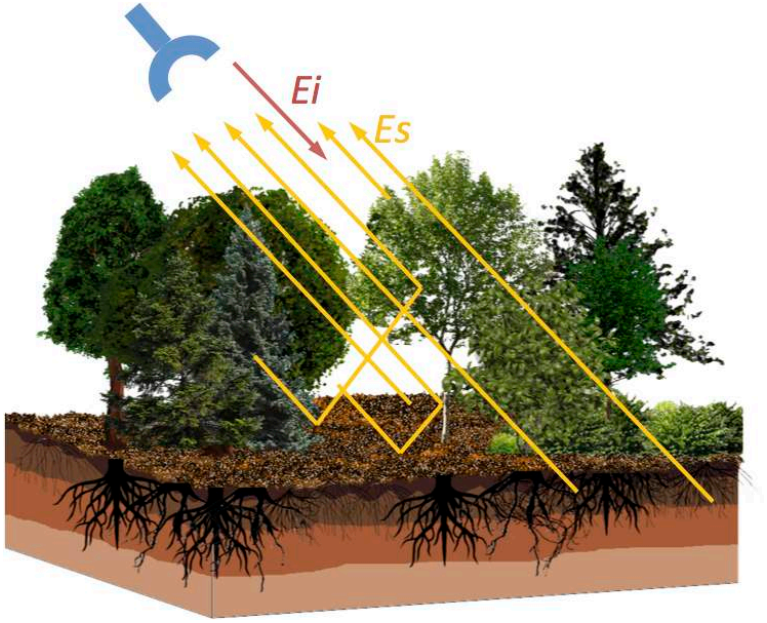
NASA

ABoVE ARCTIC BOREAL VULNERABILITY EXPERIMENT

Science Objectives

1. Develop sophisticated radar scattering models adapted for Alaska and Western Canada permafrost landscapes that account for multilayer soils with a surface organic layer and vegetation roots, and intervening tundra and taiga vegetation.
   - Use Lidar observations to parameterize above-ground vegetation structural properties.
   - Ground sampling is planned for this phase of the project.



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   - Use Lidar observations to parameterize above-ground vegetation structural properties.
   - Ground sampling is planned for this phase of the project.
2. Apply the model developed under Objective 1 to develop a regionally refined inverse algorithm to retrieve permafrost properties using dual-frequency P-band and L-band radar imagery; and
3. Use combined airborne radar remote sensing from AirMOSS and UAVSAR to retrieve and map *belowground biomass, soil moisture profile, and active layer thickness (ALT)*, and assess the retrieval error and uncertainty using ground truth observations.

Impacts on ABoVE Science

- This work directly responds to the Terrestrial Ecology Program's seeking to "strengthen the theoretical and scientific basis for measuring Earth surface properties using reflected, emitted, and scattered electromagnetic radiation."

- No other remote sensing observation is expected to provide the proposed set of products, especially the root biomass, the information which is scarce in the Arctic.

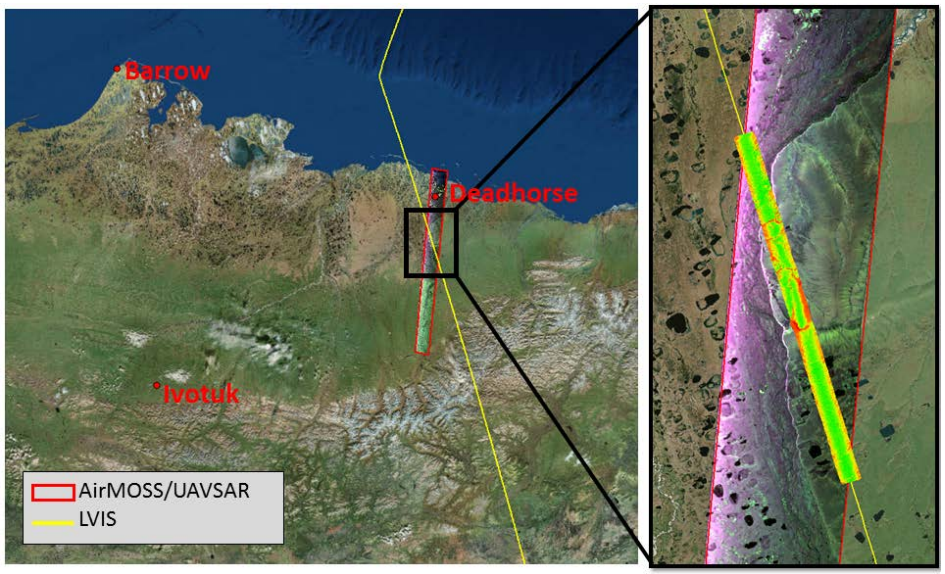
Estimation of Belowground Biomass and Permafrost Active Layer Properties Using Radar and Lidar Measurements

Sensor/Platform Summary

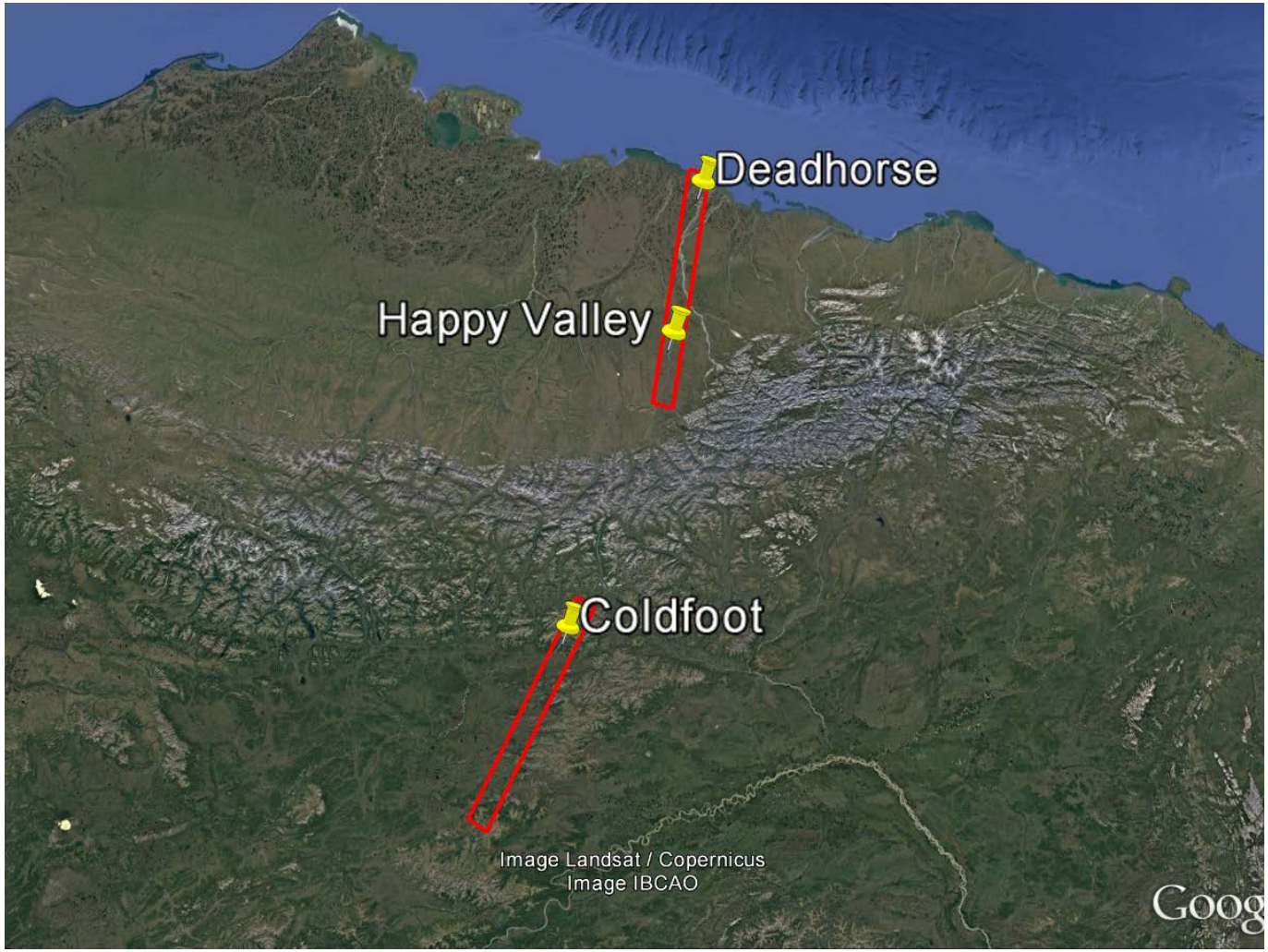
- AirMOSS
- UAVSAR
- LVIS

LVIS images and field work data will be used for

- Parametrization
- Algorithm development
- Error assessment



August Fieldwork Sites



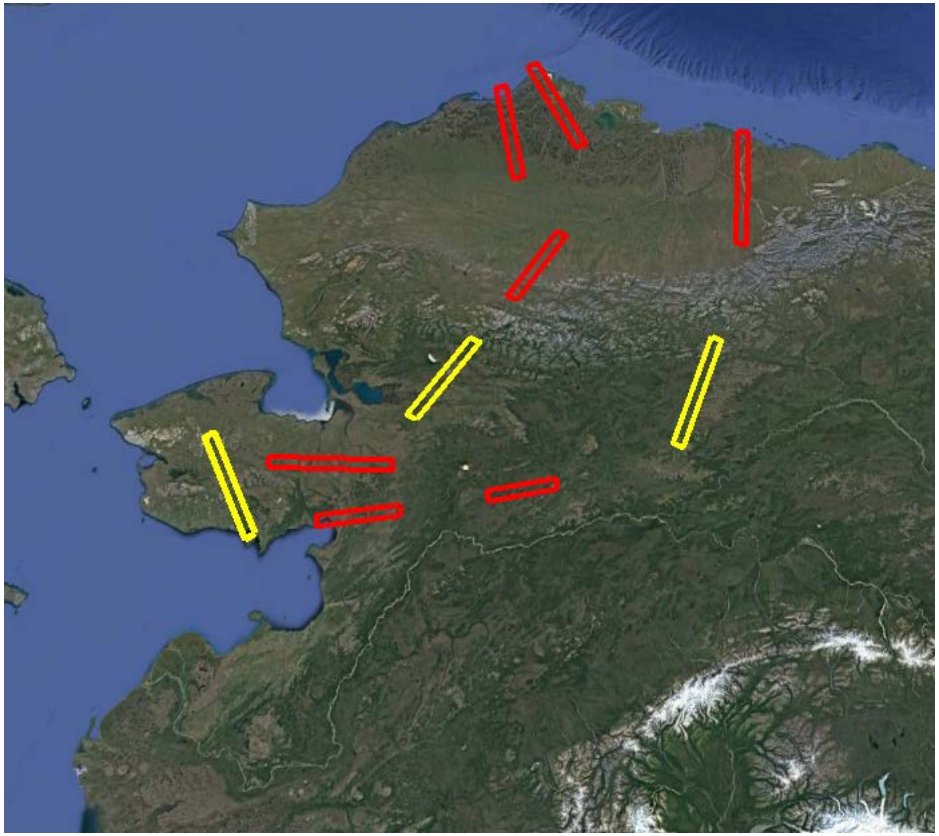
Flight Line and Timing Priorities and Needs

AirMOSS/UAVSAR deployments over the North Slope
1- Early June (beginning of thaw season)
2- Late August (maximum thaw season)
3- Early October (beginning of freeze season)

Needs for AirMOSS/UAVSAR deployments over the North Slope

- Spatially overlapping and temporally as close as possible
- Spatially covering Alaska and Canada circuits as proposed in airborne whitepaper with as much overlaps as possible with the current IDS AirMOSS/UAVSAR transects to support time-series analysis
- Spatially overlapping with LVIS flight lines to support parametrization over representative vegetation types

AirMOSS/UAVSAR/LVIS Flight Lines



- Yellow lines indicate where LVIS would ideally cover. These are the areas with significant vegetation presence for the radar model.