

Hydrology/Permafrost Breakout Group

- Potential synergies and leveraging each other's efforts:
 - Common interests among ABoVE studies in water availability, permafrost distribution & depth, snow dynamics, & freeze up/break dynamics.
 - Consistent field and lab protocols for soil moisture (volumetric & gravimetric), texture, and chemical characterization among field studies
 - Consistent characterization and analyses of hydrologic components (thaw depth, water table depth, stream condition & flow, etc.)
 - Consistent hydrologic characterizations will inform process and RS studies that will help observational studies interrogate relevant questions.
 - Utilize RS products to relate and map permafrost vulnerability to surface water inundation change and landcover/vegetation changes.

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Sharing, leveraging & synergies

Links between ecosystem services & hydrological processes:

Needs to identify and quantify:

- River flow & channel morphology change associated with permafrost thaw, erosion, and slumping.
- River navigation effects - river ice thinning & water on ice create river navigation concerns in the winter/spring. Links to increased baseflow (enhanced groundwater flow) resulting from permafrost thaw. Could be quantified by remote sensing.
- Disturbance sites (hot spots of change) identified via traditional knowledge and ecosystem surveys can be used by process studies to investigate factors that may be responsible for disturbances.

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- Field measurements & remote sensing
 - Consistent data collection techniques at common sites?
 - soil temperature, soil moisture, active layer depth, etc. – previous slide
 - High resolution lidar available to be shared
 - Identify additional shared needs among projects?

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- Primary data gaps & needs?
 - Large gaps in hydrology in general. Water is a cross-cutting variable across projects – water/soil moisture affects fauna, flora, fire severity, regional hydrology, permafrost distribution
 - Lack of emphasis on streamflow, tracking of water dynamics
 - Needs for quantifying water and materials (C, N, sediment) exports to coastal regions at multiple scales (potential synergies with Arctic-COLORS / ecosystem modeling).
 - Combined flow & concentration data to determine C yields & export
 - Snow depth, SWE, snow properties, snow change influences on flora & fauna
 - Soil/permafrost ice content – strong influence on vulnerability, land surface stability, and other thaw impacts
 - CHARS has basic hydrologic data collection protocols that could be shared/extended among project sites (ex. Quantifying flow through the active layer and to lakes and river networks)

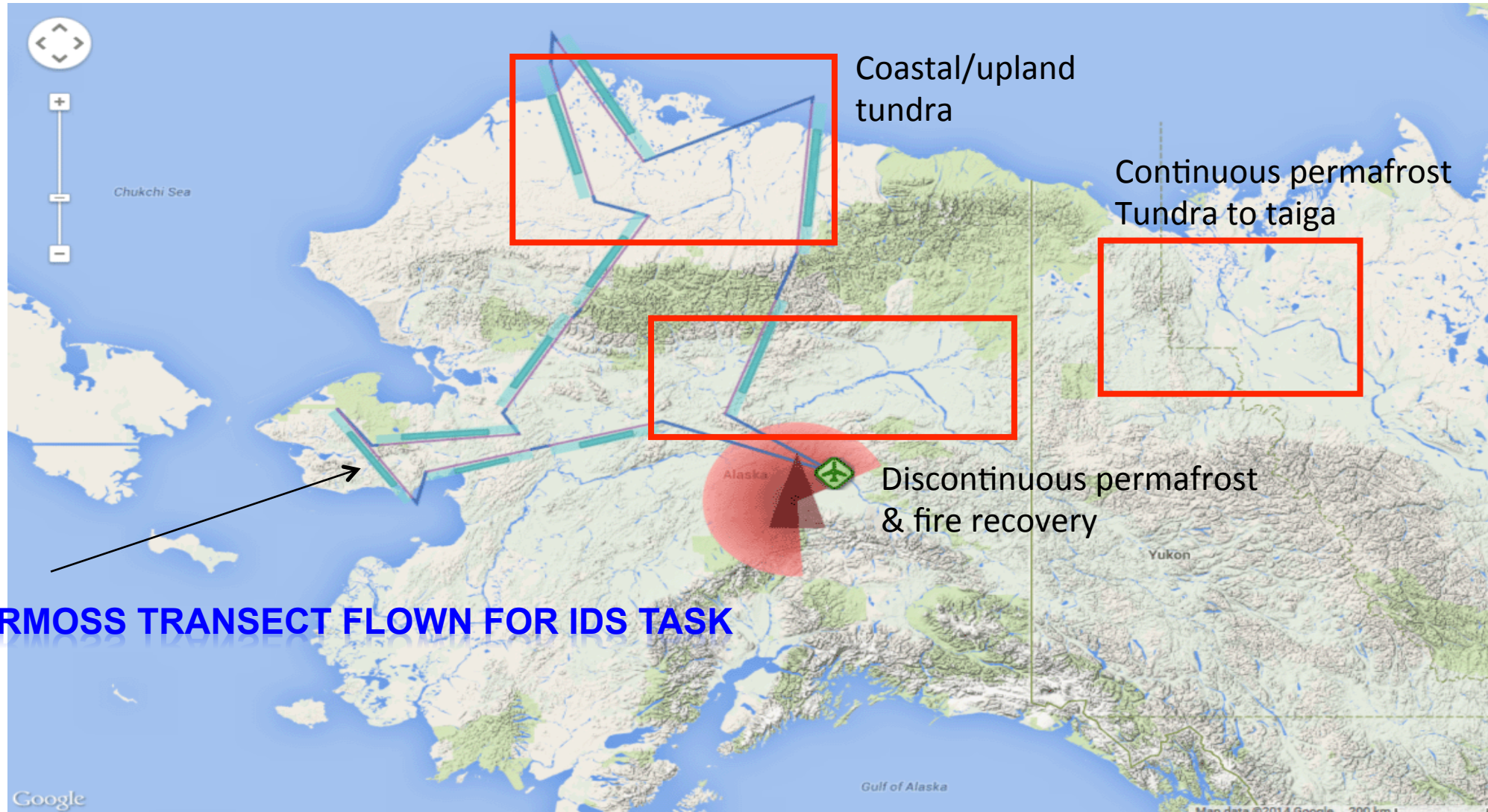
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- Airborne RS hopes & dreams (priorities)
 - Shallow (short term dream) and deeper permafrost/subsurface characterization (new RS techniques, ground and airborne geophysics, others..)
 - Cryosphere RS, snow coverage, thickness, temperature, particularly during shoulder seasons. Phenology of breakup, freeze up)
 - Streamflow using RS – emerging technologies; a potential area to explore
 - Multiwavelength lidar to determine structural & snowpack information

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- Modeling efforts
 - Framework & comparisons
 - Discussed potential ideas for methods comparisons for modeling active layer dynamics
 - Discussed importance of connecting water & aquatic C balance with ecosystem models
 - Using *in situ* measurements for calibration-validation
 - Most of these needs are being addressed by individual projects. Discussed needs for cross-site validation.

RS WISH LIST: PROPOSED COVERAGE AREA FOR P+L BAND RADAR FLIGHTS



AIRMOSS TRANSECT FLOWN FOR IDS TASK

PROPOSED SAR FLIGHTS:

Coastal to upland tundra:

- Continuous permafrost
- Gradients of active layer and water table

Discontinuous:

- Boreal fire recovery
- Taiga
- Increasing biomass effects
- Organic layer variations
- Active layer variations

Continuous tundra to taiga:

- Take advantage of ongoing detailed cal/val and hydrology studies
- Spans network of research watersheds (Trail Valley, Havicpac, etc.)

Will need to figure out timing and details of spatial extent of P band and L band SAR flights

From these data, we get: thaw layer thickness and/or depth to water table, soil moisture, vegetation properties