

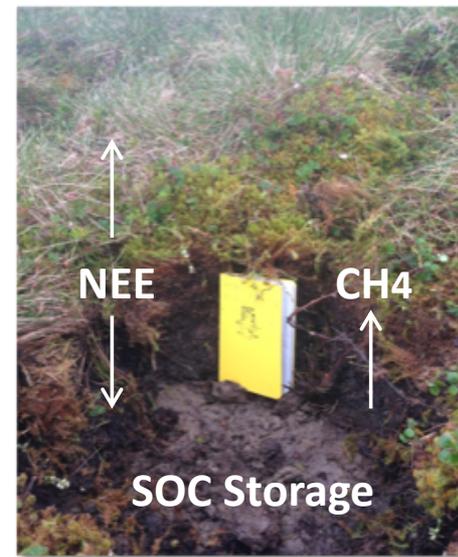
Atmospheric Concentrations & Fluxes Report

- (1) What are the **carbon storage budgets** for the ABoVE domain (e.g. soil carbon pool, above-ground carbon pool)?
- (2) What are the **carbon flux budgets** for the ABoVE domain (e.g. GPP; autotrophic above & below-ground respiration; heterotrophic respiration from soils & aquatic systems)?
- (3) How do these carbon pools and flux budgets **compare against a given baseline**? Can we detect a *trajectory of change* given noise in background? **What should our reference baseline be**?
- (4) How do carbon pools and fluxes **change following abrupt** (e.g. fire) **or longer-term disturbance** (e.g. soil warming; Δ hydrology) ?

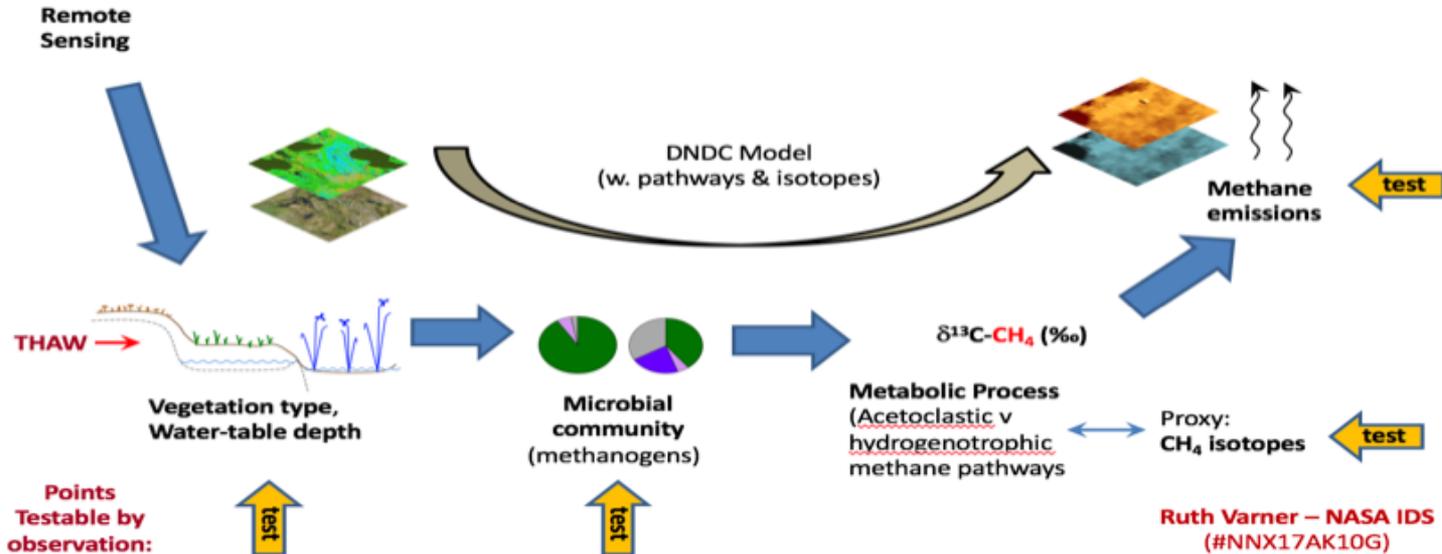
Overarching question: **can we systematically utilize various soil carbon pool and carbon flux sampling records (e.g. chamber, flux tower, tall tower, airborne) to assess and quantify carbon dynamics for high latitude ecosystems?**

Soils

- We need soil carbon pool maps that are **better stratified** by depth.
- The snapshot for carbon pools is ok, but we don't have maps of soil **carbon pool change over time** (and how it affected by disturbances).
- A need to collaborate with those doing **radiocarbon** work.
- Better understand **soil microbial** communities & emission pathways.



From Archaea to the Atmosphere – Can we remotely sense microbes?



Landscape/Atmosphere

- Do our flux tower locations adequately represent the landscape? Are we missing data for key locations? **YK Delta is a gap.**
- 6 tall towers needed across Alaska to represent domain (there are 2). **YK Delta is high priority.**
- We need data from Canadian tall tower network.
- We need better understanding of how carbon fluxes vary across terrestrial to aquatic gradient (**improve interaction** between terrestrial and aquatic communities).
- Flux collection during winter periods remains limited. **Invest in towers** capable of running through winter periods.
- Opportunity for **winter flux airborne activities** across Alaska & western Canada. Incl. deployment of instruments on commercial aircraft for repeat sampling.
- We need **multi-layer, sub-surface soil temperature measurements** to inform “zero curtain” & how seasonal and multi-year changes in soil thermal characteristics are influencing soil flux.

- Improve our understanding of **lateral flux transport**, within watershed and across river networks. Transport of C from rivers to oceans? Loss of C from coastal erosion? (this requires cross-discipline work with aquatic community)
- Use atmospheric observations to provide **mass balance constraints**; see how much loss of carbon pools are occurring; identify regions showing change and apply targeted flux and soil sampling here against “baseline”.
- Compare airborne flux measurements and up-scaled flux fields **with CH4 imaged through AVIRIS**.
- Synthesis project opportunity: data-model comparison over the CARVE time period. Use synthesis to identify gaps and provide recommendations.
- Pull in more localized inversions for Alaska to answer question: **are we really double counting CH4 from the bottom up?** Where are we double counting?
- *We need **cross-community & working group collaborations** to address questions related to carbon balance & budgets across high latitude ecosystems. Hydrology & Permafrost; Vegetation Dynamics; Fire Disturbances.*