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Landscape-related ground ice variability on the Yukon coastal plain inferred from computed tomography and remote sensing

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Why is ground ice content crucial?

Thaw dynamics
Subsidence
Carbon Release
Lateral hydrological flow

Few landscape-scale studies with vertical resolution of permafrost ground ice, but **no** vertical resolution

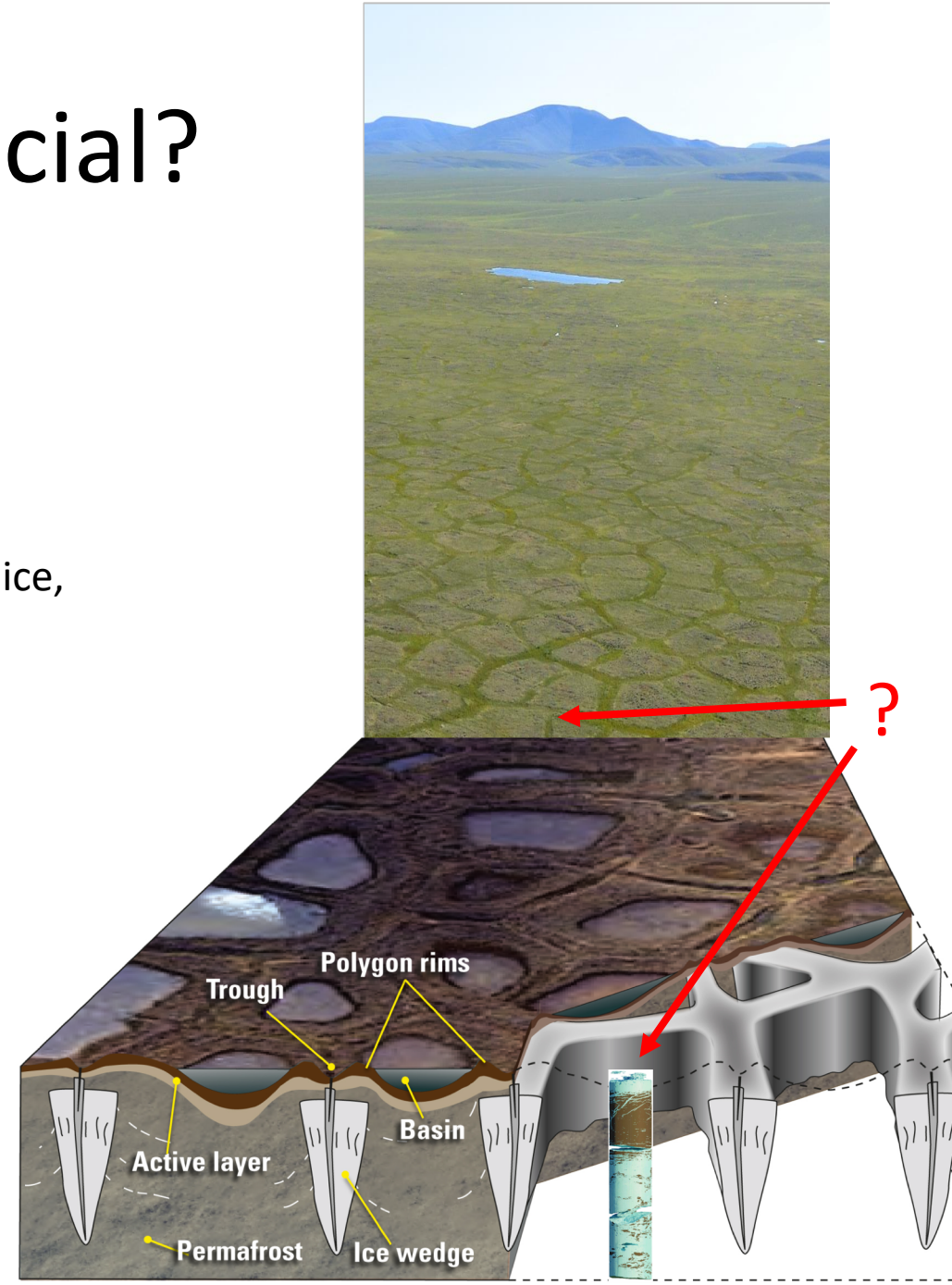
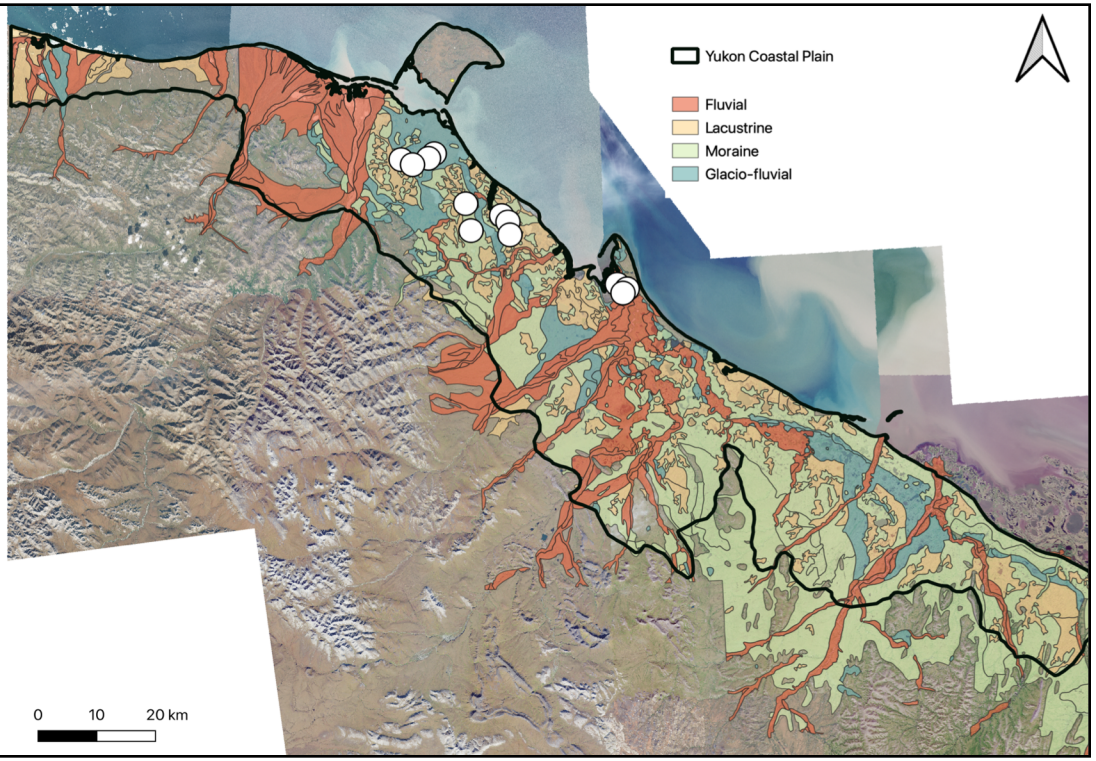


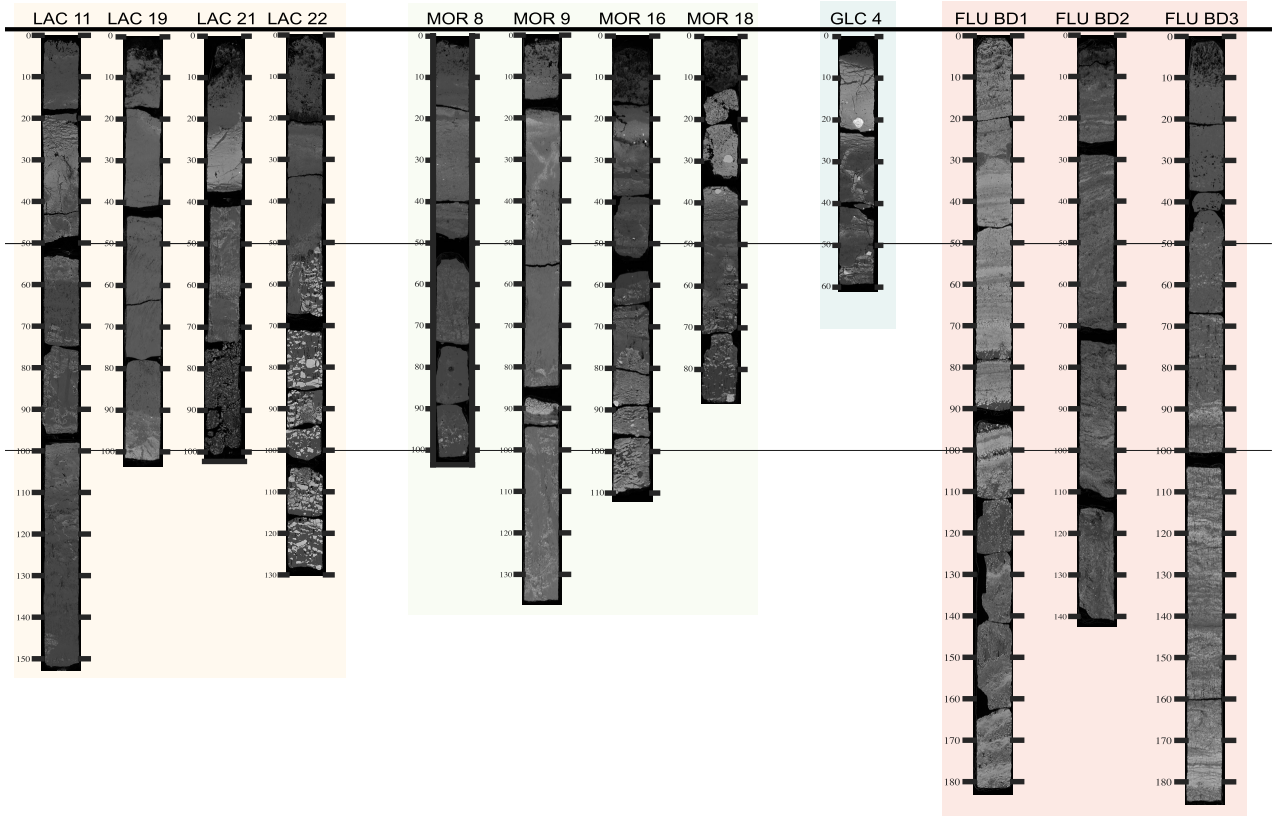
Photo by G. Tanski; R. Mitchell/Inkworks for U.S. Fish and Wildlife Service.

<u>Study aim:</u>

- Estimate volumetric ground ice content in the Yukon Coastal Plain
- Dual-approach - macroscale and microscale analysis
  - Microscale – vertical distribution of sediment, gas content in active layer and permafrost using computed tomography
  - Macroscale – Wedge-ice content in the landscape
- What is the potential soil subsidence in this area?

Yukon Coastal Plain: our field site



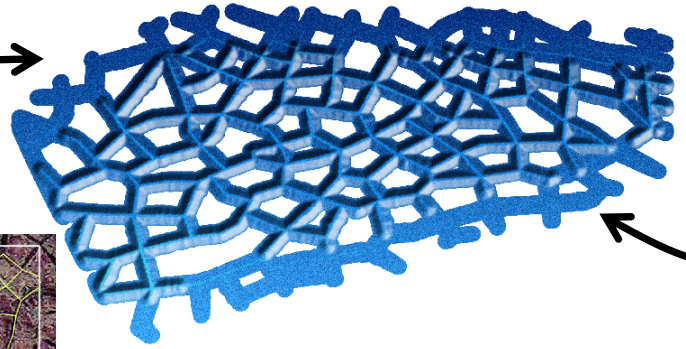


Fieldwork and sampling in Spring 2019
12 permafrost cores using SIPRE coring system
Across 4 landscape types

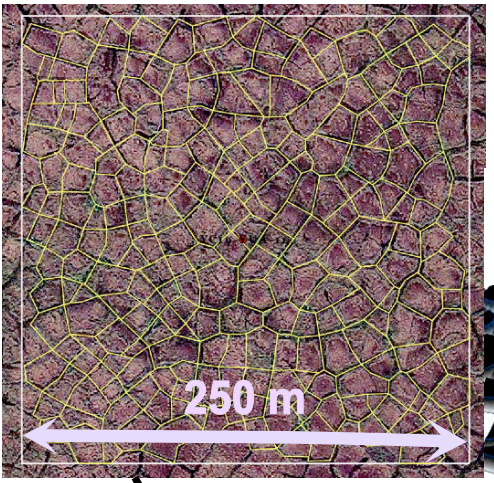
Photos by G. Tanski;

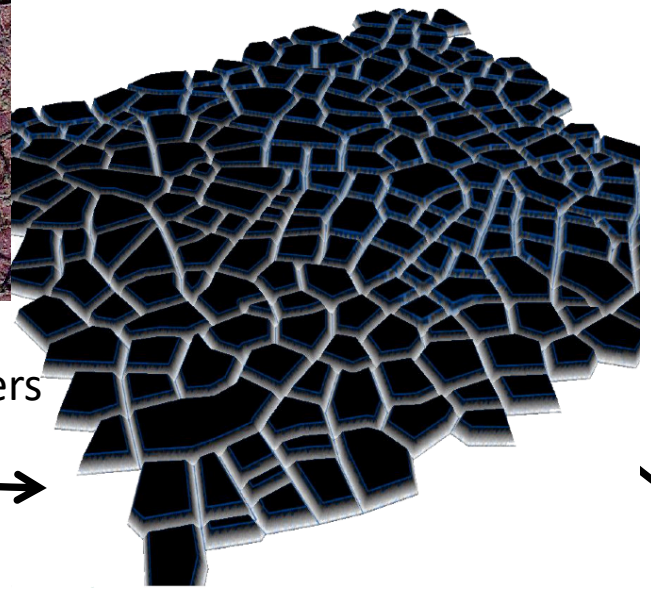
Ground ice – on a macro- and microscale

Wedge ice along polygons



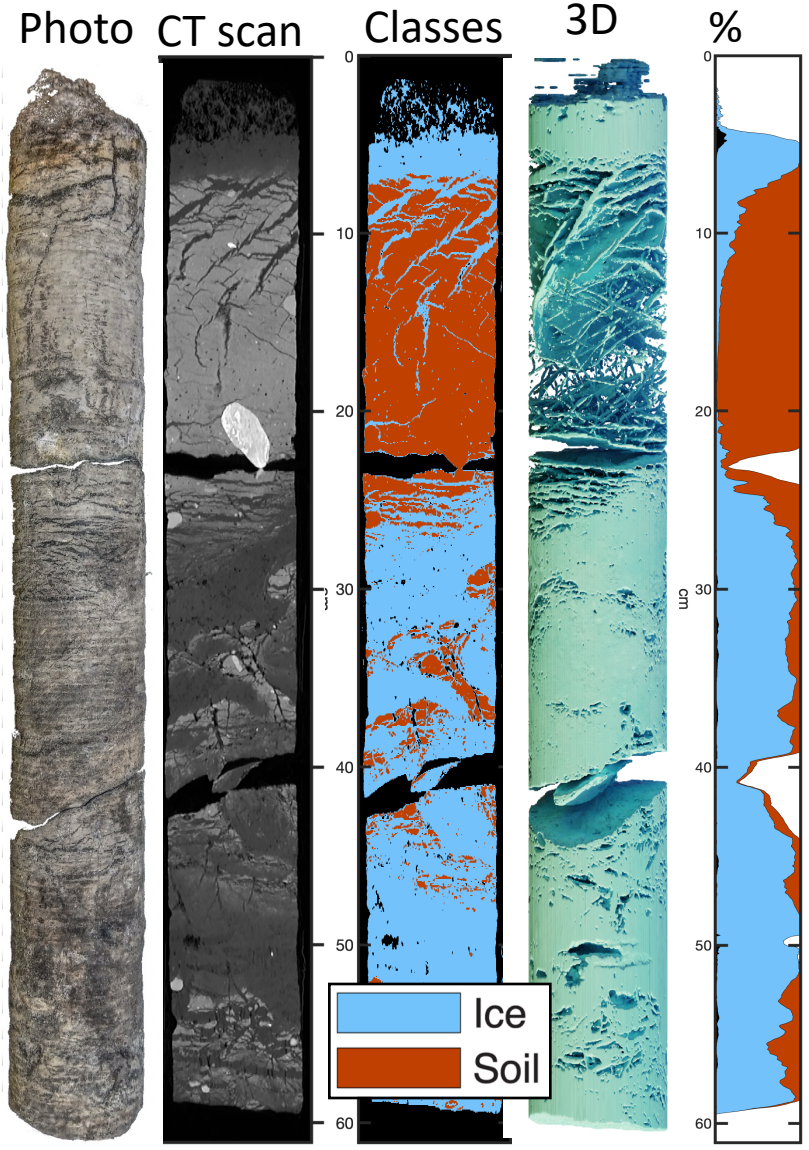
Wedge-ice ice
almost 100% ice



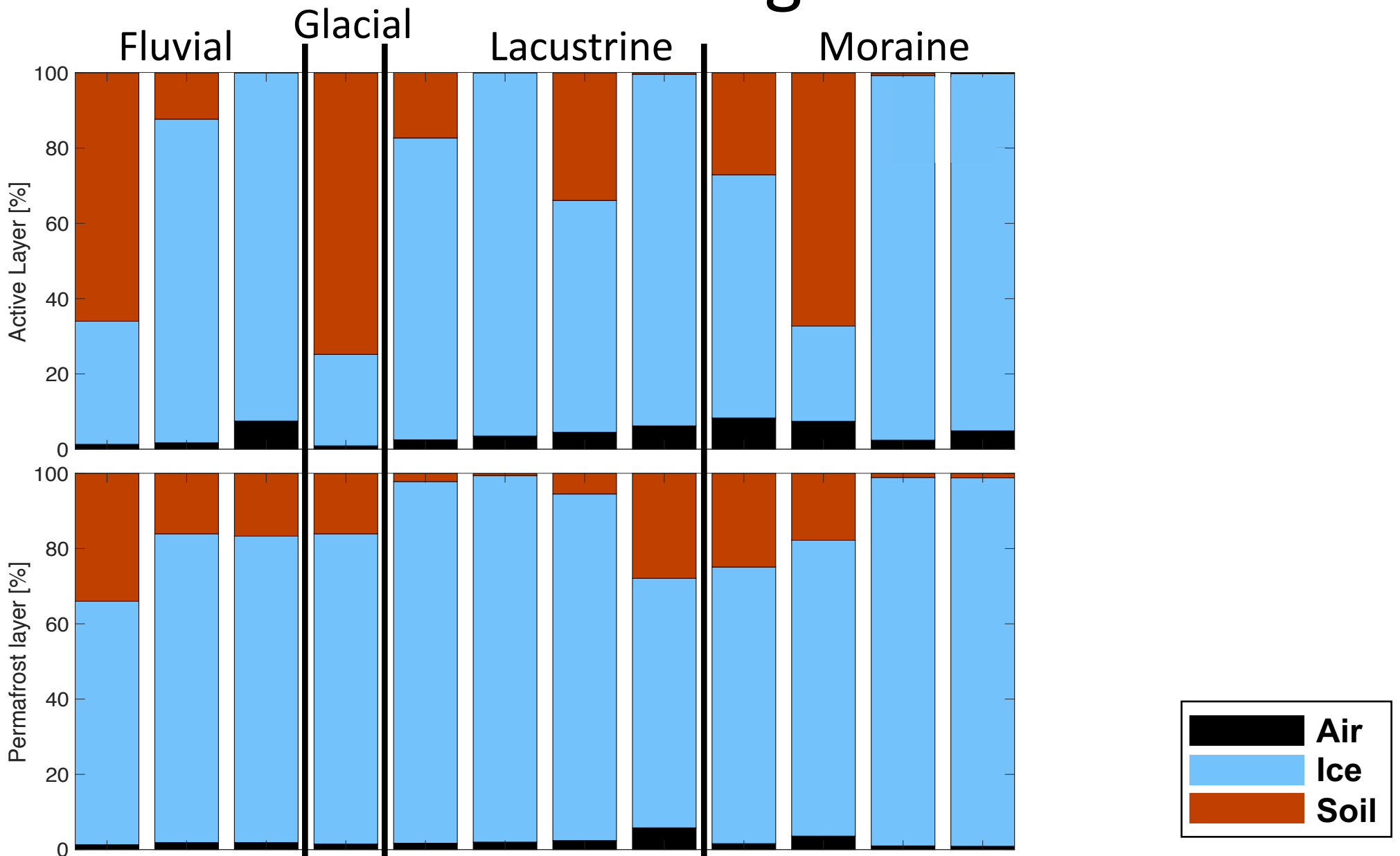


Polygon centers

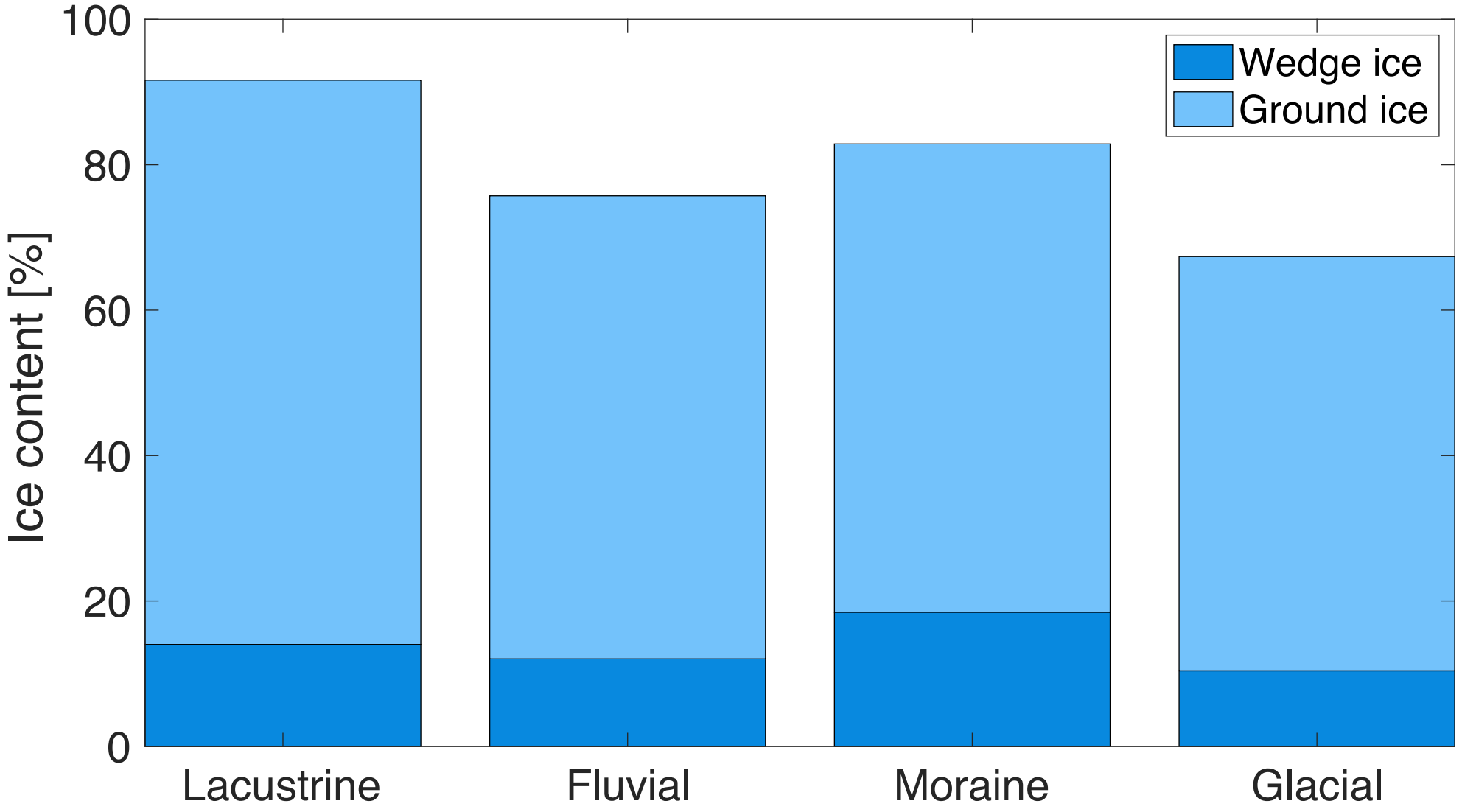
Polygon centers also
excess contain ice:
pore ice
segregated ice
Ice lenses



Ground ice content in cores – high but variable



Combining macro- and microscales



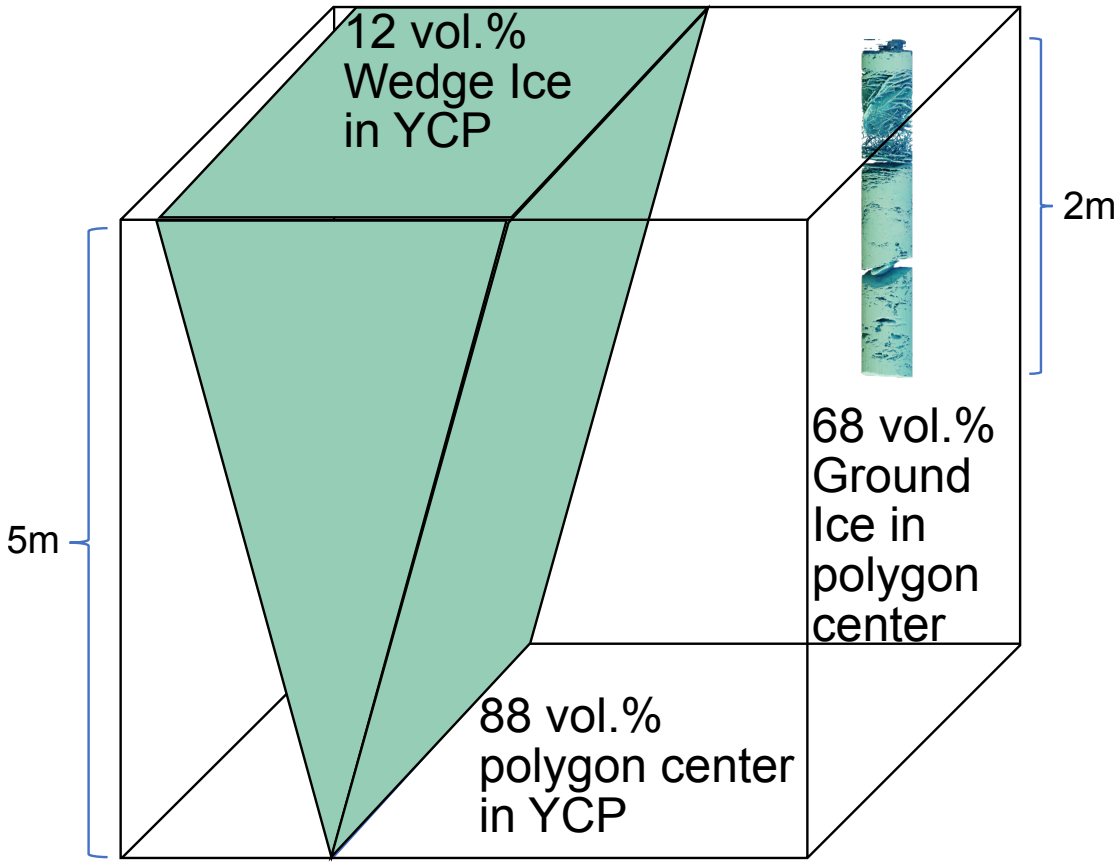
Take home messages

High average and large variability in ground ice content– compared to previous findings

High ground ice content
-> substantial changes of the landscape

Changes will differ among landscape units

CT scans highlight vertical ice distribution
-> method still requires lab validation



YCP: Yukon Coastal Plain