

Carbon and nitrogen mobilization along thermokarst-affected permafrost coasts and its degradation mechanisms before entering the near shore zone

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Permafrost coasts

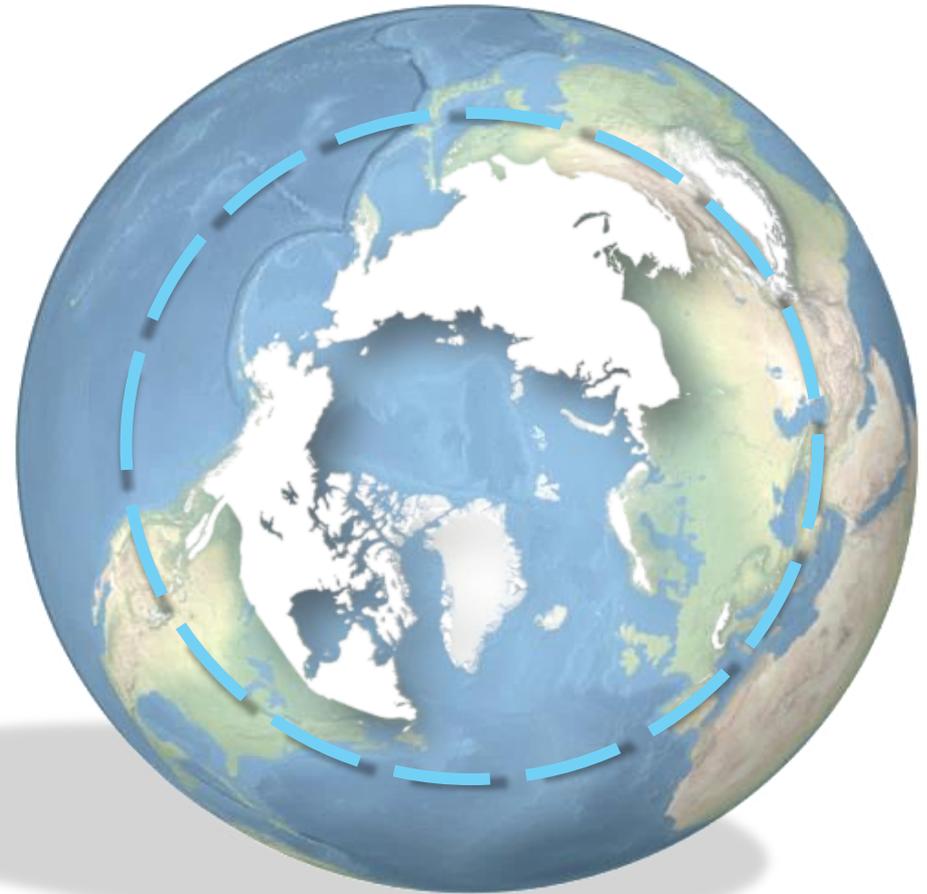
34% of global coasts

400,000km coastline

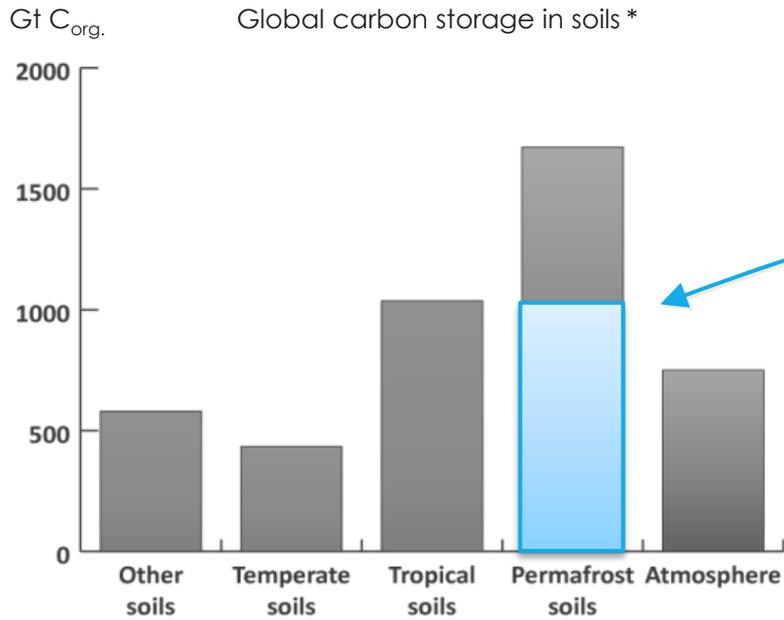
1/3 unlithified cliffs

18% ground ice

0.6m yr⁻¹ erosion



Lantuit et al. 2012

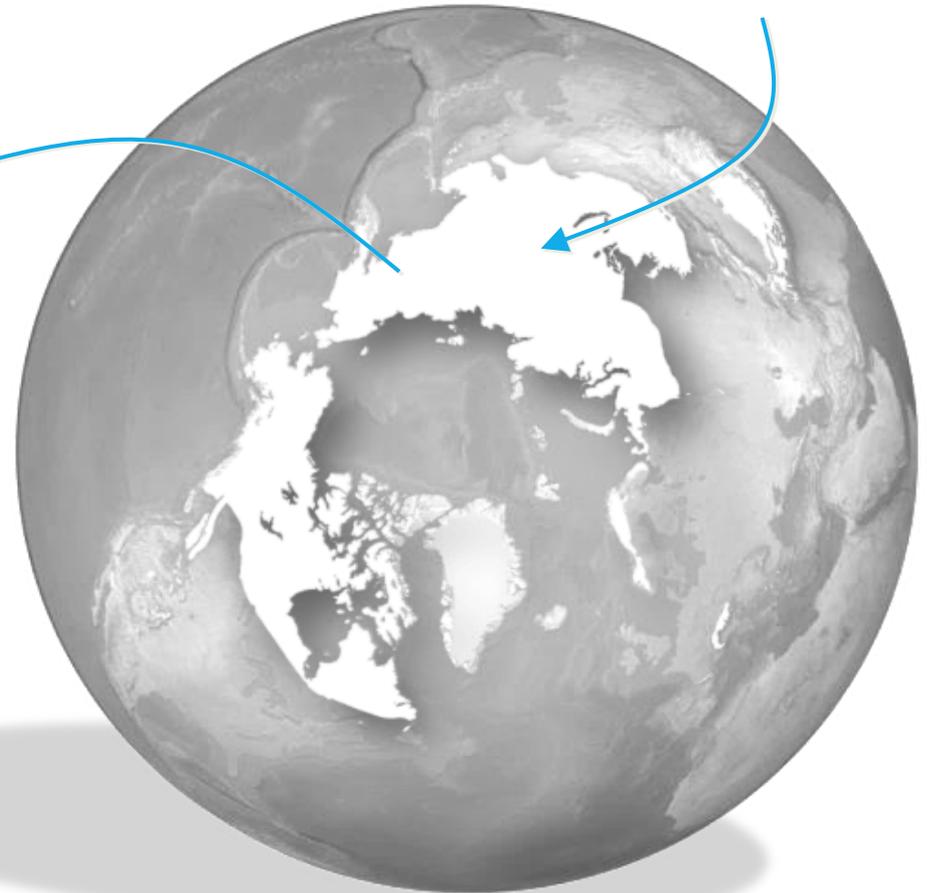


Tarnocai et al. 2009

*SOC content in 0–3 m of soils: 1035 ± 150 Pg (Hugelius et al. 2014)

66 Pg nitrogen (N) in the uppermost 3 m (Harden et al. 2012)

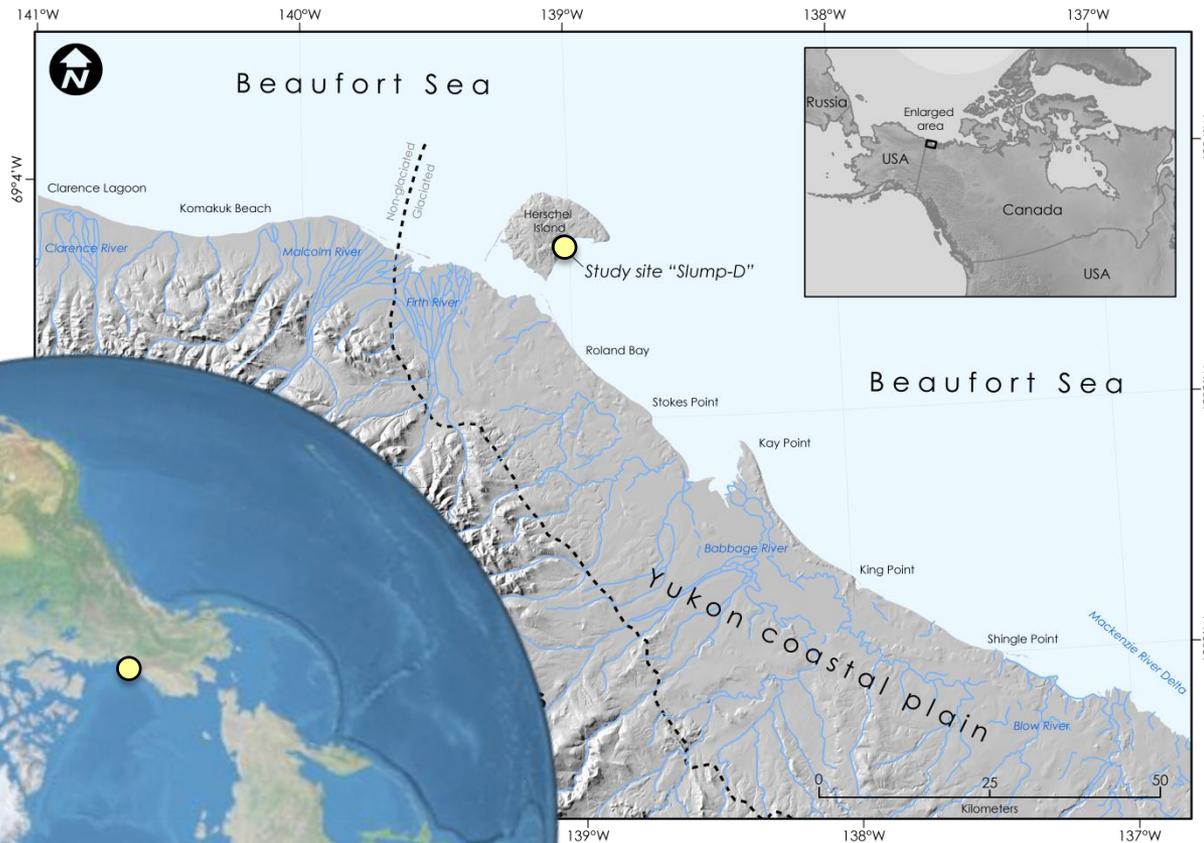
Permafrost
Carbon



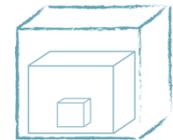
Objectives

- Quantify and compare terrestrial OM contents
- Assess transformation processes after affected by thermokarst
- Track fate of terrestrial OM in the nearshore zone

Yukon coast



Cont. permafrost
~600m depth



Ground ice
37%



Coastal erosion
0.7m yr⁻¹

Low cliffs



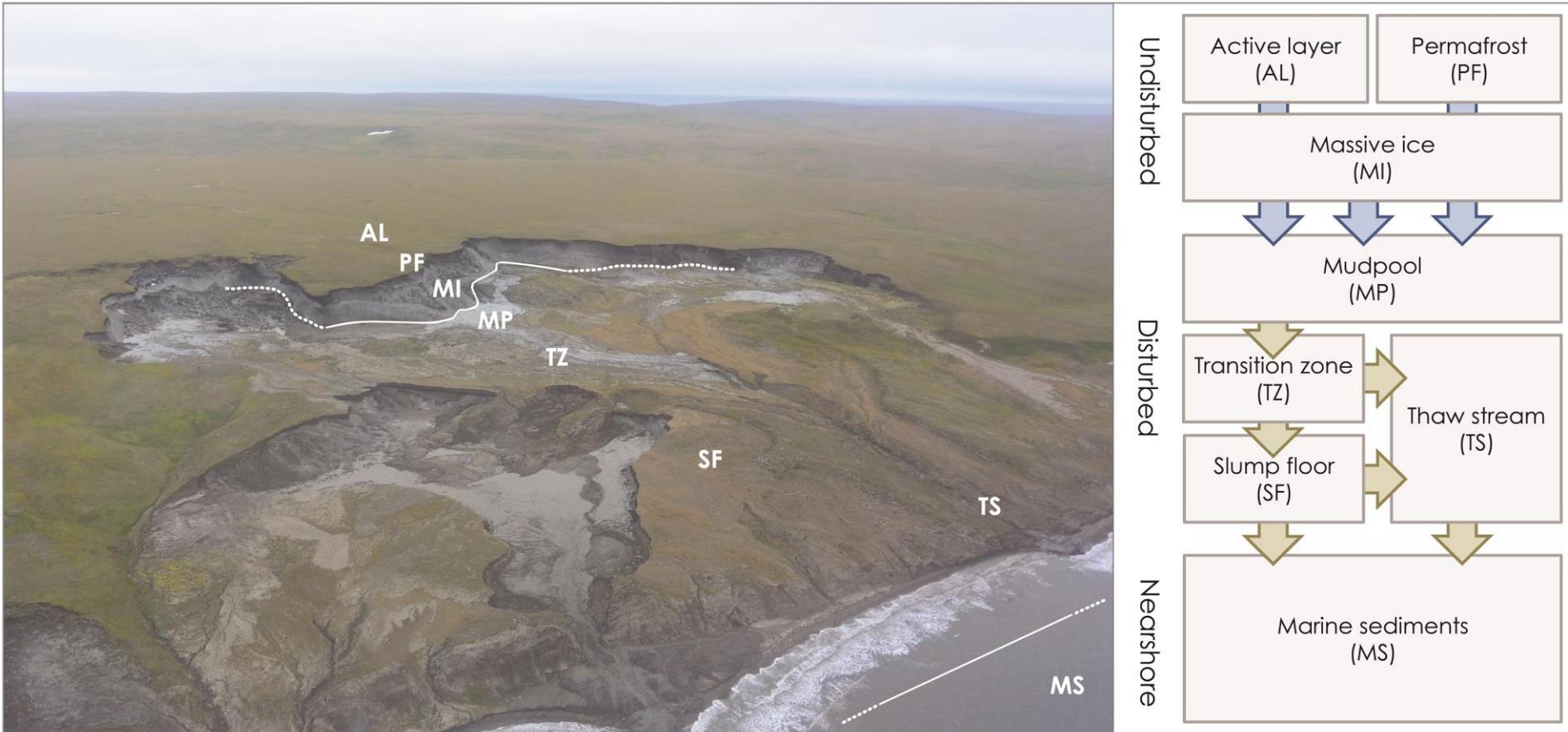
High cliffs



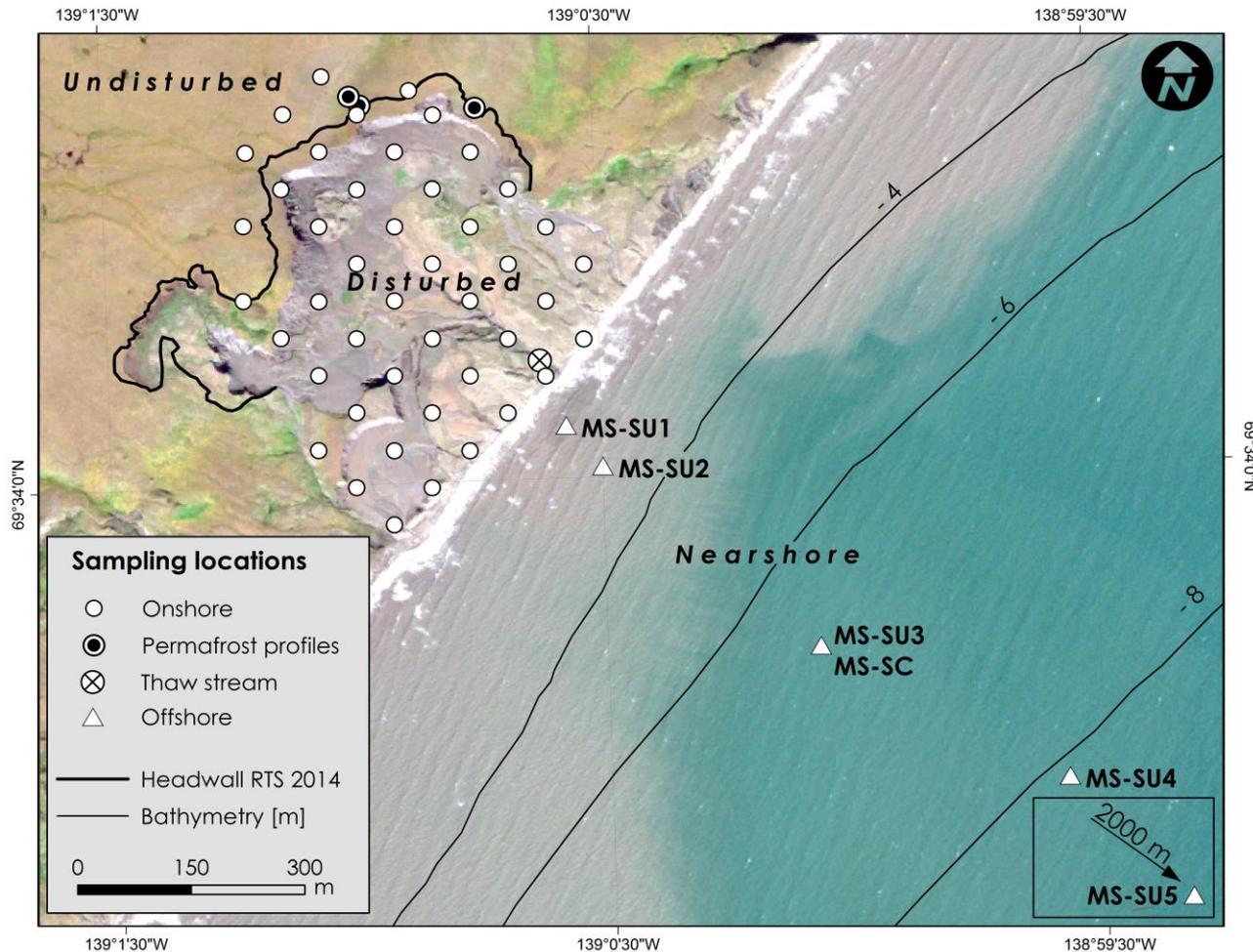
Thermokarst affected



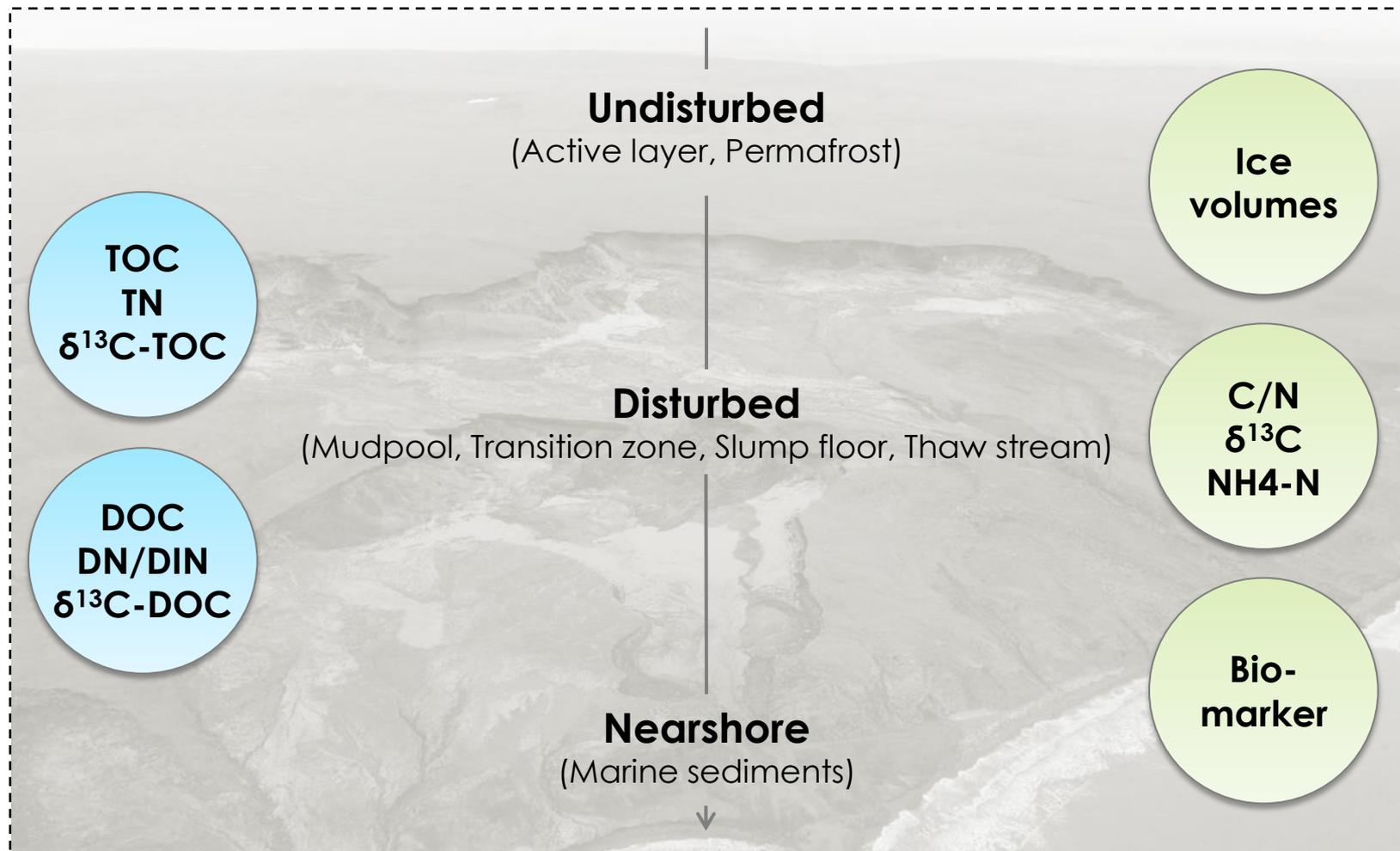
Classification



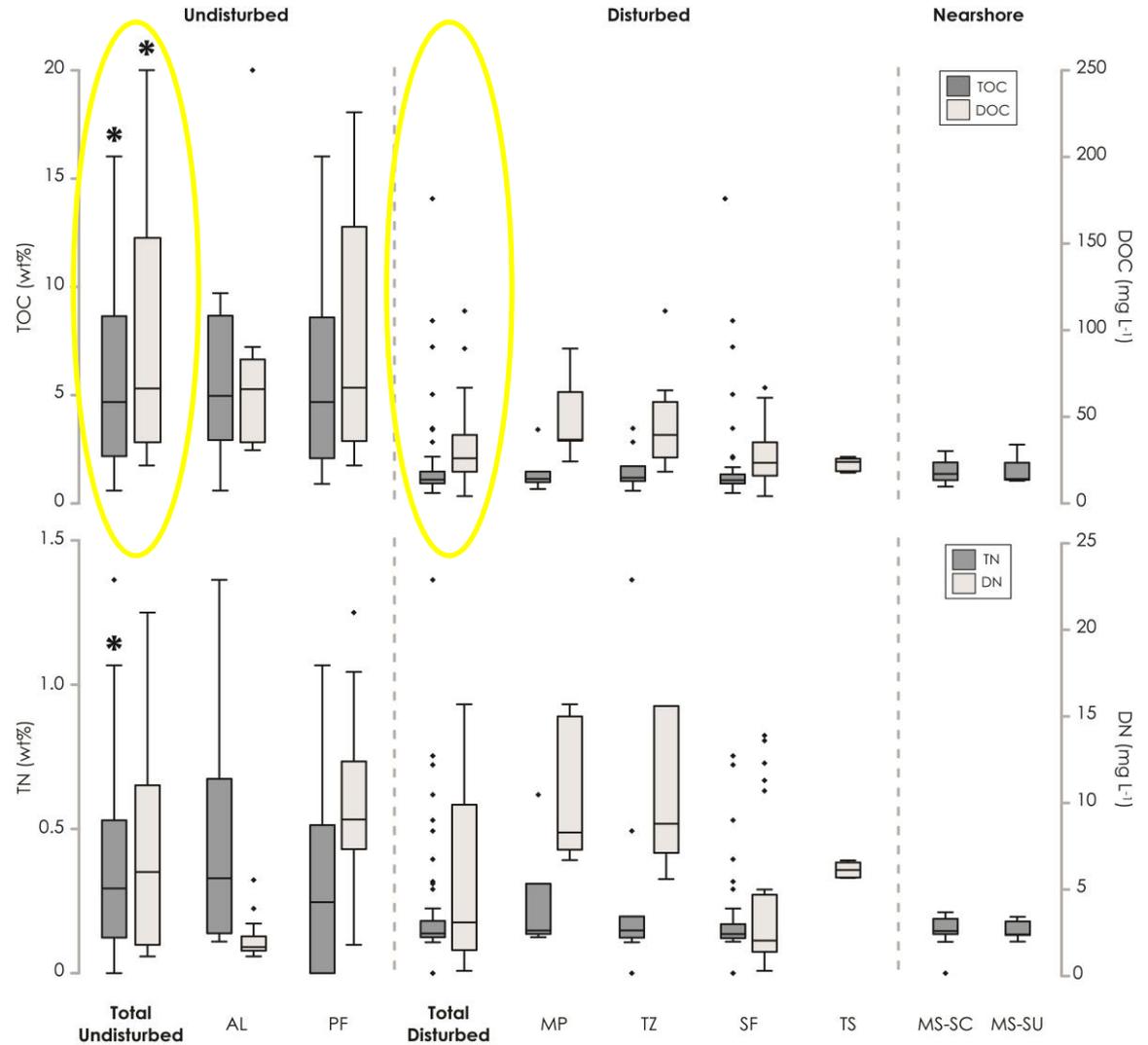
Sampling



Geochemical analysis



Significant OM decrease



Dilution



	Height	Vol.	DOC conc.
I	0.4m	3%	65.9 mg L ⁻¹
II	2.5m	14%	66.8 mg L ⁻¹
III	14.0m	83%	2.9 mg L ⁻¹

calculated

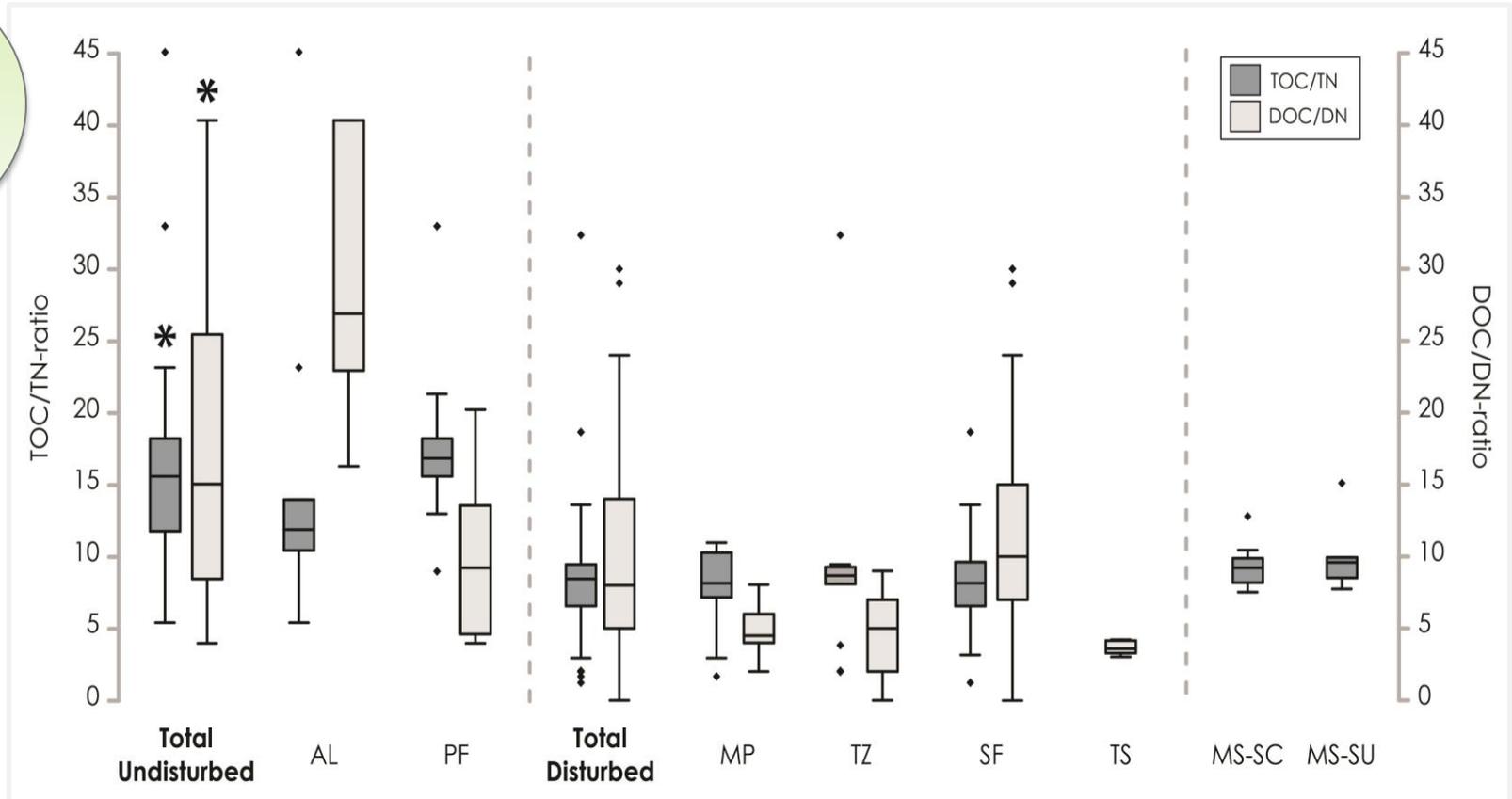
13.9 mg L⁻¹

measured

26.5 mg L⁻¹

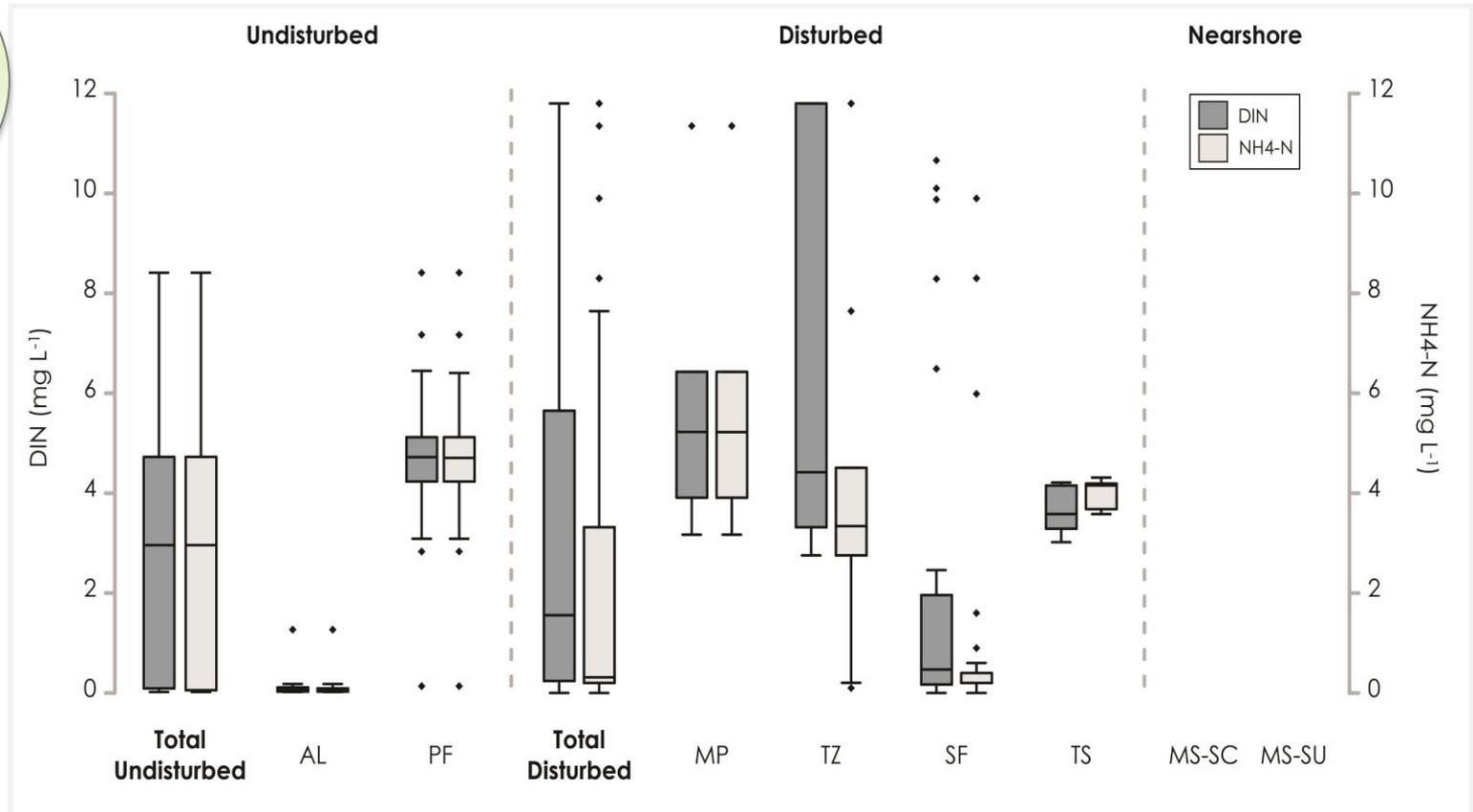
Mineralization and direct transport offland

C/N

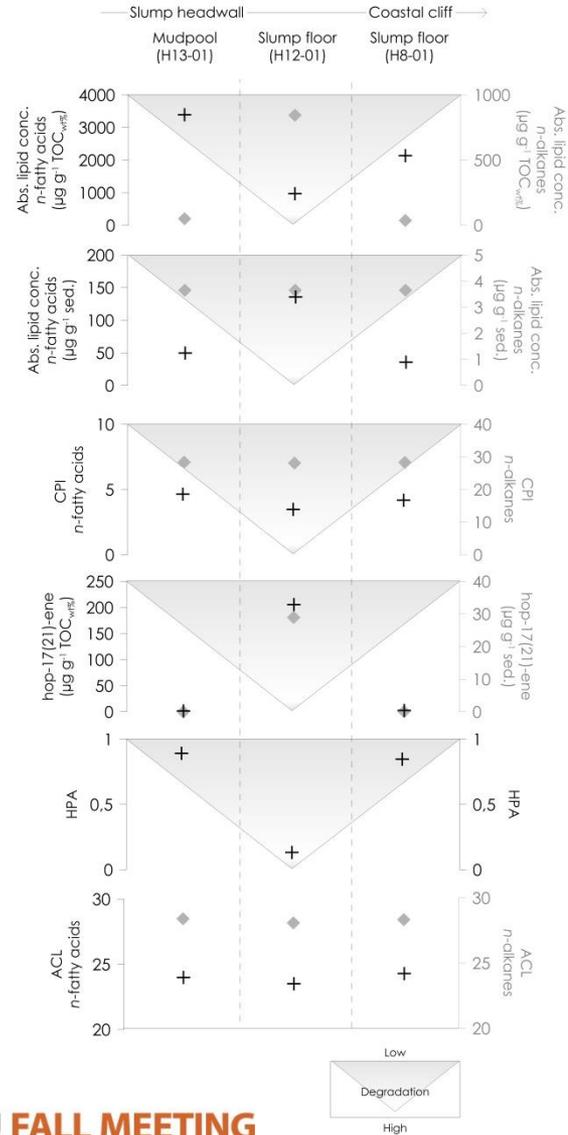


Mineralization and direct transport offland

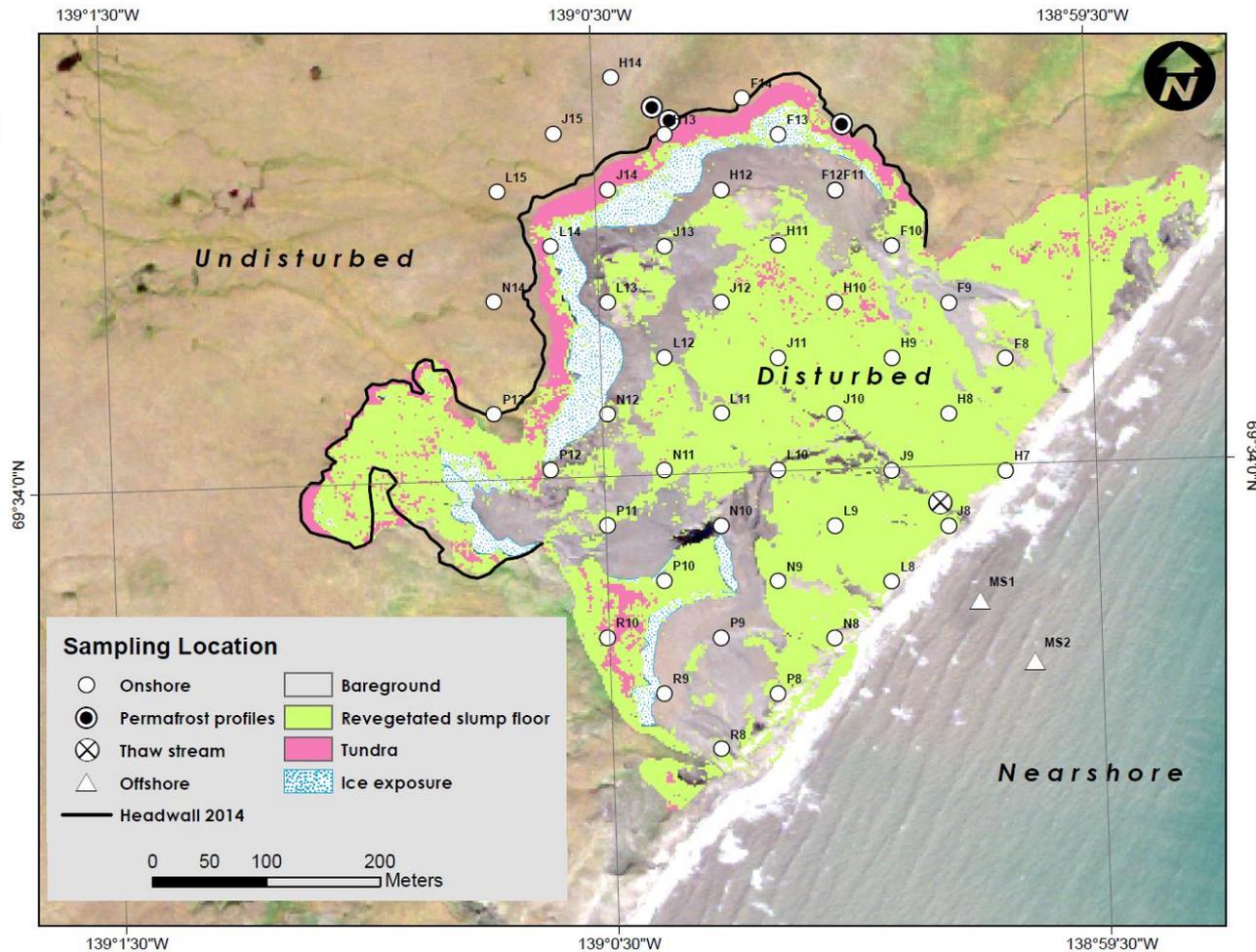
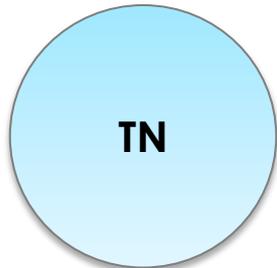
NH₄-N



Mineralization



Revegetation



- ❖ OM contents decrease substantially due to thermokarst formation before entering the nearshore zone
- ❖ Dilution, mineralization, direct transport, and plant uptake as main transformation mechanisms
- ❖ OM directly buried in nearshore sediments, esp. heavier fractions
- ❖ OM characteristics are drastically changed due to thermokarst
- ❖ Thermokarst along ice-rich coasts with strong impact on the coastal environment

Outlook & Open questions

What happens with permafrost carbon after **transport** into the ocean?

What are possible **impacts** on **marine ecosystem** in the nearshore?

How is OC incorporated into local **food webs**?

Acknowledgement



Parcs
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Parks
Canada



