# Nearshore Carbon and Sediment
## Dynamics of an Eroding Permafrost Coast: Herschel Island, YT, Canada

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## Introduction

Through the combination of thermal abrasion and coastal erosion, arctic coasts are highly threatened by climate change that result in extremely high rates of shoreline retreat. The eroded materials contain large fractions of organic carbon tems, and possibly act as a positive feedback to ongoing climate change (Fig.1).

Sediments and carbon enter into the nearshore through "normal" shoreline retreat, but also through discharge of retrogressive thaw-slumps (RTS) that act as point sources. Previous workers hint at the possibility of deposition within the nearshore. Submarine permafrost degradation and sea-level rise are possibly creating accommodation space (Figs 2, 3).

## Questions

This study focuses on the following questions:

- How is the cross-shore and longshore coastal morphology related to shoreface evolution?
- How does shoreface evolution relate to sequestration of carbon and coastal erosion?
- What percentage of eroded sediment is buried within the near shore?
- How might the shoreface evolve given present trends of climate change and sea-level rise?
- What changes can be anticipated for sedimentary features such as Simpson Point, the site of a historic whaling settlement?

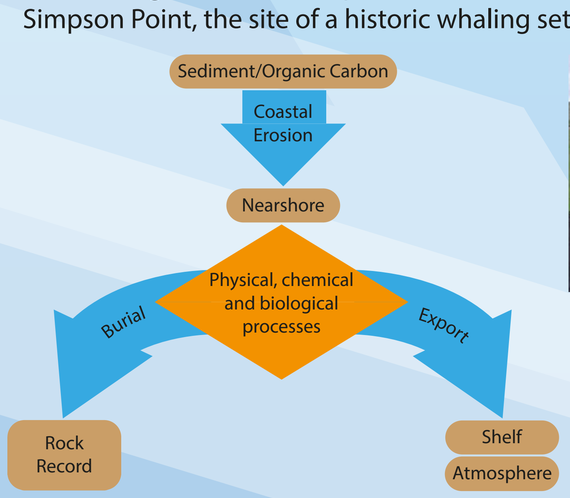
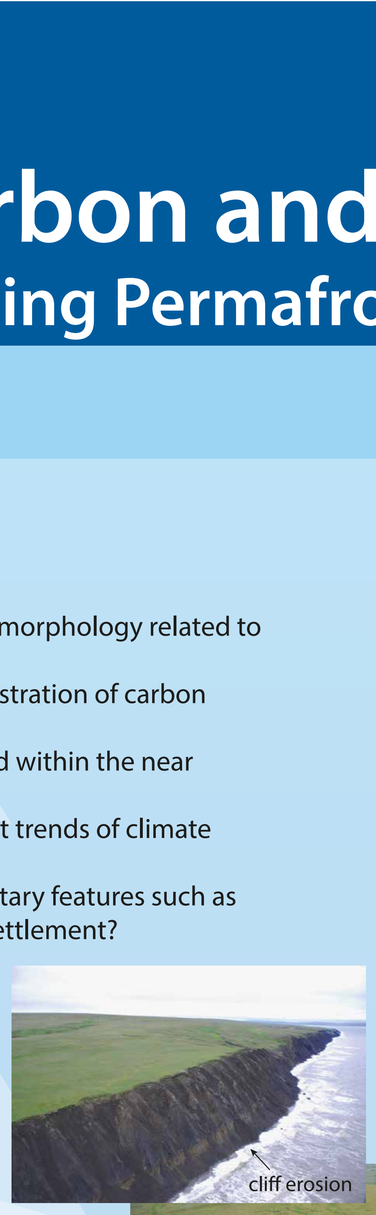
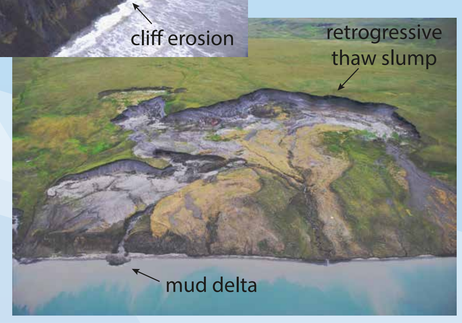



Fig. 1. The fate of sediments and organic carbon released by coastal erosion.



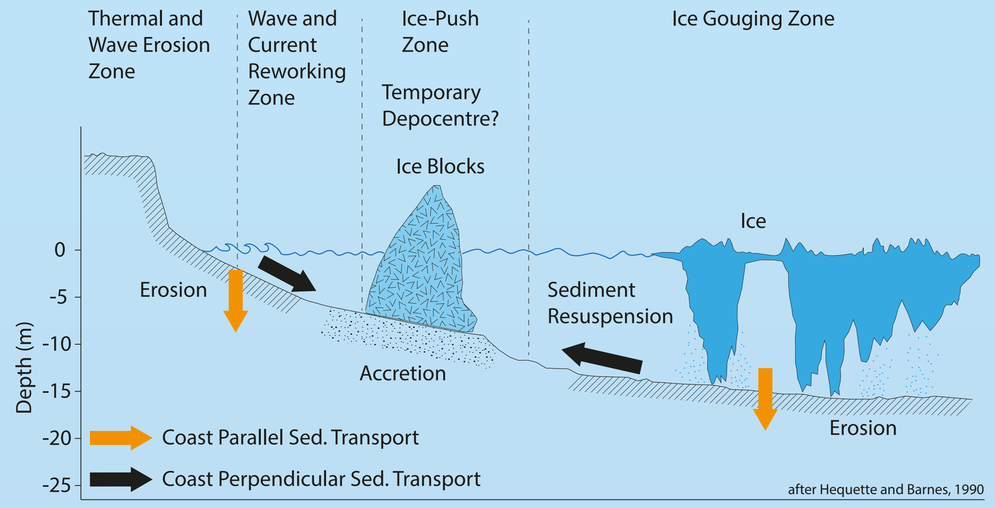




Fig. 2. Conceptual model of shoreface processes in the Canadian Beaufort Sea.

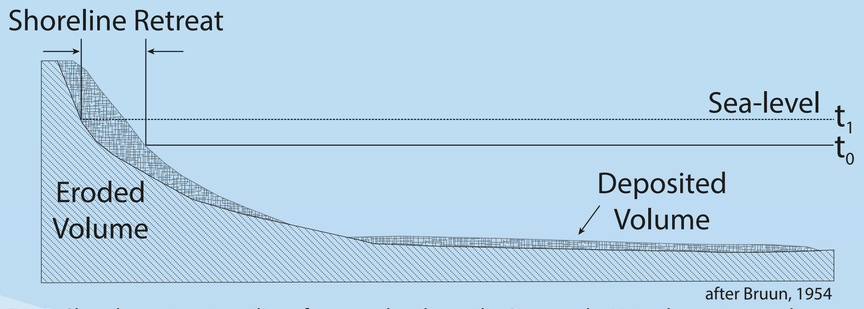



Fig. 3. Shoreline retreat resulting from sea-level rise, the Bruun rule. Note deposition on lower shoreface.

## Study Area

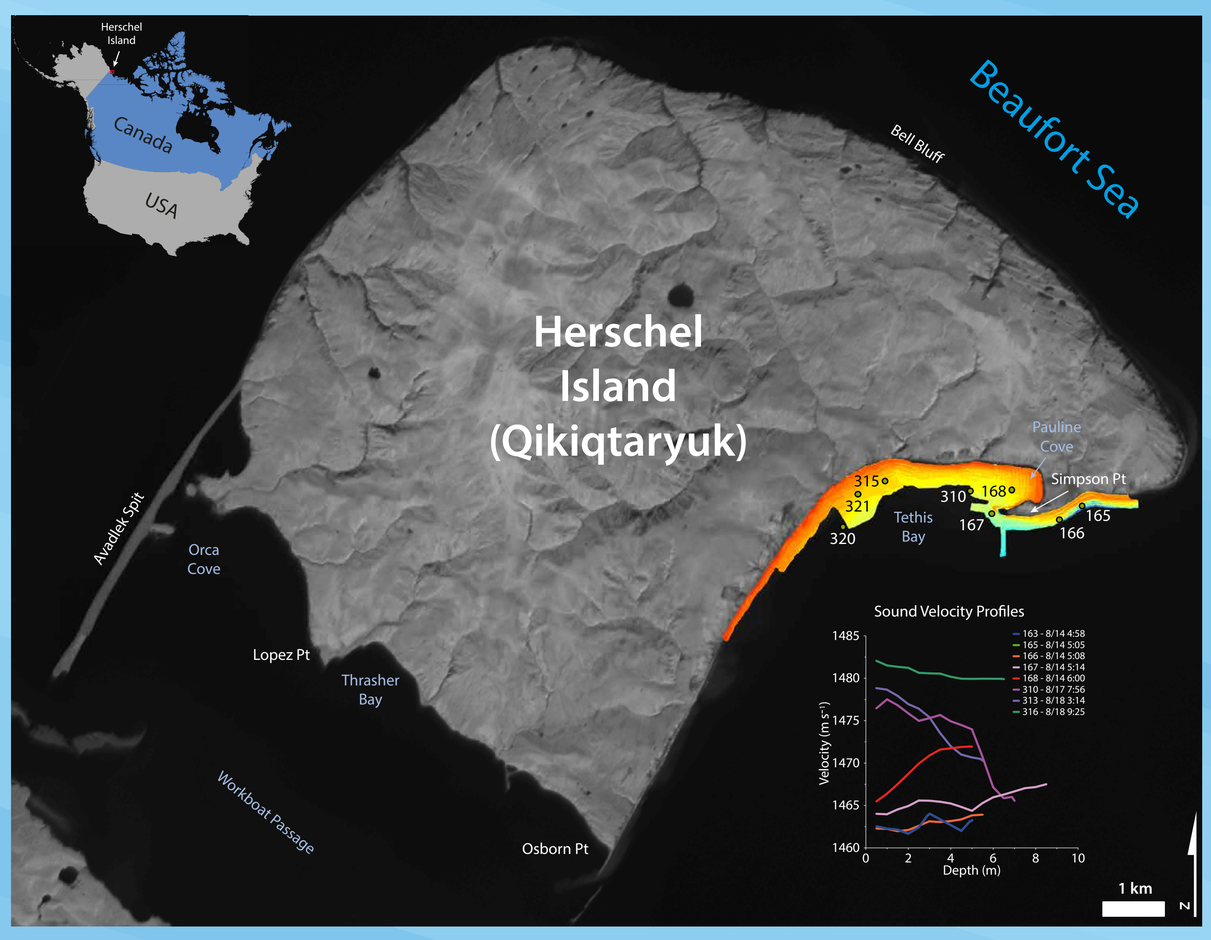



Fig. 4. Map of Herschel Island showing sidescan coverage, and sound velocity profiles (SVPs) and their locations.

## Methods

An array of complementary geophysical and conventional geologic methods are applied in this study.

- interferometric sidescan sonar (coupled with a real-time kinematic GPS system)
- seismic sub-bottom profiler
- surface sediment samples
- sediment cores

Fig 7. The AWI RV Christine is equipped to perform sidescan and seismic surveys.





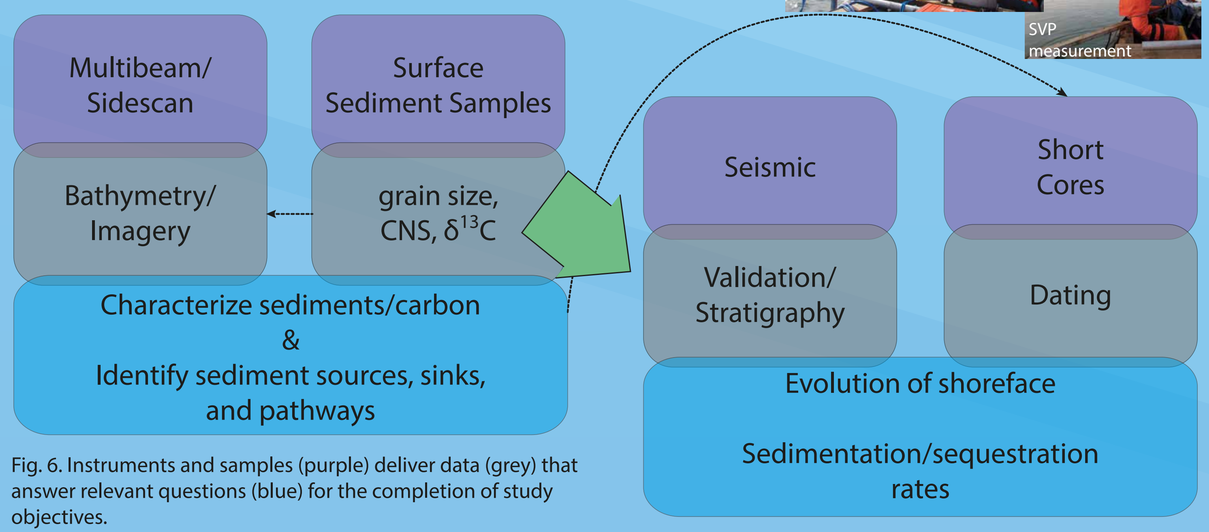



Fig. 6. Instruments and samples (purple) deliver data (grey) that answer relevant questions (blue) for the completion of study objectives.

## Results (Preliminary)

The 2012 field season yielded sidescan bathymetry and surface sediment samples (Figs. 4, 8, 9). Additional sidescan-, seismic-, as well as the collection of surface grab samples and shallow cores is planned for the summer of 2013 (Fig. 9).

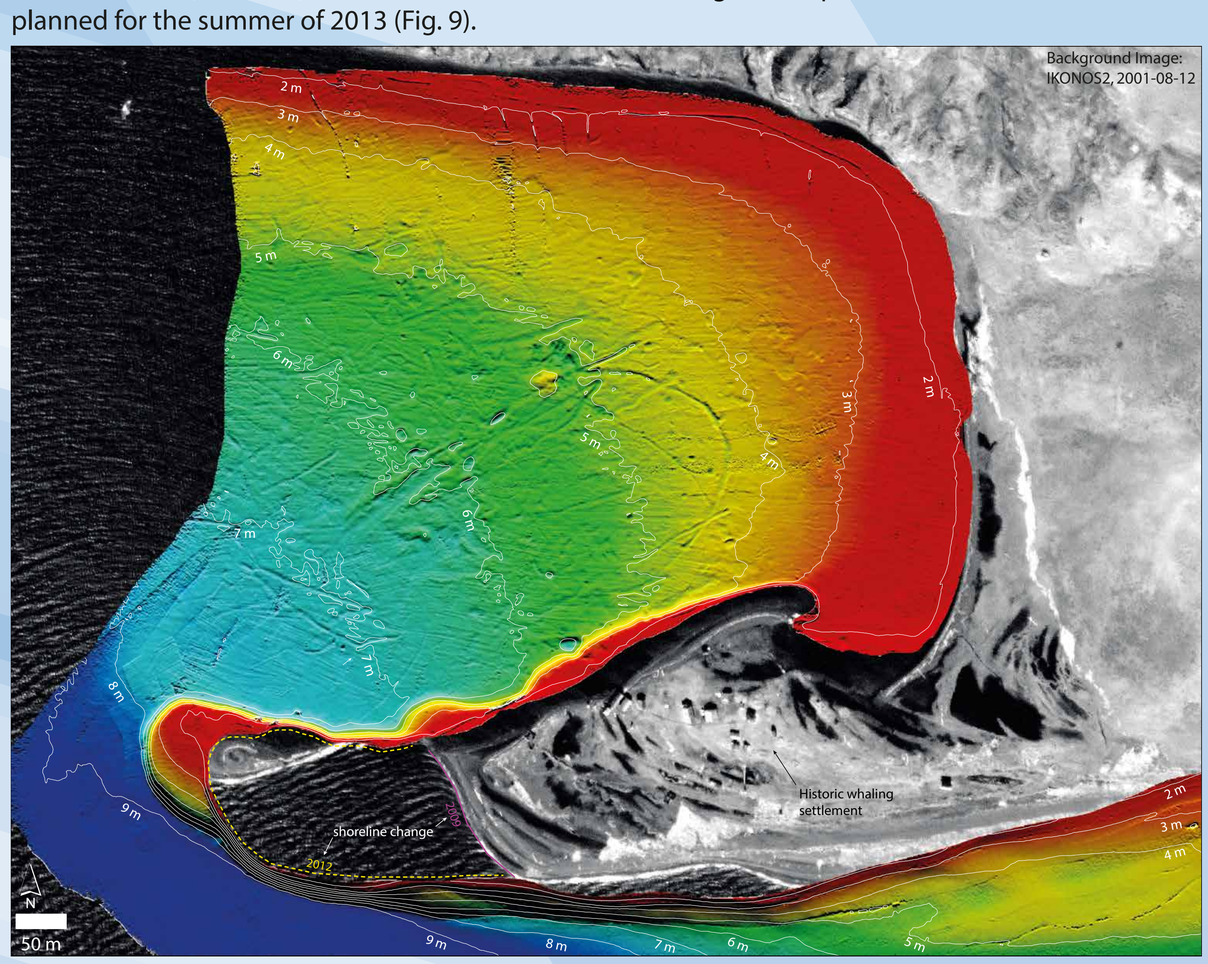



Fig. 8. Hillshade of Pauline Cove bathymetry from 2012 data reveals benthic features of cryogenic origin. Simpson Pt, where the historic whaling settlement is located, grew considerably as the background image taken in 2001 indicates.

## Outlook

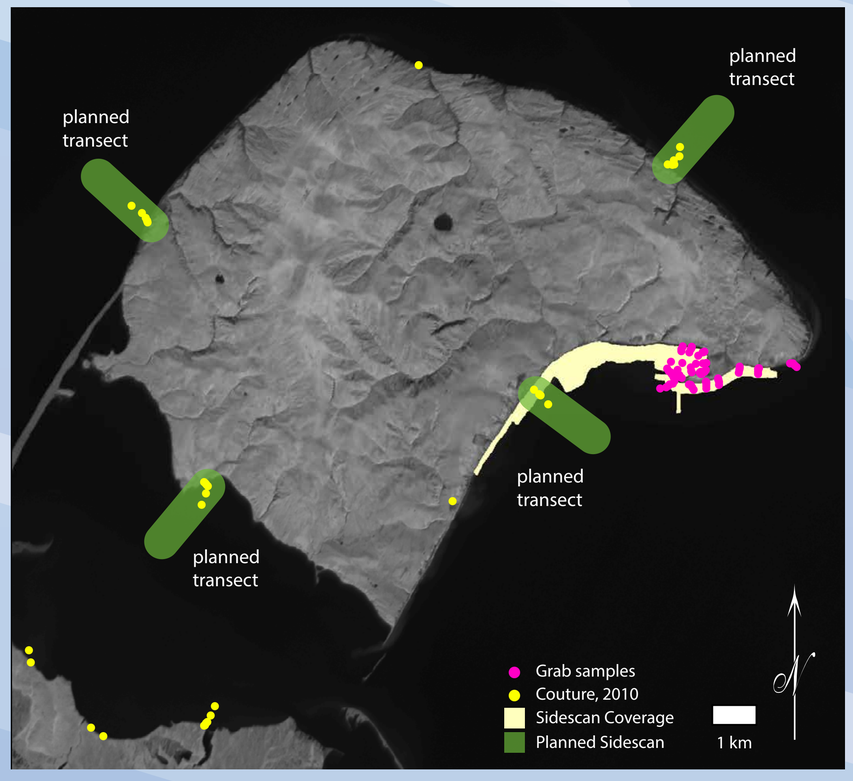
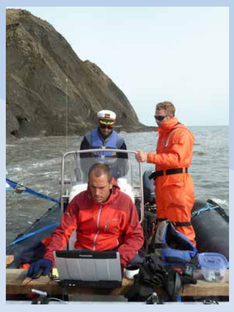



Fig. 9. Sidescan coverage, locations of surface grab samples, and soil organic carbon samples by a previous study. Areas shaded in green indicate future focus locations.



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Have questions? Feel free to contact me!
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