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WHERE AND WHY DO COASTAL RETROGRESSIVE THAW SLUMPS DEVELOP?

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Introduction

Retrogressive thaw-slumps (RTSs) are among the most dynamic thermokarst landforms in the Arctic. These **slope failures created by permafrost thaw** are initiated when active layer detachments or wave erosion expose the ice-rich permafrost layers to solar radiation.

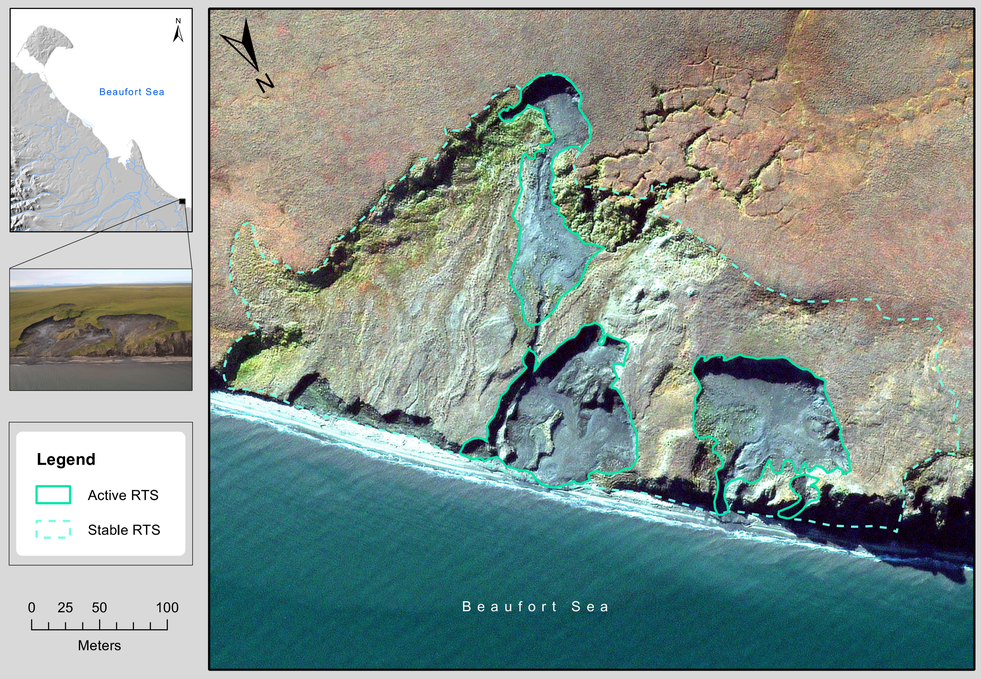
RTS occurrence is mostly driven by climatic factors, such as **air temperatures, precipitation events** leading to **changes in the ground thermal conditions.**

In some areas of the Arctic , RTSs undergo a period of enhanced activity. However RTSs are **heterogeneous** and do not develop in a homogeneous way everywhere along the Arctic coast.

In order to better predict Arctic coastal dynamics, it is crucial to get a better overview of RTS distribution along the Arctic coasts and to determine the prevailing factor accounting for their occurrence.

Our objectives are to:

- Describe the extent of RTSs
- Explain differences in the density and coverage of RTSs



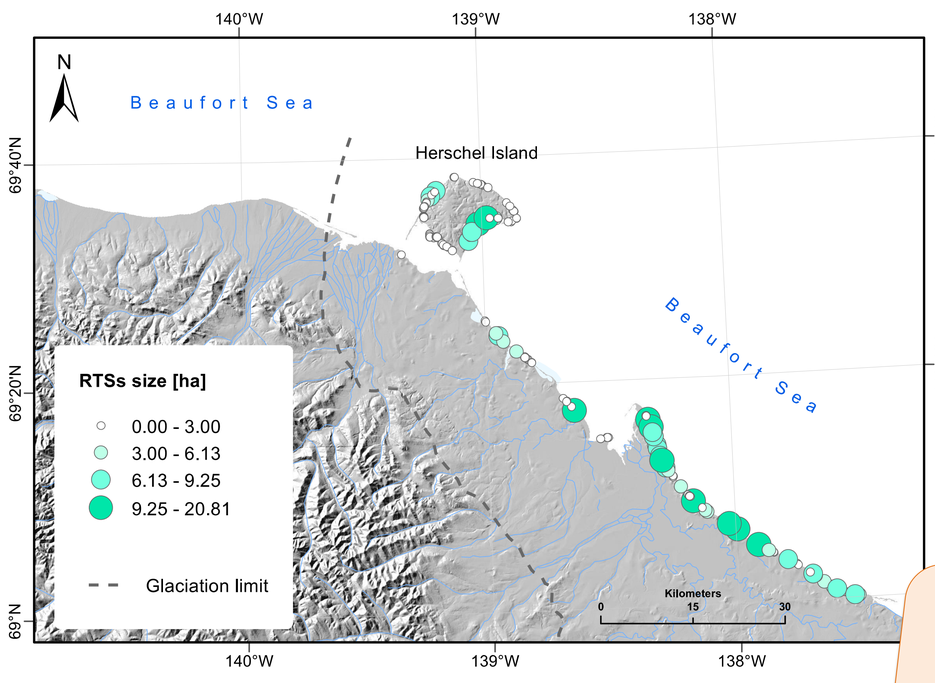
Study Area & Methods

The study area comprises a 235 km long and 2 km wide coastal segment of the Yukon Coastal Plain including Herschel Island, Canada. The total study area is 115.4 km^2.

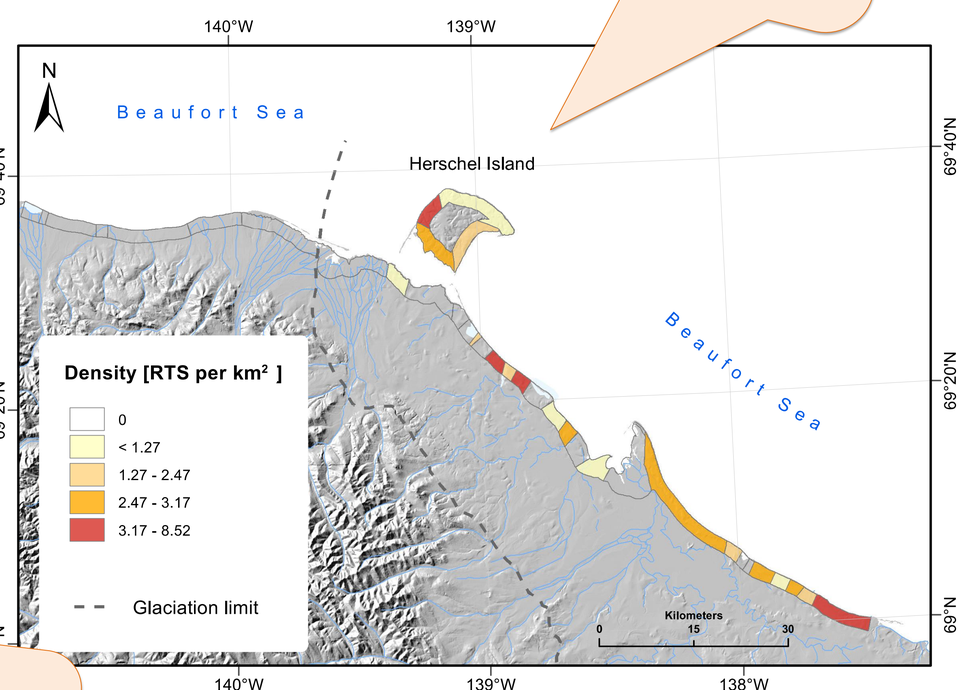
We used a extensive dataset with 26 environmental variables[1] and applied univariate regression trees to define the most influent factors explaining high density of RTSs and large coverage.

RTSs located:
- on the previously glaciated areas,
- mostly on moraine deposits.

Results



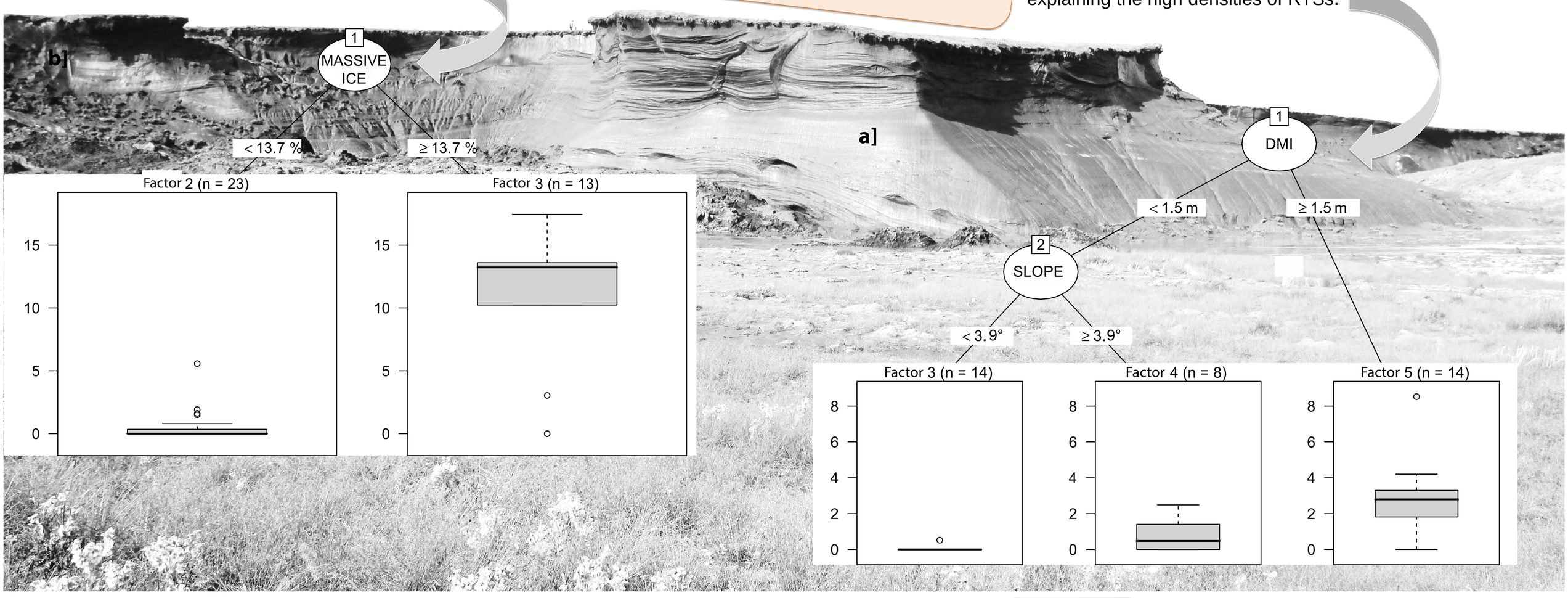
Type	N	Size (ha, med)	Slope (°, x̄ ± sd)	Aspect (°, med)
Active	229	0.15	13.2 ± 8.0	NE, 45.0
Stable	96	1.08	12.4 ± 5.9	NE, 45.0
All	325	0.24	13 ± 7.5	NE, 45.0
New	*129*	*0.14*	*11.3 ± 9.4*	*NE, 41.8*



- RTSs occupied **4%** of the whole study area.
- **1.3 RTSs per km of coast**.
- Highest densities on **rolling moraines** (2.9 RTSs per km of coast).

Explanation: RTSs were affecting a larger surface area of coastal segments, which contained a percentage of **massive ice equal or greater than 13.7%**.

Explanation: RTSs occur mostly where the the **thickness of Massive ice (DMI)** is more than 1.5 m. Where the massive ice bodies were thiner, the **slope angle** was the major factor explaining the high densities of RTSs.



[1] Data obtained from:
N. Couture, 2010: Fluxes of soil organic carbon from eroding permafrost coasts, Canadian Beaufort Sea. *PhD Thesis, McGill University, Montreal*.

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