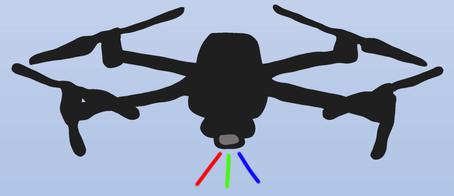

Impacts of Local-Scale Variables on Discontinuous Permafrost in NunatuKavut and Nunatsiavut, Labrador.

Anika Forget[1], Robert Way[1], Rosamond Tutton[1], Yu Zhang[2], Yifeng Wang[1], Nhu Le[3], Andrew Trant[3], Luise Hermanutz[4]

[1]Queen's University, [2]Natural Resources Canada, [3]University of Waterloo, [4]Memorial University

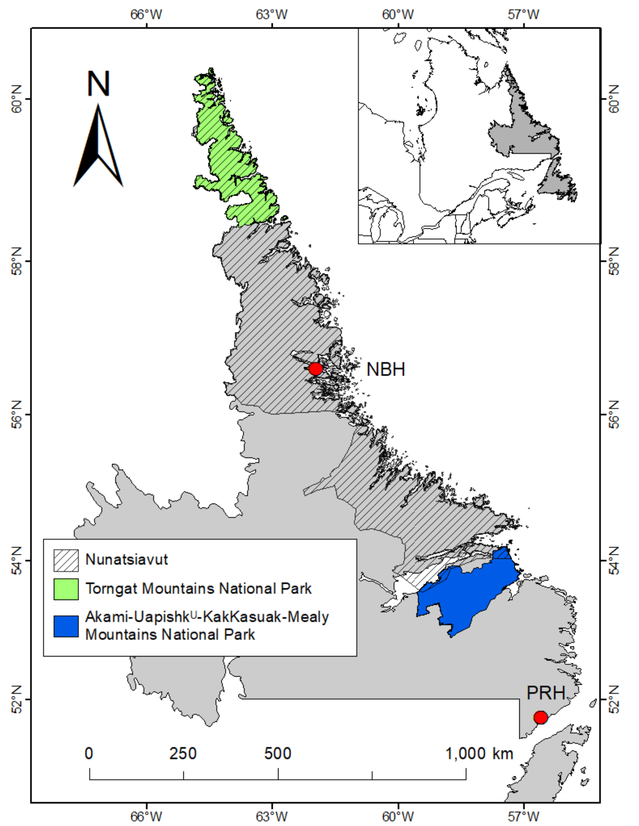

Figure 1. Map of Labrador showing the locations of the field sites at Nain Bay Hills (NBH) in Nunatsiavut and Pinware River Hills (PRH) in NunatuKavut.

Figure 3. Photo of a section of NBH field site showing the variation in low shrub forest and tundra areas during the summer season (Tutton, 2019).

Objectives

1) Novel assessment of linkages between local-scale variables and ground temperature for the coastal Labrador region.
2) Evaluate historical and future evolution of permafrost change at the two field sites.

Introduction

In the discontinuous zone, permafrost distribution is controlled by local-scale variables like snow and vegetation. Vegetation can have a cooling effect in the summer while snow causes a warming effect in the winter. Differences in the magnitude of these opposite effects can complicate permafrost distribution modelling. However, high resolution field data and spatial modelling can be used to overcome these challenges.

Methods

Exploration of associations between local-scale variables and ground temperatures will occur at Nain Bay Hills (NBH) and Pinware River Hills (PRH) sites, located at the northern and southern ends of the discontinuous permafrost zone in coastal Labrador. Ground surface temperature loggers will be deployed in a stratified random sampling scheme using unique combinations of ecotype and snow thickness derived from maps produced from remotely piloted aircraft (RPA) imagery. This sampling scheme will ensure that measurements are recorded in the warmest and coldest portions of the landscape. Field work will include collecting vegetation, snow, and soil composition data at each logger location.

Analysis

Ground surface temperatures will be analyzed using machine learning in combination with *in situ* field data. These data will also be used to calibrate regional process-based modelling using the Northern Ecosystem Soil Temperature (NEST) for historical (1950-2020) and future periods (2020-2100).

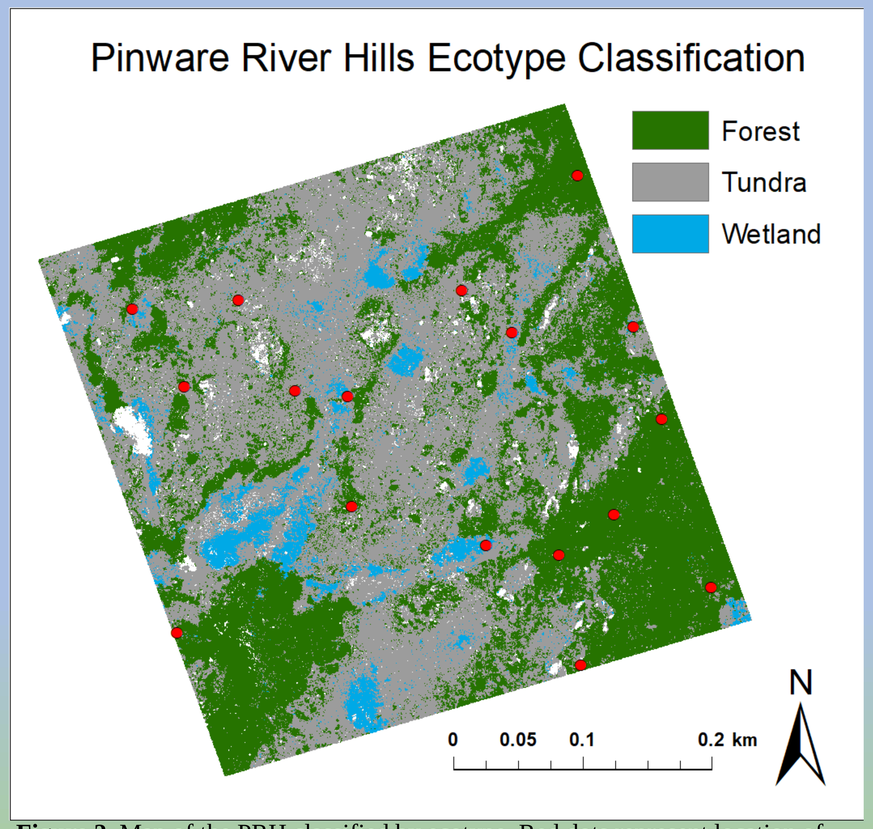

Figure 2. Map of the PRH classified by ecotype. Red dots represent location of ground surface temperature loggers. White areas are uncovered bedrock.

Significance

This work of predicting permafrost distribution and rate of change for an area that has previously lacked extensive permafrost research will contribute to filling a knowledge gap. This local-scale approach will allow the communities located in these regions to better understand permafrost related subsidence and ecosystem modifications amplified by climate change[4].

References

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