The Variability of Snow Density Across Ecotypes in the Low-Relief Coastal Mountains of NunatuKavut, and Nunatsiavut Labrador, Canada

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ABSTRACT

Decades of northern science has shown that the ground thermal regime of discontinuous permafrost is significantly influenced by the distribution and characteristics of seasonal snow cover. Although coarse snow metrics such as area and duration can be derived from satellite imagery, understanding the thermal impacts of snow on ground temperatures requires collecting field-intensive information, including snow thickness and density. Scale-related challenges due to local snow cover variability would be most significant in high snowfall regions with extensive wind redistribution, such as the low-relief coastal mountains in Labrador. This study presents early results from snow monitoring undertaken across forest-tundra transitions at two research basins (NBH & PRH) located near Nain, Nunatsiavut and Pinware, NunatuKavut. At both sites, winter and summer field data collection was undertaken in 2019 (July) and 2020 (March), with the latter field season including randomly distributed measurements of snow depth and snow density across different ecotypes. Remotely Piloted Aircraft (RPA) image acquisitions were also completed in March 2020 at both sites and in July 2019 at PRH, allowing for the generation of high-resolution digital surface models and derived metrics (vegetation height, snow depth) at PRH. An RPA-derived machine learning-based ecotype classification was used in conjunction with RPA estimated snow depths and a simple snow density model to spatially represent snow water equivalent (SWE) measurements across the entire PRH research basin. Our preliminary results show that the distribution and density of snow cover at the research basins is strongly linked to topographic position and ecotype, highlighting the importance of prevailing winds in coastal mountains. Our analysis also showed that tall vegetation was associated with the highest overall SWE values but the largest range in SWE (0 to 23 cm) thus reflecting large within ecotype heterogeneity Outputs from this projects will inform ground thermal and hydrological modelling throughout coastal Labrador.

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