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Neither Arctic nor Alpine: Snow Characterization in the low-Arctic Region of Nunavik, Canada

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Snow is an integral part of high latitude regions and is highly affected by global warming. While high-Arctic snowpacks over herb tundra can be approximated by a two-layer structure formed of low-density depth hoar covered with a denser wind slab, low-Arctic snow over shrub tundra tends to be more complex with a greater variety of layers. Furthermore, a high interannual variability makes it difficult to characterize low-Arctic snow as its physical properties such as its height, density, and thermal conductivity fluctuate greatly from one year to another.
In this study, we attempt to provide an overview of this interannual variability and its implications on the energy budget of the snow cover. For this purpose, we present multiple years of snow observations collected from automated stations and manual snow pits from a low-Arctic valley of northern Quebec, Canada (56°32'N 76°33'W). The experimental setup included a vertical array of continuous thermal conductivity and snow temperature measurements, combined with eddy covariance data to establish a full energy budget of the snow cover.
Snow height varied by a factor of two (0.7 m to 1.4 m) from one year to another with tremendous impact on the stratigraphy. In thick-snow years, the snowpack was more alpine-like, with density decreasing with height while in thin-snow years, the snowpack was more Arctic-like with an inverted density profile. This alpine-like snow effectively shielded the ground from the cold air temperature and the soil remained several degrees warmer than in other years. Heat fluxes above the snowpack, however, did not show differences between alpine-like snow and arctic-like snow.