Response for RC2

This paper presents data from snow pit observations conducted during the snowmelt season at four sites with different conditions in Sodankylä, Finland, and discusses the factors contributing to the differences between the observation sites. The paper reports snow depth, bulk density measured by two methods, stratigraphy of snowpack, and wetness of the snow layers. Regarding the factors contributing to the differences between sites, the discussion remains limited to the qualitative arguments traditionally cited. There is no meteorological data related to snowmelt, nor is there any discussion of the radiation balance. Consequently, I have determined that this paper does not contain any new scientific findings.

We thank the reviewer for the careful summary and constructive feedback. In response, we have substantially revised the manuscript to strengthen its scientific contribution. In particular, we have now included time-series meteorological data relevant to snowmelt, as well as an analysis of the radiation balance and the energy available for snowmelt. We would like to clarify that the primary aim of this study is to document and analyse a unique, multi-site snow pit dataset. While the study is largely observational, the inclusion of energy balance considerations significantly enhances its interpretative value and provides new insights into snowpack evolution. We hope that these additions address the reviewer's concern and improve the novelty and scientific depth of the manuscript.

There is insufficient information regarding the sampling sites. If the site is located within a forest, information on the open-space ratio is required. The relative positions of the AWS and snowfall observation sites must be specified. In addition to photographs, a schematic diagram explaining the situation or zoomed-in aerial photographs of each site are required. The following information is required regarding observation methods: the cross-sectional area of the sampler used to measure bulk density, the cross-sectional area of the density cutter or the volume of the sample collected, and the number of density measurements taken in one snow layer. The measurement frequency of the automatic snow height measurement device.

We thank the reviewer for these helpful suggestions. Regarding site characterization, quantitative estimates of the open-space ratio are unfortunately not available. However, to better illustrate site conditions, we have added new aerial images showing the surrounding vegetation structure. These images now include clear markings of the measurement locations as well as the automatic weather station and radiation measurement sites. We have also expanded the description of the measurement methods. Specifically, we now report the cross-sectional area of the SWE sampler (69 cm^2), the volume of the density cutter (500 cm^3), and that one density measurement was conducted per snow layer. In addition, we clarified that the automatic snow depth measurements are recorded at 1-minute intervals, with 10-minute averages used in the analysis.

We require time-series data on meteorological conditions (such as temperature, wind direction, wind speed and so on) for the observation period. Understanding the environmental conditions under which snowmelt occurs will help us discuss differences between sites. If radiation balance data is available, it should be included, and an analysis of the radiation balance should be conducted.

The report contains only qualitative discussions. Furthermore, the content is limited to the scope of findings obtained to date.

We appreciate this important comment and have revised the manuscript accordingly. Time-series data of key meteorological variables from the Sounding Station have now been included, comprising air temperature, wind speed and direction, precipitation, and snow surface temperature. Snow surface

temperature is also provided for the Lichen Fence site. In addition, we have incorporated an analysis of the radiation balance and estimated the energy available for snowmelt at the Sounding Station (radiation data were not available for the other sites). The relevant equations, methodology, and assumptions are now described in detail, and the results are integrated into the discussion. These additions allow us to move beyond a purely qualitative interpretation and provide a more physically based explanation of the observed snowpack evolution and site-to-site differences. We agree with the reviewer that this substantially improves the manuscript.