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Discussions

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Interactive comment on "Snow cover variability across glaciers in Nordenskiöldland (Svalbard) from point measurements in 2014–2016" *by* Marco Möller and Rebecca Möller

Anonymous Referee #3

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This manuscript describes data collection and processing for 109 point snow depth/density measurements on 17 different glaciers in Svalbard over three years.

Major Comments:

1. Although this is a large dataset and it is clear that distributed snow depth/density observations have significant value for a number of different scientific fields, it's unclear to me whether this specific dataset, given its spatiotemporal sampling, can be fully utilized. While acknowledging that this is a ESSD submission, the manuscript and corresponding dataset would be much stronger if it included additional analyses (i.e., comparison to a reanalysis product or other in situ weather/glaciological observations)

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Discussion paper

that demonstrate the datasets value.

2. A potentially different and valuable direction would be to emphasize the snow density observations, rather than the depth/SWE observations. Seventy-four density observations is actually a huge dataset (often similar snow studies have 3-8 density observations), and thus the finding that density shows limited variability is quite useful and could result in a highly-cited paper.

3. These observations were collected during the late winter/early spring, so presumably more snow accumulated between the sampling date and peak accumulation. Constraining this additional accumulation would increase the datasets value, as it would align these observations with a glaciological mass balance framework. In addition, the Study Area section should have a brief description about these three winters – were they normal? What was unique about them? Such information would prove useful for interpreting this dataset and the observed interannual variability.

4. Although the Monte Carlo simulations are one approach for estimating density uncertainty, it seems like a potentially more insightful approach would be to calculate the predicted density using Equation 1 for all known density locations (using neighboring sites) and then reporting the RMSE between the observed and predicted.

5. The manuscript notes that the most prominent finding is the "marked interannual variability of the correlations between snow depth and longitude". Adding scatterplots of swe/density vs. elevation/longitude would be a revealing and useful addition to the manuscript.

Minor Comments: 1-16 – what is meant by inevitable data bases? 1-17 – the meaning of terrain climate is unclear, perhaps for "studies looking at snow redistribution due to the interaction between terrain and meteorological forcings." 2-10 – Is this referring to glacierized terrain specifically or just terrestrial snow covered terrain? 2-11 – replace "snow drift related gains and losses" with wind redistribution 2-12 - replace "can thus be expected to show a rather" with exhibit a complex pattern. . .. 2-13 – replace "snow

cover data form" with snow observations are an... 2-17 – replace the "widely known necessities" with Despite the clear importance of snow observations, such datasets are lacking and thus limit the validation of glacier mass balance studies. 2-23 – what is meant by precise snow cover? 2-24 – remove "in the cosmos" 2-29 – replace "insides" with insight 4-16 – soundings suggest some sort of sonic or sonar approach, could "probings" be used instead. 5-8 – reporting the mean snow depth across three years and across a range of transects doesn't actually seem all the meaningful. 5-14 – replace "show evidence for" with exhibit and patterns rather than pattern 5-18- replace "but" with thus 5-20 – replace "sticks out as the year richest in snow" with had the greatest snow depths

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