

The Cryosphere Discuss., referee comment RC2  
<https://doi.org/10.5194/tc-2021-125-RC2>, 2021  
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## Comment on tc-2021-125

Craig Smith (Referee)

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Referee comment on "Local-scale variability of seasonal mean and extreme values of in situ snow depth and snowfall measurements" by Moritz Buchmann et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-125-RC2>, 2021

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The submitted paper by Buchmann et al. describes a methodology and results of a study to assess the impact that local-scale variability in snow depth and snowfall measurements have on determining seasonal mean and extreme indices. The study uses 30 co-located (within 3 km horizontally and 150 m vertically) pairs of manual measurements throughout Switzerland where the pairs of stations are operated by independent institutions (SLF and MeteoSwiss). The authors show the differences in seasonal mean snow depth, sum (accumulation) of new snow, maximum 3-day new snow sum, days with snow on the ground and days with snowfall when they are calculated with the co-located measurements. In general, the variability varies by site and the period used to calculate the indices. The authors attempted to examine some potential causes of the differences, such as sunshine hours during ablation, but concluded that the metadata records are inadequate for any detailed or conclusive results.

The paper provides some insight into the potential variability in local-area climate indices that users can expect due to measurement station location and local-scale variability in snow cover properties, and the potential pitfalls of extrapolating point-measurement-derived indices to the regional or landscape scale. The paper is interesting and relatively well written. I do have a couple of concerns that should be addressed before this paper can be published in TC. My major concerns are as follows:

- I have concerns about the use of the term "uncertainty", largely in the title, abstract, and conclusions. I don't consider myself a metrology expert, but to me, "uncertainty" is a metric attached to a measurement to inform the user of the range of values to be expected when the measurement is made with respect to what the true value actually is. Therefore, each manual measurement presented in this paper would have an attached uncertainty, and that uncertainty would contribute to the overall uncertainty in the calculation of seasonal climate indices. However, the more appropriate terminology for what is actually being assessed here is "variability", or specifically, the impact of spatial variability on the indices. This suggested revision doesn't impact the interpretation of the results (in fact, the term "uncertainty" is really only used in the title, abstract, and conclusion, and not in the results) so updating these sections with

more appropriate terminology should be a relatively easy revision.

- The paper presents some insight into the impact of local-scale variability of snow cover measurements on seasonal climate-related indices and offers some explanation as to why snow cover measurements can be quite variable in space. I believe that it is implied, but both the authors and the readers need to understand that it is highly unlikely that two measurements can adequately assess local-scale variability. I suggest that this point be clearly made (with references where appropriate) so as not to accidentally mislead the reader.

More minor and specific issues and suggested revisions are embedded in the attached annotated document.

Please also note the supplement to this comment:

<https://tc.copernicus.org/preprints/tc-2021-125/tc-2021-125-RC2-supplement.pdf>