

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-227

Nicolas Marchand (Referee)

Referee comment on "Implementing spatially and temporally varying snow densities into the GlobSnow snow water equivalent retrieval" by Pinja Venäläinen et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-227-RC1>, 2022

The work presented in this article aims to push further what was already described in P. Venäläinen 2021. The larger dataset used to analyze or validate the SWE retrieval value helps discussing the improvement of the method. The insertion of dynamic snow densities in the retrieval process of the SWE algorithm seems to be an interesting way to move forward, but it is not entirely clear through the paper how relevant the improvements are in terms or relative values (percentages). This might help seeing more clearly the contribution to the proposed improvement on the method. The limitations still existing on the globsnow swe retrievals are not discussed enough in the conclusion of this paper.

L45-47 - SWE retrieval limited by high uncertainties... put an exemple of those high uncertainties, seems rather relevant and would avoid to go find them in the literature, even if all necessary sources are there

L80... Snow density and SWE data... How were taken into account the variabilities of the different sources of the large dataset ? Did you take into account the variability and incertitude on the measurments, or on the methods / models used to obtain them ? You could include some basic informations on those uncertainties in your table 1.

L151 - Could go into more details about those snow free areas... radiometers... which frequencies... optical... what do you use... ? How accurate is it ? Might be relevant to have more insight.

L217 - Don't you need to go more subscale than that for your variograms fittings ? East and west Canada/USA separately, Europe and Asia separately ? Can you justify this choice ? Have "subcontinental" / "regional variograms" have been tested, and how would their results have compared to the IDWR method ?

L265 - Supports previous point to also look into more detailed characterization (variograms to fit) regarding the areas... west versus east north America for exemple...

L300 - Figure 4... increase police size of legend on the left and right of the plots... very difficult to read

L330 - Paragaph... you put some facts out... might be appreciated for them to be backed with a few references

L337 - Difference in grain size... reference

L465 - Figure 10... increase legends left and right

L495 - Dot missing

L522 - It is not clear whether you put out this specific example a positive or negative consequence ?

L531 - How would you deal with the errors of reanalysis depending on the environment, latitude, lacking or overestimation of precipitations, ... ?

L540 – 550 - You don't make it clear what it is you recommend to be used... one of the 3, or multiples at the same time... or different version depending on the geography ?