

Revisions of: A Prototype Passive Microwave Retrieval Algorithm for Tundra Snow Density

By: Welch and Kelly

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1 General Comments

I will start by saying how impressed I am about the amount of quality work that was done for this review. Most comments from the reviewers have been addressed and this study is now much more rigorous.

5 The radiative transfer modelling has considerably been improved. This includes switching to IBA instead of non-sticky spheres DMRT. This allowed to work with SSA as a grain size proxy and the evolution of SSA is well documented in the Arctic. The authors use good models to treat the grain growth. Including atmospheric corrections like what is proposed in the GlobSnow products also improves the rigorousness of the study. Allowing the depth hoar layer thickness to evolve in the calibration process also brings great value to this study. Showing that having this parameter as a dynamic variable, allows to achieve the desired uncertainty range ($\pm 10\%$), is a great result in itself.

10 Although I am not fond of retrievals done at the PMW scale, I do appreciate the discussion section, which takes it into account, and shows the usefulness of the methodology with its limitations.

I only have a few minor edits/suggestions listed below. NOTE: the line number are associated with the track-change document.

L. 15: ... parameterization was used ...

15 L. 49: delete "in"

L. 51: ... the difficulty in ... L. 64: delete "in" before intensive

L. 163: explicitly mention "wind" slab layer. Something that needs to be done throughout the manuscript

L. 247: AMSR-E

L. 302: microwave-plausible

20 L. 315: I feel like section 4.4 should be in the data section since it describes stages of snowpack evolution

L. 376: Domine et al., (2018), the whole reference should not be in ()

- L. 382: Add ° symbols throughout section 4.4.3
- L. 392: metamorphoses
- L. 394: The Taillandier et al. relationship has been shown to work well for Arctic snowpacks, good choice!
- 25 L. 411: microwave-plausible, please review the entire manuscript to ensure it is all switched from DMRT-plausible
- L. 466: polar desert
- L. 489: compared to those
- L. 492: great results with regards to the depth hoar layer impact!
- L. 516: simulations are included
- 30 Figure 7: Very important to add the SSA curves here. It will allow the reader to truly understand what is happening in the retrieval process. Please do the same in the figures of the appendix.
- L. 600: Detailed snow surveys
- L. 607: oasis
- L. 668: causing

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Finally, when submitting track-change documents, I encourage the authors to take the time and remove comments and submit a clean document for review.