

Dear Dr., Sandells,

Thank you for your painstaking review and guidelines. We appreciate it. We addressed the comments as follows.

- *Before this is published, please could you clarify how the LUT derivation has changed from Mousavi et al., 2021.*
 - The main differences are in the range and resolutions of the background parameters as described in Section 2.3 (Melt Retrieval Algorithm). Mousavi et al., 2021 (and 2022) generated look-up-tables (LUTs) with a larger range for background temperature (110-265K) for highly reflective layer (Layer 2 in Fig. 4), and the semi-infinite ice layer (Layer 3 in Fig. 4) than we used here. We used a similar procedure to derive the LUTs, but with a higher background temperature in the lower end ($\geq 200\text{K}$), as described in Sec. 2.5 (lines 276-294 in the marked-up manuscript).
- *Lines 278-294 (marked up version) describes your methodology, but not what Mousavi et al. did. Is the difference in stratigraphy / LUT resolution or something else? Please insert this into the manuscript.*
 - Please, see above, and Mousavi et al. (2021, 2022)'s work, to the best of the authors' ability, are inserted.
- *I have not undertaken a complete proof-read of the document, but noticed the following, so to save you a small amount of time later, please could you correct the following (line numbers in marked up version)*
 - Thank you for your review. We have made the following corrections.
- *Minor changes:*
 - Line 249: 'high reflective layer' -> 'highly reflective layer': Corrected
 - Line 546: 'Aa' -> 'As': Corrected
 - Line 551. *Is this a validation of algorithm that is difficult, rather than detection per se?*
 - Thanks, we simplified and rephrased it in the following way,
“Miller et al., (2022a, b) developed empirical technique to map Greenland's perennial firn aquifers with SMAP L-band brightness temperature; however,

without complementary observations of firm aquifers via other means such as radar sounding while the detection itself is ambiguous, the quantification would be more challenging.”

References:

1. Mousavi, M., Colliander, A., Miller, J. Z., Entekhabi, D., Johnson, J. T., Shuman, C. A., Kimball, J. S., and Courville, Z. R.: Evaluation of Surface Melt on the Greenland Ice Sheet Using SMAP L-Band Microwave Radiometry, *IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens.*, 14, 11439–11449, <https://doi.org/10.1109/JSTARS.2021.3124229>, 2021.
2. Mousavi, M., Colliander, A., Miller, J., and Kimball, J. S.: A Novel Approach to Map the Intensity of Surface Melting on the Antarctica Ice Sheet Using SMAP L-Band Microwave Radiometry, *IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens.*, 15, 1724–1743, <https://doi.org/10.1109/JSTARS.2022.3147430>, 2022.