

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2021-116

Anonymous Referee #2

Referee comment on "An empirical algorithm to map perennial firn aquifers and ice slabs within the Greenland Ice Sheet using satellite L-band microwave radiometry" by Julie Z. Miller et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-116-RC2>, 2021

The authors present a very thorough study of mapping perennial firn aquifers and ice slabs using satellite L-Band microwave radiometry. The manuscript is rather technical but extremely well thought out and provides robust results and a sophisticated new method that will be of benefit to the community in further entangling the liquid water storage on the Greenland ice sheet. The figures are clear and the placing of the sections obvious.

As I am not an expert on the observational techniques and algorithms used, my main comments will be on the structure of the manuscript, and I hope the other reviewers will provide more detailed comments on the methods used. My main comment is that the manuscript is too long and too technical, especially the abstract, introduction and method sections. For the manuscript to become at all readable to a neutral reader with no existing knowledge on the topic, these sections should be significantly cleaned up. For instance, the introduction (and to a smaller extent the abstract) includes lots of technical explanations of the techniques used, while it should just serve as introducing the perennial aquifers, ice slabs and perched aquifers, their importance for cryospheric studies and a brief outline of the manuscript. Several paragraphs could basically be omitted or combined and number of pages considerably cut down.

If the authors are able to tighten up the manuscript I recommend publication, solely on the basis that even though my comments above are critical, the overall results and conclusions are clear and convincing. Below I note a few things in abstract, intro and summary that serve as a basis to how the manuscript could be shortened:

Comments:

P1, l20: No note on what perennial means. One of the characteristics of the perennial firn aquifers is that they last through winter; they are perennial. I do not see this explained anywhere, while this is important for the reader to understand the importance of this phenomenon.

P1, l40-43: Drop the technicalities. Just note: "An recalibrated empirical algorithm is used to map the extent of aquifers".

P1, l48-53: Manuscript has many of these extremely long sentences. Please tighten up.

P2, l68: Where is the aquifer introduced? Explain what it is first.

P2, l76: "...through winter".

P3, l85-95: Too technical for introduction. Why is this here? Either remove or combine with paragraph p4, l119-128.

P2-3 general comment: First explain, in less words, what a aquifer, ice slab and perched aquifers are, then come to the techniques used to measure them. Now it's back and forth between the two. The structure of the introduction is not very logical.

P5, l 152-175: This paragraph is likely better placed at the beginning of the introduction, as it is good to start by encouraging the reader by noting what is so special and important about the aquifers, instead of concluding the introduction with this.

P6, l209-214: This is exactly some thing that should be in the introduction and not in the methods sections. Many things are actually repeated through the methods section, and could be removed to clean up the manuscript.

P37 l1077-1115: This is a good paragraph with concisely presented information.

P38: 1116-1150: What a big blob of text. Try to at least introduce some indentations to improve readability. To me, this paragraph is unclear. What would you want to improve exactly? Try to subdivide the respective future topics more clearly.

P38: What about applications on other ice sheets?

