Review of Cavitte et al., 2023: *"Investigating the spatial representativeness of Antarctic ice cores: A comparison of ice core and radar-derived surface mass balance"*, submitted to The Cryosphere.

This paper represents an extended study of the previous work of Cavitte et al. (2022), where the authors derive surface mass balance (SMB) from ground-based radio-echo sounding (RES) data at ice rises along Dronning Maud Lands' coast (East Antarctica) as well as at the Dome Fuji site. The RES SMB is compared to SMB data derived from ice cores intersecting with the RES data, and a thorough analysis of uncertainties and representativeness of the RES-derived SMB to the ice core SMB is performed. Moreover, several gridding products with different resolutions are computed based on the RES SMB data and analysed in terms of their spatial representativeness, which is particularly important when comparing measured SMB data with model outputs.

Overall, I found the paper and the results very interesting, and I believe it will make an excellent contribution to *The Cryosphere*. I think this work is highly relevant to the glaciological community, and I look forward to seeing more outcomes of this project in the future (I hope that's what is indicated in the conclusions). The methodology is very well explained, which enables many people to reproduce the results or apply the same methodology to other data. I have to admit that I got lost here and there due to the many different sites, abbreviations and results, which are expressed in "%", but that is a relatively minor issue. My conclusion is that this paper deserves publication after minor revisions and clarifications.

Main thoughts:

- Maybe it would be more precise to say at least "East Antarctic" ice cores in the title, because, actually all data is located in Dronning Maud Land.

- For most readers, it is probably obvious, but could you define/explain in one sentence the term "spatial representativeness" with respect to the objectives of the study (maybe in the last paragraph of the introduction).

- The names of the ice sites are sometimes fully written in the text and sometimes abbreviated. I think sticking to either way is fine if it is consistent. Personally, I would tend to use the full names in the text as I keep forgetting the abbreviations all the time.

- All the ice core sites are more or less located in East Antarctica's Dronning Maud Land. While reading the text, I wondered how your results on SMB representativeness and SMB pattern around the dome and ice rises compare to similar studies in West Antarctica (if any out there) or other regions in East Antarctica. This could be an excellent addition to the story.

- The results section starts with the methodology of the error analysis of radar and ice core SMB. Also, the errors are presented after the "regular" results. For my feeling, it would be better to place the radar and ice core SMB uncertainty methodology in the method section and to present the uncertainty results, e.g., in section 5.4. where the spatial representativeness is discussed or in a separate subsection in the results.

- Define w.e. yr^{-1} where it first appears.

Detailed points:

Table 1: While reading the text, I had problems memorising the abbreviations of the sites. Maybe it helps (at least for me, it would) to add a column in Table 1 with the full site name. I am aware that they are already mentioned in the figure caption of Figure 1, but I have the feeling that it might be easier for the reader to have the Site names and abbreviations in a table.

L97, "across-track data density": maybe add that this refers to the profile spacing of the radar surveys.

Figure 1:

- For most of the readers it might be completely clear where in Antarctica inset (a) Is located. But I think another overview map of entire Antarctica highlighting the outline of (a) would make everything clear.
- What is the grey stuff in (g)?

L113-114 (Section 4.1): This section is about ice core SMB, and you refer to the published data in Table 1 for the key source data. In Table 1, however, it says in the caption that it shows "key references for all radar surveys in this study". Is this correct? I am a bit confused…

L117: Has R^2 been introduced?

L119-120, "Note that applying a Herron-Langway depth-density fit (Herron and Langway, 1980), as applied for the radar-derived data gives the same R2 values (within ±0.02) of the R2 exponential fits." What is the context of this statement, or better, what does this mean with respect to the density estimation of the ice cores?

L160-163: This is a very nice summary. What about moving this statement to the beginning of subsection 4.2.1 and incorporating it into the first sentence?

L292, "[…] the very SMB uncertainties […]": word missing between very and SMB?

L327-L356: This is a very long paragraph. If possible, try to make it two paragraphs that reflect two topics.

L371-372: Single sentence paragraph.

L409-414, Conclusions: The first four sentences begin with "We". If possible, please paraphrase.

L432: "Another interesting exercise would be to [….]". The word "exercise" is probably not optimal here.

Thanks again for the interesting read.

Steven Franke