

Clim. Past Discuss., referee comment RC1
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Comment on cp-2022-95

Pete D. Akers (Referee)

Referee comment on "An age scale for new climate records from Sherman Island, West Antarctica" by Isobel Rowell et al., Clim. Past Discuss.,
<https://doi.org/10.5194/cp-2022-95-RC1>, 2023

Reviewer Comments for Rowell et al 2023

Pete D. Akers

Overview:

The authors here present their chronology development for a borehole from Sherman Island in West Antarctica. They use multiple methods to determine their chronology, largely based on the constraints of their sampling and changes in the ice chemistry resolution with depth. They find their borehole covers back ~1200 years and propose that ice near the bedrock could be early Holocene.

Overall, I find that their methodology is sound (although I will admit that I do not have personal experience with flow or thinning modelling). It generally accomplishes its goal of presenting an age-depth scale for the location, but broader discussion is rather limited outside of extrapolating what the bedrock age of the ice might be. The writing is generally good and easy to follow, with only a few minor technical/grammar issues highlighted in the technical comments.

As a stand-alone manuscript, this comes across lacking in parts at times. This manuscript is clearly complementary to Rowell et al, 2022, but readers unfamiliar with that paper will feel rather lost reading the present manuscript. I personally didn't understand many of the mechanics and specifics alluded to in this manuscript until I had to go read Rowell 2022. While it is of course fine to point out that the details on certain methods and analyses are in Rowell 2022, this manuscript in review needs to be able to stand alone enough that reader can understand all the basic results and discussion in the manuscript.

Following on that, the overall discussion of the final chronology and work feels a bit underwhelming and undeveloped. I don't think that a massive expansion of discussion is required (or warranted), but it would be nice to see some broader impacts and discussion about the chronology results. Is the final accumulation rate different from what is observed elsewhere or expected from models? How does the quality/resolution compare to the SI Core or other core-based results from similar sites? Are there any broad lessons learned about in how this method could be applied or where it should be applied elsewhere? Note that these aren't questions I'm requiring the authors to answer; they are simply pointing out some ways that a deeper discussion could make the manuscript more

impactful than just largely a technical report specific only to this Sherman Island site.

Altogether, the manuscript is generally a solid report on the results of a chronology production. Should the editor(s) desire more than this, I think the paper could be made more impactful by developing the discussion more (both what exists on the bedrock age modelling and adding some broader comparative context and/or applicable lessons).

Major Comments:

Introduction: The first paragraph sets the scene well, but I struggled to understand exactly the point and details of the project in the next two paragraphs. For example, is the RAID system different from other drilling systems? Why was Sherman island chosen? It is serving as a constraint of what? Moreover, what is the actual point and objective of THIS paper? There doesn't need to be a ton of detail on this stage, but more clarity and structure to prepare the reader for what they are about to read.

35: The use and reasoning of the RAID aren't clear here. Since it isn't stated what the RAID is, or how it differs from normal drilling, I don't know why it would be chosen in light of the risk of Sherman Island. (Reviewer note: Later I see that Rowell 2022 has this information, but the basics need to be summarized here in this manuscript also).

35: Why was Sherman Island chosen, then, if it had such high risk of not contributing to the goals of the WACSWAIN project? Did it have other virtues that warranted the risk, or was it simply logistically easy?

Drilling and measurements: Some more information is needed here. Although papers with detailed descriptions are cited, this manuscript should include the minimum details required to understand the rest of the paper without having to look up a second paper. Namely, what sort of samples is the RAID bringing up? If they are chips, are they in stratigraphic order? What is the modern environment at the drill site (accumulation, etc)? What is the vertical resolution of samples if they are mixed? These are all critical to understanding the rest of the paper, and a reader shouldn't have to go find a second paper to get this information.

Figure 1. A close up map of the Sherman Island region and drill site would be beneficial to understanding the local geography and ice structure/flow.

105: Why was EPICA Dome C chosen as the assumed proportional accumulation as opposed to, say, WAIS? Is there any evidence to think that Dome C and SI would be proportional? They are very different climate systems.

110: This sentence reads awkwardly. Better fitting than the markers? Better fitting judged in what way? "It became clear" gives us no insight into what decisions were made, statistics performed, or observations made.

113: Again, if it is clear, you don't need to state it to the reader. You should present what made it clear.

114: Annual resolution isn't necessarily required to detect volcanic events. They are found at Dome C, for example, and the signal there is blurred over annual levels. In fact this raises an interesting question: since the sulfate fallout can extend over several months, did any of the volcanic peaks interfere with your annual dating by SO₄ peaks?

140: Note that Kuwae is still disputed as a source for the 1458 eruption

(<https://doi.org/10.1038%2Fs41598-019-50939-x>). Should become more clear with some research over the next decade, but you could add a “commonly attributed to Kuwae” or “eruption in 1458 (possibly Kuwae)” style to be safe.

Figure 4: The legend is hard to see with its small size and placement. I recommend enlarging it and placing it at the top and/or direct labelling the y-axes and lines.

233: What is known about the bed of the glacier here? Is it thought to have significant melt? Is the assumption about no basal melting simply for calculations, or is there geologic evidence supporting this assumption?

253: Again, there are references to the uniqueness or special nature of the RAID samples, but they were never described in this manuscript.

Discussion: Sections 5.1-5.3 are very short and do not add much discussion of the previous parts. I'd argue that they could simply be appended to their appropriate section in the results. Section 5.4 has some intriguing points, but is underdeveloped and feels a bit like an afterthought.

Data availability: Are the data (d^2H , chemical species, etc) that led to the creation of the age model in an online archive or otherwise available? I didn't see a link at Rowell 2022 (unless they are contained in that paper's supplementary material).

Technical comments:

17: The acronym MISI is never used again in the manuscript, and therefore it is not necessary to define it here.

21: Both of these acronyms are only used once elsewhere. Remove acronyms and just spell out in second instance.

26: LIG is used three other times. It may be better for readability to simply spell it out each time.

45: Suggestion to consider flipping the sentences in this section so that you give a brief summary of the important necessary information here, and then end with the sentence that “a detailed description...”.

Section 3: The numbering scheme is odd with 3.0.1, 3.0.2, etc. Since there is no 3.1, shouldn't these simply be sections 3.1, 3.2, etc.?

67: Is SI core the name of the ice core, or an abbreviation for Sherman Island? If it is the core name, perhaps adding a date and/or length to the end will make it more unique of an identifier. If it is an abbreviation, Sherman Island isn't abbreviated elsewhere (which I think is good)..

73: This phrasing seems odd to me. Perhaps “This variability could reflect the local geography of Sherman Island...”

74: “and IS then closely by...”

Figure 2 (and others): The line thicknesses are rather thick, which makes it hard to see small details where exactly indicated lines are falling. Consider making the thicknesses thinner.

102: Sentence starting with "That is" is a fragment.

111: a priori not prior, I think here.

Figure 4 (and others): This particular shade of red and green is difficult for many colorblind people. The colors aren't overlapping, so it isn't as big of a concern, but something to consider if you revise your figures. However, someone colorblind would not be able to make the connection from your legend to the lines.

178: This paragraph could be merged with previous.

Fig 7: Is this the best x-axis display for this plot? It seems to add more confusion and oddness since the yr BP axis goes negative and positive on the log axis.