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Climate of the Past Discussions

Interactive comment on "Pleistocene glacial history of the New Zealand subantarctic islands" *by* Eleanor Rainsley et al.

Anonymous Referee #2

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The manuscript by Eleanor Rainsley and co-authors presents a wealth of new data from two subantarcitc islands south of New Zealand, which will revise the current understanding of the late Quaternary glacial history in this remote area at high southern latitude. The authors applied a multi-disciplinary approach using different archives and synthesized this proxy data with glacier flow modeling. The science behind the study is solid and the reconstructed glacial history clearly deserves publication in the Journal Climate of the Past. However, the manuscript lacks in some parts a clear structure and needs some modifications.

1. Structure and content of the methods and results chapter

- In chapter 2, the authors often talk not about the methods, but about study locations and even present results in this chapter. Chapter 2.2 is entitled "Sedimentary analysis",

but the authors only discuss the different study sites. The same is true for a large part of chapter 2.3 about the chronology. There is very little information about the dating methods, but mostly explaining the different study sites and what was dated. The last part of chapter 2.3.2 contains even the results of the optical dating approach. So maybe the paper needs a chapter, where the authors introduce the different study sites in a more systematic way. That would make it easier for the reader to follow the different arguments of the authors.

- In the first sections in the chapter 3.1 "Geomorphology" the authors discuss the results of Enderby Till analysis. . ..but this has nothing to do with geomorphology. Therefore, I would not discuss it under the title "geomorphology".

- In addition, the authors decided to have an appendix with extended information about the methodology. However, there is a large overlap between chapter 2 and the appendix for the geomorphological survey and the sediment analysis. In my view, I would include the information in the extended methodology in the main text for these two sections. The extended methodology for the chronology and the flowline model description makes sense.

2. Basal peat ages (p. 12, line 15ff)

It would be nice to have more information about these basal ages. Why not plotting these basal ages against a time axis so that the reader can see distribution of the onsets of peat growth. Maybe include this data in a synthesis figure (see comment 4).

3. Perseverance Harbour moraine

In Figure 5, the authors show multibeam data that potentially indicate the presence of moraine ridge on the floor of the inlet. The question would then be if the ridge at Shoal Point is also of glacial origin. Looking at Google Earth, Shoal Point is a limited, but very straight structure, which I rather attribute as a 'hardrock' feature. Are there any indications that the Shoal Point has any glacial deposit on land? See also comment for

Fig. S9.

4. Synthesis figure

What I miss in this paper is a figure that synthesizes the (many!) results of this study. Figure 9 currently only shows two gray bars (!) representing a tiny amount of the generated results! Why not compiling your data including all the dates from the onset of the peat formation, the modeled glacial length, and so on. Maybe extend the time axis further back in time (evt. with axis breaks). That would greatly increase the impact of the paper.

Minor remarks:

Abstract: The maximum ice extent around 68 ka is not mentioned in the abstract.

p. 6, line 18: Explain why the top part of the LLS Cirque core was not sampled between 64-104: Lost? No recovery?

p.6, line 24: Mention here that the Enderby Formation was sampled at Site 1.

p. 9, line 2: Introduce the acronym NIWA

p.12, line 3: This should be Fig. S7D (and not S3D)

p. 12, line 27: . . .the age inversion is further UP (not down) the core. . .

p. 14, line 1: The subset of 25 simulations is shown in Fig. S10!

p. 14, line 22: Port Ross is not labeled on the map in Fig 1.

p. 19, line 6ff: Here, the authors talk about the loss of catchment. Can this loss of catchment be quantified in order to judge if that is an important factor for the more recent glacials. For me it is hard to believe that this substantially modified the growth of the glaciers in the recent past.

p. 25, line 2: Space before reference

Figure 1: Site 20 is not mentioned in the manuscript

Figure 3: Maybe add on the side the extent of Fig. S7D for reference. Figure needs a higher resolution. Erosional contacts are very hard to see.

Figure 4: Short explain how the two sections were correlated.

Figure 9: Label in the figure should most likely be NZ eLGM (instead of NZ gLGM) In the figure caption: Space before reference (twice).

Figure S7C: Please explain what you want to highlight with the dashed red line/box and the red star.

Figure S9: In the hydrographic chart in Fig. S9A the position and the shape of the proposed moraine ridge in Norman Inlet is clear, but are there any signs of a moraine ridge visible on land in Fig. S9B? If so, then please mark the geomorphological features attributed to a glacial deposit in the photograph. Please give reference of the hydrographic chart.

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