

Response to reviewers.

Reviewer 1

Reviewer comment in black and our response in red.

The manuscript by Thomas et al. is much improved on the previous version and was a very enjoyable read. I have just a handful of minor comments to finesse the structure, flow and readability of figures, after which I would recommend it for publication.

Thank you, I agree the paper is much improved and appreciate your input.

L2 and throughout: Unsure why there is now an apostrophe in “island’s”? I don’t think this is needed in almost all cases.

Checked and updated.

L22: “data were collected”

Corrected.

L69-70: one terminus or several termini? I’m also unclear about the phrase “ice ages of between...” – are you referring to the age of the ice (if so, how from plateaus?) or perhaps the last glacial maximum?

Termini. Sentence updated to clarify “The estimated age of the ice at bedrock for the glacial termini sites is between 8,000-12,000 years old”

L121: 3,110 m above sea level?

Corrected – all updated to m.a.s.l after line 116

L185: “data are”

Corrected

L192-194: Any references to support these values and your particular choice?

Reference Martin and Peel

L207: “ice core extraction site”?

Corrected

L210: Bedrock description is repetitive of L205

Removed repetition.

L219: “were these” should be deleted, I think

Removed.

L246: “altitude corrected” should be “elevation-corrected” – particularly as you use elevation in all later instances

Corrected.

L271: “melt observations ... have”

Corrected.

L276: How do you determine which sections would have a strong enough reflection? In addition, while I see why you have included this and the next (misnumbered) section here, it would make more sense to put the methodological parts into the Methods, and present the actual results here.

Corrected numbering.

Reflected layers were picked manually as described in Line 169. "strong enough reflection" is assumed as visible in the profiles at full resolution.

Added extra definition in brackets.

L277: Figure 7 has not yet been mentioned? I assume it is coming later, so these two figures should be swapped in order

Order swapped.

L294-317: Most of this section is interpretations, and should thus be in the Discussion section

Added a sentence referencing the values in table 3 to this section and moved the rest to discussion. Included under an additional subheading 4.1.1

L365: "sites" needs an apostrophe

Corrected.

L392-404: Suggest merging these paragraphs, as the second continues on from the first

Corrected.

L450-452: This paragraph either needs some context/discussion, or to be moved to the Results

Moved to bottom of section 3.5

Figure 1: This is much easier to visualise now, thank you. Just one comment that the scale bars (and coordinates on some panels?) are still too small to read – perhaps pull them out and have them underneath each panel so that they can be larger but not obscure any of the images. The placename fonts on each of these panels also needs to be large enough to read – one way to do this would be to make all the panels much larger.

Figure updated with increased font size and larger scale bars.

Figures 2-6: Thanks again – these are also much easier to interpret. The resolution is a little fuzzy on my document – but this could be the download, and it doesn't preclude ability to see layers you have depicted. Just querying why the picked lines are black in all except Figure 4? Either is fine, but continuity between similar figures is always nice. The panels in Figure 6 would be easier to read if they were a similar size to the previous figure panels – I can't see/read much at present. Panel 6f is not mentioned in the caption, and I wonder if e and f should be swapped around?

Figure 4 and captions updated.

Reviewer 2

The revised manuscript has addressed my earlier concerns - nice work!

Thank you.

I have some minor editorial suggestions for the revised version. In particular:

- the use of apostrophes in the revised text (e.g Island's - lines 2, 18, 19, 459, and more should not have a apostrophe)

Corrected. Overuse of find and replace option in word.

- perhaps "firn cores", or "cores" would be more appropriate than "ice cores"?

OK, I have changed to firn cores throughout the text.

Additional suggestions for your consideration are included in the attached file.

All text changes updated.

And a few other suggestions annotated on the attached revision

Line 271: changed "while the GPR has an expected range of visibility of ~35 cm (theoretical resolution)" to "while the 400 MHz antenna provides a range of visibility of ~35 cm for the dielectric permittivity values at these firn conditions (Koppenjan, 2009; Arcone, 2009).

In addition to the reviewer suggestions we have also added a new reference in the introduction.

Perren, B.B., Hodgson, D.A., Roberts, S.J. et al. Southward migration of the Southern Hemisphere westerly winds corresponds with warming climate over centennial timescales. *Commun Earth Environ* 1, 58 (2020). <https://doi.org/10.1038/s43247-020-00059-6>