

Authors' response for 'Detecting Holocene retreat and readvance in the Amundsen Sea sector of Antarctica: assessing the suitability of sites near Pine Island Glacier for subglacial bedrock drilling' by Johnson et al.

We thank the three reviewers and Editor, Arjen Stroeven, for their helpful comments. In response, we have made the following changes to improve the manuscript and re-numbered all sections accordingly. The new line numbers stated below correspond with the line numbers in the marked-up version of the manuscript.

Changes made:

1. Amended author affiliation for Greg Balco, which has changed since the original submission.
2. Amended the title to more accurately reflect what is in the paper. We have kept the reference to detecting Holocene ice thickness change – but rephrased it so as not to give the impression that we present results from cosmogenic nuclide measurements – because our purpose is to demonstrate the suitability of sites for detecting (specifically) Holocene changes, not just their suitability for bedrock recovery. We discuss this in detail later in the manuscript, explaining the importance to determining Holocene ice history of existing above-ice thinning histories and the requirement of bedrock lithologies suitable for in situ ^{14}C measurement.
3. Combined sections 1 and 2 (Introduction and Aims of drilling at PIG). We have removed the now uncited references from the reference list.
4. Added “mass balance changes” to point (i) in line 108 [now line 159].
5. Added some text [at lines 177-194] to improve the clarity of our description of factors relating to the suitability of bedrock lithology for cosmogenic nuclide analysis. This addition was not requested by any of the reviewers but rectifies the unintentional omission in our original manuscript of some important considerations.
6. Added a short discussion of the importance of permeability and the expected firn-ice transition depth in the Hudson Mountains [now at lines 199-212].
7. Added text at the beginning of section 4 [now section 3] to describe the whole process of choosing a drill site and included section numbers to help readers find the description of each section in the later text.
8. Moved section 4.1.3 (Nunatak topography; now section 3.1.2) to immediately before the modelling section. Added text to this section to describe the topography of Inman and Meyers Nunataks to ensure follow-through of reasoning now that this section is in a different place within the manuscript.
9. Amended Figure 4 (and its caption) to include labels for Inman and Meyers nunataks, which were missing.

10. Clarified how grounding line retreat resulting in an island at Evans Knoll would affect its suitability as a drill site (by amending/adding text around lines 225-226; now lines 320-323).
11. Added text to section 4.1.2 [now section 3.1.3], at lines 327-331, to explain that new modelling was beyond the scope of our study and that no published modelling has yet simulated a Holocene retreat inland of present in this region, so we had to use future simulations as analogy for a smaller than present Holocene ice sheet configuration.
12. Section 4.1.5 [now section 3.1.5]: inserted text to describe our initial assessment for site suitability and removed sites that do not pass that test from Table 1. This also clarifies what Table 1 contains (addressing a comment from Reviewer 3). To improve clarity in the table, we also removed the “? = unclear” category (see caption to Table 1) and incorporated it into “(x) = unclear/probably not”.
13. Shortened section 4.2 [now section 3.2] by being more concise with our use of language.
14. Rephrased lines 526-7 [now lines 640-643] to more clearly state that Maish Nunatak was visited in 2019-20 and some aspects of the site’s suitability assessed, but that it was not possible to carry out a GPR survey.
15. Changed title and numbering of section 4.2.4 to “3.3 Final selection of drill site”.
16. Added a paragraph (in section 5; now section 4) summarising what we have learned about site selection to help with future project planning. Modified the abstract accordingly.
17. Added a scale to the captions for Figures 9 and 13.
18. Specified in the captions to Figures 7 and 11 that the field of view in panels c and d is identical.
19. Data Availability section: Added a link to the doi for the radar data and updated the reference list accordingly.
20. Throughout the manuscript, we have made small edits to the text to improve readability.