

Valley longitudinal profiles record the fluvial landscape evolution and geological structure of the Gamburtsev Subglacial Mountains, East Antarctica

Response to reviewers (version 2)

We thank the reviewers for their constructive comments on the revised version of our manuscript. Below, we list our responses to the points raised by reviewers 1 and 2, emphasising the changes made to the manuscript that we hope satisfactorily address the comments. Comments made by the reviewers are in *black italics*, and our responses are in blue. Line numbers refer to the revised manuscript file that includes tracked changes.

Reviewer 1

While there is still a bit of speculation involved in interpreting the results, particularly around subaerial and subglacial erosion rates, the authors have, in my view, adequately addressed the reviewers' comments. The current manuscript is much clearer in stating the assumptions and providing a balanced interpretation.

We thank the reviewer for this summary and are pleased that we have adequately addressed their previous concerns.

I found this to be an interesting study, combining some typically disparate fields to make new inferences as to the pre-glacial history of Antarctica. It highlights the utility of higher resolution geophysical datasets for sub-ice sheet paleogeomorphic analysis.

We are glad to hear this!

Reviewer 2 (Anna Grau Galofre and Evan Blanc)

We have now finished reviewing a revised version of this manuscript and we thank the authors for their careful consideration of all our comments and suggestions. After reviewing the manuscript and additional material, we only have a couple of minor suggestions we invite the authors to consider before acceptance:

We thank the reviewers for their further consideration of the manuscript.

Lines 265-266: the two sentences here read very repetitive, we suggest the authors condense and rephrase.

We agree and have condensed and bridged these two sentences into one sentence, avoiding the repetition (264-267).

Sub-ice vs. subglacial: the manuscript uses the two terminologies interchangeably; we would recommend the authors choose one of the terminologies and use it consistently across the text. We do believe subglacial to be the more appropriate term given the nature of the ice sheet cover.

We agree and have removed all uses of 'sub-ice' and replaced them with 'subglacial.' The one exception is when referring to 'sub-ice drilling', which we have maintained since this is a specific and commonly used term in the wider literature.

Line 534: subglacial drainage can also carve bedrock - and it is in fact fairly common in alpine environments, with many subglacial gorges existing in the Alps. Larger bedrock valleys may have also been carved subglacially, including into hard crystalline bedrock, see the review work by Kehew and collaborators in 2012 on tunnel valleys.

We have reworded this sentence to acknowledge that valleys can be incised into hard bedrock by subglacial meltwater, but reaffirm that the observed depths/widths, cross-sectional shapes, and planform geometry of the valley network are not consistent with one that was primarily incised by subglacial meltwater. A minor contribution is possible, which we acknowledge (lines 533-536).

Line 584: a bit more discussion (perhaps a specific mention to a figure) on how the magnetic data feeds into this interpretation would be welcome here.

We have added some additional detail to highlight how the patterns within the magnetic data link to geological interpretations of Gamburtsev structure, with a specific reference to Fig. 7a (lines 585-590).

We would like to thank the authors for their very considerate, respectful and thoughtful response. This was a very creative, highly multidisciplinary and interesting paper, and we very much appreciate the scope

We thank the reviewers for their supportive comments.

Additional revisions

We have added a reference to a recently published paper by Gernon et al. (2026; *Science*), which proposes that the East Antarctic interior (including the Gamburtsevs) experienced a degree of rejuvenation in the Eocene due to the geodynamic effects of Gondwana breakup. This is therefore a relevant study for this manuscript, and we have added it to a relevant part of section 5.3 where we discuss possible triggers of Gamburtsev uplift (line 660). Beyond its contextual relevance, the paper does not impact our findings or conclusions.