

Dear Prof Humbert and co-authors,

Thank you for your thorough response to the reviewers' suggestions. I find the paper much improved in structure, particularly in the methods and results. However, I agree with the reviewers that the exciting story is rather lost in some of the detail, and despite your rewrite I still find this to be the case. I would like to request another revision, particularly addressing the discussion. I provide some suggestions below, both in detail (including some language and structure edits), and in overview of the main message.

Please provide a revised document, and I will determine whether the reviewers should be engaged again after this revision. We all agree that this is a very interesting study, but that the storytelling needs to be clear to ensure that the paper has the impact that it deserves.

Thank you for your submission to The Cryosphere.

Suggested amendments

Note that line numbers refer to the authors' tracked changes document.

L21: 'is also playing' – replace with 'plays'

L29: 'the dynamics of ice sheets and outlet glaciers is gravity-driven lubricated flow' – this sentence is very awkward.

Suggest beginning this para at L30 with 'Meltwater that is locally formed in crevassed areas of the *ablation zone* is transported through crevasses to the glacier based and can lead to a seasonal acceleration in ice flow *via basal lubrication*.' Inserting ' of the ablation zone' and 'via basal lubrication' within this sentence to account for the first two sentences.

L32: rephrase: 'However, seasonal glacier acceleration is not linear, but varies according to ice dynamic processes and the behaviour of the subglacial environment (Moon et al)'

L34: combine sentences and simplify: 'Further upstream and at higher elevation locations, the surface meltwater either percolates into the firn matrix, or when melt onset is too rapid to accommodate complete percolation, surface runoff. The runoff becomes an organized system of streams and rivers that lead water to topographic depressions where supraglacial lakes may form. These depressions *usually* correspond to basal topographic lows, and the lakes may range in size from a few square metres to tens of square kilometres. We focus this study on....'

L43-45: remove 'moulins are features that are conduits allowing water passage to the ice sheet base' – if readers have got this far they know what a moulin is.

Add '' around 'moulin fracture' or italicize to denote your terminology, and correct 'tenth' of metres. Should read 'We use 'moulin fracture' as terminology for conduits that are formed by cracking, with horizontal extent of tens of metres'

L49: incorporate the Neckel ref into the previous sentence rather than adding a redundant short sentence.

L51: unclear whether 'these events' is referring to the deep pre-existing cracks or shallow cracks, or both. Please improve.

L61: 'other studies' but only one is cited. Suggest 'it has also been observed that an englacial conduit can remain open over a longer period of time and potentially influence basal melting (Catania and Neumann)'

L71-78: is this paragraph necessary for your story?

L85: remove 'before' at the end of the sentence, since you already have 'previously'

L86: remove 'we selected this one because' – it is implicit in the sentence without the extra words. Sentence then should read 'The lake on which we focus is exceptional in size, but mostly importantly, we were able to build an extensive database from longer-term (1995 to 2023) observations'

L109: remove 'triangular' here since it is the first appearance, and the shape is not important for the identification stage. Or define 'triangular moulins' here.

L113: some formatting errors here!

L185: sudden switch to passive voice (this study uses, vs. we used). Suggest being consistent.

L256: the first sentence is tricky for a non-modeller to interpret. What are the reasonable principle angles? A full definition is likely not required, but perhaps the sentence order could be swapped so the para begins with 'We leverage the ISSM...', or add a few words at the end of the sentence to improve understanding 'We employ an inverse model similar to..... in order to obtain reasonable principle angles of....'

L291: 'cracks were formed' instead of 'have been formed'

L293: Sentence beginning 'End of August' is missing 'At the' at the start: 'At the end of August, an overflow....'

L294: 'which we do not display here' – will these be in supplementary? There's a few of these references throughout the paragraph. I wonder if its useful to say 'not shown' since it leaves the reader feeling short-changed?! Instead, you could just state your observations.

L316: do you need to note that the feature is triangular here? You use 'triangular' 11 times in this para – I think a few instances can just be 'moulin'

L326: formatting error

In this section, the placement of text and figures occasionally makes the story harder to track, but I trust the editorial support team will come up with some good solutions on formatting of the final article

Fig 7 caption: 'Panel a and b show' instead of 'are showing'

Page 23-7: the reviewers note inconsistent paragraph structure and this remains unaddressed, particularly here. Please revisit the structure of these pages to group the sentences into thematic paragraphs.

Figure 10: not sure how useful this one is

Figure 13: add year of acquisition to the caption, and remove final m from radargram

Figure 14: define units of colour bar

Discussion

The first paragraph of the discussion needs to give an overview of your findings to help us understand a) what you have discovered and b) why this is important. At the moment, it launches straight into detailed explanation of process, which doesn't help the reader appreciate how all your different lines of evidence meet together, and why this is a significant finding for the discipline. Why is this event unusual? It may be that this is the most complete observation set for a cyclical drainage event of this size, and that the feature persists over time.

I do not find that the discussion as rewritten helps address all the reviewers' concerns, therefore I would like to request another rewrite that focusses on:

1. Explaining your story with a link between the different types of observations that you used and the processes which explain them (L536-559 do a really nice job)
2. Giving an overview of how this feature fits into our knowledge of supraglacial drainage events
3. Ensuring the paragraph structure is consistent

L581: which channel?

L589: the conclusion finishes abruptly. I request a final sentence that stresses the importance of the study, or the main finding.

Dr Liz Bagshaw, Editor