Dear Dr. Frazer Christie et al.,
We appreciate your insightful comments and for your constructive and helpful review of our manuscript. We found the additional references to be valuable in reconstructing our discussion and framing of the results.

Below, you will find our responses to your comments in blue. Thank you for your review.
Naomi Ochwat, on the behalf of the coauthors

Short comments on tc-2023-88 "Triggers of the 2022 Larsen B multi-year landfast sea ice break-out and initial glacier response" by Naomi Ochwat et al.

This is an interesting manuscript which examines the leading drivers and glaciological implications of the recent fast ice break out at Larsen B Embayment, and one which provides further evidence of the importance of sea ice (pack and fast) for the buttressing and fortification of Antarctic glaciers from damaging ocean conditions (namely swell wave-induced damage, debuttressing and subsequent calving). In keeping with the comments of Helmut Rott (Reviewer 1) and the other, anonymous reviewer (Reviewer 2), the manuscript is well written overall, timely with respect to the growing realisation of the importance of sea ice–ice sheet interactions, and for this reason we believe the manuscript's publication will be of interest to the readership of The Cryosphere.

Below, we present two short comments motivated by those raised by the reviewers, which we hope the authors will consider when revising their manuscript.

Comment 1
To add to Reviewer 2's comments pertaining to the need to "refer back to, and compare the new findings with, other studies from elsewhere around Antarctica" (see their comments #7, #10 and those re: Lines 65-68, 67,517-519 and 520 onwards, especially), the authors should also consider including in their revised manuscript reference to/discussion of the following recently published papers, which we were somewhat surprised to see omitted in the initial version of the text given their direct relevance to the study:

• Francis, D., Mattingly, K. S., Lhermitte, S., Temimi, M., and Heil, P.: Atmospheric extremes caused high oceanward sea surface slope triggering the biggest calving event in more than 50 years at the Amery Ice Shelf, The Cryosphere, 15, 2147–2165, https://doi.org/10.5194/tc-15-2147-2021, 2021.

• Christie, F.D.W., Benham, T.J., Batchelor, C.L., Rack, W., Montelli, A., and Dowdeswell, J.A.: Antarctic ice-shelf advance driven by anomalous atmospheric and sea-ice circulation. Nature Geoscience, 15, 356–362, https://doi.org/10.1038/s41561-022-00938-x, 2022.

• Francis, D., Fonseca, R., Mattingly, K. S., Marsh, O. J., Lhermitte, S., and Cherif, C.: Atmospheric triggers of the Brunt Ice Shelf calving in February 2021. Journal of Geophysical Research: Atmospheres, 127, e2021JD036424. https://doi.org/10.1029/2021JD036424, 2022.

With particular regards to the eastern Antarctic Peninsula (EAP)-wide study of Christie et al. (2022), this paper provides important regional and historical context for Larsen B's 2022 behaviour in terms of the exact types of sea ice–ocean–ice sheet interactions reported here, which we believe serve to complement the findings/interpretation of the present study well. With reference to e.g. Section 5.1 (Line 463+), Christie et al. (2022) similarly attribute the relative period of glacial advance/stability and increased sea ice presence observed along the EAP over the last ~2 decades to the (multi-)decadal influence of the IPO and SAM.

On the importance of ice mélange for ice-shelf/glacier stability (cf. e.g. Line 525), the authors may also be interested in the following recent paper pertaining to the breakaway of iceberg A-68 from the neighbouring Larsen C Ice Shelf:

• Larour, E., Rignot, E., Poinelli, M., and Scheuchl, B.: Physical processes controlling the rifting of Larsen C Ice Shelf, Antarctica, prior to the calving of iceberg A68. PNAS, 118 (40), e2105080118, https://doi.org/10.1073/pnas.2105080118, 2021.

We thank you for suggesting literature that is complementary to our study and should be discussed within our text. You will find that we have incorporated the suggestions you pose here as well as those from Reviewer 1 and 2. Please see the revised discussion. We also note that it was not intentional to leave the relevant studies out of the original manuscript.

Comment 2

We agree with Reviewer 1 that it is essential that the correct grounding line position be used when analysing the velocity acceleration patterns of the various glaciers. With the above in mind, and as the authors themselves allude to in the paper (Lines 67, 525), the glacier acceleration trends observed following fast ice breakout (in early 2023, especially) appear to contradict the observations of another recent paper by Sun et al. (note: now published at: https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2023GL104066).

On the assumption that the acceleration trends reported in the present study still hold after the grounding line is updated and velocity uncertainties are quantified (cf. Reviewer 1's comments), then some additional words reconciling (or not …) the findings of the two studies would be useful to include beyond that already stated on Line 525. For example, could the differences in velocity signal be due to differing processing and/or smoothing techniques used? (probably unlikely unless errors in this study are high). Or perhaps due to the fact that for such a confined embayment, the glacier response was simply

lagged until 2023 and hence not captured fully by Sun et al.'s analysis (whose observations ended late 2022)? Whatever the case, both studies ultimately motivate future research into the oft- overlooked nature of sea ice-ice sheet interactions at Larsen B and beyond.

We have included the grounding line that Reviewer 1 suggests we use. We have also included the grounding line that we determined using somewhat similar but different methods. We discuss the results in context of both potential grounding lines. We are currently preparing another manuscript that details the evolution of the rapid retreat of Hektoria Glacier in which we discuss the grounding line determination in greater detail. You will also find that we have included more discussion on Sun et al., 2023 and the recent preprint by Surawy-Stepney et al., 2023 results in our revised discussion.

Finally, on the subject of grounding lines, for ease of reference please also show the updated locations on each of the insets shown in Figs 1, 8, 9, 10 and 11.

We have updated figures.

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END
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