

Comments on T Surawy-Stepney et al. ---

“The impact of landfast sea ice buttressing on ice dynamic speedup in the Larsen-B Embayment, Antarctica”

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This paper discusses the extent of buttressing effects of recent Larsen-B embayment landfast sea ice and the consequences of its loss in 2022 on the tributary glaciers. It has great potential to contribute to the ongoing research regarding buttressing by multi-year landfast sea ice.

Below, we present several short comments motivated by recent observations, which we hope the authors will consider when revising their manuscript.

- Regarding the methods section and the data used in the modelling, we agree with the reviewer 1 that more information is needed about the methods and data used. In particular, selected bedrock data as well as mapped location of the grounding zone may play an important role in the model's results. There are two primary options for bedrock data, Huss and Farinotti (2014) and BedMachine (Morlighem et al., 2023). BedMachine data has recently been updated to incorporate sonar derived bedrock information for the terminus area of Crane, collected from the RV N.B. Palmer in 2006. Additionally, the Huss and Farinotti (2014) data do not cover the whole study area displayed in Fig. 1. What did the authors do in these regions? Regarding the grounding line, it is unclear how this was determined and why it was chosen for the model; it would also impact how the glacier acceleration is discussed (i.e., floating or grounded ice). We note that the paper cited in support of the grounding line is not available at this time for review. It would be interesting to discuss the effect of using other, published, grounding lines (e.g. Rott et al., 2018, Sun et al. 2023, Ochwat et al. 2023).
- Furthermore, the model output of the “glacier terminus” (cyan lines figure 1) is likely incorrect as there is 300+ m thick ice several km further downstream from the glacier terminus identified in the model/figure 1. How are the authors defining the glacier terminus?
- What are the potential problems incurred by using a 2015 DEM with a 2021 Grounding line?
- In Figure 5, please include more years as this will help with understanding the timing of the events. We also request discussion on the fact that melt was lower in 2022 than previous years, according to AMSR data and that the largest peak in T2M was in 2021.
- The connection between basal melting and the near instantaneous break-up of the ice tongues after fast ice removal is unclear. Can the authors discuss how those two processes are connected? Also, do the authors have observation or model (reanalysis) indications of a large swell event leading to the breakup of the ice tongues? The

relationship between the basal melting, swell, and ice tongue response is generally unclear.

- We also would like to see the results discussed in the context of Robel, 2017.

Robel, A. Thinning sea ice weakens buttressing force of iceberg mélange and promotes calving. *Nat Commun* **8**, 14596 (2017). <https://doi.org/10.1038/ncomms14596>

- The paragraph in Lines 326-336 is not clear.
- Lastly, the connection between the ice tongues' disaggregation and the loss of the fast ice needs to be better justified if the fast ice was not buttressing the tongues. The authors are implying an alternative mechanism for the instantaneous response if the fast ice was not offering any sort of buttressing effect, but the path to disaggregation is not clear in that case.

We look forward to seeing the revised manuscript.