

The Cryosphere Discuss., referee comment RC1  
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## Comment on tc-2021-305

Anonymous Referee #1

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Referee comment on "Geomorphology and shallow sub-sea-floor structures underneath the Ekström Ice Shelf, Antarctica" by Astrid Oetting et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-305-RC1>, 2021

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### General Comments

This paper presents mapping and interpretation of bathymetric and seismic surveys relating the former glacier bed in front of and beneath Ekstrom Ice Shelf in East Antarctica. It is good to see a systematic investigation of existing data which in this case is used to bring clarity to some of the past conditions of this glacier, and which is also used to propose hypotheses for other parts of the landsystem where the landforms remain a little more enigmatic. The work is original in terms of assembling and interpreting that data in an understudied region.

The paper is well written and presented with excellent figures. The work is scientifically rigorous in terms of its approach and its relevance is explored well. There are a few minor areas where additional clarity could be brought but overall this is a useful addition to the scientific understanding of past ice flow in this region.

### Specific comments:

Section 3.1: Worth mentioning broad survey layout in respect of total line length and an indication of spacing etc.

L90: Worth summarising the broad survey layout.

L110: you say they are randomly oriented, but you don't mention that they have variable orientations along their length too. Their along-length geometry is also an indicator that they are ploughmarks.

Section 4.1.2 Can the statistics (e.g. lengths, widths, orientations, elongation ratios) be shown graphically (e.g. distribution histograms etc.).

L206: what it meant by short lived? And how is it known that they represent a short period?

L211: different origins? Could the ice origin actually be the same glacier but that the extent of that glacier may have been different (e.g. shorter and thus calving front was thicker) when the large icebergs were discharged. Feels too speculative that the origin was different. Or maybe not if the two sets are being created at the same time.

L232: How would it effect the basal thermal regime?

L240: What is meant by basal moraines? L240-243 – this is speculation and I would remove it.

L250-253: retreat and readvance are proposed, but no age determination is possible. I think it ought to be made clear that there is no information about the length of time between retreat and readvance. This is explored in the following paragraph a little and on line 260 it needs to be made clear why this is 'less likely'. It also needs to be made clear that the Schannwell model does not simulate any readvance (yes a stillstand, but nothing more, despite the forcing). Indeed, I am not clear how changing the bed conditions would force a readvance. Could the authors reduce the speculation in this paragraph?

L270: compare also to the work of Ely et al 2016 – Geomorphology: Do subglacial bedforms comprise a size and shape continuum? - ScienceDirect) who explores geometries in detail including the transition from various elongated landform types.

L340-343: The comment about expectations for similar behaviour in other troughs – I think that if we have learned anything from other regions it is that behaviour can vary significantly even between neighbouring troughs. This point therefore does not seem to be a safe one to make.

Technical corrections:

L37: Tending towards methodology – save for later. Also, what is meant by 'bottom' of the ice shelf? Underside?

L39-41: Not sure this is particularly useful to the science being presented here.

L60: semi colon between Smith and Eisermann references – should be an 'and'?

L205: 'fare' – doesn't seem right word. Provide?

L278: 'preferably' should be preferentially.

L330: 'worth to be' should be 'worth applying'.

L338: provide a reference or weblink to instant or don't mention. It's arguable that the instant programme itself need not be mentioned because that's not so relevant to the finding of the paper. The general point of this approach and work being useful can be made without the need to link to particular programmes.

L345-346: reference to the cruise next year. Be specific about the year. Also 'aimed to be' should be 'will be'.

L351: Year for Patterson et al reference?

L370: 'suggesting' should be 'suggest'.

L380: 'to provide' should be 'for providing'.

Figure 1: Why not write the PS1385 label onto the map? The grey contour line is not obviously grey – perhaps symbolise as a black dashed line?

Figure 3: This figure needs to be full page width to enable clarity. Iceberg ploughmarks dash in the legend is difficult to see (yellow on white).

Figures 4-7: these figures need to be full page width for clarity.