

## SUBGLACIAL HYDROLOGICAL CONTROL ON FLOW OF AN ANTARCTIC PENINSULA PALAEO-ICE STREAM. LARTER ET AL.

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Larter et al present a combination of new and existing marine geophysical data and use these to interpret aspects of subglacial hydrology beneath the paleo ice sheet. This is an extremely useful application of data from the continental shelf due to the coverage and resolution of available data sets and the increased awareness of the role subglacial hydrology may play in ice-stream flow. I was especially pleased to see the inclusion of the high resolution acoustic sub-bottom (TOPAS) profile, and the legacy Deep Tow Boomer data. This study is well written and generally very well presented. Many of the comments I make in the following are intended to broaden the potential audience of the manuscript.

The introduction would benefit from an additional paragraph that briefly reviews the state of knowledge of subglacial land-forms and their significance for subglacial hydrology. I realize this is a large subject area but it's inclusion would widen the accessibility of the paper and provide more context for the observations and interpretation to come. Details on the ability of subglacial water to ascend an opposing bed slope, and modern ice sheet observations of subglacial water leading to ice sheet velocity changes [Siegfried and others, 2016, Stearns and others, 2008] could be included here. Also the implications of different distributions of water at the bed (concentrated versus distributed) could be highlighted.

**Minor Points**

There is an error in Figure 2 that led to some confusion. I think the seismic line location shown on Fig. 2 should be AMG 845-03 not BAS 878-11.

L25 either include the acronym (PD) here after Palmer Deep or omit the (AHT) on L21 (Then reconcile change with L58, L62).

L110–114 it would be worth stating the nominal resolution of these data here as the high resolution data offers a resolution in excess of what is presently possible beneath the ice sheets.

L126–127 this sort of content would be good in the suggested paragraph in the introduction.

L137 'where a MCS profile' to 'where a MCS profile (AMG 845-03)'

The Results section blends results and interpretation. Some sticklers would disagree with this approach as it doesn't allow the reader to digest the data on its own. But it is done well here

and I found it useful.

L196–197 ‘suggests that water supplied through them was important in lubricating and dilating...’ Strictly this observation suggests that there was a change in the routing of water at the bed from an upstream regime dominated by flow through a major channel incised into the bed to a more distributed system with mobile subglacial till, that was likely dilatated, facilitating fast flow of the overriding ice. This observation would couple nicely with introductory/background material on the role of subglacial water in rapid ice flow.

Section 3.3 shows compelling evidence of shear margins beneath the palaeo ice-sheet. This evidence is more compelling than what we see beneath the modern ice sheet. Perhaps a statement along these lines is necessary to avoid future interpretations of shear margins being based on the high standards of these exemplar data.

L236–252 This paragraph is not as well linked to subglacial hydrology as earlier parts of the text. I appreciate that this is a unique look at an interesting subglacial landform but if the link to subglacial hydrology could be reinforced it would fit better. (L267 does this).

L273. It would be worth annotating the relevant profile with this location.

L288. Or surface slope reduction leading to subglacial flow change/reversal.

## **Figures**

Fig 1. Make GZ dashed red lines thicker.

Fig 2. Change MCS label to AMG845-03.

Fig 4. Make these two the same scale.

Fig 6. Caption, ‘small arrows’ to upward pointing small arrows’

Fig 7. Mask the small annotations on the top axis in background of lower panel.

In closing, I thank the authors for their interesting study. I think the importance of bridging the gap between the marine and terrestrial ice sheet communities can not be over stated and I appreciate their efforts to do so.

Sincerely, Huw Horgan

## REFERENCES

- [Siegfried and others, 2016] Siegfried, Matthew R., Helen A. Fricker, Sasha P. Carter and Slawek Tulaczyk, 2016. Episodic ice velocity fluctuations triggered by a subglacial flood in West Antarctica, *Geophysical Research Letters*, 2016GL067758.
- [Stearns and others, 2008] Stearns, L. A., B. E. Smith and G. S. Hamilton, 2008. Increased flow speed on a large East Antarctic outlet glacier caused by subglacial floods, *Nature Geoscience*, **1**, 827–831.