

'Subglacial hydrological control on flow of an Antarctic Peninsula palaeo-ice stream' by Larter et al.

13 March 2019

Review summary

Larter et al. present new and legacy geophysical data from Anvers-Hugo Trough in the western Antarctic Peninsula. The bedforms indicate a strong control on ice flow and ice stream width (i.e., location of shear margins) due to the presence of basal meltwater. The study provides convincing evidence that channels drained water from a paleo subglacial lake residing in Palmer Deep, and downstream the channelized drainage fed a deforming bed with abundance mega-scale glacial lineations. The contrast between bedforms in Anvers-Hugo Trough and Perrier Troughs is striking – and an important set of observations of proximal ice streams with different basal thermal and hydrological regimes. I only have minor comments (listed below) and am in support of acceptance of the manuscript with minor revisions.

Detailed comments

Line 44: Spell out Anvers-Hugo Trough, as this is the first use in the main text.

Line 46: Identification of the lateral extent and connection with subglacial hydrology should be included in the abstract and highlighted more in the discussion.

Line 110: Quantify 'very high' resolution

Line 125: The focus is on subglacial hydrology; however, a brief morphological description of msgls and drumlins is needed, such as elongation ratios or lengths.

Line 182: What is the potential volume capacity of the Palmer Deep subglacial lake? It would be nice to insert here a comparison with identified active subglacial lakes and their timescale of drainage.

Line 196: Add further discussion on the nature of the transition between valleys (e.g., channels) and the onset of msgls, which is important for understanding the spatial transition of water drainage style (channelized versus darcian).

Line 307: Sedimentological evidence to support underlying strata as source of till?

Lines 314-320: This interpretation (or better suggestion) needs a more detailed description on the style of basal meltwater drainage and its influence on ice flow as documented in other studies. With that said, I do not think there is any evidence presented in this study to suggest that surging or flow acceleration occurred in response to lake drainage events and find this bit 'arm-wavy', which is unlike the rest of the text that is well-documented and supported.

Line 337: I don't follow this sentence. Where does the decadal to centennial timescale come from and how is it relevant here?