Paleo Ice Flow Dynamics in the Dibble Glacier section of East Antarctica

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Abstract

Geometry and character of glacial morphological features of previously glaciated continental margins provide key constrains for reliable reconstructions of the extent and dynamic of past ice sheets. High-resolution multibeam bathymetry and subbottom surveys are an essential tool for studying and analysing such features. In Antarctica the majority of these survey cover the margin of the West Antarctic Ice Sheet, where they contribute substantially to the understanding of past glacial dynamics and extent, and provide important constrains for ice sheet models. Along the East Antarctic margin, however, there are still large sections without such detailed surveys and, as a result, with little or no information about previous extent and dynamics of the paleo ice sheet. Here we present new multibeam and subbottom data from the East Antarctic continental margin between the Frost and Dibble Glaciers (128ºE and 134ºE), acquired during expedition NBP1503 with the icebreaker NB Palmer. The data show geomorphological features on the continental shelf as well as the continental slope and rise. We analysed the geometry and pattern of these features and obtained first insights into the paleo ice dynamics and extent of this section. The inner continental shelf shows a moderately deep seafloor (200-400m) with steep and deeply incised channels. On the mid shelf we identified a ~1000m deep basin with drumlin-shaped and linear glacial features. The shelf break is relatively shallow (~300m) and incised by numerous gullies that extent onto the continental slope. The presence of these features constitutes evidence that grounded, moderately fast-flowing ice has reached the shelf break during the last glaciation. The deep channels on the continental shelf and numerous gullies near the shelf break are indicative of abounded melt water underneath the grounding ice. Our interpretation shows that the ice sheet in this section has been much more dynamic than previously thought.

Keywords: multibeam bathymetry, subglacial features, East Antarctic Ice Sheet