

Seafloor geomorphology of the Cape Darnley region, East Antarctica – insights from a new bathymetry compilation

Jodie Smith¹, Yoshifumi Nogi² and Hideki Miura²

¹*Geoscience Australia*

²*National Institute of Polar Research*

Cape Darnley, on the Mac.Robertson shelf in East Antarctica, is an area of particular interest to oceanographers, biologists, glaciologists and geologists. The continental margin in this area is a key location for understanding the Cretaceous breakup of central Gondwana (Stagg et al., 2004), basins on the shelf contain valuable paleoenvironmental records (Borchers et al., 2016), the shelf is an important marine habitat (Raymond et al., 2014), and the Cape Darnley polynya is one of only four sites of Antarctic Bottom Water production – a cold, dense, nutrient-rich water mass that forms on the continental shelf and sinks to abyssal depths, driving ocean currents around the world (Ohshima et al., 2013). However, oceanographic and ecosystem models in this region are poorly constrained by lack of detailed bathymetry.

We present the first detailed bathymetry compilation and geomorphic interpretation for the Cape Darnley region. The new data, compiled from several Japanese and other international marine science voyages, improves previous regional bathymetric representations and enables visualization of shelf and slope morphology in unprecedented detail (Figure 1). The compilation provides important baseline information underpinning a range of scientific applications. In particular, the bathymetry provides the first detailed insights into potential bottom water transport pathways from the Cape Darnley polynya into the global deep ocean circulation system. Geomorphic interpretation of the bathymetry data provides insights into past glacial dynamics and contemporary seafloor processes.

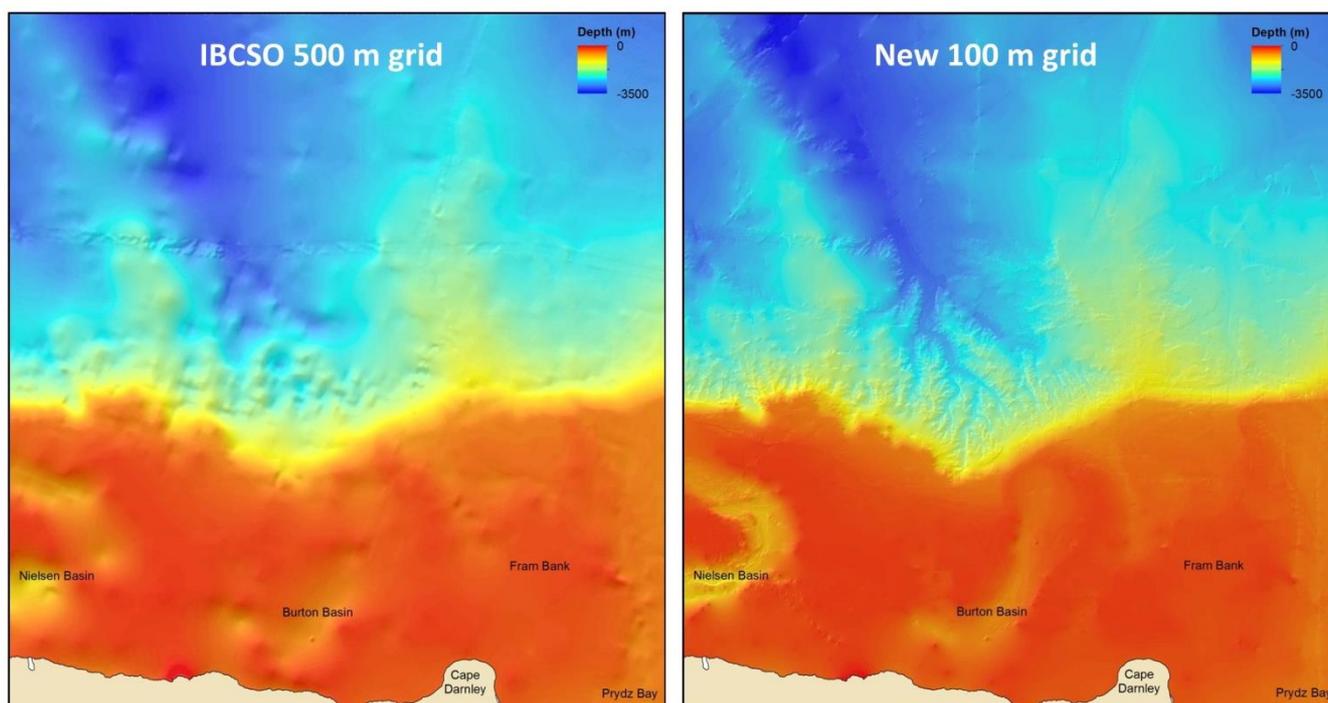


Figure 1. Bathymetry grid for the Cape Darnley region in East Antarctica. The International Bathymetric Chart of the Southern Ocean dataset (left) is a 500 m resolution grid. The new compilation (right) is a 100 m grid and includes multibeam bathymetry data from Japanese and other international surveys, as well as single beam data from multiple vessels.

References

Borchers, A. et al., 2016. Holocene ice dynamics and bottom-water formation associated with Cape Darnley polynya activity recorded in Burton Basin, East Antarctica. *Marine Geophysical Research*, 37(1): 49-70.

Ohshima, K.I. et al., 2013. Antarctic Bottom Water production by intense sea-ice formation in the Cape Darnley polynya. *Nature Geosci*, 6(3): 235-240.

Raymond, B. et al., 2014. Important marine habitat off east Antarctica revealed by two decades of multi-species predator tracking. *Ecography*: n/a-n/a.

Stagg, H.M.J. et al., 2004. Geology of the continental margin of Enderby and Mac. Robertson Lands, East Antarctica: Insights from a regional data set. *Marine Geophysical Researches*, 25: 183-219.