

Geochemical reconstruction of paleoenvironmental conditions using sediment cores from the continental slope of Sabrina Coast, East Antarctica

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Abstract

The Totten Glacier drains the largest ice catchment in East Antarctica (Rignot and Thomas, 2002) with a marine-based ice volume equivalent of 3.5 m of global sea level rise (Greenbaum et al., 2015). The high rate of glacier thinning has been linked to weak sea ice formation in the Dalton Polynya and subsequent incursion of warm circumpolar deep waters at the base of the ice shelf (Rintoul et al., 2016). Geophysical evidence of ice sheet erosion in the Sabrina Subglacial Basin suggests extensive retreat and advance of the Totten glacier in the past (Aitken et al., 2016), but observational constraints from the marine sedimentary record remain extremely limited in this region.

In January-March 2017 new marine sedimentary archives were collected on the continental slope during the Australian-led Sabrina Seafloor Survey. The mission aimed to understand the response of the Totten Glacier to past climate warming and ice sheet retreat over multiple glacial cycles. This study focuses on three of the eleven Kasten cores retrieved (2100 – 2700 m water depth), which sample distal sediments deposited in the main outflow of the Totten Glacier in the west, and adjacent to the Dalton Iceberg Tongue in the east of the study area. Four sedimentary units were identified in the 2.5 to 3.5 m length cores: At the base, glacial sand/clay with laminated silty/clay sediments, tending to clay rich diatom ooze, and silty clay rich in diatoms at the top. Elemental ratios, magnetic susceptibility and x-ray imaging measured by the Itrax core scanner provides proxy reconstruction of environmental parameters, including detrital input and ocean productivity, to determine changes in ocean conditions and the sequence of events associated with retreat of the ice sheet. These data form the basis of a multi-geochemical proxy study to resolve the sensitivity of the Totten Glacier to ocean forcing during deglaciation.

Keywords: Totten Glacier, East Antarctica, geochemical proxies, marine sediment

References

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