

Seismic stratigraphic correlation with MeBo seabed drill cores of the Amundsen Sea Embayment shelf

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Abstract

The sedimentary sequences of the Amundsen Sea Embayment shelf contain records that have the potential to reveal the environmental and ice sheet evolution from pre-glacial to glacial times for a very dynamic sector of the West Antarctic Ice Sheet (WAIS). It has been suggested that the currently observed massive loss of continental ice in this region may be a precursor to a partial or full collapse of the WAIS. Deciphering palaeoclimate and palaeo-ice sheet records from the shelf sediments is, therefore, a major scientific objective for studying processes of past warm times that can be considered as analogues to the present and future WAIS behaviour. Although the deep sedimentary structural architecture of the shelf is known from a network of multi- and single-channel seismic reflection lines, its stratigraphic composition and ages are almost completely unknown, apart from some late Quaternary records from conventional coring. The current seismic stratigraphic model of the shelf is based on a long-distance jump correlation with seismic records from the Ross Sea shelf. By operating the MeBo70 seabed drill device during RV Polarstern expedition PS104 in early 2017, we recovered – for the first time in this region – drill cores from 11 boreholes at 9 sites on the inner and middle shelf with drill depths up to 36 m. The cores contain unconsolidated sediments to highly consolidated sedimentary rocks from sequences spanning time periods from the Holocene to the Late Cretaceous. New seismic reflection and sub-bottom profiler (Parasound) lines were collected covering all drill sites, in most cases linked to pre-existing or further extending regional survey lines. We correlate the seismic lines, high-resolution Parasound records and multibeam bathymetric grids with the physical properties and a preliminary assessment of the chrono-stratigraphy of the drill cores to present a first insight into the sedimentary development of the shelf.

Keywords: West Antarctic Ice Sheet, drill cores, seismic