

## **MeBo seabed drilling in the Amundsen Sea Embayment: Operational experience and preliminary results**

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### **Abstract**

The West Antarctic Ice Sheet (WAIS) has been subject to a very dynamic history as most of its base is grounded below present sea level and, thus, sensitive to climatic changes. The reconstruction and quantification of WAIS collapses during warm periods in the geological past will provide constraints required for ice sheet models predicting its future behaviour and resulting sea-level rise. Large uncertainties exist regarding the chronology, extent, rates, and spatial and temporal variability of past advances and retreats of the WAIS across continental shelves. The Amundsen Sea drainage sector in particular has shown unusual rapid retreat and dramatic changes over the last decades, which have been suggested to be a precursor to the behaviour of the entire WAIS. The main objective of RV Polarstern expedition PS104 in early 2017 was to recover a series of long sediment cores at sites from the oldest to the youngest sedimentary sequences on the Amundsen Sea Embayment shelf by operation of the MARUM-MeBo70 seabed drilling system. The expectation was that these cores will provide material for analyses required to reconstruct the palaeo-environment of the Amundsen Sea sector since pre-glacial times and the past dynamics of the WAIS. At 9 sites we drilled 11 boreholes. Some of those sites are located in isolated basins in front of Pine Island Glacier, some along the central part of the Pine Island-Thwaites palaeo-ice stream trough in the eastern embayment and some on the western Bear Ridge flank of the western embayment. Maximum drill depth was 36 m at one site, and core recovery ranged from 7 to 76%. Late Cretaceous to Neogene sedimentary rocks were recovered from the middle shelf and have the potential to elucidate the greenhouse-to-icehouse transition in West Antarctica. Drill samples from unconsolidated, late Quaternary sediments in the inner shelf basins are expected to contain high-resolution records of past advances and retreats of Pine Island Glacier. We will present an overview of the expedition, share our experiences of seabed drilling in a glacial shelf environment, and introduce preliminary results from the drilled cores.

**Keywords:** West Antarctic Ice Sheet, drill cores, shelf sediments