



IODP Drill Cores from the Amundsen Sea Continental Shelf: Records of West Antarctic Ice Sheet History

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The marine-based West Antarctic Ice Sheet (WAIS) has likely had a very dynamic history over the last several million years; however, knowledge about past behavior of the WAIS is limited. Reconstructions of possible past WAIS collapses, based on unambiguous proximal records, are urgently needed for constraining ice sheet models that aim to predict future WAIS behavior and the potential contribution of WAIS to global sea-level rise. Large uncertainties exist regarding the chronology, extent, rates, and spatial and temporal variability of past advances and retreats of the WAIS. These uncertainties largely result from the fundamental lack of data from drill cores recovered proximal to the WAIS. The continental shelf and rise of the Amundsen Sea, where no long drill records have ever been recovered, are prime targets for drilling because the records are expected to yield archives of pure WAIS dynamics, unaffected by other ice sheets. In addition, ice that is draining into the Amundsen Sea is considered to be some of the most vulnerable to rapid change in West Antarctica due to the extreme depth at the base of the ice and the incursion of warm ocean currents to the area.

As part of the International Ocean Discovery Program (IODP), we plan a series of geologic drill sites on the Amundsen Sea shelf where seismic data reveal seaward-dipping sedimentary sequences that span from the pre-glacial phase to the most recent glacial periods. Our strategy is to drill a transect from the oldest sequences close to the boundary between bedrock and sedimentary strata at the middle–inner shelf transition to the youngest sequences on the outer shelf in the eastern Amundsen Sea. If the eastern Amundsen Sea is inaccessible due to sea ice cover, a similar transect of sites can be drilled on the western Amundsen Sea. The core transect will provide a history of the glacial cycles in the region and allow comparison to glacial history in the Ross Sea, which has been drilled before including in the recent IODP Expedition 374. Drill sites on the Amundsen Sea continental rise, which is not subject to glacial erosion like the continental shelf, are also planned and will recover continuous records of glacially transported sediments and archives of climatic and oceanographic changes through glacial–interglacial cycles. The 30-member international science party will apply a broad suite of analytical techniques to address the objectives of reconstructing the onset of glaciation in the greenhouse to icehouse transition, processes of dynamic ice sheet behavior during the Neogene and Quaternary, and ocean conditions associated with the glacial cycles.

IODP Expedition 379 is scheduled to start in Punta Arenas, Chile, on 18 January 2019 and to end in Punta Arenas, on 20 March. This talk will present preliminary results from the cruise.