New Multibeam Bathymetric data from PNRA – WHISPERS Project on the southeastern side of the Hayez Bank in the Ross Sea (Antarctica): preliminary results.

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Abstract

The Ross Sea continental slope is a key area to study the modern and deep past (Cenozoic) depositional processes directly linked to advance and retreat of the West Antarctic Ice Sheet from the outer continental shelf and the oceanic circulation. Nowadays, relatively warm Circumpolar Deep Water (CDW), encroaching the continental shelf, mixes with the colder Ross Sea Bottom Water (RSBW) contributing to the Antarctic Bottom Water (AABW) formation. Glacial and oceanographic processes interact with the seabed sediments creating peculiar morphological structures that can be studied by means of detailed multibeam and geological surveys. During the XIIth Antarctic expedition of the research vessel OGS Explora (January-March 2017), the sea-ice cover in the Ross Sea completely disintegrated, which happened only once before, in 1997. In the framework of the PNRA-WHISPERS project, new multibeam bathymetric, sub-bottom chirp, Expandable Bathy-Thermograph and Acoustic Depth Current Profile data were acquired from the easternmost margin of the Ross Sea, usually covered by sea ice. The investigated area lies at the continental shelf edge and upper slope, on the southeastern side of the Hayes Bank. Existing multichannel seismic profiles show the occurrence of scars in the upper slope, cutting through a large glacial prograding shelf margin fan.
We observe the CDW impinging the continental shelf edge and the RSBW cascading along the slope, with the fastest speed measured in the vicinity of an upper slope scar between the Hayes and the Houts Banks. This scar shows erosional features, such as incised gullies of likely glacial meltwater origin and remnants of previous deposits. Mound features previously observed on a few existing 2D multichannel seismic profiles, appear to be part of an elongated 10 km long and ca. 2 km wide SSW-NNE ridge, located at water depths from -850 to -1200 m. Sub-bottom chirp profiles crossing this ridge show that the mound has a very low amplitude reflective sea bed, supporting the hypothesis of its soft sediment nature. This is in good agreement with the very low acoustic velocity obtained from the reprocessing of existing multichannel seismic data in this area. The occurrence of internal stratification would discount a gas-related mud volcano origin. Due to bad sea conditions and the limited ship time available for this project, it was unfortunately not possible to collect any sediment cores. This would have revealed the nature of the sea bed sediment and its relationship with the slope depositional processes. Backscatter data will possibly help to decipher the origin of the ridge.

Keywords: mound, canyons, Antarctica, Hayes Bank, Houtz Bank