

Preliminary results of integrated geophysical and geological data collected offshore the Borchgrevink coast between the Coulman Island and Cape Hallett in the Ross Sea, Antarctica

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Abstract

The project Glevors (Glacial EVolution in the north-western Ross Sea, offshore North Victoria Land - Antarctica) aims at investigating the activity offshore the North Victoria Land of the marine-terminating coastal tidewater/valley glaciers, whose fluctuation and interaction with the Antarctic ice sheets, during the Neogene, contributed to the deposition, erosion and shaping of a 0.6 km thick glaciomarine sedimentary succession in the Western Ross Sea (Bart et al., 2000, 2011; Sauli et al., 2014). In the framework of the 32th Italian expedition in Antarctica (funded by PNRA), high-resolution single-channel seismic data, sub-bottom profiler data and multibeam swath bathymetry were recently acquired in the northern Drygalski basin, offshore the Borchgrevink coast between the Coulman Island and Cape Hallett during the oceanic campaign that took place in the Ross Sea from January to March 2017. Two top sediment gravity cores were also collected along the seismic profiles on the slope of a sedimentary bank at the outlet of the Borchgrevink glacier, North of Coulman Island.

We interpret the new seismic and chirp stratigraphy correlated to the coastal glaciers system activity to the existing seismic stratigraphy of the north-western Ross Sea. Seismic/acoustic facies and characteristic assemblage features of subglacial and ice-marginal units are identified and linked to the Antarctic Ice Sheets (AIS)/coastal glaciers fluctuations activity, from the Plio-Pleistocene to Holocene.

We locate backstepping distal and proximal grounding zone wedges that recorded the episodic ice-margin stillstand and retreat phases of the Borchgrevink and Tucker valley glaciers during the Pleistocene-Holocene (2 Ma) and after the Last Glacial Maximum (LGM) (21 ka).

The new seismic data show buried prograding delta and fluvial fan deposits close to the coast, such as at the outlet of the Tucker Glacier, possibly testifying deposition in previous warmer and open water condition. The subbottom profilers provide higher resolution insight into the mounded glacial deposits at the grounding-line of stillstand/retreat glaciers/AIS while the multibeam data display sub-glacial, ice-marginal and proglacial geomorphic features (Shipp et al., 1999, 2002; Anderson et al., 2014). Sediment core analyses integrates seismic stratigraphy and morphobathymetry (Corradi et al., 2003).

Newly OGS acquired data contribute to the reconstruction of the Ice Sheets and coastal valley glaciers drainage system dynamics in the northern Drygalski Basin, during the last glacial /interglacial period, documenting the grounding-zone processes associated with the glaciers retreat phases that occurred after the LGM.

Keywords: Northern Drygalski Basin, grounding zone wedge, valley glacier.

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