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Topic: Marine geology and geophysics.

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ABSTRACT Subject :

Bottom current control on sediment deposition between the Iselin Bank and the Hillary Canyon (Antarctica) since the late Miocene: An integrated seismic-oceanographic approach

Abstract 13/02/2023 11:38:41

We analyze how oceanic circulation affects sediment deposition along a sector of the Ross Sea continental margin, between the Iselin Bank and the Hillary Canyon, and how these processes evolved since the Late Miocene. The Hillary Canyon is one of the few places around the Antarctic continental margin where the dense waters produced onto the continental shelf, mainly through brine rejection related to sea ice production, flow down the continental slope and reach the deep oceanic bottom layer. At the same time the Hillary Canyon represents a pathway for relatively warm waters, normally flowing along the continental slope within the Antarctic Slope Current, to reach the continental shelf. The intrusion of warm waters onto the continental shelf produces basal melting of the ice shelves, reduces their buttressing effect and triggers instabilities of the ice sheet that represent one of the main uncertainties in future sea level projections. For this study we use seismic, morpho-bathymetric and oceanographic data acquired in 2017 by the R/V OGS Explora. Seismic profiles and multibeam bathymetry are interpreted together with age models from two drilling sites (U1523 and U1524) of the International Ocean Discovery Program (IODP) Expedition 374. Oceanographic data, together with a regional oceanographic model, are used to support our reconstruction by showing the present-day oceanographic influence on sediment deposition. Regional correlation of the main seismic unconformities allows us to identify eight seismic sequences. Seismic profiles and multibeam bathymetry show a strong influence of bottom current activity on sediment deposition since the Early Miocene and a reduction in their intensity during the mid-Pliocene Warm Period. Oceanographic data and modelling provide evidence that the bottom currents are related to the dense waters produced on the Ross Sea continental shelf and flowing out through the Hillary Canyon. The presence of extensive mass transport deposits and detachment scarps indicate that also mass wasting participates in sediment transport. Through this integrated approach we regard the area between the Iselin Bank and the Hillary Canyon as a Contourite Depositional System (ODYSSEA CDS) that offers a record of oceanographic and sedimentary conditions in a unique setting. The hypotheses presented in this work are intended to serve as a framework for future reconstructions based on detailed integration of lithological, paleontological, geochemical and petrophysical data.

