



The depositional record of the Odyssea drift (Ross Sea, Antarctica)

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The Ross Sea is one of the major areas for Antarctic Bottom Water formation (the Ross Sea Bottom Water, RSBW), representing the densest ocean water mass, filling the deepest ocean basins connected to the southern ocean. Periodic refill of the RSBW occurs through formation of dense, cold and saline water masses (brine) forming on the shelf at the Ross Sea permanent polynya by freezing and salt rejection (high-salinity shelf water, HSSW). The HSSW periodically overflows the shelf area and descends along the slope. This mechanism represents the engine of the global ocean circulation regulating the climate.

The Hillary Canyon, crossing the Ross Sea continental slope, represents one of the main conduits through which the HSSW descends the slope to reach the deeper ocean. On its western levee, there is a mounded depocentre that was mapped and ground-sampled during the Italian ITRS17-ODYSSEA expedition on board the RV OGS-Explora (January-February 2017). Geophysical data allowed interpreting such feature as a sediment drift (ODYSSEA Drift), generated by along-slope, contour currents sediment transport and accumulation through several hundred-thousands years. It was inferred that contour currents transported and deposited the sediments that descent the Hillary Canyon by means of the HSSW. Therefore, the depositional sequence of the ODYSSEA Drift potentially contains the record of the variability of HSSW formation, the along slope current intensity in association to climate change, and the interplay between the two bottom currents.

A multidisciplinary investigation was applied to six gravity cores collected in the proximal and distal area of the ODYSSEA Drift. The cores were analysed to reconstruct the age model combining AMS radiocarbon dating on foraminifera tests, biostratigraphy, and the sediment palaeomagnetic record; the sediment physical properties (wet bulk density, water content and grain size); and compositional characteristics (XRF core scan and geochemistry). Three main lithofacies were distinguished and associated to depositional processes and climatic conditions: 1) finely laminated and bioturbated sediments characterized by a relatively high Ca content with common presence of biogenic component. Such facies was associated to contour current deposition during relatively warm conditions. 2) Bioturbated sediments with abundant, sparse and/or layered Ice Rafted Debris, and high Ca content. The onset of this facies is characterized by a prominent Mn peak that was associated to bottom ocean oxygenation through ice sheet melting/decay. 3) Laminated, barren sediments associated to steady strong bottom currents under harsh climate conditions. Further preliminary data interpretations are discussed.