

The newly discovered Odyssea Drift (Ross Sea): preliminary results

Michele Rebesco¹, Yanguang Liu², Jenny Gales³, Renata Lucchi¹, Andrea Caburlotto¹, Fabrizio Zgur¹, Laura De Santis¹, Andrea Bergamasco⁴, Vedrana Kovacevic¹, Cristian Florindo-Lopez³, Laura De Steur⁵, Sookwan Kim⁶⁻⁷, Daniela Accettella¹, Elisabetta Olivo¹, Florence Colleoni⁸, Riccardo Codiglia¹ and the OGS Explora scientific party

¹OGS, Borgo Grotta Gigante 42/C, 34010 Sgonico (TS), Italy. mrebesco@inogs.it

²FIO, Xianxialing Road 6, Laoshan District, Qingdao 266061, China

³NOC, National Oceanography Centre Southampton, European Way, Southampton, SO14 3ZH, UK.

⁴ISMAR, CNR, Castello 2738/F, 30122 Venezia, Italy

⁵Norwegian Polar Institute, Fram Centre Tromsø, Norway

⁶KOPRI, 26 Songdomirae-ro, Yeonsu-gu, Incheon 21990, South Korea

⁷UST-Korea, 217 Gajeong-ro, Yuseong-gu, Daejeon 34113, South Korea

⁸CMCC, Viale Aldo Moro 44, 40127 Bologna, Italy

Abstract

Sediment Drifts are large sediment accumulations deposited in the deep sea by bottom currents during several millions of years (Rebesco et al, 2014). They are characterized by a relatively high sedimentation rate and continuity of sedimentation. As such, they are excellent paleoclimatic archives that may allow the reconstruction of past ocean dynamics and glacial history. Those around the Antarctic margins are well known archives past glacial-interglacial fluctuations and oceanic circulation since the Middle Miocene (Barker et al., 1998; O'Brien et al., 2001; Escutia et al, 2010). In particular, sediment drifts forming on the levees of canyons record the action of both down-slope currents (local terrigenous input) and along-slope currents (far-travelling input, modulated by bottom current intensity variations).

The Hillary Canyon (Ross Sea continental slope) is a main conduit for high salinity water (RSBW) forming in the Ross Sea polynya, overspilling the shelf edge at the mouth of the Glomar Challenger Basin and feeding the AABW. The main changes in ocean circulation and Southern Ocean frontal zone shifts that occurred in the past are hence recorded in the adjacent sediment drifts. During the XII Antarctic expedition of OGS Explora (January-March 2017), within PNRA ODYSSEA and EUROFLEETS ANTSSS projects, the following data have been acquired on the drift to the west of the Hillary Canyon that we named Odyssea Drift: nearly 350 km of single channel seismics (10-channel streamer, 2 G.I. guns of 210 c.i. each), 500 km of sub-bottom profiles, over 2700 km² of multibeam bathymetry, 6 gravity cores for a total of nearly 30 m of sediments, 4 box cores, 25 XBT launches, 2 rosette casts with water sampling, CTD, L-ADCP and turbidity and fluorescence probes.

The Odyssea Drift is elongated in NNE direction with dimensions of several tens of km. Fascinating landslide scars and a giant landslide deposit over 70 m thick and in the order of 200 km² wide are visible on the drift (**Fig. 1**). The cores show the presence of various layers of few cm thick with downward decreasing grainsize (from gravelly sand to clay with Ice Rafted Debris) and different colors. Living corals and well preserved forams have been sampled. The oceanographic data show the presence of Antarctic Bottom Water (<0° C) with increases in turbidity and current velocity. The overall aim of this work is to develop (also on the base of the

results of IODP drilling expedition 374) a model of sediment deposition relating to marine-based ice sheet and oceanic processes at the Ross Sea continental margin occurring through the Neogene and Quaternary. With the present work we show as preliminary results the morphology, internal geometry, superficial lithology and surrounding water masses of the Odyssey Drift.

Keywords: sediment drift, Antarctica, Hillary Canyon, Antarctic Bottom Water

References

Barker, P., et al. 1998. Antarctic glacial history and sea-level change: Leg 178 samples Antarctic Peninsula margin sediments. JOIDES J., 24(2):7-10.

Escutia, C., et al., 2010. Wilkes Land Glacial History: Cenozoic East Antarctic Ice Sheet evolution from Wilkes Land margin sediments. Integrated Ocean Drilling Program (IODP) Preliminary Report 318. doi:10.2204/iodp.pr.318.2010.

O'Brien, P.E., et al., 2001. Proc. ODP, Init. Repts., 188. Ocean Drilling Program, Texas A&M University, College Station TX 77845-9547, USA. ISSN: 0884-5883; CD-ROM volume: 1096-2522; WWW volume: 1096-2158

Rebesco, M., Hernández Molina J., van Rooij, D., Wählin, A., 2014. Contourites and associated sediments controlled by deep-water circulation processes: state-of-the-art and future considerations. Marine Geology 352, 111–15