

Paper Number: 4877

Morphology and recent sub-surface stratigraphy of Dove Basin, Scotia Sea: Physiographic constrains on bottom current deposition

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Bottom current deposition in the basins located in the southern Scotia Sea is mainly controlled by the entrance of Weddell Sea Deep Water (WSDW) that is channelized through deep water gateways along the South Scotia Ridge (SSR) and interacts with other water masses towards the north of the basins [1]. Dove Basin, located in the south-central Scotia Sea, is characterized by an irregular physiography, with several reliefs in the middle part, such as Dove Ridge and Dove Seamount [2]. The activity of tectonic structures led to the generation of frequent mass transport deposits (MTDs) [3]. In addition, Orkney Passage located south of Dove Basin is the deepest passage along the SSR, where strongest velocities of the WSDW flows have been documented [4]. As a consequence, the Late Pliocene to recent Dove Basin sediment record has been mainly influenced by the WSDW flow [5]. In this contribution we explore the influence of such complex relieves on bottom flows leading recent sedimentary processes, such as styles of contourite deposition and their interaction with gravitational processes.

We have analysed a set of high-resolution geophysical data collected onboard RV Hespérides during 2001, 2004 and 2008 in three oceanographic surveys. Swath bathymetric data were obtained with EM 12 and EM 120 SIMRAD™ systems. Very high-resolution seismic profiles were acquired using a TOPAS PS 18 system, operating in high-penetration (chirp) mode with a primary frequency of 18 kHz and up to 30 kW power. In the central part of the basin the penetration of the seismic signal may attain more than 150 m.

A preliminary inspection of the available data reveals that the margins of the basin are mainly covered by extensive plastered drifts that exhibit sub-parallel stratified facies and variable sediment thickness. Locally, these plastered drifts are separated by steep erosional surfaces, which document remobilization and mass movement processes. Chaotic facies appear interbedded within the stratified pattern, although locally they appear vertically stacked. They may extent up to the toe of the marginal slopes and indicate MTD occurrence. The sediment record of the central and deepest part of the basin contains several styles of contourite drifts, such as sheeted and confined drifts, which also may contain interbedded chaotic facies. The tectonic highs in this area are partially covered by sediment drifts that are regarded as basement-controlled drifts.

Recent bottom current deposition in Dove Basin shows marked differences with the nearby Scan Basin, which is covered by extensive sheeted drifts over a relatively flat basin plain and also exhibits mounded drifts at the base of the marginal slopes. In Dove Basin, the widespread distribution of plastered drifts over the basin margins and basement-controlled drifts along the central part of the basin suggests that

the complex structural morphology of Dove Basin has guided contourite deposition interacting with gravitational processes, generating a complex sequence of events in the recent past.

References:

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