

Mediterranean Outflow Water and contourite depositional systems in the Gulf of Cadiz

Emmanuelle DUCASSOU⁽¹⁾, Paul MOAL-DARRIGADE⁽¹⁾, Johanna LOFI⁽²⁾, Viviane BOUT-ROUMAZEILLES⁽³⁾, André BAHR⁽⁴⁾

- (1) Université de Bordeaux, UMR CNRS 5805 EPOC, Allée Geoffroy St Hilaire, 33615 Pessac cedex, France
- (2) Géosciences Montpellier, Montpellier, France
- (3) Laboratoire d'Océanologie et de Géosciences - UMR 8187 LOG, Université Lille 1, France
- (4) Institute of Earth Sciences, University of Heidelberg, Heidelberg, Germany

The Contourite Depositional Systems (CDS) in the Gulf of Cadiz are unique archives of the Mediterranean Outflow Water (MOW) variability since the Gibraltar gateway opening. These CDS have been generated by the upper and lower paths of the MOW, MUW and MLW respectively. These CDS have been drilled during the IODP Expedition 339 (2011-2012), offering a new data set over a longer period, allowing comparisons between recent and older climatic cycles, in sites both under the MUW and MLW cores.

This work provides results of a detailed sedimentological and facies analysis of different CDS in the Gulf of Cadiz, using mainly grain size, grain sources (petrography of sands and clay assemblages), natural gamma ray data, and XRF results from specific intervals. Downhole and core gamma ray data coupled to grain-size results provided a regional scale chronostratigraphic framework for the CDS contourite deposits and hiatuses at the regional scale. These long sedimentary records provide an overview of the behavior and circulation regime of the MOW over the large changes in climate and sea-level cyclicities and especially over two periods: the last climatic cycle MIS1-MIS2 and at the mid-Brunhes Event (MIS10-12) which is an analog of the last cycle.

One of the defining characteristics of contourite systems is the marked cyclicity in grain-size and related sediment properties. Drilling in the Gulf of Cadiz during IODP 339 recovered over 4.5 km of contourites with over 600 distinct contourite sequences. These show irregular cyclicity, much variation in thickness (0.5-4.0 m) and estimated duration (4-10 ky). Approximately 60% are bi-gradational sequences, whereas the rest are partial sequences. Three principal controls have been considered as likely causes for the sequences: (a) long-term variation in bottom-current velocity; (b) episodic lateral influx of clastic material; and (c) variation in vertical supply of biogenic material.

The bi-gradational sequence, particularly for the muddy drift sites, validate the primary control exerted by long-term variation in bottom-current velocity. The high degree of cycle correlation between adjacent sites further supports this contention. A secondary control of lateral clastic supply is more evident for the proximal sandy contourite sites, and for partial base-cut sequences. Work is in progress on cycle duration and sediment sources.