Geophysical Research Abstracts
Vol. 14, EGU2012-14264, 2012
EGU General Assembly 2012

Onset, evolution and effects of the Mediterranean Outflow: Preliminary Results of IODP Expedition 339 in the Gulf of Cadiz

J Hernandez-Molina (1), D. Stow (2), C. Alvarez-Zarikian (3), and the Expedition 339 Scientits Team

(1) 1Departmento Geociencias Marinas, Universidad de Vigo, Facultad de Ciencias del Mar, Vigo, Spain (fjhernan@uvigo.es), (2) Institute of Petroleum Engineering, Heriot-Watt University, Edinburgh, Scotland, United Kingdom (dorrik.stow@pet.hw.ac.uk), (3) Integrated Ocean Drilling Program, Texas A&M University, College Station, Texas, USA (zarikian@iodp.tamu.edu)

IODP Expedition 339 drilled 5 sites in the Gulf of Cadiz and 2 off the west Iberian margin (November 2011 to January 2012), and recovered 5.5 km of core with an average recovery of 86.4%. The Gulf of Cadiz was targeted for drilling as a key location for the investigation of Mediterranean Outflow Water (MOW) through the Gibraltar Gateway and its influence on global circulation and climate. It is also a prime area for understanding the effects of tectonic activity on evolution of the Gibraltar Gateway and on margin sedimentation.

We penetrated into the Miocene at two different sites and established a strong signal of MOW in the sedimentary record of the Gulf of Cadiz following opening of the Gibraltar Gateway. Preliminary results show contourite deposition from 4.2-4.5 Ma, although subsequent research will establish whether this dates from the first onset of MOW. The Pliocene succession, penetrated at four sites, shows low bottom current activity linked with a weak MOW. Significant widespread unconformities, present in all sites but with hiatuses of variable duration, are interpreted as a signal of intensified MOW, coupled with flow confinement. The Quaternary succession shows a much more pronounced phase of contourite drift development, with two periods of MOW intensification separated by a widespread unconformity. Following this, the final phase of drift evolution established the CDS architecture we see today.

There is a significant climate control on this evolution of MOW and bottom-current activity. However, from the closure of the Atlantic-Mediterranean gateways in Spain and Morocco just over 6 Ma and the opening of the Gibraltar Gateway at 5.3 Ma, there has been an even stronger tectonic control on margin development, downslope sediment transport and contourite drift evolution. Based on the timing of events recorded in the sedimentary record, we propose a tectonic pulsing in the region, linked with asthenosphere activity.

The Gulf of Cadiz is the world's premier contourite laboratory and thus presented an ideal testing ground for the contourite paradigm. Following examination of over 4.5 km of contourite cores, the existing models for contourite deposition are found to be in good working order. Their further study will allow us to resolve outstanding issues of depositional processes, drift budgets, and recognition of fossil contourites in the ancient record onshore. The expedition also verified an enormous quantity and extensive distribution of contourite sands that are clean and well sorted. These represent a completely new and important exploration target for potential oil and gas reservoirs. Preliminary work has shown a remarkable record of orbital-scale variation in bulk sediment properties of contourites at several of the drift sites and a good correlation between all sites. The climate control on contourite sedimentation is clearly significant at this scale; further work will determine the nature of controls at the millennial scale.