Geophysical Research Abstracts
Vol. 16, EGU2014-6028, 2014
EGU General Assembly 2014

Highly variable MOW flow speed during MIS 1-5 inferred from XRF scanning of contourite deposits in the Gulf of Cadiz (IODP Exp. 339)

André Bahr (1), Francisco Jimenez-Espejo (2), Nada Kolasinac (1), Patrick Grunert (3), Ursula Röhl (4), Carlota Escutia (5), Javier Hernández-Molina (6), Dorrik Stow (7), David Hodell (8), Carlos Alvarez-Zarikian (9), and the IODP Expedition 339 Scientists Team

(1) Institute of Geosciences, University Frankfurt, Frankfurt, Germany (a.bahr@em.uni-frankfurt.de), (2) Institute of Biogeosciences, Japan Agency for Marine-Earth Science and Technology, Yokosuka, Japan, (3) University of Graz, Institute for Earth Sciences, Graz, Austria , (4) MARUM, University of Bremen, Bremen, Germany, (5) Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Armilla (Granada), Spain, (6) Facultad de Ciencias del Mar, Universidad de Vigo, Vigo, Spain, (7) Institute of Petroleum Engineering, Heriot-Watt University, Edinburgh, UK, (8) Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge, UK , (9) Department of Oceanography, Texas A&M University, College Station, TX, USA

During IODP Expedition 339 complete sequences of Pliocene and Quaternary contourite deposits were drilled in the Gulf of Cádiz. Since the build-up of these contourites is tightly linked to the Mediterranean Outflow Water (MOW) they provide a unique archive of MOW variability and its influence on global circulation and climate. We performed high-resolution XRF scanning on spliced sections of two sites: 1) U1387, located on Faro Drift in 559.1 m water depth in the upper branch of the MOW, and 2) U1389, in 644 m water depth on Huelva Drift ∼90 km W of Cádiz, located more proximal to the Gibraltar Gateway. Due to their different water depths, both sites can be used to infer vertical shifts of the MOW. The high sedimentation rates (25 cm/kyr for U1387 and ∼40 cm/kyr for U1389) permit high-resolution reconstruction of MOW strength in millennial-scale resolution.

Based on the good correlation of the Zr/Al ratio with grain size changes we propose that Zr/Al can be used to reconstruct bottom current strength, hence, MOW activity. For correlating both sites by means of XRF data Br appears to be most valuable, as the Ca signal, typically reflecting climate-driven carbonate production, is severely compromised by reworking. For the investigated interval of MIS 1 to 5 we identify a strong link to high northern latitude climate signals. High MOW is generally inferred during glacial terminations and high latitude cold phases (Last Glacial Maxiumum and Greenland Stadials during MIS 3-5). Heinrich-Events are also elevated in Zr/Al but show reduced MOW strength during the so-called “Sierro-Events”. Minimum MOW strength has been reconstructed for the early Holocene and MIS 5e, concomitant to sapropel formation in the Mediterranean Sea. Hence, there is a tight link to deep water production in the Mediterranean. While most of these changes occur rather synchronously at both sites, we observe a more complex behavior of the MOW during MIS 5b-e. In particular during MIS 5b-c a shoaling of the MOW core occurs synchronously to the intensification of the subtropical gyre circulation in the Northern Atlantic. The accompanying salt accumulation in the subsurface of the mid latitudes might have altered the density gradient in the Gulf of Cádiz and thereby forced the migration of the MOW into shallower water depths.