O-3071

Gibraltar Outflow and Mediterranean overturning circulation during the last 500 ky

Francisco J. Sierro[1], David A. Hodell[2], Nils Andersen[3], Lucía A. Azibeiro[1], Francisco J. Jimenez-Espejo[4], Andre Bahr[5], José A. Flores[1], Francisco J. Hernandez-Molina[6], Mike Rogerson[7], Rocío Lozano-Luz[8], Susana M. Lebreiro[8]

[1]University of Salamanca, Salamanca, Spain. [2]University of Cambridge, Cambridge, United Kingdom. [3]Leibniz-Laboratory for Radiometric Dating and Isotope Research, Kiel, Germany. [4]JAMSTEC, Yokohama, Japan. [5]Institute of Earth Sciences, Heidelberg University, Heidelberg, Germany. [6]Royal Holloway Univ. London, Egham, United Kingdom. [7]School of Environmental Sciences, University of Hull, Hull, United Kingdom. [8]Instituto Geológico y Minero de España, Madrid, Spain

Abstract

In order to explore past changes in the Mediterranean Outflow Water (MOW) we analyzed the fine sand content in the sediments together with some geochemical proxies and planktic and benthic stable isotopes at IODP site U1389. This site was recovered in the vicinity of the Strait of Gibraltar along the path of the main core of the MOW. The content of fine sand together with Zr/Al ratios were used to investigate the MOW speed variability along the past 500 ky. The MOW speed variability at this site was mainly driven by changes in the density contrast between the Inflow and Outflow, which was, in turn, governed by changes in the Mediterranean heat and freshwater budgets. Events of enhanced freshwater input to the Mediterranean associated to northward shifts of the Intertropical convergence Zone reduced the density contrast at Gibraltar and weakened the MOW at Gibraltar. Weak MOW events were recorded at times of sapropel deposition in the eastern Mediterranean.

At millennial scale, the MOW intensified at times of Greenland stadials and weakened during interstadials. However, during Heinrich stadials typical three-phase events were observed, with a sandy contourite layer at the bottom and top and a phase of weak MOW in the middle of the stadial, coinciding with the arrival of icebergs to the Gulf of Cadiz. For Heinrich stadial 1 this weak MOW event occurred at the time of the massive release of icebergs from the Laurentian ice sheets. However, the inflow of less saline water to the Mediterranean should have increased not decreased the density contrast between the Inflow and Outflow, especially because freshwater discharge to the Mediterranean from the African monsoons was extremely low. We propose different scenarios to explain these weak MOW events in the middle of Heinrich stadials that were certainly triggered by prominent changes in the Mediterranean heat and freshwater budget.