Geophysical Research Abstracts
Vol. 12, EGU2010-8391, 2010
EGU General Assembly 2010

Gateway restriction and climatic conditions of the Mediterranean Sea during the Messinian Salinity Crisis; A box model including Sr-isotope ratios

Robin Topper (1), Paul Meijer (1), Rachel Flecker (2), and Rinus Wortel (1)

(1) Department of Earth Sciences, Utrecht University, Budapestlaan 4 3584CD Utrecht, The Netherlands, (2) BRIDGE, School of Geographical Sciences, Bristol University, University Road, Bristol BS8 ISS, United Kingdom

Under certain conditions the ratio of two stable isotopes of strontium present in the water of a semi-enclosed basin ($^{87}Sr/^{86}Sr$) is known to be sensitive to the relative size of the inflow of ocean water and river input. Combining Sr-isotope ratios measured in Mediterranean Late Miocene successions with data on past salinity, *Flecker et al.* (EPSL, 203, 221-233, 2002) and *Flecker and Ellam* (Sed.Geol., 188-189, 189-203, 2006) were able to derive quantitative information on the Mediterranean hydrological budget at times before and during the Messinian Salinity Crisis (MSC). The authors obtained this hydrological budget by inverting the salinity and strontium data with steady-state solutions to the conservation equations of salt, strontium and water.

In this study, we incorporate strontium concentration, Sr-isotope ratio and a Late Miocene water budget from *Gladstone et al.* (P3, 251, 254-267, 2007) in the box model from *Meijer* (EPSL, 248, 486-494, 2006) which quantifies the water and salt budget of the basin under specified conditions of connectivity with the Atlantic Ocean, representing tectonic restrictions of the Rifian and Betic gateways, and atmospheric fluxes, induced by climatic changes. This model will give insight in the coeval behaviour of salt and Sr-isotope ratios under changing contributions of ocean and fresh water. With respect to the model of *Flecker et al.* (2002) the extended model is a significant advancement as it allows for examination of the temporal evolution of salt and Sr-isotope ratio as a function of the individual hydrologic fluxes (Atlantic inflow and outflow, river input and evaporation, instead of the inflow and outflow parameters used by *Flecker et al.* (2002)), and the possibility of non-equilibrium states during the Late Miocene. Model evaluation is performed using the Sr-isotope ratio data set compiled by *Flecker and Ellam* (2006).

Results from our model have implications for the timing and extent of Late Miocene Atlantic gateway restrictions and climatic changes (expressed as changes in evaporation and river input) and hence for scenarios for pre-MSC and MSC intervals.