Geophysical Research Abstracts
Vol. 14, EGU2012-7732-1, 2012
EGU General Assembly 2012

Benthic foraminiferal response to trophic changes across the last glacial-Holocene transition in the abyssal eastern Mediterranean Sea

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Benthic foraminifers have been studied in high temporal resolution in a well-dated abyssal sediment record from the Levantine Basin of the eastern Mediterranean Sea. Major target was to document the exact temporal sequence of changes in quantity and quality of organic matter fluxes and reconstruction of nutrient cycling during the last glacial, glacial termination and Holocene intervals and to evaluate its role in the formation of sapropel S1 during the early Holocene. The low-diverse modern benthic foraminiferal faunas of the abyssal eastern Mediterranean Sea are dominated by miliolids, and a few epifaunal arenaceous and hyaline taxa reflecting low food availability and ultra-oligotrophic conditions in the open-marine surface waters of this region. Specifically, the presence of the small opportunistic species Eponides pusillus and Anomalinoides minimus are associated with seasonal phytoplankton blooms and related phytodetritus pulses to the deep-sea. During the last glacial period, elevated proportions of shallow infaunal taxa indicate relatively higher organic matter fluxes than at present. The inferred glacial increase in surface water productivity can be attributed to intensified wind-induced vertical mixing of surface waters and related nutrient cycling. With the transition to Holocene boundary conditions, surface water productivity decreased and the abyssal faunas lack evidence for eutrophication with onset of sapropel S1 formation. This finding corroborates results from recent studies on the stable nitrogen isotope signature of organic matter but is in contrast to previous geochemical evidence. Comparison with faunal records from marginal areas of the eastern Mediterranean basins suggests that increased productivity in surface waters during the early Holocene was restricted to areas in the vicinity of riverine nutrient fluxes. Enhanced productivity in surface waters and related organic matter fluxes did obviously not contribute to the formation of sapropel S1 in the deeper basins. In addition, the record of the small opportunistic taxa allowed a detailed reconstruction of changes in the seasonality of surface water production and phytodetritus pulses that will aid to map the spatial and temporal variability of trophic changes in the eastern Mediterranean Sea during the transition from the last glacial to the Holocene.