Geophysical Research Abstracts
Vol. 14, EGU2012-12958, 2012
EGU General Assembly 2012

Holocene climate variability and environmental changes in the NE Mediterranean Sea along a N-S transect

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The Eastern Mediterranean Sea (EMS) lies in a climatological transition zone, under the influence of both tropical and mid-latitude climate processes. Early Holocene sediment records collected in the EMS bear witnesses for the formation of the most recent sapropel S1, closely associated with distinct minima in the orbital precession cycle and the insolation-driven monsoon maxima. The different scenarios of S1 deposition involve changes in marine productivity, organic matter preservation and circulation changes and are still under debate. Herewith, we focus on combined geochemical and micropaleontological proxies, namely organic biomarkers, organic carbon and nitrogen stable isotopes and coccolithophore assemblages, aiming at reconstructing climate-related parameters such as sea surface temperature (SST), marine productivity patterns, stratification and nutricline fluctuations and continental inputs in three gravity cores collected along a north-south transect in the EMS. Depending on the water column depth, the sediment accumulation rates and the hydrographic circulation patterns, S1 deposited in our records between ∼9.8 to 6.4 kyr BP. During the Holocene climatic optimum, SSTs increase gradually more than 4˚C and reaches values as high as 21.2˚C, 22.5˚C and 23˚C along the N-S transect. Our records also show a pronounced centennial-scale cooling that culminates at ∼ 8.0 kyrs BP, coeval to the N. Atlantic cooling event, causing an interruption in the deposition of S1 in all sites. Moreover, SST fluctuations are detected between 4.9 and 4.1 kyr BP, with a sharp positive shift to 24.9˚C indicating the presence of a warm period in the mid Holocene. Higher accumulation rates of TOC, marine biomarkers and coccolithophore assemblages were recorded during the S1a, S1b and Mid Holocene Humid (MHH) phases, indicating higher productivity and/or better preservation of organic matter. Furthermore, distribution patterns, composition and characteristic ratios of marine biomarkers and of coccolithophoride species exhibit variability in paleoproductivity trends, hydrographic dynamics and nutricline levels during the Holocene. The distributions of land plant biomarkers are indicative of variable terrigenous organic matter supply and the concomitant transport of nutrients to surface waters. The different types of δ^{13}Corg excursions associated with stronger fluvial delivery (terrestrial inputs) in the north site, whereas the other two sites received most marine organic matter. Lighter values of δ^{15}N within S1 and MHH phases reflect a significant contribution of N-fixing organisms to the N-cycle, related probably to higher demand for nitrogen due to the established dysoxia in the water column/sediment interface, leading to denitrification and P regeneration.