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A biomarker study of high resolution sedimentary records in the eastern Mediterranean Sea since the last glacial maximum

G. Katsouras (1,2), A. Gogou (1), I. Bouloubassi (3), K.-C. Emeis (4), M. V. Triantaphyllou (5), and V. Lykousis (1)

(1) Hellenic Centre for Marine Research, Institute of Oceanography, 19013 Anavyssos, Greece, (2) University of the Aegean, Department of Marine Sciences, 81100 Lesvos, Greece, (3) Locean - IPSL Université P. et M. Curie C 4, Place Jussieu, 75252 Paris Cedex 05, France , (4) University of Hamburg, Institut für Biogeochemie und Meereschemie, D-20146 Hamburg, Germany, (5) University of Athens, Faculty of Geology & Geoenvironment, Dept. of Historical Geology-Paleontology, Panepistimiopolis 15784, Athens, Greece

Information stored in sedimentary records provides evidence on climate and environmental variability at decadal to centennial time scales. The eastern Mediterranean Sea and the related Aegean Sea exhibit high sedimentation rates in certain areas and are considered as sensitive regions to record paleo-environmental and –climatic changes. The aim of our study is to reconstruct high-frequency paleoclimatic variations and identify associated changes in the physical, chemical and biological environment in selected basins of the eastern Mediterranean Sea, using molecular biogeochemical proxies.

Here we present a high-resolution multi-proxy study along two Aegean Sea cores (north (152SL) and southeast (NS-14)) and a Libyan Sea core (HCM2/22). An important time marker and indicator of remarkable climatic and environmental changes is sapropel S1, a sediment layer rich in organic carbon. Depending on the water column depth, the sediment accumulation rates and the proximity to freshwater and water formation sources, S1 deposited between ∼9.8 to 6.4 kyr BP, with an apparent interruption in the S1 deposition that occurred from ∼8.6 to 7.6 kyr BP. SSTs based on alkenone unsaturation index Uk´37, δ^{15}tot, δ^{13}Corg and various marine and terrestrial biomarkers are used to investigate the region's climatic variability, and the modifications in the biogeochemical functioning of the eastern Mediterranean Sea.

Uk´37 SST distribution in our records reveals significant fluctuations in temperature over the last 20.000 yrs. Organic carbon stable isotopes values span a narrow range over the whole sequence, with values varying to typical marine origin. The distributions of land-plant biomarkers are indicative of variable terrigenous organic matter supply and the concomitant transport of nutrients to surface waters. Furthermore, the distribution patterns and characteristic ratios of marine biomarkers exhibit differences in the paleoproductivity trends and ventilation changes over the last 20 kyr. Low δ^{15}N values within the sapropel layers reflect a significant contribution of N-fixation to the N-cycle, related probably to higher demand for nitrogen due to denitrification and sedimentary phosphorous regeneration processes under low-oxygen conditions.