ORGANIC GEOCHEMICAL PROXIES IN THE SEDIMENTARY RECORD OF THE E. MEDITERRANEAN SEA: PALEO-ENVIRONMENTAL AND -CLIMATIC RECONSTRUCTIONS DURING THE LAST 20,000 YRS

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Abstract
Sedimentary organic matter (OM) provides a variety of proxies for the reconstruction of marine and continental paleoenvironments and paleoclimates. In this study, we compare biogeochemical proxies isolated from three sediment cores in the Eastern Mediterranean Sea (from the Aegean and Libyan Seas) during the last 20,000 yrs. The marginal Eastern Mediterranean Sea represents a 'natural laboratory' for paleoceanographic studies due to its sensitivity to oceanographic and climatological changes ([1], [2]).
Keywords: Aegean Sea, Eastern Mediterranean, Organic Matter, Paleoceanography, Sapropel

Early Holocene sediment records collected in the Eastern Mediterranean Sea (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 ([3]). The different scenarios of S1 deposition involve changes in marine productivity, organic matter preservation and circulation changes and are still under debate ([4], [5], [6]). Herewith, we present a high-resolution study of organic geochemical proxies in three gravity cores collected from the EMS, namely the cores SL152 and NS-14 collected from the Aegean Sea (north and southeast, respectively), and core HCM2/22 collected from the Libyan Sea. Our goal is to investigate the patterns of organic matter accumulation and preservation and reconstruct paleo-SSTs based on alkenone unsaturation index Uk´37 during the last 20,000 yrs with focus on the deposition of sapropel S1 along a north-south transect in the EMS. Depending on the water column depth, the sediment accumulation rates and the proximity to freshwater and water formation sources, S1 deposited in our records 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. At 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 (in cores 152SL, NS-14 and HCM2/22 respectively). Our records also show a pronounced centennial-scale cooling that culminates from ~8.2 to 7.6 kyrs BP, coeval to the N. Atlantic cooling event ([7]), causing an interruption in the deposition of S1 in all sites. SST fluctuations are detected between 4.9 and 4.1 kyr BP in core NS-14, with a sharp positive shift to 24.9°C indicating the presence of a warm period in the mid Holocene ([8]). The higher accumulation rates of TOC and all marine biomarkers within the sapropelic layer S1a and less pronounced within S1b in the Aegean Sea compared to the Libyan Sea indicate the importance of productivity – OM reaches the shallower sites more effectively – for the intensity of S1 deposition period. Organic carbon stable isotopes values span a narrow range. The different types of δ^{13}Corg excursions associated with stronger fluvial delivery (terrestrial inputs) in the north Aegean Sea whereas the other two sites received most marine organic matter. 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. Lighter values of δ^{15}N within S1 and Mid Holocene Humid (MHH) phases reflect a significant contribution of N-fixing organisms to the N-cycle related probably to higher demand for nitrogen (denitrification/ P regeneration) due to the established dysoxia in the water column/sediment interface.

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