Geophysical Research Abstracts
Vol. 13, EGU2011-7420, 2011
EGU General Assembly 2011

Abrupt changes in the sedimentation rate and evidence for submillennial periodicities in an annually laminated S5 sapropel from the Eastern Mediterranean.

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The eastern Mediterranean today is a concentration basin, characterized by an excess of evaporation over meteoric and riverine input, where thermohaline circulation favors the formation of intermediate and deep water and makes it to a well oxygenated marginal sea. In contrast, sapropel horizons occured during warm and certain cool periods, and coincide well with maxima in insolation and precipitation by an intensified Monsoon over Northern Africa. Freshwater input to the Mediterranean increased to an amount, where the thermohaline circulation was weakened and finally led to the formation of a more stratified and partly anoxic water column. The undisturbed sedimentation during times of sapropel formation, in the relatively small and fast responding Mediterranean basin, bears the potential to accumulate climate sensitive proxies, which record the hydrographic as well as terrestrial conditions on the adjacent landmasses.

Whereas most sapropel horizons typically show a thickness between 20 and 30cm, implying a sedimentation rate too low to monitor climate forcing during sapropel formation at centennial resolution, we present data from a laminated sapropel horizon with a thickness of ∼85cm. The sapropel has been deposited in the Northern part of the Levantin basin and was recovered in three cores (M40-4 SL67: 34 48.85 N, 27 17.76 E, 2157m, M51-3 SL103: 34 48. 80 N, 27 16. 98 E, 2154 m. M51-3 SL104: 34 48. 89 N, 27 16. 96 E, 2155 m). The section has been studied by means of planktonic foraminiferal census counts, elemental data from XRF-Scanning and isotopic measurements at a resolution of 3mm – 0.2mm. Various events of disappearance and reappearance of planktonic foraminifera as well as prominent events in d18O and d13C measurements (G. ruber) allow the precise correlation with other Mediterranean S5 sapropels and further indicate a sudden and drastic increase in the sedimentation rate after the first half (∼2.5kyr) of sapropel formation. This change in sedimentation rate is associated with a transition to a diatomite facies, with strong layering caused by seasonal settling of mat forming diatom frustules (Thalassionema, Thalassiotrix), whose presence is indicated directly by REM imagery as well as increased Si/Ca-contents and elevated water content and porosity. About 2500 discrete laminae were counted in resin impregnated thin sections in the section, corresponding to the second half of sapropel formation and found to be consistent with annual deposition. This expanded section of the S5 sapropel thus offers an unprecedented opportunity to analyze climate forcing in the eastern Mediterranean region at sub-decadal resolution. Wavelet analysis of XRF elemental profiles of the expanded section of the sapropel indicate periodicities in certain time bands between 20 and 300yrs in elements, sensitive to aeolian dust input and productivity, which potentially point at a solar forcing of interglacial climates.