



Geochemical comparison of the Eemian and Holocene interglacial marine ingressions into the Black Sea

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During R/V *Meteor* expedition M72/5 in 2007, two gravity cores (22-GC-7/3) were recovered which contain a second sapropel 7 m beneath the recent (Holocene) one. Both sapropels were sub-sampled on millimeter scale and analyzed by XRF, ICP-OES and HR-ICP-MS for major and trace elements. Additionally, samples of the second sapropel were analyzed for U and Mo isotopes by MC-ICP-MS. The estimated age of the older sapropel fits with the Eemian interglacial. The trends in total organic and inorganic carbon (TOC, TIC) in the Eemian sapropel compare well with the Holocene one. This fact allows to create a lithological classification analogous to the acknowledged unit classification of the Holocene sapropel. Comparable enrichments of redox-sensitive elements (e.g. Co, Cr, Cu, Fe, Mo, Ni, Re, U and V) indicate that both sapropels were deposited in anoxic and/or euxinic environments. These trace metal enrichments suggest a similar formation mechanism, but a slightly different paleoenvironment during the different time periods (units), which may be differentiated by $\delta^{238}\text{U}$ and $\delta^{97}\text{Mo}$. Both isotope proxies show an anoxic but non-euxinic environment during the Eemian interglacial, while in the Holocene an euxinic water column was fully established. The enrichment of major and trace elements of the Eemian sapropel shows similarities with the Holocene sapropel from the same location, as well as with the age-equivalent S5 sapropel from the Mediterranean. The geochemical data also fit quite well to the bulk sample from DSDP Leg 42B Site 379A core 11 (Ross et al. 1978), the only record that recovered the Eemian sapropel in the Black Sea until now. The bulk $\text{Sr}_{xs}/\text{Ca}_{xs}$ ratio shows at least two marine events during the Eemian interglacial, while in the recent sapropel only one marine ingressions is documented. Ca_{xs} , $\text{Mg}_{xs}/\text{Ca}_{xs}$ and Ti/Ca ratios show the alternating warm and cold events during the glacial period and the transition to the Holocene interglacial in the region of the southern Black Sea. Paleoproductivity proxies (e.g. TOC, P, Ba, Cu and Ni) document increased deposition/preservation of organic matter during the warmer periods in the Black Sea. Our study implies that repeated marine sapropel formations are linked to interglacial periods and reflect the global sea level rise and flooding of the Bosphorus sill.

References:

Ross, D. A., 1978. *Initial reports of the Deep-Sea Drilling Project Vol. XLII*. U.S. Government Printing office, Washington D.C.