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Deposition, depth-dependent redox-controlled preservation and interruptions of the most recent Sapropel (S1)

Gert J. De Lange (1), Amalia Filippidi (1), Rick Hennekam (2), and Jiawang Wu (3)

(1) Utrecht University, Geosciences-Geochemistry, Earth Sciences, Utrecht, Netherlands (gdelange@geo.uu.nl), (2) Royal NIOZ, Department of Ocean Systems, P.O. Box 59, Texel (NL), (3) State Key Laboratory of Marine Geology, Tongji Univ., Siping Rd, Shanghai (CN)

The repetitive deposition of organic-rich layers, sapropels, in the Eastern Mediterranean confirms the basin's sensitivity to climate-induced hydrological changes. The most recent sapropel S1, was deposited synchronously basin-wide between $\sim$ 10.8-6 cal.ka BP [1] within the African Humid Period. This period is characterized by intense humid conditions prevailing in the circum-Mediterranean. The Nile river was considered to be the major contributor of excess runoff during S1 in response to variations in solar activity (2). It is now realized that not only runoff from the Nile but also from fossil river/wadi systems of the Libyan Tunisian margin (3) and the Adriatic mainland have been substantial (4) during S1.

The excess runoff resulted in a stratified water column, cessation of deep-water formation, and in enhanced primary production in the surface waters, thus enhanced bottom-arriving organic fluxes. As a consequence, oxygen-depleted conditions developed and were associated with the preservation of sapropel units. Anoxic conditions prevailed in the entire basin during the first part of sapropel formation. However, redox-sedimentary conditions that controlled S1 preservation have been variable in relation to water-depth. In addition, brief cooling episodes, linked to the Northern climate system, disrupted sapropel formation by triggering the temporary resumption of deep-water formation, hence bottom-water ventilation at 8.2 and 7.4 cal.ka BP(5). The large Mn-peak (Marker Bed), at the top of S1 demarcates the nearly concomitant recovery of the system and final restoration of normal oxic conditions. Nonetheless, high-resolution studies at relatively shallow water depths have shown that re-oxygenation of bottom waters has been gradual from the 7.4cal.ka BP interruption onward. Such variations are more prominent for sites in the vicinity of deep-water formation areas, i.e. Adriatic and Aegean Seas. This points to a depth- dependent evolution of deep-water formation frequency and related bottom-water oxygenation variability, in particular during and at the end of S1 formation. This confirms the basin's high sensitivity to climate change associated to both Northern and N. African climate systems. In the light of future climate change, it also points to the high potential of the Mediterranean, with its amplified signals and enhanced preservation of emblematic diagnostic proxies, for prognostic (palaeo)-oceanographic studies.

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