



Evolution of conditions for sapropel deposition in the eastern Mediterranean from Pliocene to Holocene: Multiproxy study on paleoproductivity and paleoxygenation

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Cyclic deposition of sapropels characterizes the sedimentary sequences of the eastern Mediterranean during the last 5Ma. Sapropels are the consequence of climatically induced variations in the paleoceanographic conditions in the basin that led to an increase in primary productivity and a parallel decrease in bottom water oxygenation. Although similar conditions are observed across the basin through time, significant differences are obvious when comparing recently deposited sapropels with older equivalents, detected both in paleoproductivity and paleo-redox proxies. We apply a multi-proxy approach, using major and trace elements, element ratios, Total Organic Carbon (TOC) content and C and N stable isotopic composition, in order to determine the evolution of the sapropel deposition on four different settings in the Eastern Mediterranean, from Pliocene to recent. All sapropels are linked to an increase in primary productivity, detected by Ba-excess. The maximum rate of productivity and TOC accumulation is described during the Pleistocene, whereas the highest TOC concentration is found in Pliocene layers. On the other hand, we observe a progressively better bottom-water oxygenation of the basin during and after sapropel formation from Pliocene through to Holocene. We thus infer that, while sapropel formation during the Pliocene is strongly controlled by oxygen availability and deep circulation, Pleistocene-Holocene equivalents are mainly formed due to enhanced productivity,

overwhelming the rate of organic matter decay. Recent sapropels show evidences of active oxidation immediately after deposition, indicating normal bottom water circulation. The different geographical settings provide a picture in which sapropel deposition occurs basin wide, but concentration of organic carbon in the sediment is dependent of water depth. The Nile river debaucher exert a direct influence particularly recognizable over the area around the delta, providing nutrient into the basin.