Geophysical Research Abstracts
Vol. 18, EGU2016-1864, 2016
EGU General Assembly 2016

Redox-Controled Preservation of Mediterranean Sapropel S1 deposits during Formation and Interruption

Gert J. De Lange (1), Amalia Filippidi (1), Marie-Louise Goudeau (1), Rick Hennekam (1,2)
(1) Utrecht University, Geosciences, Utrecht, Netherlands (gdelange@geo.uu.nl), (2) now at NIOZ-Texel, NL

Organic-rich units (sapropels) occur in Mediterraneran sediments in a repetitive, climate-controled way. Their deposition is thought to be precession-related and to be associated with humid climate conditions. The last humid period from 11 - 5 kyr 14C ago, occurred simultaneous with a sustained circum-Mediterranean wet period and vegetated Sahara. Within that period, the most recent sapropel (S1) formed synchronously between 9.8 and 5.7 14C ky BP at all water depths greater than a few hundred metres. As a consequence of increased fresh water (monsoon) input, surface waters had a reduced salinity and concomitantly the deep (> 1.8 km) eastern Mediterranean Sea was devoid of oxygen during 4,000 years of S1 formation. This has resulted in a differential basin-wide preservation of S1sediments determined by water depth, as a result of different ventilation/climate-related redox conditions above and below 1.8 km.
The end of this period is marked by a basin-wide high sedimentary manganese-oxide peak that represents an abrupt re-ventilation of the deep-water at 5.7 kyr. The sustaining oxic conditions thereafter have resulted in a downward progressing oxidation-front that is not only characterized by the degradation of most organic matter over its active pathway, but also by the built-up of manganese oxide. The latter has resulted in a secondary diagenetic Mn-peak below the first, upper, ventilation Mn-peak. Apart from the major re-ventilation event at the end of sapropel S1 formation, also other, short-term ventilation events appear to have occurred during its formation, notably during the 8.2 ka event. This potentially basin-wide event is particularly noticeable at relatively shallow near-coastal sites of high sedimentation rates. It marks a brief episode of not only re-oxygenated deep water thus reduced preservation, but also decreased primary productivity thus nutrient supply.
This 8.2 cal ka BP interruption event is thought to be related to enhanced deep water formation in the Aegean or Adriatic due to a period of sustained cold air fluxes from Polar regions. The amount of precipitation, thus stratified water column conditions, seems associated with the N.African monsoonal system, whereas deep-water formation, thus disrupture of a stratified water column, seems mostly related to the northern borderland climate system. Sapropel formation mechanisms, therefore, are related to a sensitive interplay between N-African monsoonal and northern climate systems. Assessing distinct, sub-Milankovitch interruptions and related climate variability are vital for understanding future climate change.