Geophysical Research Abstracts
Vol. 21, EGU2019-10017, 2019
EGU General Assembly 2019

Reconstructing Eastern Mediterranean deep-water formation during sapropel S1 deposition

Amalia Filippidi and Gert J. De Lange
Utrecht Univerisity, Geosciences, Geochemistry, the Netherlands (a.filippidi@uu.nl)

The density-driven present-day thermohaline circulation in the Eastern Mediterranean is directly influenced by mid- and low- latitude climate zones. The repetitive deposition of organic-rich layers, sapropels, reflects periods of dramatic paleoceanographic basin-wide changes. These periods are characterized by extreme humid climate conditions leading to diminished water circulation and cessation of deep-water formation. Accordingly, the most recent S1-Sapropel was deposited during the African Humid Period (∼10-6ka BP) [De Lange et al., 2008] when wetter conditions prevailed in the circum-Mediterranean. Here, we reconstruct deep-water formation variability during S1 deposition, using geochemical records of three cores along a bathymetric transect (775 -1359-1908m water depth), under the direct influence of deep-water formation from the Adriatic Sea. These sites represent intermediate-, transitional- and deep-water conditions, respectively.
The distinctly higher sedimentation rates during S1 detected in all three cores correspond with enhanced run-off emanating from the Adriatic hinterland concomitant to the African Humid Period. Hence, this indicates a significant contribution of Northern borderlands' river run-off during the same period as that of southern sources. Increased levels of primary production occurred in the surface waters and oxygen-depleted conditions developed rapidly in sediments and bottom water for all studied water depths, confirming the nearly synchronous basin-wide initiation of sapropel formation. However, redox conditions have been variable during S1 deposition at different water depths.
During the first period of S1 deposition (S1a), conditions have been anoxic at all water depths and even sulfidic at greater depths. Sediment and bottom-water conditions below ∼1.4 km water depth remained sulphidic throughout S1, but for intermediate water depth site (775m) were severely anoxic only during the first part of S1 formation (Filippidi & De Lange, 2019). Bottom-water oxygenation events, at 8.2 and 7.4 cal.ka BP, interrupted S1 formation (Filippidi et al., 2016) in response to brief climate cooling triggering temporary resumption of deep-water formation and consequent disruption of sapropel formation.
Resumption of deep-water formation has been synchronous basin-wide, but re-oxygenation of bottom-waters at intermediate water depth seems to have been more gradual. From the 7.4 cal.ka BP ventilation onward, intermittently oxygen conditions prevailed here until the full recovery of oxic bottom water conditions ($\sim 6.6 \pm 0.3$ cal. ka BP). Restoration of oxic conditions at the deeper sites, may have occurred slightly later, at $\sim 6.0 \pm 0.3$ cal.ka BP. From the S1-MarkerBed ventilation-event onward, conditions remained fully oxic at all water depths.

De Lange G.J., et al., 2008. Synchronous basin-wide formation and redox-controlled preservation of a Mediterranean sapropel. Nature-Geo 1, 606–610.
Filippidi, A., et al., 2016. Eastern-Mediterranean ventilation variability during sapropel S1 formation, evaluated at two sites influenced by deep-water formation from Adriatic and Aegean Seas. Quat. Sci. Rev. 144, 95–106.
Filippidi, A. & De Lange, G.J., 2019. Eastern Mediterranean deep-water formation during sapropel S1: a reconstruction using geochemical records along a bathymetric transect in the Adriatic outflow region (under review).