

Biomarker evidence for cyanobacterial blooms in a brackish surface layer in the Mediterranean Sea during S5 sapropel deposition

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Sapropels are organic-rich sediment layers deposited in the eastern Mediterranean Sea during precession minima as increased freshwater delivery dominated by the Nile River resulted in stratification and deep-water anoxia. Previous studies suggested that nitrogen fixation was widespread in the highly stratified, oligotrophic surface waters during depositional events and that cyanobacteria symbiotic with diatoms (DDAs: diatom-diazotroph associations) were responsible.

Here we analyzed sapropel S5 sediments for heterocyst glycolipids (HG) biomarkers that differentiate free-living and symbiotic N₂-fixing cyanobacteria. We detected a HG with a pentose (C5) head group specific for DDAs. However, HGs with a hexose (C6) head group were present in substantially (up to 60 times) higher concentration than the C5 HG. These data show that in contrast to the commonly held hypothesis of DDA dominance, free-living Nostocalean cyanobacteria, similar to present day blooms in the brackish Baltic Sea dominated. The C6 HGs increased substantially at the onset of sapropel S5 suggesting that massive seasonal cyanobacterial blooms were associated with a brackish surface layer in the eastern Mediterranean.