

# **Marine barite formation in the Mediterranean during sapropel deposition: role of microbial processes and primary productivity**

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Sapropels and Organic Rich Layers (ORLs) represent exceptional examples of productivity oscillations in the Mediterranean. A large dataset of paleoproductivity reconstructions based on Ba records exists, in particular from sapropel layers in the eastern Mediterranean. The main driver behind the deposition of sapropels was the monsoon-related freshwater inputs into the eastern Mediterranean in response to periodic northward shifts of the intertropical convergence zone. Although less thoroughly studied, ORLs in the western Mediterranean have also responded to climate oscillations and involved important variations in productivity and bottom water oxygenation. Over time, barite accumulation rates have been considerably higher in the eastern basins than in the western Mediterranean, which has been usually related to the higher enhanced fluvial discharge from the Nile and other North African rivers that resulted in considerably higher productivity in the eastern basins. In the western records, although Ba enrichments are also recognized during the deposition of some ORLs, these are not as prominent as in the eastern basins. In general, marine barite has been always used as a direct indicator of primary productivity. However, the diverse processes involved in barite precipitation are still poorly explored. Experimental work as well as observations from microenvironments of intense organic matter mineralization in the ocean water column have provided new insights into the role of bacteria and extracellular polymeric substances (EPS) production in barite formation. Thus, barite abundance in sapropels and ORLs would therefore record not only the productivity oscillations but also potential differences in related microbial processes. In fact, differences between the eastern and western basins also support differences in patterns and types of productivity. Organo-mineralization and barite formation would strongly depend on types of productivity, which could contribute to spatial differences in barite formation between sapropels and ORLs. In the modern Mediterranean significant differences in types of productivity exist. Such differences in the past could have resulted in regional changes in barite production. A better understanding of microbial processes involved in barite production is therefore required to further constrain barite accumulation rates and the temporal and spatial variability in the Ba/Corg ratios in the Mediterranean.