

## **Processes captured by Ba proxies in Mediterranean sediment records: from barite crystal growth to preservation**

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The Ba record preserved in Mediterranean sediments represents one of the most exceptional examples of productivity oscillations registered by Ba content and barite accumulation. However, the mechanisms of Ba nucleation and barite formation in the water column were largely unknown. A better understanding of the microbial processes involved in barite formation has in turn led to a better understanding of the processes involved in marine barite formation. Both bacterial cells and extracellular polymeric substance (EPS) provide charged surfaces that play an essential role in promoting locally high concentrations of Ba leading to barite formation. The ubiquitous presence of bacteria in the mesopelagic zone at depths of intense organic matter mineralization and their inherent ability to biomineralize make them extremely important agents in the biogeochemical cycling of Ba. Therefore, processes involved in barite precipitation other than primary and export production, such as organic matter degradation, bacterial respiration, EPS formation and particle sinking, are important factors controlling barite formation, accumulation rates and the temporal and spatial variability of Ba/Corg ratios. These are important aspects to consider in Mediterranean basins where significant differences in barite formation are recognized. Although Ba enrichments are also observed during the deposition of some organic-rich layers (ORLs), they are not as pronounced as in the eastern basins. In addition to significant differences in nutrient supply, this also suggests that patterns and types of productivity, particularly in terms of bacterial production, may play an important role. Reconstruction and interpretation of past productivity and its potential spatial and temporal variations should therefore take a microbial palaeoperspective into account. In terms of preservation, some spatial differences in barite abundance could also be related to the availability of sulphate in pore waters for barite preservation. In general, barite is mostly well preserved and diagenetic mobilization of Ba due to sulphate depletion has not been recognized in Mediterranean sedimentary records. However, further studies are needed to evaluate factors controlling the preservation of Ba records.