

Authigenic carbonate precipitation in the eastern Mediterranean Sea (Levant Basin, offshore Israel)

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Methane-derived authigenic seep carbonates represent a widespread global phenomenon, typical of passive continental margins and oceanic spreading centers. These carbonates play a crucial role in understanding seep dynamics and determining the source of methane-enriched fluids, while also acting as a natural mechanism for carbon sequestration. Furthermore, they serve as potential records of past fluid fluxes, providing valuable insights into the evolution of methane seepage activity over time. The recent discovery of seep carbonates in the southeastern Mediterranean Sea has considerably contributed to the understanding of this phenomenon. In this study, five sediment cores retrieved from various cold seep sites in the Levant Basin were used to explore the relationship between bioturbation and authigenic carbonate precipitation within the shallow subsurface. Specifically, this study examines whether and how bioturbation influences secondary carbonate precipitation in sediments offshore Israel at and close to the Palmachim Disturbance, retrieved during the EUROFLEETS2 SEMSEEP Expedition 2016. This study combines qualitative analysis using sedimentary petrography and micro-CT scanning together with elemental geochemistry (XRF logging). Our data reveal that, bioturbation in most analyzed samples neither promotes physico-chemical conditions sufficiently favorable for authigenic carbonate formation nor plays a crucial role in enhancing carbonate precipitation. Although bioturbation alters the macroscopic structure and appearance of the sediment, in this specific case, its direct impact on secondary carbonate precipitation appears limited. These results provide further insights into the interplay between bioturbation and authigenic mineral precipitation, establishing a baseline for future investigations to clarify and deepen the understanding of the dynamics of bioturbated sediments and their role in authigenic carbonate formation.

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