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Multi-proxy paleoenvironmental reconstruction of the cold-water coral Melilla Mounds (Eastern Alboran Sea)

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This study presents the first results of a multi-proxy characterization of core MD13-3455 collected during the MD194 EuroFLEETS Gateway Expedition in 2013. The 5 m long core record was retrieved from Brittlestar Ridge I at 319 m water depth. The Brittlestar Ridge I is part of the larger Melilla Mound Field, a carbonate mound province covering over 500 km2 in the Eastern Alboran Sea (Western Mediterranean Sea). The location of the core, situated near the summit of the mound, makes it ideal to reconstruct the paleoenvironmental setting in which the cold-water coral ecosystem developed on the Brittlestar Ridge. The combination of benthic foraminiferal assemblages with U/Th dating on the coral skeletons, grain size, Total Organic Carbon (TOC), Computed Tomography (CT) imaging and XRD/XRF data provides a solid base to decipher major and minor environmental changes in the region.

The core presents a succession of units rich in cold-water coral fragments (mainly Lophelia pertusa) embedded in a siliciclastic matrix. An extended unit characterized by the dominance of bryozoans dominates the base of the core. The XRD investigations show that the cold-water corals and bryozoans are embedded in a matrix consisting of approximately 60 wt. % of carbonate phases (i.e. aragonite, LMC, HMC and dolomite) and 40 wt.% of siliciclastic minerals (i.e. quartz, feldspars and clay minerals). The U/Th dating on the coral skeletons suggest an age of approximately 2.4 ky for the top of the core and 14.8 ky at its base. Benthic foraminiferal assemblages in the bryozoan dominated part are different from those observed in the coral dominated sediment above. The species Discanomalina coronata, previously described as a bio-indicator for cold-water coral environments (Margreth et al. 2009), is more dominant in the bryozoan dominated sediment compared to the coral dominated sediments above. In the matrix sediments surrounding the coral, high abundances of buliminids may represent periods of higher nutrient supply. Overall, infaunal species demonstrate a higher abundance in the coral supported sediments than in the bryozoan supported sediments where the abundance of epifaunal foraminifera is noticeably high.

References

Margreth S., Rüggeberg A., Spezzaferri S. (2009) Benthic foraminifera as bioindicators for cold-water coral reef ecosystems along the Irish margin. Deep-Sea Research I, 56, 2216-2234.