Understanding the temporal and spatial variability of early diagenesis in carbonate mounds

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Authigenic mineral precipitation in marine sediments is believed to account for at least 10% of the global carbonate accumulation [1] and may be an important controlling factor in the stabilization of cold-water coral carbonate mounds [2]. In sub-recent mounds located on Pen Duick Escarpment in the Gulf of Cadiz, secondary carbonate precipitation can be mediated by microbial induced changes in alkalinity associated with methane consuming archaea and sulphate reducing bacteria in a shallow sulphate methane transition zone (SMTZ) [3]. The 4D-DIAGENESIS@MOUND project aims to understand the functioning of a carbonate mound as a biogeochemical reactor, triggering early diagenetic processes in space and through time. This study focuses on the characterization of authigenic mineral and dissolution phases in two gravity cores retrieved from Alpha Mound and in-vitro flow experiments with an in-house designed bioreactor. Mineralogical variability within the carbonate mound sediments points towards a dynamic system. Lipid biomarker analysis and 3D visualization by means of multi-scaled nanotomography show the nature of diagenetic phases and elucidate a link between diagenesis and microbial activity.

[1] Sun & Turchyn (2014), *Nature Geoscience* **7**, 201-204. [2] Pirlet et al. (2012), *Sedimentology* **59**, 578-604. [3] Wehrmann et al. (2011), *Marine Geology* **282**, 118-137