Antecedent Topography as a Control on Facies Heterogeneity in a Shallow Heterozoan Carbonate System, SE Spain

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Pliocene heterozoan carbonates in the Agua Amarga basin, SE Spain reveal facies heterogeneity resulting from depositional processes interacting with substrate topography. The surface upon which Pliocene strata were deposited consists of two low-relief terraces separated by ~10m of vertical relief, likely resulting from episodes of transgressive marine erosion. Oldest deposits crop out on the uppermost terrace and are packstones with mollusks and rhodoliths. A Pliocene relative sea-level fall resulted in erosion of these and underlying deposits, and created a local surface with morphology resembling a paleovalley. Pliocene carbonate facies deposited during or after subsequent reflooding consist of abraded, very¬¬ fine to medium sand sized carbonate packstones with variable amounts of rhodoliths, oysters, and rounded micrite pebble intraclasts. On terraces, heterogeneity correlates with proximity to the edge of the terrace. Near breaks in slope on terrace margins, deposits are massive and coarse (30-55% rhodoliths, oysters, micrite intraclasts). Oysters are more common on the upper terrace. In contrast, relatively flat terrace interiors are dominated by abraded sand-sized packstone; strata are massive, normally graded, or trough crossbedded with alternating sharp-based coarser (10-50% coarse) and finer (0-10% coarse) layers. We interpret these alternations to reflect the following: (1) sporadic storms deliver coarse material derived from margin areas; (2) periods of wave and tidal energy abrade and produce crossbeds; and (3) periods of lower energy produce massive beds through bioturbation. On areas of steeper slope between terraces, facies are similar to terrace interiors, with alternation of finer and coarser packstone layers. Increased numbers of alternations on slope areas suggest intermittent transport from terraces upslope, and amalgamation on terrace interiors. Overall facies distribution indicates terrace margins as locations of preferred carbonate productivity, due to higher energy and increased nutrient input at breaks in slope. These results indicate that prediction of heterogeneity in heterozoan carbonate systems should combine an understanding of the controls on production (e.g. nutrient availability and currents) and physical processes controlling where carbonate sediments ultimately accumulate. Antecedent topography is an important control for both production and heterogeneity of heterozoan carbonate facies.