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Geometries, Cyclicity and Facies of a Temperate-Water Carbonate Succession Deposited During Icehouse Conditions: Pliocene Carboneras Basin, Southeast Spain

Most carbonate reservoir models are based on controls developed for tropical systems. Pliocene carbonates in southeast Spain provide contrasting models because they were deposited during a time of temperate climate. The Carboneras basin (~ 4 by 4 km) exposes up to 80m of Pliocene heterozoan limestone deposited on a substrate of Miocene carbonates and volcanics with at least 100 m of paleotopographic relief. After sea-level rise inundated the basin, Pliocene carbonate deposition was dominated by clinoforms prograding from several areas of gently sloping substrate. Individual clinoforms can be traced proximally to distally with 5-14 m of depositional relief and have dips ranging from 5-18 degrees. Distal deposits typically consist of rhodolite and coarse bivalve packstone and pass updip to structureless bioclastic packstone dominated by relatively well-sorted, fragmented, and abraded grains. The abrasion and sorting of grains, sedimentary structures indicative of episodic deposition, and absence of sedimentary structures typical of shallow-water deposits indicates the bioclastic packstone, in proximal parts of clinoforms, was bypassed downslope from shallower water areas. In contrast to tropical systems, sediment deposited at or near sea level does not appear to be preserved. High frequency glacio-eustacy is known for this time interval and appears to be recorded as 1-2 meter-thick, asymmetric shoaling-upward cycles. Cycles consist of coarse-grained rhodolithic and molluscan deposits fining upward to abraded and sorted bioclastic sands. In contrast to tropical models in which shallowing upward is commonly preserved as coarsening upward cycles, these temperate-climate carbonates preserve shallowing upward as fining-upward cycles.