Vadose Diagenetic Dissolution Textures, Cementation Patterns, and Aragonite and Mg–Calcite Alteration in the Holocene Isla Cancún Eolianite Aragonitic Ooids: Modern Analog for Ancient Ooid-Grainstone Pore Networks

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ABSTRACT

The Holocene Cancún Eolianite along the eastern shore of Isla Cancún in Yucatán, Mexico, is an excellent natural laboratory for investigating sedimentological and diagenetic processes in a costal carbonate eolian-dune system. The eroded outcrops, comprised of loose ooid sand to lithified ooid grainstone, present well-exposed dune stratification consisting of climbing translatent stratification, grainfall laminations, and sandflow cross-stratification. The sediments are comprised of aragonitic ooids that are undergoing extensive early diagenesis in the vadose zone by meteoric water. Different parts of the eolianite have achieved various stages of diagenesis, which allows the observation and understanding of the progression of aragonite ooid sand/grainstone stabilization. Dissolution of the unstable aragonite and Mg–calcite nuclei creates oomoldic pores, and the generated calcium carbonate is reprecipitated as very fine- to fine-crystalline equant calcite in interparticle pores. In ooid cortices, aragonite needles undergo dissolution by separating into nanoballs. No cement is being reprecipitated in the dissolving nuclei for lack of suitable nucleation sites. The vadose zone of the Cancún Eolianite is a closed system relative to conservation of calcium carbonate. The amount of dissolution of aragonite and Mg–calcite approximates the amount of very fine- to fine-crystalline equant calcite cement in the interparticle pore space. The early pore network has many similarities to ancient pore networks in ooid grainstones, such as cement-reduced interparticle pores, cortex-dissolution-band pores, oomoldic pores, and abundant nano- to micropores in altered ooids. Concepts derived from investigating the Cancún Eolianite can be applied to understanding how ancient ooid-reservoir pore networks formed and evolved.

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