Evolution of a Modern Ooid Sand Island South Joulter Cay, Great Bahama Bank

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Abstract

The Joulter's Cays ooid sand body covers some 400km^2 of the northern Great Bahama Bank north from Andros Island. It is famous as a site for the study of high-energy carbonate sediments and is a central analogue for understanding oolitic grainstone reservoirs due to the clearly observable interplay between vast stabilized sand flat and active ooid bars. The geological story of the three Joulter Cays, however, deserves equal attention. These islands, built of lightly cemented oolitic and peloidal sediments, form along the eastern, windward-facing margin of the ooid sand body. Their presence armors the sand body at its most energetic margin and significantly influences the local water circulation and thus depositional patterns. Their presence also introduces an element of spatially constrained meteoric diagenesis contemporaneous to sand generation and deposition. Previous field mapping and local coring integrated the islands into the overall story of sand body development and established that they are a very recent feature with radiocarbon dating showing ages from ~2000 ybp to present. Ongoing examination of South Joulter Cay (SJC), the largest of the islands, targets better delineation of the timing and processes that formed the island. High resolution imagery and a DTM constructed from a drone survey improve on previous maps. They show SJC is nearly 2.5 km long and up to 600 m wide and comprises a series of more than 24 elongate ridges formed from oolitic sands and their intervening lows or swales. Major ridges diverge toward the southern end of the island, and bankward-dipping foresets Indicate primarily seaward to bankward deposition. The ridges generally crest 3 m above MSL, and are closely spaced (50 m or less apart) with a few higher ridges up to 5 m. An abandoned tidal channel cuts through the southern third of the island.

The channel is filled with muddy sand and floods from the bankward direction during very high tides through a mangrove-lined network of channels. Historically, SJC records a period of higher ooid production than is seen in the sand body today. Ooid sand production was able to overwhelm the system’s ability to hydrodynamically redistribute sediments. The ridge and swale topography suggest the active bars locally built to beaches and back-beach dune ridges formed repeatedly. A scenario for island development based on existing data is presented and the need for additional data to answer specific questions is highlighted.

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