

Late Pliocene to Holocene platform evolution in northern Belize, and comparison with coeval deposits in southern Belize and the Bahamas

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ABSTRACT

Lithostratigraphy, depositional facies architecture, and diagenesis of upper Pliocene to Holocene carbonates in northern Belize are evaluated based on a *ca* 290 m, continuous section of samples from a well drilled on Ambergris Caye that can be linked directly to outcrops of Pleistocene limestone, and of overlying Holocene sediments. Upper Pliocene outer-ramp deposits are overlain unconformably by Pleistocene and Holocene reef-rimmed platforms devoid of lowstand siliciclastics. Tectonism controlled the location of the oldest Pleistocene platform margin and corallgal barrier reef, and periodically affected deposition in the Holocene. A shallow, flat-topped, mostly aggradational platform was maintained in the Holocene by alternating periods of highstand barrier-reef growth and lowstand karstification, differential subsidence, and the low magnitude of accommodation space increases during highstands. Facies in Pleistocene rocks to the lee of the barrier reef include: (i) outer-shelf corallgal sands with scattered coral patch reefs; (ii) a shoal–water transition zone comprising nearshore skeletal and oolitic sands amidst scattered islands and tidal flats; and (iii) micritic inner-shelf deposits. Four glacio-eustatically forced sequences are recognized in the Pleistocene section, and component subtidal cycles probably include forced cycles and autocycles. Excluding oolites, Holocene facies are similar to those in the Pleistocene and include mud-mounds, foraminiferal sand shoals in the inner shelf, and within the interiors of Ambergris and surrounding cayes, mangrove swamps, shallow lagoons, and tidal and sea-marginal flats. Meteoric diagenesis of Pliocene and Pleistocene rocks is indicated by variable degrees of mineralogic stabilization, generally depleted whole-rock $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values, and meniscus and whisker-crystal cements. Differences in the mineralogy and geochemistry of the Pliocene and Pleistocene rocks are attributed to variable extent of meteoric alteration. Dolomitization in the Pliocene carbonates may have begun syndepositionally and continued into the marine shallow-burial environment. Positive dolomite $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values suggest precipitation from circulating, near-normal marine fluids that probably were modified somewhat by methanogenesis. Sedimentologic and diagenetic attributes of the Pliocene–Pleistocene rocks in the study area are similar to those in the Bahamas with which they share a common history of sea-level fluctuations and climate change.

Keywords Belize, dolomitization, platform evolution, Pliocene to Holocene, rimmed platform, tectonics.