

**AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003**

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Spatial and Temporal Variations in Rates of Sediment Accumulation of Holocene Shallow-Marine Sediments, Belize

Rates of sedimentation, which are assumed constant in beds of similar lithology, are critical for converting stratal thickness to depositional duration in studies of cyclic deposits. Based on radiocarbon ages of mangrove peats and reference to a published sea-level curve, we have determined sedimentation rates of Holocene, shallow subtidal carbonates within a 700 km² area of Chetumal Bay in Belize to test this assumption. Sedimentation rate of the entire Holocene section varies from 0-118 cm/ky and averages 32±27 cm/ky. Rates are greatest in depocenters of thick mud-mounds (maximum 42±17 cm/ky) and are lower elsewhere (15±14 cm/ky), and correlate well with bedrock depth and poorly with water depth. Vertical variations in rates are indicated, with the highest being in early-transgressive mangrove peats (214-938 cm/ky) and the lowest in overlying or laterally-correlative early-transgressive carbonates (20-48 cm/ky). Combined rates of overlying late-transgressive and early highstand carbonates are 112-166 cm/ky, but are 242-460 cm/ky for highstand deposits alone. These trends correspond to transgressive catch-up and highstand keep-up sedimentation during Holocene sea-level rise. Sedimentation rate correlates poorly with sediment thickness but exponentially with duration. Results suggest that vertical and lateral variations in sedimentation rate are inherent during a single cycle of sea-level rise, and are controlled by interaction among bedrock topography, mechanisms of sediment redistribution and accumulation, and the nature of sea-level rise.