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

Eugene C. Rankey[1], Peter B. Burgess[2] (1) RSMAS/University of Miami, Miami, FL (2) Shell International E&P, Rijswijk, Netherlands

Unraveling Complexity on Carbonate Tidal Flats: Insights from Integrated Modeling and Field Observations

The stratigraphic architecture of carbonate tidal flats represents the complex, cumulative result of numerous interacting processes across a range of spatial and temporal scales. We compare and contrast observations and aspects of numerical forward model behavior, paving the way for integration of spatial characterization and numerical modelling to better understand complexity in carbonate systems.

The numerical forward model combines depth-dependent mosaic carbonate production and sediment erosion, transport and deposition that produces prograding islands. Interactions and feedbacks among subsidence, production and transport rates control island spacing and parasequence thicknesses. As the islands prograde due to accretion on their seaward side, a flooded 'moat' forms behind the islands due to relative sea-level rise and sediment starvation. Eventually, water depths in the moat become great enough that carbonate production resumes, generating a new tidal flat and prograding island.

Observations show the tidal flats of southwest Andros Island border a wide, shallow subtidal region with a straight shoreline. Landward of the shoreline is a broad supratidal plain that slopes gradually landward into shallow ponds, interrupted by numerous elongate or V-shaped palm hammocks that appear to be relict levees and shorelines created during progradation. Further landward, pond size and abundance increase suggesting progressive flooding of the area behind the prograding shoreline, as seen in the numerical forward model. Building on this basic test of the model, our continuing work is focusing on quantitatively addressing how complexity arises in carbonate systems and what spatial patterns are likely to be preserved.