Facies and Architectural Variability of the Albian Stuart City Margin

Phelps, Ryan M.[1]; Kerans, Charlie [1] (1) Geological Sciences, The University of Texas at Austin, Austin, TX.

Revitalization of tight-gas carbonates of the Albian Stuart City shelf margin over the last decade has provided new geophysical, core, and production data that are the impetus for a refined, integrated structural/depositional framework. Productive facies of this Northern Hemisphere Albian microbial-rudist margin is distinct from recently discovered Southern Hemisphere carbonates in the Santos Basin of Brazil, or their closer relatives from the Faja de Oro trend of Mexico. The combined effects of halokenisis and syndepositional differential compaction over the buried Aptian reef margin are primary influences on the position and facies architecture of the Stuart City.

A total of 5,000 ft of detailed core descriptions from Pawnee, Word, Sawfish, and Moray Fields provides a superb sample of the full spectrum of lagoon/tidal flat, rudist skeletal shoal/island, high-angle reef wall, and slope to basin environments. Core descriptions are complemented by extensive 3-D seismic data along the shelf margin and well-log correlations linking the shelf margin to platform interior strata near the Central Texas outcrop belt.

Integration of core, structural data, and seismic profiles point to a high-angle, early-lithified, sponge-microbial-stromotoporoid-coral reef wall with vertically extensive syndepositional fractures. Stromatolitic-coral-rudist facies form the reef flat, and these are backed by periodically exposed back-reef grainstone/rudstone shoal complexes. Shallow sub-tidal miliolid packstones and inter-tidal algal laminites lie less then 3 kilometers landward of the reef margin. While it is broadly applicable across the trend, this model is accompanied by numerous depositional profiles through architecturally diverse areas of the trend. This array of profiles illustrates observed variation in the dip-angle of reefal clinoforms, the abundance of syndepositional fractures and the extent to which fore-reef bioclastic debris zones are developed. It is postulated that the terminal location of the underlying Sligo reef (Aptian) caused variations in the dip-angle of Stuart City clinoforms, leading to low-angle progradational reef systems developed in areas overlying Sligo shelf strata. High-angle clinoforms with near vertical reef walls developed in zones within which Stuart City reefs developed beyond the terminal Sligo margin and a unstable substrate prevented significant progradation of the Stuart City system.