Resedimented deep-water model for Albian Glen Rose D Alabama Ferry Oolite "Shoals": Impact of the Houston Trough on Depositional Patterns and Facies Architecture

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Abstract

Intrashelf basins within broad shallow-marine carbonate platforms have been well documented, showcasing their dramatic impact on carbonate and siliciclastic facies architecture and depositional environments. Intrashelf basins are also loci of organic-rich carbonate deposits and that are associated with unconventional reservoirs (Grelaud et al. 2016). While controls on the creation of intrashelf basins vary as a result of both stratigraphic and structural influences, understanding their impact is crucial for prediction of depositional patterns and associated reservoir development.

The "Houston Trough" is defined here for the first time to recognize a half graben located near the intersection of the Brazos and East Texas Basins and which heavily influenced subsidence rates and depositional patterns of both Cretaceous and Tertiary deposits. The Lower Cretaceous Upper Glen Rose 'D' Member in the southern East Texas Basin, Brazos Basin, and Houston Trough, is a known producer of conventional hydrocarbons (e.g., Alabama and Fort Trinidad fields) and is currently an unconventional target. The Glen Rose D is composed of interbedded ooid and skeletal grain-dominated facies and siliciclastic mudstones, some of which are organic-rich. Reservoirs in the carbonate strata have been economic for many years and with the advent of oil and gas production from unconventional mudrock, the organic-rich argillaceous and calcareous mudrocks in the Glen Rose 'D' are now being evaluated.

Here, we use a suite of 7 wells with > 500 m of core, over 300 vintage SP-Resistivity-Gamma Ray wireline logs, and a 290 km long dip-oriented seismic line that intersects a number of key tectonic elements including the East Texas and Brazos Basins as well as the newly defined Houston Trough.The data for this study lie fifteen to forty km landward of the coeval Stuart City Reef margin and records the complex depositional patterns associated with syndepositional halo kinesis and differential compaction. Previous studies of the Alabama and Fort Trinidad fields suggested a shallow-water wave agitated setting for the Glen Rose D strata, but observations from cores in this study which include sharp erosional contacts between ooid facies and intercalated mudstones, starved ripples within high-TOC mudrock, normally graded bedding, and absence of traction-current sedimentary structures favor a resedimented high-density turbidite model. The depocenter for these gravity flows is the previously undocumented Houston Trough. The new depositional model for this carbonate-siliciclastic trend that recognizes fan-like depocenters rather than strike-parallel ooid shoals may help guide additional exploitation of the Alabama Ferry trend.

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