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SYSTEMS TRACTS: VARIATIONS IN THICKNESS AND LITHOFACIES WITH PALEOBATHYMETRY

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ABSTRACT

Well log-seismic sequence stratigraphy dip sections located offshore Texas and Louisiana, Gulf of Mexico, permit the recognition of numerous sequences and systems tracts based on the integration of high resolution biostratigraphy, paleobathymetry, well logs, and seismic profiles. The identification of sequence boundaries, maximum flooding surfaces, and lowstand systems tract boundaries within each sequence permits the recognition of the thickness and lithofacies variations of systems tracts with paleobathymetry in a downdip direction. The lowstand systems tract basin floor fans are usually found in inter-slope basins in the middle to lower bathyal environment. In the Plio-Pleistocene, lowstand systems tract slope-fan-complexes are very well developed in upper to middle bathyal environments. Here, they commonly consist of sand-filled channel and overbank deposits and attached lobes. The slope fan complexes typically pinch out by onlap in an updip direction near the outer neritic to upper bathyal boundary. In the lower bathyal environment, the slope fan complexes usually consist of turbidite mudstones. The late Miocene and older slope fans are similar except they are commonly deposited in deeper (lower upper bathyal to middle bathyal) environments. The lowstand systems tract prograding complexes are commonly thin, hemipelagic shales in the bathyal environments and become very thick, shallowing upward prograding deltas and shorelines in the upper upper bathyal to outer neritic environments. In the middle and inner neritic environments, they are typically thick, interbedded shoreface sands and neritic shales. The updip equivalent is commonly fluvial incised valley fill. In certain areas having high deposition rates and a relative steep slope on top of the slope, fan-complex shingled-turbidites commonly develop in outer neritic to upper bathyal environments. The transgressive systems tracts are very thin hemipelagic shales in the bathyal environments, develop basal shoreface sands and overlying shales deposited in the outer neritic environments, and become interbedded shoreface sands and neritic shales in the middle to inner neritic environments. If the incised valleys are not filled with sediments by the fluvial lowstand prograding complex, they are commonly filled with estuarine sediments during the transgressive systems tract. The high stand systems tracts are also thin in the bathyal environments, become thick prograding packages of sediments in the outer neritic environment, and have well developed shoreface sands interbedded with marine shales in the middle to inner neritic environments. The variations in systems tracts with paleobathymetry downdip provides the biostratigrapher, geologist, and geophysicist with a means to anticipate the overall thickness and lithofacies of the systems tracts on well logs and seismic profiles. Thick hydrocarbon reservoir rocks may be present in the deepwater basin floor fan, slope-fan channel-fill and overbank deposits, and shingled turbidites. Shallow water reservoirs occur in the prograding coastal belt and incised valley fill sands.

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