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ABSTRACT

DELTAIC TO ESTUARINE REGIME CHANGE ON PROXIMAL PALEO-ORINOCO SHELF: MORNE L'ENFER FORMATION, SOUTH TRINIDAD

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The Morne L'Enfer Formation, onshore southern Trinidad, records the regressive-to-transgressive shelf transit of the Late Pliocene Orinoco delta as it built across south Trinidad. Much of our current understanding of paleo-Orinoco sand reservoirs come from the storm-wave dominated outer-shelf and shelf-edge areas in the Columbus Basin. The Morne L'Enfer Formation, however, encapsulates an early regressive deltaic phase of a wave-tide-dominated delta, the sequence boundary and the turnaround to a tide-dominated estuarine phase in the proximal paleo-Orinoco.

Integration of outcrop and well data provides a window into better understanding the delta-estuary cycle at an inner-shelf site, illustrating how the regime change on deltas lead to contrasting style of tide-dominated reservoir facies and architectures.

The basal regressive deltaic deposits show repeated coarsening upward parasequences, up to 25m thick. These sand packages have a very heterolithic character suggesting a mixed wave-and-tide influenced, rather than wave-dominated regime.
The overlying transgressive deposits are characterized by thick channelized units of blocky coarse-grained sands, ranging from 25 – 50m thick. The clean-water, tidal character of the environment is evident in outcrop by (1) repeated sandprone units with stacked of 2-D dunes, some flood oriented, (2) sigmoidally cross stratified sands and (3) rhythmic sand and mud stratal units. The thickness and blocky but dis-connected nature of the tidal-channel sands suggests that the earlier distributary valleys became a back-filled, sandy estuarine system, providing better hydrocarbon reservoir than the related, underlying regressive deltaic half-cycle.

The character of these proximal delta-estuary couplets, compared with those developed at the shelf edge, provide data for a proximal-distal regime change model on the paleo-Orinoco shelf, and for the contrasting reservoir geometry between regressive and transgressive phases of shelf cycles.