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Facies and architecture of the tide-dominated Late Pliocene Orinoco Delta (Upper Morne L'Enfer Member) SW Trinidad

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The exceptionally high subsidence rates (0.8-6.0+mm/yr), great dimensions and basinward stepping of the paleo-Orinoco shelf prism allow the process regime and the evolution of Late Pliocene paleo-Orinoco Delta to be evaluated onshore SW Trinidad. The repeated transgressive-regressive phases of shelf-delta growth caused aggradation of the topsets of the shelf prism and were produced by interaction of Icehouse sea level changes, sediment flux across the shelf and rapid subsidence of the Orinoco margin.

The study focuses on the outcropping strata of the Upper Morne L'Enfer Member (Late Pliocene) along Cedros Bay and Erin Bay in southwest Trinidad, and documents sedimentology and architectural data of the 302m-thick and 706m-thick successions in Cedros Bay and Erin Bay respectively. Large fossilized tree trunks occur in both successions and are used as a partial aid in correlation. The study sites are some 50-100 km landward of the coeval shelf-slope break on the shelf margin. The initial subdivision in the facies associations is between those that are transgressive and tend to show an overall fining upward of grain size, which include the inner estuary fluvial-distributary channel sandstones with minimal brackish-water or tidal influence (FA1), the central zone fluvial-tidal distributary channel sandstones (FA2), tide-dominated, estuarine channel-bar association (FA3), and tidal flat units (FA4), and those that are regressive, mainly showing an upward coarsening , which includes tide-dominated delta front deposits (FA5), and shoreface deposits (FA6). These facies associations define the tide-dominated deltaic and estuarine depositional systems. The tidal signals in the succession include bi-directional paleocurrents (channels), extensive mud drapes on cross-stratal foresets and topsets (delta front), and flaser and lenticular bedding (tidal flats) as well as the thick successions of stacked cross strata on the delta front. There are very few signals of open-coast storm waves in the succession.

Likely correlation between the two study locations (15km apart) suggests that: (1) Cedros bay represents a slightly more proximal site compared to Erin Bay, because of a higher frequency of distributary channels here as compared to more frequent tidal estuarine bars at Erin Bay, (2) the paleocurrents directions are northward or northeastward in Cedros Bay and more eastwards in Erin, which accord with the likely northeastward progradation of the Orinoco Delta, and (3) the lower part of both sections, especially at Erin Bay, represents the most distal reaches of the deltaic-shelf system. The overall vertical change from distal deltaic up to coaly delta plain deposits in both successions show the clear progradational character of the Upper Morne L'Enfer deltaic prism, despite the superimposition of the 17 high-frequency regressive-transgressive units. A prediction of the larger scale, continuation of the succession to the outer shelf and shelf edge in the east is presented.

Keywords: Orinoco Delta, time-space evolution, tide-dominated, Upper Morne L'Enfer Member