THE 4TH GEOLOGICAL CONFERENCE
OF
THE GEOLOGICAL SOCIETY OF TRINIDAD AND TOBAGO
June 17-22, 2007, Hilton Trinidad & Conference Centre,
Port-of-Spain, Trinidad and Tobago

"Caribbean Exploration – Planning for the Future"

ABSTRACT

THE GROWTH OF THE ORINOCO SHELF PRISM: INTERACTION OF TECTONICS,SEA LEVEL,SEDIMENT SUPPLY AND BASIN PROCESSES

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The migration of the Orinoco River and Delta system into the East Venezuelan Basin in mid-Miocene times has provided abundant sand reservoirs of both deepwater and shallow-water types, sited along the proximal to distal reaches of shelf and shelf-margin clinoforms. Columbus Channel and Columbus Basin seismic data illustrate well the late Miocene to present history of these clinoforms, developed by interaction of tectonics, sea level, sediment supply and basin processes. The variability of reservoir type along these clinoform time lines is not only because of shallow and deepwater depositional sites, but also because of process-regime change on the delta as it repeatedly made cross-shelf transits, progressively extending the width of the Trinidad and East Venezuela shelf. As the delta reached the outer shelf and shelf-edge area at any point in time, open-ocean waves had a significant effect on the sands that were to become reservoirs. In contrast, the delta was much more tidally influenced when it was sited on the inner to middle reaches of the shelf, much as the delta is today. During the broad, long-term eastwards progradation of the shelf margin, the delta system also spilled across Trinidad, as far north as the Northern Basin. However, here the character of the delta was strongly influenced by protective, active tectonic uplifts (eg Central Range), impacting the developed sand bodies with more tidal influence and affording protection from wave influence, compared to what is seen farther south. Miocene and Pliocene outcrop examples from the now-uplifted shelf-slope system, onshore Trinidad, illustrate well the range of sand body types from deepwater slope to shallow shelf, and from shallow-marine deltas with strong storm-wave signals to those that are tide-dominated.

Very high tectonic subsidence rates on the Orinoco shelf and shelf margin have had two major effects on the reservoirs: one relates to the voluminous sand partitioning into local, shelf-edge, growth-faulted compartments, the other is that the resultant near-continuous relative sea-level rise has caused very much of the Orinoco sand budget to be stored on the shelf, with correspondingly less volume available for the deepwater areas. However, times of prominent sand bypass from the shelf into deepwater, probably caused by pulses

of very high sediment supply, can be deduced from time intervals when the Orinoco shelf-edge trajectory was flat.