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Tectonic Model for Eastern Venezuela and Trinidad since 12 Ma

The tectonic and basin history of Eastern Venezuela, Trinidad since Middle Miocene occurred in three main stages: (1) Middle Miocene oblique collision of Caribbean Plate and South American margin; (2) Late Miocene-Early Pliocene dextral transtension and creation of N-ward-opening half grabens; (3) Late Pliocene-Recent dextral transpression. The distinction is useful because each stage produced characteristic structural styles that can guide ongoing exploration. Also, structures produced during one stage can interfere with HC migration resulting from older stages. The model integrates, synthesizes primary structural and depositional aspects in the region, and is fully consistent with a 12Ma change in Caribbean migration direction and subsequent history of east-west shear at about ~20mm/yr. Onset of transtension at ~12Ma triggered new subsidence and created a new set of basins above a Middle Miocene 'post-orogenic' unconformity. Since Pliocene, transpression has become important and several transtensional basins have become inverted, producing many young exploration targets. The Central Range Fault and 'Pedernales Lineament' are examples of inverted, previously transtensional faults; Southern Range and the southern flank of El Furrial structure (Eastern Venezuela) may also be. The model suggests all these faults are systematically interconnected and genetically related to the plate boundary zone; map views and cross sections demonstrate paleogeographic implications, and provide a basis for understanding Pleistocene migration of the plate boundary zone into the ultra-deep water offshore. Modeled deformations have occurred during time of peak hydrocarbon generation and are critical to refining of hydrocarbon migration models in this economically important province.