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The Macuspana Basin, South Gulf of Mexico: Impact of Shale Tectonics and Late Contraction of an Extensional Basin on Hydrocarbon Accumulation

The Macuspana Basin (South Gulf of Mexico) is located north of the Chiapas foldbelt between the Mayan carbonate platform and the Reforma/Comalacalco region. The basin formed by early Tertiary basement normal faulting, allowing deposition of thick shale. Late Miocene northwestward deltaic progradation of wave-dominated and shoreface deposits caused differential loading, northwestward expulsion of the mobile shale, and formation of listric growth faults trending SW-NE, dipping to the NW and detaching on the mobile shale. Fault slip led to local aggradation of >300 m of reservoir sandstone in large rollover folds. Growth faults subdivided the basin in several subbasins younging toward the northwest. As sediment progradation and shale expulsion toward the north and northwest continued, depocenters migrated northwestward toward the Costero area, where lower-middle Pliocene shoreface sandstones (>500 m thick) accumulated in the hanging walls of growth faults trending NW-SE and dipping to the SE. We found evidence of at least one contractional episode, possibly related to tectonic reactivation of the adjacent Chiapas foldbelt. Shortening is restricted to the south part of the basin (10-20% shortening during early- to middle Miocene time) and was accommodated by increase of the flexure of strata in the subbasins, northeastward reverse faulting, and inversion of some listric normal faults. To the west, along the margin of the basin, shortening is characterized by growth of squeezed shale diapirs and collision between sediment depocenters. Tectonic inversion was a key element in forming three-way and four-way closures, where major, currently producing fields are located.