

New Insights into the Cenozoic Architecture Along the Flextrend of the Northern Gulf of Mexico

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Abstract

Modern reprocessing technology and innovative velocity model building provides a complete imaging of the Cenozoic passive margin sequence of the northern Gulf of Mexico (GOM). The seismic data capture the sub-salt architecture beyond the shallow salt layers along the Flextrend of the GOM, which encompasses the area of the present day shelf break. Here the sub-surface is dominated by gravitational instabilities, most prominently by RoHo basin developments interrupted by deep reaching mini basins. The seismic data reveal multiple layers of ROHO style systems at various depth levels, which had been mobilized during the Miocene and the Pliocene, presumably driven by loading from migrating depo centers along the GOM paleo shelf. Completely preserved ROHO systems show classic up-dip extension and down-dip continuation into basal low-angle detachments/welds of the translation zone, those balanced with contraction features such as local thrusts and salt-cored anticlines at the frontal section of the individual basins. The principal kinematic direction of these systems reveal south-southeast propagation, but can vary depending on the local loading history. Salt rollers associated with the extensional and the compressional faults are arranged along basin detachments, which originated from individual salt sheets or salt tongues. Salt feeders connecting to deeper salt levels are evident by inclined welds near the up-dip section of individual Roho systems. Ultra deep Neogene mini basins in this area lack flanking salt bodies and appear to be controlled by deep-rooted gravitational spreading processes (rafting). The multilayer approach for delineating individual salt bodies is a key salt model building strategy for enhanced seismic imaging of the sub-salt domain including the primary basin. Identifying shallow salt bodies helped to separate underlying salt

geometries that would otherwise be lost in voluminous salt. The lean salt approach avoids large salt bodies and allows proper capture deeper sedimentary sections of the Flextrend architecture. The Paleogene primary basin reveals tilted expanded sequences related to raft architectures while open anticlines are truncated by a regional (Mid/Lower Miocene?) unconformity. Little evidence are present for extensive deep salt bodies such as salt stocks or pedestals resulting in a significant reduction of the regional salt budget. Capturing the complete Cenozoic section under the Shelf break of the northern GOM has a direct impact on the hydrocarbon exploration as it offers promising potential for new plays within reach of existing infrastructure.