SEISMIC STRATIGRAPHIC FRAMEWORK OF THE LOUISIANA CONTINENTAL MARGIN: CLUES TO HYDROCARBON SOURCING

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ABSTRACT

Interpretation of several thousands of miles of multi-channel seismic data indicates that large volumes of continental rise and basinal sediments have been continuously entrapped and are overriden by the basinward flow or creep of broad, extensive salt tongues which form the lower slope and Sigsbee Escarpment. Thick accumulations of lower Cretaceous to upper Miocene sediments are identified beneath the salt at least 60 km landward of the escarpment. Spotty seismic data suggest that the Cretaceous to Mid-Miocene succession extends up to 120 km landwards of the escarpment and beneath the present shelfbreak. Pleistocene-Holocene sequences of the Deep gulf can be traced up to 15 km landwards of the escarpment, where they are truncated by the base of the salt. Similar truncation of older deep gulf sequences by salt occurs progressively farther landward of the escarpment.

Along the middle and lower slope, salt occurs primarily in broad and extensive salt tongues with thin sediment cover. In contrast, salt diapirs and ridges are more common below the outer shelf and upper slope. The outer shelf and upper slope is also characterized by deep basins with thick ponded sedimentary fills of probable Miocene to Holocene age. In several cases these basin fills appear to lie directly on top of the underlying Cretaceous-Early Tertiary marine sediments.

Traverse faults and imbricate "thrust" slivers of salt and shallow salt diapirism and salt sills or plugs along the escarpment are similar to features along the compressional toe of large submarine slides. Along the Louisiana shelf, directly updip, large scale growth-faulting reflects a largely tensional regime associated with sediment loading. The Louisiana slope and rise exhibits a strong southward bulge. This bulge is considered to be indicative of the unstable nature of the margin and may represent an enormous slide along a decollement zone located at the base of salt. The onset of significant sediment loading on the shelf in Miocene to Pleistocene depocenters suggests that slope instability, growth faulting, salt, diapirism, and (finally) salt flow over the bathyal-abyssal sediments was probably initiated in late Miocene time.

Recently, the case has been made that hydrocarbons found in seeps and reservoirs on the outer shelf and upper slope are generated from Miocene anoxic basins buried at depth. Anoxic slope basins are presently rather rare and their total sediment volume is quite small. It is unlikely that these anoxic basins were significantly more numerous in Miocene times or that their sediment volume was significantly greater. Therefore, the scenario of large allochthonous salt tongues, or flows, overriding flat-lying continental rise and basinal sediments high in organics suggests that much of the hydrocarbons found in shallow Plio-Pleistocene reservoirs along the shelf and upper slope may have been generated from the now deeply buried Cretaceous to early Tertiary marine sedimentary sequences since late Miocene-early Pliocene time, and that they migrated vertically upward relatively recently along post-sedimentary faults which cut the decollement.

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