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Integrating Paleogeography with Regional Salt Tectonics—Implications for Sub-salt Exploration in the Gulf of Mexico

Current structural models subdivide the Northern Gulf of Mexico into distinct tectonostratigraphic provinces. These provinces are primarily influenced by the following first-order controls: depth and structure of the basement, original thickness of Jurassic mother salt, and the thickness and distribution of Tertiary clastic depositional sequences. Each province exhibits a unique salt inflation/deflation history that differs from adjacent provinces (Hall, 2001). Additionally, current depositional models have effectively tied the up-dip sedimentation on the shelf using well control to deep basin seismic stratigraphy outboard of the present day Sigsbee escarpment. However, regional depositional studies have generally left a large gap across the complex and poorly imaged sub-salt terrain across the outer shelf and deep water.

An integrated regional approach is used in this study as a predictive tool to address the remaining sub-salt play potential in the Gulf of Mexico. The methodology utilizes an understanding of salt geometry and loading history on a regional scale to predict the age and nature of lithologic facies in areas that are poorly understood due to sub-salt seismic imaging issues. Stratigraphic objectives, structural play-types, and salt evolution for each tectonostratigraphic province are presented with an emphasis on sub-salt exploration. Finally, this integrated approach is combined with well, seismic, gravity, magnetic, and biostratigraphic data to produce a suite of paleogeographic maps for the Gulf of Mexico. These paleogeographic maps combine the structural and stratigraphic history of the Gulf of Mexico in a unique manner. This integrated methodology is an effective way to illustrate the dynamics of salt/sediment interaction on a regional scale.