Evaluating the Basement Architecture and Mesozoic Prospectivity of the Eastern Gulf of Mexico

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The eastern Gulf of Mexico (EGoM) is an attractive yet largely untested region of the highly productive Gulf of Mexico petroleum province. Demonstrated production has long been established for on-shore areas of the EGoM; however, evaluating prospectivity in the offshore EGoM is hampered not only by limited data availability, but also by the lack of a coherent basin evolution model to guide exploration efforts. Early evolution of the EGoM basin fill was influenced primarily by basement tectonism during Triassic to mid Jurassic time, followed by primarily salt tectonic deformation during mid Jurassic to Cretaceous time; however, temporal and spatial relationships, if any, between these two styles of basin evolution are poorly understood. Multiple, non-unique solutions of total basin subsidence patterns, and thus subsidence mechanisms and structural development, are possible, because mass was not conserved along any given plane due to salt volume loss. As a result, structural restorations of the EGoM margin will yield multiple projections for thermal evolution of potential source rocks and development of depocenters for reservoir rock accumulation. Development of a comprehensive basin model is integral to identifying deeply buried and potentially prolific targets in the EGoM Mesozoic section. One proposed approach to this problem is to map basement faults and distribution of the Norphlet Formation, the first prospective post-salt reservoir-bearing unit. Previous studies in the EGoM indicate that the earliest deformation related to salt was triggered by the deposition of Smackover carbonates above the Norphlet Formation and Louann Salt. Thus, distribution of Norphlet strata can be used to determine the mid-Jurassic configuration of basement-involved structures. Reconstructions based on a Norphlet Formation datum can then be used to evaluate later modification, enhancement or reactivation of these basement-involved structures as salt tectonic structures. Evaluating basement-dominated and salt-dominated structural evolution in this way will advance efforts to model the EGoM evolution and also highlight potential lower Mesozoic targets in the EGoM.