Structural and Stratigraphic Controls on Mesozoic Source Rock Maturity and Hydrocarbon Play Prospectivity of the Deepwater Yucatan and Campeche Margins, Southern Gulf of Mexico

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ABSTRACT

Bajocian-Callovian age salt deposits are found in both the northern U.S. Gulf of Mexico (Louann salt) and the southern Mexican Gulf of Mexico (Campeche salt). The presently, divided salt basins reflect their late Jurassic tectonic history; when <50 to >350 km of oceanic spreading along an EW-oriented ridge system separated the original basin into the two parts. The deepwater Yucatan and Campeche margins along the northern edge of the Campeche salt province encompass both rifted continental crust overlain by salt, and adjacent younger oceanic crust where salt spreading has occurred. These areas hold important future hydrocarbon potential—with widespread, late Jurassic, post-oceanic crust, Smackover-equivalent source rocks (varying >5000m in depth across the sub-areas), and numerous hydrocarbon seeps. This study uses >220,000-km² grid of 2D seismic data, tied to published seismic lines and wells, to correlate Mesozoic to recent strata over the deepwater Campeche and Yucatan margins. The Yucatan and Campeche margins can be separated into distinctive, structural domains each characterized by promising hydrocarbon plays. The updip Yucatan margin consists of thin salt rollers associated with potential Norphlet-equivalent reservoirs, translating downslope to a compressional area of large diapirs with flanking structural traps. The deepwater Campeche margin is characterized by more confined salt flow with large, penetrative diapirs. The lack of a significant salt canopy in the southern GOM results in a distinct difference in structural style with compared discoveries in the deepwater conjugate northern GOM. Regional source rock maturation trends are defined using a series of pseudo-wells modeled at eight representative areas from east to west. Subsidence models based on these pseudo-wells illustrate the variability of Jurassic source maturity; from overmature in the abyssal GOM to the oil window along the shallower Yucatan slope. Local-

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ized effects reducing source rock maturity, as a result of thermal conductivity of large, localized salt bodies is characterized.