Progress and Problems in our Current Understanding of the Mesozoic Opening History of the Gulf of Mexico Basin

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ABSTRACT

The purpose of this talk is to summarize compare recent observations on the deep structure and stratigraphy of the Gulf of Mexico (GOM) with tectonic models proposed for its Mesozoic opening history. Early models for opening during the 1980s were less constrained by potential fields data and deep-penetration seismic reflection data and postulated a single and sustained phase of Triassic-Jurassic, northwest-to-southeast GOM opening about the same pole of rotation as the Central Atlantic The introduction of marine satellite data from the GOM in 2014 clearly showed its highly arcuate opening of the central GOM area and linear, right-lateral transform margin along the eastern continental margin of Mexico. This finer-scale glimpse of the deeply buried, late Jurassic GOM oceanic crust, its short spreading ridges, and its fracture zones have been incorporated into more quantitative, two-phase GOM of recent years. The first phase of northwest-southeast opening during the late Triassic and early Jurassic led to broad extension of the continental crust beneath the US GOM and its continental margin in the southeastern USA; this phase did not result oceanic spreading and was instead terminated by the incursion of seawater into a large, post-rift sag basin that became the site of the extensive Louann-Campeche salt basin. A second, late Jurassic phase of GOM opening was related to a 40 degree counterclockwise rotation of the Yucatan block and produced the crescent shaped area of oceanic crust and a marginal rift system. The oceanic crust and its marginal rift system crosscuts the older, Phase 1 rifts in the eastern GOM and offset the salt basin into two parts; the northern Louann salt basin and the southern Campeche salt basin. The largest remaining problem area for understanding the opening history of the GOM is its broad northern margin where thick sedimentary deposits that include remobilized Louann salt obscure the original geometry of the rifted continental crust. For understanding the northern GOM, our approach is to use the shape of the rifted margin of the southern GOM—which is more shallow-

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ly buried and better imaged seismically—to predict the shape and location of the deeper buried and less well imaged conjugate beneath the northern GOM. We have compiled all the opening models from the past 10 years in Gplates to compare previous predictions with our own opening model.