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Maria Veronica Castillo¹, Paul Mann¹, Albert Bally² (1) University of Texas at Austin, Austin, TX (2) Rice University, Houston, TX

Deeply Buried, Mid-Cretaceous Limestone Karst Surface, Southern Maracaibo Basin, Inferred from 3D Seismic Reflection Data

A ~300 m thick, tabular, shallow-marine Cretaceous carbonate section beneath 3 to 9 km of Tertiary clastic sedimentary rocks in the Lake Maracaibo records gradual, thermal subsidence of the passive margin of northern South America following its rifting from the southern margin of North America in the late Jurassic. Analysis of 1600 km² of 3D seismic data from the southern basin at a depth range of 3.7-4.5 seconds (5-7 km) reveals the presence of a prominent, irregular reflection surface across the entire study area characterized by sub-circular depressions up to 600 m wide and ~100 m deep. This irregular surface formed within the shallow-water carbonate Apón Formation and is interpreted as a karst surface formed during Albian time. We propose that the surface may have formed during a eustatic worldwide drop in Albian sea level that also produced the well-known Mid-Cretaceous unconformity recognized in the Gulf of Mexico, France, and Middle East. The karst interpretation may allow a better understanding of reservoir characteristics at this level in the carbonate platform, which are generally attributed to fracturing rather than subaerial weathering. The presence of a regionally extensive karst surface at depth beneath other basins along the northern margin of South America may prove to be a useful play concept.