Interaction of Deepwater Deposition and a a Mid-Ocean Spreading Center, Eastern Gulf of Mexico Basin, USA

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ABSTRACT

The general position of a Jurassic–Early Cretaceous spreading center in the eastern Gulf of Mexico has been suggested for many years, yet the precise location has not been defined. New seismic reflection and refraction data and plate reconstructions allows for delineation of this Tithonian to Valanginian age ocean ridge system and illuminate its prolonged influence on deepwater Cretaceous sedimentation. The extinct spreading center displays morphological characteristics associated with slow-spreading mid-ocean ridges: (1) large and wide axial valleys, ranging from 5 to 20 km wide; (2) deep axial valleys, often over 2 km deep; (3) normal faults that dip toward axial valleys; and (4) discontinuous, isolated basement highs, with elevations over 1 km above regional oceanic basement depth that reflect local variations in magma supply.

Correlation from Florida Platform wells to this extinct spreading center confirms the precise time of oceanic crustal emplacement and thus estimation of spreading rate, consistent with plate reconstructions and morphotectonic observations. Reflections tied to the Top Haynesville-Buckner, Cotton Valley–Bossier, and Cotton Valley–Knowles downlap onto contemporaneous oceanic crust, confirming the depositional history of the area. These correlations imply that source rock intervals such as the Tithonian and Oxfordian are absent in a large portion of the abyssal plain south of the Florida Escarpment.

The extinct spreading center remained a major element of the deepwater seascape, diverting sediment gravity flows during the Mesozoic. Pronounced depositional thicks occur north of the ridge line confirming that it acted as a partial barrier to seismogenic debris flows initiated by the Chicxulub impact but derived from the Florida Platform area.

The extinct spreading center and its associated seamounts are prominent structural highs that are draped by prospective Paleogene and younger reservoir intervals. Several of these features have been leased by oil companies for possible future drilling. Exploration here would test the outer limits of several Cenozoic play fairways, both from a reservoir and source rock standpoint.