Crustal Structure of the Oceanic Crust in the Western Gulf of Mexico from Integration of Marine Seismic Reflection, Refraction, and Gravity Data

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ABSTRACT

The deep Gulf of Mexico (GOM) Basin is underlain by oceanic crust that formed during the late Jurassic to early Cretaceous and separated the salt basin and thinned continental crust into the present-day areas of the US GOM and Mexican GOM. We integrate 12,553 km of 2D industry seismic reflection data, 23 wells, and 60 seismic refraction stations to: (1) better understand the crustal architecture of the extinct spreading center and transform faults in the western GOM; (2) to better delineate continent-ocean boundary (COB) under the salt canopy in the western GOM; and (3) to better compare the oceanic crustal character of oceanic crust in the western and better studied eastern GOM. Refraction data suggest that the average Moho depth of the western GOM oceanic crust is ~19.7 km. The Moho depth was inverted from free-air gravity using Parker's Equation, and the crustal thickness was computed integrating with the top of the crustal basement. The calculated thickness of oceanic crust ranges from ~4 km to ~14 km and is asymmetrical with the wider flank on the north side of the spreading center. The observed asymmetry of oceanic spreading with the wider flank to the north can be used to predict the location of the COB that is now deeply buried beneath sediments and salt in the northern GOM. The areas of thinnest oceanic crust occur to the east of the extinct spreading center. The extinct spreading center and associated transform faults have a deeper Moho and thicker crust than surrounding oceanic crust indicating a period of magma-rich rifting. The transform faults can be seen from basement lows on 2D seismic data.

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