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T43F-0513: Geophysical Framework of the Extinct Jurassic Spreading Center in the Gulf of Mexico: An Integration of Marine Seismic Reflection, Refraction, and Gravity Data

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The late Jurassic arcuate seafloor-spreading center in the Gulf of Mexico (GOM) extends approximately 898 km from its eastern end, near 24°N, 85°W, to its western termination where it intersects a continent-ocean fracture zone offshore central Mexico, near 21°N, 95°W. The axial valley of the spreading ridge can be mapped from gravity data, and it is buried by about 7 km of sedimentary rocks in the east, and over 13 km in the west. We integrated 29,434 km of 2D industry seismic reflection data, 23 wells, and 60 seismic refraction stations to establish the geophysical characters and possible differences between the eastern and western ridge segments. The ridge segment in the eastern GOM is composed of six distinct spreading ridges that vary in length from 58 to 106 km, and they are roughly colinear with minor fracture zone offsets, ranging between 23 and 43 km. The ocean basin flanking the eastern ridge system is distinctively V-shaped and asymmetrical, with the wider flank on the northeast, and a pronounced axial valley filled locally by high-relief volcanoes. Gravity models suggest that the oceanic crust in the eastern GOM ranges from 5.5 to 6.4 km thick. The rate of seafloor accretion in the east, derived from ages of sedimentary downlap, has been estimated to be about 2.2 cm/yr. The four spreading segments in the western GOM range in length from 75 km to 128 km and exhibit much longer fracture zone offsets of 145 to 467 km. Extrapolating the spreading rate from the east suggests a 4.7 km/yr opening rate in the west. This faster spreading rate produced thinner crust (3-6 km) and lower relief of ridges and fracture zones (0.3-2 km). Gravity models support these results, indicating 4.5 km average thickness in the western GOM, which is thinner than in the east. The differences in crustal thickness and morphology of the eastern and western GOM are related to the slower spreading rate in the east near the pole of rotation.