Petroleum System Modeling and Hydrocarbon Prediction of the Gulf Mexican Ridges

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ABSTRACT

The study covers approximately 60000 km² of the Mexican Ridges in the deep Gulf of Mexico. The development of a petroleum system modeling was focused to evaluate the petroleum potential of the study area. Regional sections were used to build a pseudo cube, where the main stratigraphic sequences were delimited. The interpretation results suggest extensional and contractional structures related to Neogene gravitational tectonics. Structural traps were formed during the late Miocene–Pliocene. Before building the 3D model, a robust geological, geophysical, and geochemical database was completed in order to define the petroleum system elements, the occurrence of the source rocks, hydrocarbon charge, and reservoirs. The gas isotopic and bitumen biomarker correlations indicate a possible Upper Jurassic source rock. An efficient migration pathway in the Mexican Ridges is a fault set, allowing the flow of hydrocarbons toward the sea bottom in some places. The 2D/3D modeling results suggest that hydrocarbon migration is more efficient in the Paleogene sequences, due to their proximity to the Jurassic source rocks. The hydrocarbon charge process into the Oligocene-Neogene reservoirs is inefficient due to the existence of regional Eocene strata that blocks the migration. Therefore, the number of Paleogene hydrocarbon accumulations volumetrically is bigger than the Neogene ones. The results indicate that the central portion of the studied area is the zone with the best chances for hydrocarbon accumulations.

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