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Oxfordian Carbonate Petroleum System Characterization and Modeling: Upper Jurassic Smackover Formation, Northeastern Gulf of Mexico, USA

Fourteen global petroleum systems with Upper Jurassic source rocks are estimated to contain 25% of the world's discovered oil and natural gas. Of these Upper Jurassic petroleum systems, the Oxfordian Smackover carbonate petroleum system ranks fourth and is categorized as a giant petroleum system. The Upper Jurassic Smackover Formation is a prolific petroleum reservoir in the northeastern Gulf of Mexico of the U.S., including the Mississippi Interior Salt Basin. Modeling and characterization of the Smackover petroleum system facilitate exploration efforts in the Mississippi Interior Salt Basin by providing information on Smackover overburden, source, reservoir and seal rocks and on the events of hydrocarbon generation, expulsion, migration, trapping and preservation. In the Mississippi Interior Salt Basin, the components of the Smackover petroleum system include pre-rift, syn-rift and post-rift siliciclastic, evaporite, and carbonate underburden rocks, Smackover subtidal lime mudstone source rocks, Buckner anhydrite sabkha seal rocks, and upper Smackover shoal complex and tidal flat complex packstone, grainstone, boundstone and dolostone reservoir rocks. The critical events include the initiation of the generation of crude oil, the commencement of hydrocarbon expulsion, the initiation of hydrocarbon migration, and the entrapment of hydrocarbons during the Early to Late Cretaceous. The critical moment for the Smackover petroleum system is the time of peak hydrocarbon expulsion in the mid to late Early Cretaceous in basin center areas.