
Correlating High-Quality, Upper Jurassic Eolian Sandstone Reservoir Units between the Northeastern U.S. Gulf of Mexico and the Mexican Gulf of Mexico along the Northern Yucatan Margin Using Regional Grids of Seismic Reflection Data

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ABSTRACT

The Norphlet Formation is a highly productive, well-sorted, quartz-rich sand unit deposited across a vast, Late Jurassic (Oxfordian) desert in the present-day areas of Mississippi, Alabama, Florida, and the deepwater northeastern Gulf of Mexico (GOM). The high porosity and permeability of the Norphlet reservoir sand and the quality of its source and seal in the overlying Oxfordian lime mudstones of the Smackover Formation have made them key components of many major discoveries in the northeastern GOM over the past 40 years. Removal of the 158–140 Ma oceanic crust in the deep central GOM restores the older 160 Ma Norphlet sands of the northeastern GOM adjacent to its Norphlet-equivalent in the Yucatan and expands the reservoir fairway by 6,000 km².

This study makes use of 9 wells from the western, southeastern, and northeastern GOM tied to published regional seismic lines and two large grids of 2D seismic data along the northeastern GOM (60,000 km²) and northern Yucatan margin (134,000 km²) to constrain the stratigraphy of the northern Yucatan margin and make detailed comparisons between the present structural setting and thickness of the units on both margins. In the northeastern GOM, the thickness of eolian Norphlet facies reaches 300 m onshore and 100 m in the deepwater. Its structural setting ranges from a broad, undeformed platform in central Mississippi to areas 250 km offshore that have undergone gravity sliding of the Upper Jurassic section near Destin Dome and Desoto Canyon. For the Yucatan margin, this study investigates the magnitude of salt-related sliding of the Norphlet-equivalent sandstone and KPg-age effects of the Chicxulub impact on these sands and overlying strata. Thicknesses of the proposed Norphlet-equivalent reach 100 m and are associated with a large detachment dipping northward from the Yucatan platform. These structures have been restored to reveal a single, previously continuous region of Norphlet deposition that preceded the Oxfordian initiation of seafloor spreading in the northeast GOM.

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