
The Jurassic Norphlet Formation of the Deep Water Eastern Gulf of Mexico: A Sedimentologic Investigation of Aeolian Systems and their Stratal Relationship with Extradunal Facies Types

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ABSTRACT

Aeolian systems consist of dune and interdune deposits that are intimately associated with a variety of extradunal facies (e.g., wadi, sabkha, sand sheet, alluvial fan, etc.). The Jurassic Norphlet Formation is extensive buried Aeolian sandstone first discovered in 1922 in Norphlet, Arkansas. Following its discovery, many producing fields have been found extending the system southward and eventually southeast into the offshore Alabama area of the Gulf of Mexico. Hydrocarbon accumulation is attributed to the overlying Smackover Formation acting as both source and seal. Recent drilling in the deepwater eastern Gulf of Mexico, utilizing high-resolution 3D seismic has led to further seaward extension of this vast aeolian system. This work focused on stratigraphic position within the overall erg system, lateral extent of aeolian facies, and the effect of salt tectonics on the resultant stratal architecture of the dune and interdune facies that comprise the Norphlet depositional system. The investigation utilized whole core integrated with petrophysical data for sedimentary facies identification and their percentages. Aeolian strata interpreted includes dune deposits characterized by grainflow, grainfall, and wind ripple, as well as interdune deposits with dry, wet, and evaporitic interdune elements. Reservoir properties of these aeolian systems are shown to be related to primary depositional processes and post-depositional diagenetic modifications. Within these aeolian reservoirs, sublayers of variable reservoir quality are shown to be directly related to the differential distribution of stratification types and are key to understanding the permeability anisotropy observed both vertically and horizontally. Analogs to this study include the modern Namib Desert in Namibia, Africa and the ancient Cedar Mesa (Permian) in Utah. Excellent satellite photography provided by Google Earth displays high-resolution dune morphology within the Namib Desert of southwestern Africa very well, and the size and geographic extent is analogous to that of the Jurassic Norphlet. The Cedar Mesa provides exceptional outcrops of ancient aeolian accumulation.