

Seismically Defined Siliciclastics Depositional Trends in Saudi Arabia

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Abstract

The Early Permian Nuayyim Formation in Saudi Arabia is comprised of a series of fluvial, tidal, playa, lacustrine and eolian sandstone depositional trends, which exhibit lateral variability. This paper discusses the application of high-density full-azimuth broadband seismic data to assist with identifying these clastic depositional trends.

The area is characterized by a predominance of highly porous eolian sandstone facies that constitute the main reservoir. The eolian facies trends are relatively continuous within a west-east trending depositional fairway that has been defined by both well and seismic data. This is known as the main eolian fairway.

A regional reconnaissance effort took place farther away from the main depositional fairway, supported by extensive 2D coverage and some sparse 3D surveys for structural purposes. However, these were not good enough to image those porous intervals within the Nuayyim Fm. The acquisition of new high-density full-azimuth broadband 3D surveys with significant areal coverage allowed the detection of several previously unidentified depositional fairways, trending west-east and roughly parallel to the already identified main eolian fairway. High porosity sweet spots and the potential role of syn-depositional structures controlling sandstone deposition have been recognized from seismic and the scarce but increasing well data. New wells have shown us that our ability to seismically detect these porosity sweet spots has improved.