

Developing Stratigraphic Traps – A Semi-Automated Approach

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ABSTRACT

The Faridah Reservoir is an evolving stratigraphic play concept in Saudi Arabia. The Faridah Reservoir is a member of the Middle Jurassic Dhurma Formation, which consists of a succession of predominantly moderately shallow marine carbonates associated with fourth order sequence spanning the Bajocian to Bathonian. Core data indicate a facies change from shelf carbonates to tight basinal facies over a distance of a few kilometers.

Seismically, The Faridah Reservoir is characterized by a series of gently dipping stacked seismic reflections (referred to as clinoforms) underlain by a conformable, high amplitude continuous reflector of Dhurma shale interpreted to represent paleogeography during deposition of the Faridah Reservoir units. Interpreted well data and seismic amplitude analyses indicate that the steeper clinoforms are composed of coarser, grainier reservoirs. The clinoform reservoirs consist of coarsening upward debris toward the clinoform toes, and grainy in-situ carbonate deposits toward the top of the clinoform.

The biggest challenge is to map individual clinoforms with reasonable confidence due to the limitations in vertical and horizontal seismic resolutions. A semi-automatic workflow was developed that enabled detailed mapping of these bodies in a shorter timeframe. In this approach, the base of the Faridah Reservoir units, represented by the Dhurma shale seismic reflector was mapped and then iso-sliced upward through the Upper Dhurma Member at equal time intervals. The mean amplitude attribute was extracted along each slice. The slicing technique cuts through gently dipping clinoforms and highlights key interpreted morphological features like lateral extents, shelf edges, and shelf breaks, greatly helping interpreters focus their mapping efforts in prospective areas. This process eventually helps identify and map geobodies as potential stratigraphic traps. The success of this approach will greatly enhance and optimize our abilities to identify and mature stratigraphic traps.