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Stratigraphic Trapping Models of a Permo-Carboniferous Reservoir in Central Saudi Arabia

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ABSTRACT

The Permo-Carboniferous clastic reservoirs of Central Saudi Arabia are trapped both structurally and stratigraphically. Due to the insufficient drilled wells, combined well-seismic sections analysis was used to predict the strata distribution and establish the stratigraphic framework. A workflow that combines geological data from drilled wells with improved waveform classification seismic facies analysis was used to predict the sedimentary facies distribution combined with the geological model. Oil and gas reservoirs in the Nuayyim Formation were sourced from the early Silurian basal “hot shale” of the Qusaiba Member, and are capped by basal shales of the Khuff Formation. The hydrocarbon conducting system and reservoir-seal assemblage of the Nuayyim Formation were analyzed to propose hydrocarbon trapping models. Stratigraphic traps and combined stratigraphic-structural traps are the main two types of traps in the Nuayyim Formation in the study area. Stratigraphic traps are the most developed and important type which are controlled by depositional environment and architecture. Unconformities, controlled by the stratigraphic framework, and faults form the hydrocarbon-conducting system. Reservoir and lateral seal distribution, controlled by deposition, form the stratigraphic traps.