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Emerging Play Concept for Exploring Jurassic Carbonate Stratigraphic Traps in Eastern Saudi Arabia: A Play-based Exploration Approach

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ABSTRACT

Jurassic carbonate reservoirs host significant oil reserves and produce from giant and super giant oil fields in Saudi Arabia. For revealing the exploration potential for Jurassic carbonate stratigraphic traps, a robust sequence stratigraphic framework has been unraveled by integrating core, well-logs, 2-D/3-D seismic interpretations and attributes mapping, seismic chronostratigraphy, chemostratigraphic analysis, forward stratigraphic modelling, and 3-D basin modelling.

Distinctive intrashelf basins were developed over the Arabian carbonate platform interior during the Jurassic times. Significant source rocks were deposited within the intrashelf basins during the Bajocian-Bathonian (e.g., Dhruma/Sargelu source rocks) and the Callovian-Oxfordian (e.g., Tuwaiq Mountain-Hanifa/Najmah source rocks). A variety of grainier carbonate reservoirs was deposited along margins of the intrashelf basins over the carbonate platform interior. Sequence stratigraphic architecture indicates extremely dynamic evolution of the Jurassic sequences through time and space, resulting in significant exploration potential for stratigraphic traps due to lateral and vertical facies shifting and juxtaposition.

Emerging exploration concepts and play types for Jurassic carbonate stratigraphic traps have been revealed through a play-based exploration approach. Detailed mapping of presence and effectiveness of reservoir, seal and charge, gross depositional environments, and 3D basin modelling provided great insights for exploring stratigraphic trap opportunities. Examples of exploration concepts at various stratigraphic intervals of the Jurassic petroleum systems will be presented.