AP01

Spatial Organization, Heterogeneity and Complexity of Triassic and Early Jurassic Deposystems of the Arabian Plate

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SUMMARY

The Triassic - Early Jurassic stratigraphy of the Arabian Plate is notably different to all underlying and overlying units. Several unique features include an often thick, very strongly vertically heterogeneous and often thin-bedded stratigraphy dominated by evaporites, restricted facies carbonates, and paralic siliciclastics. MFS are marked by open marine carbonates, and may be traced laterally across the plate. In general these record very low energy environments that are faunally impoverished; carbonates dominate intrabasinal and basin flank highs. Evaporites are concentrated in depocentres and are dominated by sulphates. Siliciclastics fringe the basin system. This is the least prospective of the post-Carboniferous units; sporadic carbonate reservoirs are usually thin, high-energy dolomitized oolites. Other reservoirs are thicker continental clastics. Source rocks have an evaporitic to locally lacustrine signature and yield generally light oils, but are mostly localised in depocentres where reservoir rocks are often lacking; whilst sealing evaporites are also often restricted to basinal areas whilst being absent on paleohighs. Future success within this stratigraphy will mainly depend upon our ability to predict the distribution and thicknesses of reservoir units within areas of reasonable burial depth; whilst the complex stratigraphy and regional thickness changes offer the possibility of locating stratigraphically trapped reserves.

The Triassic and Early Jurassic stratigraphy of the Arabian Plate is notably different to all underlying and overlying units. Several unique features are presented that include an often thick, very strongly vertically heterogeneous and often thin-bedded stratigraphy that is dominated by evaporites, associated restricted facies carbonates, and paralic siliciclastics. Maximum flooding surfaces are marked by the rare development of more open marine carbonates, which may be traced laterally over very wide distances (in some cases, from Zagros to the Levant margins of the plate). In the absence of clearly-developed seismic-scale progradational and onlap features, and because of the generally layer-cake nature of the stratigraphy at least on a local scale, an understanding of sequence stratigraphy has to rely heavily upon concepts of cycle stacking and by applications of techniques such as Fischer Plots.

Within the stratigraphy there are regionally-developed unconformities of significant magnitude, and locally, volcanics that may show considerable thicknesses. In general the platform carbonates record very low energy environments that are faunally impoverished; carbonates tend to dominate intrabasinal and basin flank highs. Because of this, palynology is often a more useful tool in age identification than micropalaeontology. Evaporites are usually concentrated in depocentres and are dominated by sulphates although halite is present locally. Siliciclastics fringe the whole basin system and are associated with intrabasinal erosion; within these, are a range of facies from continental sandstones to continental and marine shales.

Implications of the stratigraphic organization as outlined above are firstly that this interval, to date, is one of the least prospective of the post-Carboniferous units within the stratigraphy of the plate. Specifically, productive carbonate reservoirs tend to be thin, and represent the rare high-energy facies (typically dolomitized oolites) that are only sporadically developed, such as in the upper parts of the Kurra Chine of NW Iraq and in the Marrat 'C' of Kuwait. These commonly require the presence of fractures in order to flow commercially. Other reservoirs include the thicker continental clastics where these have encroached onto or over the carbonate platform, as in the Euphrates Graben area of Syria. Source rocks are present within the system, having an evaporitic to locally lacustrine signature and yielding generally light oils, but are mostly localised in depocentres where reservoir rocks are often lacking; whilst sealing evaporites are also often restricted to basinal areas whilst being absent on palaeohighs. Future success in terms of petroleum exploration within this stratigraphy will mainly depend upon our ability to predict and map the distribution and thicknesses of the various higher-energy reservoir units within areas of reasonable burial depth; whilst the complex stratigraphy and regional thickness changes offer the possibility of locating stratigraphically trapped reserves which, to date, have not been explored for in the region.