

Identifying Local vs Regional Drainage Networks within the Moroccan Triassic: Implications for Reservoir Quality and Distribution within the TAG-I Play

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Abstract

The Triassic TAG-I sandstones are one of the most productive Mesozoic hydrocarbon plays in North Africa. Recent exploration activity by Sound Energy has extended the TAG-I play to the west, with their play opening gas discovery within the Tendrara Block of the Tendrara-Missour Basin, in Eastern Morocco. A key uncertainty within both Eastern Morocco, and the TAG-I more broadly, is predicting reservoir quality and distribution within the continental fluvial - aeolian sandstones. Through the development of analogue models from outcrop our study focuses on the Kerrouchen Basin of the Middle High Atlas of Morocco and integrates field data and provenance analysis to identify local and regional scale depositional systems across a Triassic rift basin. The Kerrouchen Basin is an understudied rift basin exposing over 600m of Triassic stratigraphy, which was partially inverted during the Atlasic orogeny, whilst preserving the original basin geometry. Within the Kerrouchen Basin, two distinct fluvial systems are present. The first, recorded by the K3 formation is a braided-meandering type fluvial system, showing vertical and lateral amalgamation. The K3 is an axial fluvial system that shows a predominant drainage direction towards the north-north-east, parallel to the rift axis and ultimately draining towards the Tethys Ocean. The second fluvial system is recorded within the K4 formation, where a distributary fluvial system (DFS) is present. The K4 formation records three facies' belts of a DFS system, with a proximal, medial, and distal zone organised in a concentric lobate geometry. Paleoflows predominantly record drainage to the SSW, transverse to the basin axis. Heavy mineral and petrographic analysis of the two fluvial systems indicates a distinct provenance for the two systems. The K3 system records a higher maturity signal, indicative of sedimentary recycling, whereas the K4 system records a lower maturity signal reflecting input from local basement areas. Comparison with the cored section from wells drilled in the Tendrara - Missouri Basin indicates analogous depositional style. Facies analysis suggest the discovery wells have primarily targeted areas dominated by DFS deposition, suggesting by comparison to the Kerrouchen basin that higher quality reservoirs within braided-meandering fluvial systems may be present in axial positions of the basin, providing a target for future exploration efforts.