Complex controls on facies architecture of Upper Triassic fluvio-aeolian sandstone reservoirs in NW Africa: lessons learned from outcrop studies in Morocco (Argana Valley) in omparison to subsurface data from Algeria

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Carnian-Norian continental fluvio-aeolian sandstones (e.g. the Triassic Agrilo-Gréseux Inférieur or TAGI of Algeria) form prolific hydrocarbon reservoirs across NW Africa. This study compares time-equivalent sequences exposed in the Argana Basin (Argana Valley, SW Morocco) with subsurface data from the producing Berkine Basin (Algeria), in order to improve the understanding of reservoir architecture by assessing the controls on spatial facies distribution active during deposition of these highly variable continental deposits. The study specifically focuses on climatic versus local tectonic controls affecting reservoir architecture.

The evolution of both studied basins is strongly affected by the tectonic regime. While the break-up of the super continent Pangaea initiated extensive rifting in Morocco, the intracratonic Saharan Platform (Algeria) was subject to more modest subsidence resulting in halfgraben development (failed rifts), with a NNW strike directions in eastern-central Algeria. In addition to the effect of local fault activity within both basins during deposition of the clastic sequences, the entire region was located at low palaeolatitudes of around 10-20 degrees, and strongly influenced by the prevailing monsoonal climatic regime active during the Upper Triassic.

The sedimentary facies are comparable between both basins, however that the stacking pattern and vertical evolution of the sections vary. Regardless of the tectonic regime, perennial fluvial flow is recognised to be the responsible for the majority of the fluvial facies preserved, although lateral facies distribution can vary strongly due to local tectonics. The study highlights the influence of climatic oscillations as a control on long term changes in fluvial flow, while the spatial facies distribution is driven by the basin morphology. Detailed sedimentological analysis allowed the recognition of sedimentary cyclicities within reservoir intervals driven by climatic variations, offering a valuable tool for improved understanding of the sedimentological and architectural complexity of the Triassic sandstone reservoirs of NW Africa.