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Is the Pre-salt Sequence Underexplored Regionally in North Africa?

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ABSTRACT

The Greater Ghadames Basin is a Triassic to Jurassic salt basin with at least two proven petroleum systems. Source rocks include the Silurian Tanezzuft with TOC up to 17%, and the organically-rich Middle to Upper Devonian Aouinet Ouenine Group. There are two major pre-salt reservoirs- the fluvial sand-rich Norian TAGI (Argilo-Gréseux Inférieur) and the shalier Rhaetian TAGS (Argilo-Gréseux Supérieur). The reservoirs are trapped in various structural and combination trap configurations in the northern Ghadames basin. Most structural traps are the result of vertical and high-angle movements caused by Hercynian compression/transpression and subsequent Triassic–Jurassic extension, and the most typical pre-salt traps are low-relief forced folds at the TAGI or TAGS level, positioned in the footwall of major Triassic normal faults. Traditional interpretation considers pre-existing diapiric salt walls above Mesozoic extensional footwall blocks that were reactivated in the Cenozoic. Yet more recent structural geology studies of some of these anticlines suggest a more complex scenario of regional alpine inversion reactivating Mesozoic normal faults, with shortening transferred into a salt décollement with thin-skinned tectonics in the post-Triassic stratigraphic cover. If correct, this pre-salt petroleum system would rely on long-distance lateral migration beneath salt from Paleozoic and/or Triassic source rocks, charge of Triassic reservoirs trapped in low-amplitude inverted anticlines beneath diapiric salt walls, and Upper Triassic to Lower Jurassic evaporites “super” seals. The lack of exploration efforts to target this play is mostly due to poor pre-salt trap definition and seismic depth conversion uncertainties, degraded reservoir quality with depth, and the high cost of drilling through thick salt sequences. However, a gas discovery in this notional pre-salt play could open a new exploration play fairway across large parts of Tunisia, Algeria and Morocco.