

Sequence Stratigraphy of the Triassic to Middle Jurassic of Abu Dhabi: Implications for Exploration Plays

Nigel Cross¹, John Aitken², Kate Al-Tameemi², Abusaa Elila²

¹Subsurface Global Management Consultants LLC;

²Abu Dhabi National Oil Company (ADNOC)

Abstract

In mature petroleum provinces attention invariably turns to under-explored reservoir units, deeper stratigraphies or complex geological successions that offer potential for subtle stratigraphic trapping of hydrocarbons. The Triassic to Middle Jurassic succession of the southern Gulf includes several prospective but poorly understood reservoirs. These units form part of a proven gas play, of considerable economic interest in Today's energy environment, which are, therefore, coming under renewed focus to realize their full exploration potential. The Triassic to Middle Jurassic stratigraphy includes the Jilh/Gulailah, Minjur, Marrat, Hamlah and Izhara formations, which build a thick, mixed carbonate and clastic epeiric shelfal succession deposited on the western margin of Neo-Tethys. As with many Mesozoic sequences of the north-eastern Arabian plate, local clastic-dominated units represent progradational deltaic and shoreface deposition during episodes of limited accommodation and hinterland erosion. Conversely transgressions and highstands of relative sea-level push clastic facies belts into proximal areas adjacent to the Arabian shield whilst regional shelfal areas play host to widespread shallow marine carbonates. Although depositional environments reflect a largely quiescent passive margin setting, characterized by cyclic stratigraphies that are driven by regional relative sea-level changes, the Triassic-Jurassic boundary coincides with renewed extensional tectonism linked to long-range plate tectonics. Correspondingly stratigraphic architecture is built from complex carbonate and clastic interactions with erosional remnants associated with a major Triassic-Jurassic unconformity. Historical exploration studies in the area have tended towards formation-scale lithostratigraphy which does not take into account along-systems-tract variability in important reservoir units. The study presented here adopts a sequence stratigraphic approach to understand regional clastic-carbonate architectures and highlights its use in the de-risking of exploration plays.