



Lower Jurassic sea level changes in Saudi Arabia and selected regions of the Neo-Tethys and Gondwanaland

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Abstract

The Toarcian Marrat Formation is exposed in central Saudi Arabia at Marat, Khashm adh Dhibi, and the Khashm al Jufayr mountains and displays a variety of clastic and carbonate facies associated with well-preserved depositional geometries. It is unconformably overlain by the Triassic Minjur Formation and it in turn overlies the Middle Jurassic Dhurma Formation. Thirteen lithofacies types can be identified from wackestones to boundstones that permit the recognition of five lithofacies associations in a mixed clastic / non-clastic platform. These lithofacies range from low-energy peritidal, intertidal, and back-shoal to moderate- and high-energy shoal and foreshoal lithofacies associations. The Marrat Formation exhibits an obvious cyclicity, distinguishing it from vertical lithofacies-type variations that are arranged in three depositional sequences bounded by four sequence boundaries. Each sequence is grouped into a transgressive systems tract (TST) and a highstand systems tract (HST) and then bounded by maximum flooding surfaces (MFSs). The TSTs are generally identified in clastic tidal-flat beds and back-shoal wackestones, while the HST is generally recorded in the carbonate tidal-flat and shoal deposits that are composed of dolostone and argillaceous limestone beds with echinoids, coated grains, and peloids. The vertical succession of facies associations from peritidal to foreshoal depositional environments is indicative of a deepening upward and retrogradational systems tract, from lower to upper Toarcian. The correlation between the studied sections reveals a general shallowing towards the south. We found similarities between the studied sequences and others in the Arabian Gulf, the northern Neo-Tethys plate, and Gondwanaland countries.

Keywords: Sequence stratigraphy, Lower Jurassic, Marrat Formation, Saudi Arabia, Neo-Tethys, Arabian Gulf, Gondwanaland.