

New Insights on the Stratigraphy of the Hanifa and Jubaila Formations: Outcrop Evidence from Central Arabia

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ABSTRACT

The integration of micropaleontological and sedimentological data from the upper part of the Hanifa Formation and the lower part of Jubaila Formation in the outcrop belt in central Arabia reveals noteworthy new information about Hanifa stratigraphy, paleoenvironments and sequence stratigraphy. The Hanifa Formation outcrop shows a remarkably consistent thickness for approximately 200 km distance, from the vicinity of Al Ghat in the north to Wadi Dirab, close to Riyadh city. A sequence stratigraphic and micropaleontological analysis of the upper Hanifa and the lowermost Jubaila successions across this area highlights a consistent number of high frequency sedimentary cycles and the micropaleontological vertical stacking patterns. In light of this data, a revised top Hanifa Formation is proposed, lowering it to the last shallow marine deposits containing lagoonal biofacies with intense bioturbation. The mixed carbonate/clastic layers that were originally assigned to the uppermost Hanifa Formation in central Arabia outcrop are re-interpreted and re-assigned to the lower Jubaila Formation. These quartz-rich layers are interpreted to represent lowstand deposits during the Oxfordian age. The overlying deep marine facies containing Kimmeridgian age biocomponents are considered the initial transgressive system tract of the Jubaila Formation. This sequence stratigraphy-based study improves our understanding of the fundamental controls on the Hanifa Formation lithofacies variability in both outcrop and subsurface.