The Albian-Turonian age Wasia Formation in the Rub’ Al-Khali Basin of Saudi Arabia represents a time of shallow-water carbonate progradation directed northeasterly into an intrashelf basin. Up to 150 kilometres of lateral progradation is observed on the windward western side of the intrashelf basin, terminating with a rimmed carbonate shoal platform with up to 900 feet of relief. New biostratigraphic interpretations have provided a basis for identifying third-order and fourth-order cycles within the Wasia Formation, and can be tied to log and seismic data, allowing construction of chronostratigraphic lithofacies maps. Higher frequency depositional cyclicity is observed and it is possible to interpret individual depositional assemblages comprising bioclastic shoals and rudist-bank facies, in areas with 3D seismic coverage and well control.

Based on new micropaleontological data, the Mishrif Member of the Wasia Formation, consists of up to four 4th-order depositional sequences. Each sequence commences with a planktonic foraminiferal dominated biofacies that represents deep marine conditions of the transgressive system tract (TST). Highstand system tract (HST) associated foraminiferal and rudist biofacies are represented by shallow marine carbonates typically deposited in shoal and localised rudist-banks. These deepening and shallowing cycles have been correlated across the eastern Rub’ Al-Khali, and designated Mishrif TST1-HST1, TST2-HST2, TST3-HST3 and TST4-HST4 in ascending order. Mishrif source rocks correspond to the Mishrif TST1 sequence and the overlying Mishrif HST1 reservoir sequence is sealed by the next transgressive cycle, MishrifTST2. This reservoir-seal cyclicity continues in some places up to TST4-HST4, which is ultimately sealed by regionally extensive shales of the Aruma Formation.

There are two proven petroleum systems within the Wasia Formation, the Safaniya-Mauddud and the self-sourcing Mishrif petroleum system. New 3D seismic data provides the opportunity to apply a sequence stratigraphic framework that constrains these petroleum systems. Third-order scale geometries are clearly imaged for the Wasia Formation and 4th-order sequences can be identified locally. Internal seismic reflection geometries have been characterised into lithofacies associations. Horizon and time slices through the seismic volume are effective tools for mapping the distribution of these lithofacies. Automatic voxel tracking delineates discrete depositional assemblages.
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