We present complete sedimentological-stratigraphic outcrop descriptions of Khuff time-equivalent strata (Saiq and Mahil Formations) from the Oman Mountains. These were used to 1) establish conceptual depositional models of the Khuff Formation highlighting nature and dimensions of reservoir geobodies and to 2) contribute to a regionally Khuff stratigraphic framework by integrating bio-, chemo-, litho and sequence stratigraphy.

Primary textural heterogeneities within these outcrops were mapped-out from production (2x2km) - to exploration-scale (50x50km). Digital field geology was combined with traditional sedimentological investigations to place all observations in a 3D-framework for modeling purposes. Based on 1D- and 2D-outcrop data, hierarchical 3D-static reservoir models were generated.

On a 2x2km outcrop-scale, walked-out reservoir bodies show general layer-cake geometries of grainstone bodies. Reservoir bodies tend to have a standard deviation of 13% in thickness. This variability may influence volume calculations in producing Khuff reservoirs.

The 8x8km production-scale model revealed the importance of cyclicity on reservoir geometries. Considerable differences regarding percentage, thickness and lateral extend of individual grainstone geobodies within different stratigraphic intervals of the Khuff were observed in the outcrop. Reservoir facies developed preferentially in the regressive parts of cycles of multiple hierarchies.

Finally, an exploration-scale model of the Khuff Formation showed systematic lateral facies changes in a 50x50km area. Reservoir body distribution and stratigraphic architecture appear influenced by the Pre-Khuff topography, local paleohighs and paleogeographic position.

The results of the study are applicable to Khuff reservoir characterization and correlation from production- to exploration-scale.
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