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# Regional model of the Al Khlata Formation in the Rima area of the Eastern Flank of the South Oman Salt Basin

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## ABSTRACT

The 0-800 m thick Al Khlata Formation in South Oman has potential for further hydrocarbon discoveries given its heterogeneity and the presence of local intra-formational seals. A 1750 $km^2$ Petrel model has been constructed from seismic and well data to help improve understanding of the formation. The model also includes surfaces for the Nimr, Haima, Misfar and Gharif to reconstruct the history of progressive removal of the underlying Ara Salt.

Four lithofacies have been distinguished from well logs in the Al Khlata. Sandy diamictite is most abundant (40%), shale (30%), silty diamictite (20%) and sandstone (10%). The bulk of these deposits are interpreted as glacio- lacustrine. The lowermost interval (P9) contains the most reservoir sand (15%), and the uppermost (Rahab) the most shale (70%). The Rahab is widespread and forms an excellent top seal. Other shales or thick silty diamictites form local seals in areas of thick Al Khlata. Exposed pods of Nimr, Haima or Misfar sand became local sources of reservoir sand readily reworked by glacial meltwaters.

With the removal of salt, former peripheral synclines were inverted to create the turtle-back anticlines that host the 21 oil fields in the area. The inversion of sediment pods and the draping of strata led to localized faulting and fracturing. Thick deposits of the Nimr Group core 8 anticlinal traps. The largest bodies of Haima form the traps of the Rima and Jalmud North fields. Thick deposits of the Misfar Group led to 5 structures and pods of Al Khlata, particularly P9, a further 6. Continuing removal of salt during Gharif time led to thinner deposits over pre-Gharif pods and thicker deposits elsewhere. This is contrary to the traditionally held layer cake model for this formation.
Deposits attributed to the Devonian Misfar Group have trends similar to those of the overlying Al Khlata P9. An 18 m core contains stratified diamictites and dropstones and yet yields mid-Devonian spores. Log facies recognition, using criteria established for the Al Khlata, shows the 0-300 m interval consists mainly of sand (70%) and sandy diamictite (30%). There are no mid-Devonian glaciations known in the world and Oman was at latitudes <50°S at this time. The most likely explanation is that the palynomorphs were reworked into basal Al Khlata deposits that contain few indigenous Carboniferous forms. Whether there are true Devonian-age Misfar deposits elsewhere in Oman awaits a wider study.