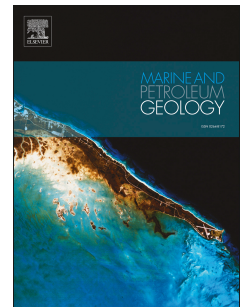


Accepted Manuscript

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PII: S0264-8172(17)30355-0

DOI: [10.1016/j.marpetgeo.2017.09.002](https://doi.org/10.1016/j.marpetgeo.2017.09.002)

Reference: JMPG 3060

To appear in: *Marine and Petroleum Geology*

Received Date: 19 April 2017

Revised Date: 25 August 2017

Accepted Date: 4 September 2017

Please cite this article as: Jafarian, A., Fallah-Bagdash, R., Mattern, F., Heubeck, C., Reservoir quality along a homoclinal carbonate ramp deposit: The Permian Upper Dalan Formation, South Pars Field, Persian Gulf Basin, *Marine and Petroleum Geology* (2017), doi: 10.1016/j.marpetgeo.2017.09.002.

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Reservoir quality along a homoclinal carbonate ramp deposit: The Permian Upper Dalan Formation, South Pars Field, Persian Gulf Basin

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Abstract

Permo-Triassic carbonate successions host some of the largest oil and gas reserves in the Arabian Plate, including the world's largest gas reservoirs of the Upper Dalan and the Kangan formations in the South Pars Gas Field, Persian Gulf Basin. Both formations are stratigraphically equivalent to the Upper Khuff Formation which has been long recognized as a major oil and gas reservoir in the Arabian Peninsula. The Permian Upper Dalan Formation is composed mainly of mixed carbonate-evaporite sequences that formed on a laterally continuous homoclinal carbonate ramp with significant variations in reservoir heterogeneity and quality. They can be grouped in 18 microfacies. High reservoir qualities are found within high-energy shoal environments with a tendency of the best reservoir quality to occur towards the basin in a mid-ramp setting. In contrast, low-energy tidal flat environments exhibit the poorest reservoir quality. Reservoir quality from lagoonal environments is diverse. Diagenesis has significantly affected reservoir properties by both enhancing and destroying original porosity and permeability. Bivariate plots of porosity and permeability values, combined with thin section petrography indicate that pore-filling "pervasive" and poikilotopic anhydrite cements had the greatest negative impact on the reservoir quality whereas dolomitization and dissolution of grains and cements played the most positive role. Two third-order sequence stratigraphic cycles link lithologies and depositional environments to sea-level fluctuations. HSTs are associated with better reservoir characteristics than TSTs.

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