



## **Vertical Reservoir Compartmentalization in a mixed carbonate-evaporate reservoir, an integrated analysis**

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The Permo-Triassic carbonate-evaporite successions in the Persian Gulf host the world largest non-associated gas accumulation. These reservoirs in the South Pars Field and its Qatari part, North Field, is divided into four units (K4, K3, K2 and K1) that consist of supratidal, intertidal, lagoon and shoal to off-shoal facies.

Detailed analysis of the reservoir sedimentology and facies, as well as "diagenetic gradient", sequence stratigraphy, petrophysical and geochemical properties (stable isotopes of bulk samples and strontium isotope residual salt analysis) all are indications of reservoirs with vertical fluid flow barriers and discontinuities.

The results of this study show two depositional/diagenetic and petrophysical composite facies or "Major Facies Groups" (MFG) in this field:

- 1) Type A MFG, formed during the prograding phase (3 Order?) in supratidal, intertidal and restricted lagoon settings and consists of anhydrite and mud-dominated facies that commonly overprinted by early and late dolomitization and anhydritic cementation. This MFG forms the non-reservoir intervals and barriers in the studied successions.

2) The reservoir compartments that coincide with type B, are retrogradational facies deposited in open marine lagoon, shoal complexes and off-shoal environments. This porous, leached and less dolomitized grain-dominated MFG is thinner but is hosting the hydrocarbon accumulation.