

Shell Executive Lectures on Carbonates

>>Anatomy of a supergiant: multi-dimensional on Permo-Triassic carbonates<<

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Increase of UR from carbonates requires a paradigm shift: a genetic link of structural and stratigraphy properties embedded in the E&P workflow. This workflow is exemplified at a reservoir with exceptional characteristics highlight the value of systematically linking structural and stratigraphic analysis. The Permo-Triassic Khuff Formation is a geological layer of the extremes: the layer is estimated to contain some 25% of global conventional gas reserves. The formation records the largest mass extinction in the Earth's history. Covering some 3.7 million km² it is one of the largest platform of its kind in Earth's history. Its architecture is flatter and laterally more extensive than almost any geological layer in the stratigraphic record, with layers dipping less than 0.001°. Seismic, core and well logs suggest uniform geology over 10's to 100s kilometers. However well productivity varies over a few 100's meters by 4 orders of magnitude, with very limited fracture contribution. Subsurface data from across the Arabian Peninsula were analyzed. These were supplemented by the largest outcrop study conducted so far at this layer.

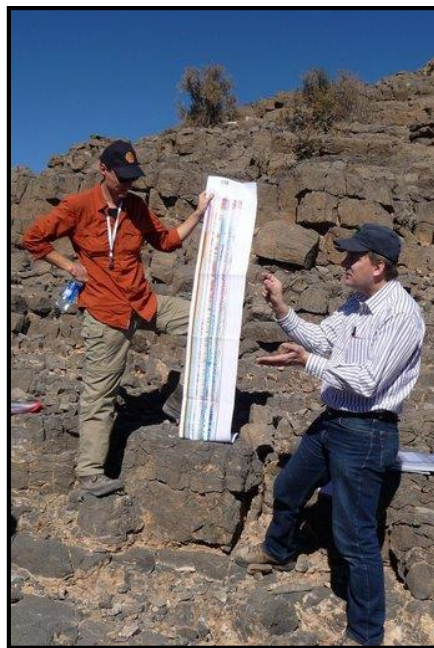


Figure 1 Geological Characterization at the Permo-Triassic boundary in Oman. This is the most significant mass extinction events and one of the most prominent time-lines world-wide.

Results show successful exploration and development of the Khuff hinges primarily on the prediction of permeable grainstone.

- 1. Order control: grainstone occurrence is controlled by basement composition, salt basins and antecedent topography. The basin topography resembles a “rippled” surface with subtle highs and lows. This paleo-topography, controlled by structural elements, had a profound influence on the distribution of source and top seal composition.
- 2. Order control: Structural diagenesis lead to diagenetically altered grainstone.
- 3. Order control: differential hydrocarbon charge preserved porosity at depth.
- 4. Order control: mild fracturing enhanced connectivity.

Exemplified at this supergiant reservoir is a universal link of structural evolution and carbonate geology. Numerous examples across the Arabia plate will be used to illustrate the Petroleum geology of a carbonate reservoir.