
Structural Evolution of the Wajid Area, Western Rub Al-Khali Basin, Saudi Arabia

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A several hundred kilometer long northwest-southeast trending halfgraben-like structure exists at a depth of approximately six kilometers below the western Rub Al-Khali desert in southwest Saudi Arabia. Cambrian and Ediacaran strata are interpreted to be vertically offset by more than 600m along faults overlying a basement terrane boundary, whereas the shallower expression of the structure is a series of relatively low relief flexures at Middle and Upper Paleozoic and Mesozoic levels.

This structure is informally inferred to as the “Wajid Graben” and is of petroleum geological importance since it disrupts the homoclinal dip of Phanerozoic strata onlapping onto the Arabian Shield in the west, thereby creating the potential for structural and stratigraphic hydrocarbon traps.

Stratigraphic correlations of regional seismic lines to outcrops in the Wajid area and to adjacent wellbore data, in conjunction with the regional interpretation of gravity and magnetic data, allow the modeling/reconstruction of the complex multi-phase re-activation history of the Wajid Graben. The interpretation of reprocessed 1990 - 2000 vintage and recently acquired 2D seismic data provide evidence for at least five major structural events: two events prior to 520 ma, a middle/upper Cambrian event, a base Devonian event, a Carboniferous event, and several tectonic pulses in the Mesozoic and Cenozoic.

Along strike the graben edge changes its character. At the Ediacaran to Cambrian stratigraphic level open folds with shallow dipping detachment-like structures underly the northwestern part. Steep dipping en-echelon faults form the central part of the half graben and in the southeast the Wajid Graben ends in an en-echelon arrangement of widely-spaced northwest trending faults with relay ramps back-stepping to the east.
