

Influence of Regional Strain Variations on Fracture Development in Reservoir Rocks, Amadeus Basin, Central Australia

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Fold-related and regional fractures occur in Ordovician sandstone reservoirs of Mereenie and Palm Valley fields in the Amadeus Basin fold thrust belt, Central Australia. Palm Valley gas field in the east of the basin is a type 2 fractured reservoir where an interconnected fracture network controls production in low permeability rocks (~0.1 mD). In Mereenie field in the basin's west matrix permeability (~10 mD) and porosity (~8%) are higher; fractures assist production (type 3 fractured reservoir). To model distribution and intensity of fractures we use structural restoration with strain capture in combination with curvature analysis. Results confirm dramatically differing fracture distributions between the Palm Valley structure formed by a low strain four-way-dipping detachment fold and the Mereenie anticline formed by a cylindrical, fault related fold.

The amount of foreland sedimentation and the spacing of regional fracture swarms correlates with lateral variations in orogenic strain. Orogenic shortening was about 13km in the west of the basin at the longitude of the Mereenie field. The spacing of regional fracture swarms is ~ 1500-2000 with ~3 km thick foreland sediments. Orogenic shortening at the longitude of Palm Valley in the east of the basin was ~33 km. The spacing of regional fracture swarms is ~300-500m with ~9km thick foreland sediments.

Thrust related strain intensity influences the development of both regional fractures and the flexural loading reflected in the thickness of foreland sediments. Thickness distribution of foreland sediments critically influences thrust-related fold styles which in turn control fold-related fracture systems.