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Julian Strand, Laurent Langhi, Andrew Stuart Ross, Christopher Dyt



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Coupled stratigraphic and fault seal modelling used to describe trap integrity in the frontier Bight Basin, Australia.

Julian Strand^{ab}, Laurent Langhi^a, Andrew Stuart Ross^a, Christopher Dyt^a

^aCSIRO Energy, Australian Resources Research Centre, 26 Dick Perry Avenue, Kensington, WA 6151.

^bCorresponding author

Abstract

Top seals and faults represent key risks to trap integrity and therefore preservation of hydrocarbons in the frontier Ceduna Sub-basin, offshore Southern Australia. Due to a paucity of well data in the basin, to provide constraint to the stratigraphic distribution of the prospective Cretaceous deltaic and marine sequences, stratigraphic forward modelling was utilised to create facies, grain size and V_{shale} volumes. These modelled V_{shale} volumes were subsequently used to investigate the structural control(s) on potential hydrocarbon leakage and migration within key stratigraphic sequences in the sub-basin.

A set of coarse (20 km horizontal resolution), large scale (1100 x 600 km) stratigraphic forward models simulated the deposition of Late Jurassic to Tertiary stratigraphic sequences in the sub-basin with an initial 1 Ma interval. Smaller (80 x 60 km), finer scale (0.5 km horizontal resolution, 200 ka interval), models focussing on the Tiger and Hammerhead Supersequences over the Trim 3D seismic survey were used to investigate fault seal and top seal frameworks, using shale gouge ratio and silt and shale thicknesses from V_{shale} volume. Four stratigraphic forward models were produced to match a range of estimates of V_{shale} derived from the Gnarlyknots-1A well, the only well penetrating the central Ceduna Sub-basin. These stratigraphies were in turn integrated into a geological model

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