

Integrated Interpretation of Geophysical Data Over the North West Shelf, Australia (Westralia ACCESS project)

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ABSTRACT

The North West Shelf of Australia is a world class gas province, consisting of several major sedimentary basins (Carnarvon, Roebuck, offshore Canning, Browse and Bonaparte) that cumulatively make up the Westralian Superbasin. Filled with thick Late Palaeozoic, Mesozoic and Cainozoic sedimentary succession related principally to the fragmentation of Gondwana, it is estimated to contain 92% of Australia's remaining conventional gas reserves (144 Tcf, Geoscience Australia/BREE report, 2012). Two extensive multi-client marine surveys, which acquired gravity, magnetic and 2D seismic data across the NW Shelf, have been reprocessed and interpreted to provide a regional update to the structural and tectonic configuration of the continental margin. Integration of these datasets with public domain potential field data has enabled a new qualitative interpretation that includes the COB, major and minor faults, depocentres and structural trends. These data layers were subsequently used within selected 2D models, with physical properties based on the analysis of key well logs, to validate the seismic interpretation and refine the basement surface and composition in areas where it was poorly imaged. The basement horizon was extrapolated between the seismic control using 3D gravity modelling. A 10-layer earth model of dimensions 2400km by 700km was constructed, and using merged survey and public domain gravity data, initial constrained gravity inversions were followed by manual editing of the basement surface (for instance, using grid-editing tools to replicate extensional fault geometries as defined from the qualitative interpreted work) to derive an updated basement surface. The resulting model should provide a significant uplift in the understanding of the highly prospective Westralian basins.