

The Neogene Tectonic History of the Northwest Shelf

Keep, Myra¹, Mathew Harrowfield², Warwick Crowe³ (1) University of Western Australia, Perth, Australia (2) Woodside Energy, Perth, Australia (3) Fugro, Perth, Australia

Australia's North West Shelf represents a continuum from early-stage collision (Timor Sea) to present-day passive margin (Carnarvon Basin) due to diachronous collision of the Australian Plate with the Banda Arc. In the Timor Sea continental crust reached and jammed the subduction zone sometime in the region 15 Ma to 3 Ma. This ongoing collision has resulted in less than 1% shortening of the Timor Sea, and paradoxically the dominant offshore structures are large normal faults, from near the Timor Trough axis inboard to the producing basins. We interpret the normal faults to be the result of elastic flexure of the plate during collision, re-amplifying the inherited structural highs and lows, whilst not yet resulting in discrete brittle failure. One result of this is that the main depocentres remain in the same place through time, despite the change in tectonic regime from extensional to collisional.

The Carnarvon Basin has not yet reached collision. It preserves the complete passive margin sequence, and is affected mainly by far-field stress from the Indian Ocean and Himalayan thrust front. Discrete contractional failure occurs in narrow zones on the inboard part of the margin, coeval with similar onshore deformation. The preservation of this passive margin allows us some unique insights into the collision geometries that must have occurred along strike, and their subsequent effects on the petroleum systems. This paper will present results from both the passive and collisional segments of this margin, explore the resulting structural styles and their effects of the petroleum systems