

INFLUENCE OF PERMIAN AND CARBONIFEROUS EXTENSIONAL HISTORY ON THE NORTHERN CARNARVON BASIN AND ITS INFLUENCE ON MESOZOIC EXTENSION

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The North-West Shelf of Australia is a marginal rift system related principally to the fragmentation of Gondwana. Permian-Carboniferous structures along the margin have long been recognised as fundamental events responsible for the formation of the offshore basins that comprise the prolific hydrocarbon producing region. However, the tectonic setting in which this rifting occurred remains unclear.

Detailed mapping of the geometry of Permian and Carboniferous structures on the southern margin of the Carnarvon Basin is possible using regional scale interpretation of publically available 2D and 3D seismic data. Seismic interpretation, combined with 2D structural reconstruction of major faults reveals two distinct orientations of structures. NNE trending faults were initiated in the Carboniferous or Devonian but were underfilled, resulting in erosion of the fault block crest and filling of the remnant rift-related topography by conformable sequences of later Permian and Triassic sediments. By contrast, NE-SW oriented faults experienced a distinct phase of Permian activity and are unconformably overlain by Triassic sediments.

This older rift architecture has clearly affected the geometry of the subsequent Upper Triassic to Middle Jurassic rift and can account for the en-echelon style of faulting on the northern margin of the Dampier Basin. Reactivation of the eroded fault block crests results in complex fault geometries and significant deformation of hanging wall strata during Mesozoic extension. The crustal scale geometry of these fundamental faults may also account for the unusual nature of the Lewis Trough in which the syn-rift sequence forms a broad syncline, rather than the more typical rotated fault blocks and syn-rift wedges.