Multistage Deformation of Linked Fault Systems in Extensional Regions: An example from the northern Perth Basin, Western Australia

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Abstract

Linked fault systems identified in the northern portion of the onshore Perth basin comprise northerly striking normal faults, the dominant structures in the basin, and hard linkages—easterly striking transfer faults. The former are either divided into segments of distinctive character by, or terminate at, the transfer faults. The fault systems were initiated by WSW-ENE extension in the Early Permian but were reactivated by subsequent rifting with approximately W-E extension in the Jurassic. They were also reactivated by the oblique extension of NW-SE orientation associated with Gondwana continental breakup in the Late Jurassic-earliest Cretaceous. In addition to reactivation, older structures of the linked fault families controlled the development of younger fractures and folds. During the oblique extension, the linked fault systems define releasing and restraining bends in which extensional and compressional deformations, respectively, are recognized. At releasing bends, a rollover anticline, the forms in the hanging wall of the listric normal fault which retains an overall extensional character, whereas at the restraining bend, contractional folds developed and these are sites of major commercial hydrocarbon fields in the basin.

Key words Perth Basin, linked fault system, fault reactivation, transfer fault