

# **Structural and Depositional Style of the Syn-rift Systems of the Northwest Australian Margin: A Comparison with Atlantic Passive Margin Systems**

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Many passive continental margins are characterized by a regional distribution and thickness of syn-rift and post-rift sediment packages that are not consistent with the minor amounts of brittle deformation observed in either seismic sections across the margin (e.g., Exmouth Plateau, northwest Australia; Marion Plateau, northeast Australia; Grand Banks; Brazilian and West African margins; and West of Shetlands basins). While the geological details and sedimentary facies differ between the various margins, the style of deformation and the regional distribution of accommodation are remarkably similar. The development of significant post-rift accommodation in the same region characterized earlier by minor syn-rift faulting and shallow depositional environments has been explained in terms of depth-dependent extension that is partitioned vertically across a zone of decoupling that results in the development of a relatively non-deforming upper crust (i.e., the upper plate) from a ductile-deforming lower crust and lithospheric mantle (i.e., the lower plate), the boundary between them having a ramp-flat-ramp geometry.

Exactly how the lithospheric extension is balanced was the rationale for R/V Ewing cruise EW0113, which collected over 2000 km of multi-channel seismic reflection and more than 800 km of OBS wide-angle refraction data across the continent-ocean transition zone of the Exmouth Plateau and Cuvier margin. Seismic reflection and refraction data has allowed the mapping of the ocean-continent transition, which appears to a broad zone ~200 km wide containing landward and seaward dipping reflectors, “rafted” crustal blocks, and supposedly exposed continental mantle. Underplating has occurred, but is relatively minor and has helped source the basalts that comprise the seaward- and landward-dipping reflectors - excessive magma production is independent of mantle plumes.