2-D Basin Modeling of Three Regional Seismic Profiles from Browse Basin, Northwest Australia

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Three Regional 2-D seismic lines across the Browse Basin and Scott Plateau, NWS Australia, were interpreted and underwent 2-D structural modelling, backstripping & fault-forward modelling. Sequential backstripping of the three 2-D lines to the Jurassic 'syn-breakup' timestep (i.e. ~160Ma) was performed to investigate beta (ß) stretching-factors and syn-rift basin geometries across the margin. Forward modelling was performed to determine the magnitude of fault-controlled rift extension and enabled comparison of results with lithosphere ß-factors derived from backstripping.

The modelling involved: sequential removal of the stratigraphic/volcanic sequence accompanied by sediment decompaction and incorporated long-term eustasy; isostatic unloading applying flexural isostasy in 2-D; reverse thermal-subsidence modelling of two conceptual rift events; and calibration against geological data, bathymetry, emergence and erosion.

Each sequential structural restoration linked directly to the corresponding regional Gross Depositional Environment map, and these maps were cross-referenced with an independent interpretation of Moho depth and crustal basement thickness based on a 3-D gravity inversion (incorporating a lithosphere thermal gravity anomaly correction).

Primary results of the analysis indicate that: i) east of Buffon/Brecknock/Barcoo, Browse Basin is a "normal" fault-controlled rift basin (ß ~1.5); ii) west of Brecknock/Buffon/Barcoo is 'transitional' continental/oceanic crust (ß ~3-6); iii) the Wilson Spur is a continental block separated from the continental plate by a failed rift (c.f. Hatton Bank / Faeroe Islands, N. Atlantic); iv) upper crustal extension/faulting can account for ß ~1.8 (including effects from a preceding rift event) and is less than the lithosphere ß ~ 3-6 derived from backstripping (indicating depth-dependent lithosphere stretching).