

## **The Rockall Trough, NE Atlantic: An Extinct Young Ocean Basin or a Failed Breakup Basin?**

Alan Roberts (1), Nick Kusznir (2), and Andy Alvey (1)

(1) Badley Geoscience, Spilsby, UK, (2) Dept. of Earth, Ocean & Ecological Sciences, University of Liverpool, Liverpool, UK

We investigate the crustal structure and composition of the Rockall Trough which is located in the NE Atlantic to the west of Ireland and the UK. The Rockall Trough is a large extensional basin formed in the Early Cretaceous and has dimensions of approximately 250 km in width and 1000 km in length. It is one of several basins formed during the complex Mesozoic northward propagation of rifting, continental breakup and sea-floor spreading initiation of the North Atlantic; other adjacent basins formed at this time include the Porcupine Trough to its east and the East and West Orphan Basins on the Canadian conjugate margin.

To investigate the crustal structure of the Rockall Trough we have used three independent analyses of available 2D and 3D data:

1. 3D gravity inversion, using public-domain gravity and sediment-thickness information, has produced maps of (i) depth to Moho, (ii) crustal thickness (figure 1) and (iii) stretching/thinning factor across both margins.
2. Gravity inversion as above, but using public-domain gravity data combined with new proprietary 2D sediment-thickness information, has produced a series of cross-sections which show (i) depth to Moho, (ii) crustal thickness and (iii) stretching/thinning factor across both margins
3. Geodynamic modelling, comprising 2D flexural backstripping and forward modelling, has been used to produce (i) estimates of stretching/thinning factor, (ii) whole-crustal cross-sections and (iii) predictions of palaeobathymetry through time along a series of project-specific transects.

Our analysis of the Rockall Trough shows a rapid shallowing of crustal basement thicknesses on the flanks of the basin with central values of crustal thickness typically 8-10 km consistent with previously published seismic estimates. An important question is whether this thin crust is hyper-extended continental crust or proto-oceanic crust. Locally isolated patches of crustal thicknesses as low as 3km are observed which are consistent with the gravity inversion and subsidence analysis expression of serpentinised mantle. Our interpretation is that the Rockall Trough formed in a magma-poor extensional tectonic environment and that extension stopped prior to pervasive mantle exhumation and continental breakup. We therefore interpret the Rockall Trough as a failed breakup basin rather than an extinct young ocean basin. We briefly review other global analogues of failed breakup basin.