AAPG HEDBERG CONFERENCE
"Hydrocarbon Habitat of Volcanic Rifted Passive Margins"
SEPTEMBER 8-11, 2002, STAVANGER, NORWAY

Structural interpretations of the northern Vøring basin, offshore mid-Norway using deep geophysical data integration

Chris M. Edwards[1]*, Steve Matthews[2], Chris F Elders[1], and David G. Roberts[2]
[1]Royal Holloway and Bedford New College, University of London
[2]BP, Sunbury-upon-Thames, Middlesex, England

**Present address: Stratigraphy Research Group, Dept. Earth Sciences, University of Liverpool, 4 Brownlow St., Liverpool L69 3GP*
(cedwards@liv.ac.uk)

The Vøring Basin, offshore mid Norway, provides a unique insight into the dynamics of highly attenuated continental crust. High extension magnitudes during Late Jurassic-Early Cretaceous rifting with subsequent thermal subsidence provided the accommodation for extreme thicknesses of sediment, locally more than 15 km. Using a combination of deep (14s TWT) seismic reflection and publicly available seismic refraction data a crustal-scale structural model for this basin is proposed.

Deep reflection seismic data reveal sub-Moho energy here interpreted as intra-mantle shear zones akin to those reported from the northern North Sea and the London-Brabant platform. Simple section restorations reveal a highly asymmetric form to the rift geometry that is comparable in style to that of the Rockall Trough further purporting to a detachment-style of extension. Despite the presence of very thin crust, significant fault offsets are not clearly resolved on long offset seismic data implying that depth-dependent stretching may be directly observed, similar to numerically derived examples in other extensional settings.

Paleocene plume-related underplating accreted great thicknesses of buoyant igneous material to the base of the crust prior to continental separation. The greatest thicknesses lie beneath zones of greatest extension and contributed to preserving elevated intra-basinal areas during Tertiary thermal subsidence.

A number of extensional faults can be seen to have been reactivated under contractional stresses and are observed as inversion anticlines and overtightened synclines adjacent to elevated basement blocks. These contractional features show a striking resemblance to those reported from Gulf of Suez and may have their origins in post-extensional crustal relaxation (e.g. Knott, 2001). This provides a unique alternative to previous postulated theories on the origin of these compressional features. Elevated basement highs can also be identified on regional gravity maps. Significantly, spatial relationships between the inversion structures and intra-mantle energy suggest a platform-basin boundary in the area of the Utgard High. The only unequivocal evidence for *persistent* Tertiary contraction comes from gentle up-bowing of the Naglfar Dome for which a ridge push causal mechanism is advocated.