AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

Caroline E Gill[1], John R. Underhill[2] (1) University of Edinburgh, Edinburgh, United Kingdom (2) Edinburgh University, Edinburgh, United Kingdom

Controls on the Rate of Deformation, Strain Localization and the Migration of the Locus of Extension in the Northern North Sea Rift System

Extensional fault growth and linkage plays an important role in the development of rift systems. Recent results have highlighted the main controls on structural styles and their effects on the temporal and spatial evolution of basin physiography, stratigraphic geometries and sediment dispersal in rift basins. However, little application of these controls has been made to analogous subsurface examples. This study uses temporally-constrained, densely-spaced 3-D seismic data from the highly prospective East Shetland Basin, northern North Sea to document the evidence for, and effects of fault growth during the Late Jurassic syn-rift episode. Integration of excellent biostratigraphic control in the North Sea enables much better timing controls than can be achieved in the field and allows development of a holistic model in which the timing of movement and lengthening of faults can be understood in terms of consequent structural feedback upon lateral fault growth and strain localisation. Interpretation of 3-D seismic data over the East Shetland Basin suggests that the locus of extension migrated east towards the Viking Graben with the latest primary motion occurring on the Visund-Gullfaks-Alwyn fault array. The effect of strain localisation towards the basin centre with time led to passive rotation of earlier (more westerly) structures and their depocentres (e.g. Snorre). New structural interpretation has demonstrated that the Viking Graben is highly asymmetric and should be considered a half-graben. The impact of progressive easterly migration and rollover into the Viking Graben led to reactivation of Triassic structures on the Horda Platform as antithetics in the Jurassic system.