Geophysical Research Abstracts
Vol. 16, EGU2014-7280-1, 2014
EGU General Assembly 2014

Crustal architecture of the Faroe-Shetland Margin: insights from a newly merged high resolution gravity and magnetic dataset

Stephen Rippington, Stan Mazur, and Chris Anderson
United Kingdom (stephen.rippington@arkex.com)

The Faroe-Shetland region is geologically complex; it has undergone several phases of extension and rifting since the middle Palaeozoic (Ritchie et al., 2011; Coward et al., 2003), culminating in the Eocene with continental breakup between Northwest Europe and Greenland (Gernigon et al., 2012). Final breakup may have been facilitated by the presence of the Iceland Plume and was accompanied by the emplacement of voluminous basaltic rocks, attributed to the North Atlantic Igneous Province (White and McKenzie, 1989).

It is difficult to image beneath the thick Paleogene basalts in the region using conventional seismic methods, because the high impedance contrast between the sediments and shallow basalts causes strong reflections. These mask deeper and weaker reflections and cause prominent inter-bed multiples (White et al., 1999). Consequently, determining the location and shape of basins and basement highs, and elucidating the timing and manner of their formation, remains a major cause of uncertainty in the appraisal of the hydrocarbon potential of the region.

Gravity and magnetic data record variations in the density and susceptibility of the entire crust. Consequently, the thick basalt piles that are shallow in the section do not hinder the ability to detect deeper features. Instead, the principal challenge is distinguishing superposed bodies, with different densities and susceptibilities, from the combined gravity and magnetic anomalies.

In this study, seismic data and horizons from the shallow section are used in combination with gravity and magnetic data to produce map view interpretations, and 2D and 3D models of the crust in the Faroe-Shetland region. These models help distinguish important variations in timing of rifting in different basins, and reveal the crustal architecture of the Faroe-Shetland Basin from the seabed to the Moho. We present a new structural and kinematic interpretation of the geology of the region, and propose an asymmetric simple shear model for the Faroe-Shetland segment of the UK Atlantic Margin.

The authors would like to acknowledge the management at ARKeX and PGS for giving permission to present this work.

Coward, M.., Dewey, J.F., Hempton, M., and Holroyd, J., 2003, Tectonic evolution, in Evans, D., Graham, C.G., Armour, A., and P, B. eds., Millenium Atlas: petroleum geology of the central and northern North Sea, Geological Society of London.
Gernigon, L., Gaina, C., Olesen, O., Ball, P.J., Péron-Pinvidic, G., and Yamasaki, T., 2012, The Norway Basin revisited: From continental breakup to spreading ridge extinction: Marine and Petroleum Geology, v. 35, no. 1, p. 1–19.
Ritchie, J.D., Ziska, H., Johnson, H., and Evans, D., 2011, Structure, in Ritchie, J.D., Ziska, H., Johnson, H., and Evans, D. eds., Geology of the Faroe-Shetland Basin and adjacent areas, British Geological Survey, Faroeses Earth and Energy Directorate, p. 9–70.
White, R.S., Fruehn, J., Richardson, K.R., Cullen, E., Kirk, W., and Latkiewicz, C., 1999, Faeroes Large Aperture Research Experiment (FLARE): imaging through basalt, in Fleet, A.J. and Boldy, S.A.R. eds., Petroleum Geology of Northwest Europe and Global Perspectives: Proceedings of the 5th Conference, Geological Society of London, p. 1243–1252.
White, R., and McKenzie, D., 1989, Magmatism at Rift Zones: The Generation of Volcanic Continental Margins: Journal of Geophysical Research, v. 94, no. B6, p. 7685–7729.