Geophysical Research Abstracts, Vol. 8, 05672, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05672

A regional 3D model for the crustal architecture and evolution of the mid-Norwegian continental margin

J.I. Faleide (1), R. Mjelde (2), F. Tsikalas (1), A.J. Breivik (1), T. Raum (2), J. Wilson (1) and O. Eldholm (2)

(1) Department of Geosciences, University of Oslo, P.O. Box 1047 Blindern, N-0316 Oslo, Norway, (2) Department of Earth Science, University of Bergen, Allegt 41, N-5007 Bergen, Norway (j.i.faleide@geo.uio.no / Fax: +47 22854215 / Phone: +47 22856677)

The volcanic margin off mid-Norway is one of the best explored and studied both by academia and industry and was the target area of the EUROMARGINS 2003 OBS Experiment. In addition to the new OBS data, the large existing geophysical and geological database comprises a regional grid of deep wide-angle seismic data (OBS and ESP), deep and standard multichannel seismic (MCS) reflection profiles, potential field data, heat flow, and scientific and commercial boreholes. Integrated analysis of the data reveal important vertical and lateral variations in crustal structure and composition resulting from a complex history of rifting prior to and during the last Late Cretaceous-Early Tertiary rift episode leading to break-up and volcanic margin formation. We recognize Late Paleozoic-Early Mesozoic, Late Jurassic-Early Cretaceous, mid-Cretaceous (Aptian/Albian-Cenomanian) and Late Cretaceous-Paleocene rift structures and a progressive focusing of the central rift zone with time towards the initial breakup line. There is a well-defined along-strike margin segmentation and the various segments are characterized by distinct crustal properties, structural and magmatic styles, and post-opening history of vertical motion. The wide-angle seismic data make it possible to map structures below the extrusives and intrusives associated with early Tertiary breakup which mask the deep basin configuration and underlying crustal structure in seismic reflection data covering the central and western parts of the deep Møre and Vøring basins. The OBS data have provided significant new insight on the thickness and extent of volcanic flows and intrusions, the nature of the continent-ocean transition, and the depth to crystalline basement, lower crust and Moho. Furthermore, the Vp and Vp/Vs ratio have been used to constrain lithologies in the sedimentary

basins and composition of the underlying crystalline basement rocks. A lower crustal body (LCB), characterized by high velocities and densities, are found widespread on the Vøring and Møre margin segments but with significant lateral thickness variations. The nature and composition of this body are not clear and alternative interpretations - massive gabbroic complex emplaced during breakup, sill intrusions into lower crust, melted continental crust, serpentinized mantle rocks, pre-existing high-grade rocks - have different implications for the quantitative modeling that is carried out within EUROMARGINS. Modeling will lead to enhanced understanding of the fundamental processes responsible for the breakup and separation of lithospheric plates. In this context, addressing magmatic processes during breakup and early sea floor spreading is an important aspect of the study. A series of 2D crustal transects have been constructed and these provide key constraints for quantitative modeling of margin dynamics focusing on processes controlling continental breakup and subsequent margin evolution. The large geophysical and geological database has also been integrated into a regional 3D crustal-scale model that forms the basis for 3D structural modeling of the Norwegian margin.