Geophysical Research Abstracts, Vol. 9, 07388, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07388

Thin oceanic crust on the extinct Aegir Ridge, Norwegian Basin, N.E. Atlantic predicted by satellite gravity inversion

E.E. Greenhalgh and N.J. Kusznir

Department of Earth and Ocean Sciences, University of Liverpool, Liverpool, L69 3BX, UK

Satellite gravity inversion incorporating a lithosphere thermal gravity anomaly correction has been used to map crustal thickness and lithosphere thinning factor for the N.E. Atlantic. Predicted oceanic crustal thicknesses in the Norwegian Basin are between 4 and 7 km on the extinct Aegir Ridge, increasing to 9 - 10 km at the margins, consistent with volcanic margin continental breakup at the end of the Palaeocene. The observation (from gravity inversion and seismic refraction studies) of thin oceanic crust produced by the Aegir Ridge in the Oligocene has implications for the temporal evolution of asthenosphere temperature under the N.E. Atlantic during the Tertiary. Thin Oligocene oceanic crust may imply cool (normal) asthenosphere temperatures during the Oligocene in contrast to elevated asthenosphere temperatures in the Palaeocene and Miocene-Recent as indicated by the formation of volcanic margins and Iceland respectively. The inversion of gravity data to determine crustal thickness incorporates a lithosphere thermal gravity anomaly correction for both oceanic and continental margin lithosphere. The lithosphere thermal model used to predict the lithosphere thermal gravity anomaly correction may be conditioned using magnetic isochron data to provide the age of oceanic lithosphere. The resulting crustal thickness determination and the location of ocean-continent transition (OCT) are however sensitive to errors in the magnetic isochron data. An alternative method of inverting satellite gravity to give crustal thickness, incorporating a lithosphere thermal correction, has been used which does not use magnetic isochron data and provides an independent prediction of crustal thickness and OCT location. Failure to incorporate a lithosphere thermal gravity anomaly correction produces an over-estimate of crustal thickness. Crustal thickness estimates do not include a correction for sediment thickness and are upper bounds. Oceanic crustal thicknesses determined by gravity inversion for the Ae-

gir Ridge are consistent with recent estimates derived using refraction seismology by Breivik et al. (2006). Thicker crust (c.f. ocean basins) is predicted for the Jan Mayen micro-continent, with crust of the order of 20 km thickness extending southwards to connect with both the Faroes-Iceland Ridge and N.E. Iceland. Predicted crustal thicknesses under the Faroes-Iceland Ridge are approximately 25 km.