Geophysical Research Abstracts,
Vol. 11, EGU2009-5851-1, 2009
EGU General Assembly 2009

An anomalous upper mantle unit beneath southern Norway revealed by P-wave travel time residuals.

A. Bondo (1), N. Balling (1), B.H. Jacobsen (1), R.W. England (2), R. Kind (3), R. Bödvarsson (4), C. Weidle (5), S. Gregersen (6), and P. Voss (6)

(1) University of Aarhus, Department of Earth Sceinces, Aarhus N, Denmark (anna.bondo@geo.au.dk), (2) University of Leicester, England, (3) GeoForschungsZentrum Potsdam (GFZ), Germany, (4) University of Uppsala, Sweden, (5) University of Oslo, Norway, (6) Geological survey of Denmark and Greenland (GEUS), Denmark

We investigate whether high topography in southern Norway is associated with an anomalous upper mantle and we identify the western boundary of thick shield lithosphere.
Several studies describe crustal structure in southern Scandinavia, whereas high-resolution information on upper mantle structures is sparse. We present relative P-wave travel time residuals (P-residuals) and preliminary tomography from southern Norway, southern Sweden and northern Denmark. We analyze distant earthquakes registered by seismological stations in projects CENMOVE, CALAS, MAGNUS and SCANLIPS together with selected TOR stations, and permanent stations in southern Sweden, southern Norway and Denmark.
Station means of P-residuals corrected for topography and contributions from the crust varies by up to about 1 s across the study area. We associate early arrivals to the east of the Sorgenfrei-Tornquist Zone (STZ) and east of the Oslo Graben with thick shield lithosphere. Late arrivals observed in the Norwegian-Danish Basin southwest of the STZ are consistent with thinned lithosphere related to the basin formation. In southern Norway west of the Oslo Graben area, late arrivals indicate reduced P-wave velocity in the upper mantle and perhaps some regional isostatic buoyancy from the upper mantle. However, arrivals are early in the northern part of southern Norway, still in areas of high topography. Thus, a clear spatial correlation with areas of high topography is not observed.
We identify the western boundary of thick shield lithosphere by interpretation of station means of P-residuals, together with the azimuthal dependence of single P-residuals in southern Scandinavia. We find this boundary to follow the STZ from the southeast into the northern part of Jutland. From there it proceed northwards. In southern Norway the western boundary of thick shield lithosphere is found around the Oslo Graben, proceeding to the northwest approaching the Norwegian coast.