Geophysical Research Abstracts
Vol. 16, EGU2014-10014, 2014
EGU General Assembly 2014

P-wave and S-wave traveltime residuals in Caledonian and adjacent units of Northern Europe and Greenland

Babak Hejrani (1), Niels Balling (1), Bo Holm Jacobsen (1), Rainer Kind (2), Frederik Tilmann (2), Richard England (3), and Søren Bom Nielsen (1)

(1) Aarhus university, Department of Geoscience, Aarhus C, Denmark (babakhejrani@gmail.com), (2) GFZ Potsdam, Germany, (3) Departmentof Geology, University of Leicester, Leicester, UK

This work combines P-wave and S-wave travel time residuals from in total 477 temporary and 56 permanent stations deployed across Caledonian and adjacent units in Northern Europe and Greenland (Tor, Gregersen et al. 2002; SVEKALAPKO, Sandoval et al., 2003; CALAS, Medhus et al, 2012a; MAGNUS, Weidle et al. 2010; SCANLIPS south, England & Ebbing 2012; SCANLIPS north, Hejrani et al. 2012; JULS Hejrani et al. 2013; plus permanent stations in the region).

We picked data from 2002 to 2012 (1221 events) using a cross correlation technique on all waveforms recorded for each event. In this way we achieve maximum consistency of relative residuals over the whole region (Medhus et al. 2012b).
On the European side 18362 P-wave travel time residuals was delivered. In East Greenland 1735 P-wave residuals were recovered at the Central Fjord array (13 stations) and 2294 residuals from the sparse GLISN-array (23 stations). Likewise, we picked a total of 6034 residuals of the SV phase (For the Tor and SVEKALAPKO projects we used data from Amaru et al. 2008).

Relative residuals within the region are mainly due to sub-crustal uppermost mantle velocity anomalies. A dominant subvertical boundary was detected by Medhus et al. (2012), running along the Tornquist zone, east of the Oslo Graben and crossing under high topography of the southern Scandes. We delineated this boundary in more detail, tracking it towards the Atlantic margin north of Trondheim. Further north (Scanlips north), a similar subvertical upper mantle boundary seems to be present close to the coast, coinciding with the edge of the stretched crust.

The North German Caledonides were probed by the new JULS (JUtland Lower Saxony) profile which closes the gap between Tor and CALAS arrays. Mantle structure found by the Tor project was confirmed, and modelling was extended to the eastern edge of the North Sea.

References:
Amaru, M. L., Spakman, W., Villaseñor, A., Sandoval, S., Kissling, E., 2008, A new absolute arrival time data set for Europe.Geophysical Journal International, 173, 465–472.
England, R. W.; Ebbing, J., 2012, Crustal structure of central Norway and Sweden from integrated modelling of teleseismic receiver functions and the gravity anomaly.GEOPHYSICAL JOURNAL INTERNATIONAL, 191, 1-11.
Gregersen S., Voss P., TOR Working Group, 2002. Summary of project TOR: delineation of a stepwise, sharp, deep lithosphere transition across Germany-Denmark-Sweden, Tectonophysics, 360, 61–73.
Hejrani, B., Jacobsen, B. H., Balling,N. and England, R. W.. 2012, A seismic tomography study of lithospheric structure under the Norwegian Caledonides.Geophysical Research Abstracts, 14, 4334.
Hejrani, B.; Jacobsen, B.H.; Balling, N.;Tilmann, F.; Kind, R., 2013, Upper-mantle velocity structure beneathJutland, Denmark and northern Germany:Preliminary results. Joint Assembly Gothenburg Abstract S401S2.01,
Medhus, A. B., Balling, N., Jacobsen, B. H., Weidle, C., England, R. W., Kind, R., Thybo, H., Voss, P. (2012a): Upper-mantle structure beneath the Southern Scandes Mountains and the Northern Tornquist Zone revealed by P-wave traveltime tomography. Geophysical Journal International, 189, 3, 1315-1334.
Medhus, Jacobsen, B. H.,A. B., Balling, N., 2012b, Bias Problems in Existing Teleseismic Travel Time Databases: Ignore or Repair? Seismological Research Letters, 83, 1030-1037.
Sandoval, S., Kissling, E. &Ansorge, J., 2003.High-resolution body wave tomography beneath the SVEKALAPKO

array: I. A priori three-dimensional crustal model and associated traveltime effects on teleseismic wave fronts, Geophys. J. Int., 153, 75–87.
Weidle, C., Maupin, V., Ritter, J.,Kværna, T., Schweitzer J., Balling, N.,Thybo, H.,Faleide, J. I.,and,Wenzel, F., 2010, MAGNUS-A Seismological Broadband Experiment to Resolve Crustal and Upper Mantle Structure beneath the Southern Scandes Mountains in Norway. SEISMOLOGICAL RESEARCH LETTERS, 81, 76-84.