Geophysical Research Abstracts, Vol. 9, 04227, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04227

A new lithospehre model as input for the European strength map

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Tectonic studies made in intraplate Europe have shown that this area is more active than would be expected from its location far away from plate boundaries.The first strength map showed that the European lithosphere is characterized by major spatial mechanical strength variations, with a pronounced contrast between the strong lithosphere of the East-European Platform (EEP) east of the Tesseyre-Tornquist Zone (TTZ) and the relatively weak lithosphere of Western Europe.

In order to improve the results previously obtained, we have constructed a new crustal model, in which we implement the results of recent seismic studies. The new crustal model consists for continental realms, of two or three crustal layers and an overlying sedimentary cover layer, whereas for oceanic areas one crustal layer is used. The results of deep seismic reflection and refraction and/or receiver function studies are used to define the depth of the crustal interfaces and P-wave velocity distribution. The Moho depth variations are reconstructed by merging the most recent maps compiled for the European regions (e.g. Ziegler and Dèzes, 2002, Kozlovskaja et al, 2004) and by ourselves using published interpretations of seismic profiles (e.g. in the Vøring and Lofoten basins). To each layer of the model we associate a density value and corresponding lithology.

Strong differences in the crustal structure are found between the areas east and west of the TTZ, respectively. The eastern region is mostly characterized by high velocity of the lowest layer (*Vp*$\sim$7.1km/s) and thick crust, e.g. over the Baltica region ($\sim$42-44 km) with a maximum of over 60 km in the Baltic Shield. By contrast, crustal structure is more heterogeneous to the west from TTZ, being characterized by Variscan crust with slower P-wave velocity in the lower crust (*Vp*$\sim$6.8km/s) and an average thickness of 30-35 km, orogens (e.g. the Alps and the Pyrenees), where the crustal thickness is increased up to 45-50 km, and locally by strong extensional deformation, which resulted in a very thin crust in the Pannonian Basin ($\sim$25 km) and in the Tyrrhenian Sea ($\sim$10 km). Concerning the oceanic domain, the crustal thickness is generally decreased towards the ridge (up to 10 km in the most western part), with local maxima up to 20-25 km (e.g. in the Vøring and Lofoten basins) and up to 35-40 km beneath the islands (e.g. Iceland and Faeroe islands), on account of mantle underplating.

Seismic tomography data are used to get the location of the lithosphere-astenosphere boundary and calculate the temperature distribution. These results, jointly with the new crustal model, allowed us to refine the previous strength map. Furthermore, the gravity effect of the crustal model is calculated and removed from the observed gravity field in order to get residual mantle anomalies. These anomalies distribution are compared with the new strength results. Negative mantle gravity anomalies and relative low strength values characterize Western Europe, while the reverse is true for Eastern Europe. Large differences exist also for specific tectonic units: a pronounced contrast in lithosphere properties is found between the strong Adriatic plate and the weak Pannonian Basin area, as well as between the Baltic Shield and the North Sea rift system.