Geophysical Research Abstracts, Vol. 7, 04605, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04605
© European Geosciences Union 2005

Preliminary 2D density and magnetic models of the lithosphere for the Polish part of the CELEBRATION 2000 seismic experiment.

T. Grabowska, G. Bojdys

Institute of Geophysics

AGH University of Science and Technology – AGH-UST

Cracow, Poland

tgrabow@geol.agh.edu.pl

Profile CEL01 is the most representative of a few DSS lines designed in SE Poland for the international seismic project CELEBRATION 2000. Running from SW to NE, the profile is 900 km long and crosses the Pannonian basin, Western Carpathians and the Carpathian Foredeep, southern part of the Paleozoic Platform (PLZ) with the Holy Cross Mts. (HCM), the Teisseyr'e-Tornquist Zone (TTZ) and southwestern edge of the East European Craton (EEC). A northeastern part of profile CEL01 lies within the EEC.

The following data were used to create a density model of the Earth's crust and the upper mantle: 1) geological information (geological cross-sections, geological maps, rock density) for the sedimentary crust, 2) DSS data (crust's velocity model) to designing the geometry of the crystalline crust and, partly, of the upper mantle, 3) geothermal data from SE Poland (heat flow map).

In addition to seismic and geothermal data, information on magnetic properties of the crystalline basement rocks were employed to create a magnetic model of the crystalline crust.

Two different approaches, which allowed for the effect of pressure and temperature on density of rocks at different depth, were applied to calculate the density distribution in the crystalline crust (Sobolev and Babeyko 1994, Christensen and Mooney 1995).

An average density of the upper mantle rocks was evaluated by means of two different equations; the first one employs only geothermal data (Lachenbruch and Morgan, 1990, Ranalli, 1997) whereas in the other the density depends on seismic wave velocity in the mantle (Christensen and Mooney, 1995).

Based on a seismic model for the crystalline crust and geothermal data, a 2D magnetic model of the crystalline crust was created by magnetic modeling.

Gravity effects and magnetic effects calculated for the assumed crusts' models analyzed together with results of gravity and magnetic modelings suggest that a density model of the crust within the TTZ should be verified. Those results prove also that there are horizontal density changes in the upper mantle rocks, which point to an increase of average density northeastwards.

References

1. Christensen, N. I. and Mooney, W. D., 1995. Seismic velocity structure and composition of the continental crust: A global view. Journal of Geophysical Research, vol. 100. No, B7, 9761-9788.

2. Sobolev, S. and Babeyko, A. Y., 1994. Modeling of mineralogical compositions, density and elastic wave velocities in anhydrous magnetic rocks. Surveys in Geophysics, 15. 515-544.

3. Lachenbruch, A. H. and Morgan, P., 1990. Continental extension, magmatism and elevation; formal relations and rules of thumb. Tectonophysics, 174, 39-62.

4. Ranalli, G., 1997. Rheology of the lithosphere in space and time. In: I. Burg and M. Ford (eds.): Orogeny through time. Geological Society Special Publication 121, 19-37.