Geophysical Research Abstracts,
Vol. 11, EGU2009-3126, 2009
EGU General Assembly 2009

Velocity-density relation for the continental crust and uppermost mantle obtained by regional 2-D gravity modelling

L. Krysinski (1), M. Grad (1), and S. Wybraniec (2)

(1) Institute of Geophysics, University of Warsaw, Pasteura 7, 02-093 Warsaw, Poland (lkrys@mimuw.edu.pl), (2) Polish Geological Institute, Rakowiecka 4, 00-975 Warsaw, Poland

In this paper we search for a reference relation between seismic P-wave velocity V and density Dref for the continental crust. Basing on the results of modern seismic experiments, we compiled a 2-D seismic models into a network of four, each about 1100-1400 km long, continental-scale seismic transects cutting all main tectonic units in the Central Europe. The Moho depth and crustal structure of this area are characterised by large variation. The deepest Moho was found beneath the TESZ in SE Poland (about 52 km), why the shalowest was found beneath the Pannonian Basin (about 25 km). The 2-D gravity modelling applied for crustal cross-sections representing the regional structure, based on unified gravity anomaly map of the area, allows for a stable determination of some general features of the regional reference velocity-density relation for continental crust and uppermost mantle. In general three seismo-petrological types of rocks can be distinguished: sediments, crystalline crust and mantle. In compacted sediments the reference velocity-density relation is well described by classical models. Calculated gravity anomalies using unified velocity-density relation for the whole crystalline crust well describes observed anomalies, with r.m.s. of about 14 mGal. However, calculated gravity anomalies using separated velocity-density relations for the crystalline crust of Precambrian and Phanerozoic Europe describes observed anomalies better than for whole crust, with r.m.s. 12 mGal. The most important feature of these relations is large differentiation of derivative dDref/dV in the crystalline crust, being about 0.3 g·s/m4 for Precambrian, and about 0.1 g·s/m4 for Phanerozoic crystalline crust. The modelling suggests a very small density values in the uppermost mantle D=3.11 g/cm3 below the younger area, while for the older it is D=3.3 g/cm3.