Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03203, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03203
EGU General Assembly 2008

Thermal and rheological models of the Carpathians foreland on the Romanian territory, constrained by seismic velocity data

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The complex structure of the lithosphere beneath the Romanian territory is the result of the compressive tectonic interaction of three major tectonic compartments (East European Platform, Moesian Platform, Tisza-Dacia and Alcapa terranes) during Carpathians orogeny. Temperature is a key physical parameter controlling the crustal and mantle dynamics. The evaluation of the lithosphere temperature required realistic estimates on crustal structure and distribution of the thermal parameters within the lithosphere. Geological, geophysical and seismological information collected during the last years indicated complex thermo-mechanical structures of the crust and lithosphere and characteristic seismic velocity-depth distributions for each of the mentioned tectonic units. This study proposes a re-evaluation of the tectonic evolution models for the lithosphere in the main tectonic units in the extra-Carpathian area (the Central Moesian Platform, Black Sea Block and East-European Platform) and a minimization of the uncertainties in the spatial distribution of the parameters required in thermal modelling by assimilation of the information supplied by tomographic seismic data, using a conversion procedure of seismic wave velocity to temperature. For the tectonic regenerated extra-Carpathian zones, the thermal structure of the lithosphere has been obtained by thermal simulation of the main processes implying the entire lithosphere or parts of it, namely: sedimentation in Focsani Depression and convergence process in the Eastern Carpathians. In these simulations finite-elements and finite-differences computer codes to solve the heat transfer equation are used. The result of this study consists of profiles of the temperature distribution with depth, in the crust and mantle. To analyse the rheological behaviour of the rocks in compres-

sive regime, rheological profiles have been produced by valuating the thermal structures obtained by modelling. The rheological structure of the lithosphere in the study area has than been interpreted in correlation with the characteristics of the seismic wave propagation process (quality factor of the medium Q). The integration of the results concerning the thermo-mechanical peculiarities of the lithospheric rocks with the propagation characteristics of the seismic waves could significantly contribute to answering several disputed questions regarding the deep structure in extra-Carpathian areas, and the processes responsible for the occurrence of the strong seismic events of the Vrancea region.