Geophysical Research Abstracts, Vol. 8, 06231, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06231

Global density model of the crust and upper mantle based on joint inversion of the new satellite gravity and seismic data

M.K. Kaban and M. Rothacher

GeoForschungsZentrum, Dept.1, Telegrafenberg A17, Potsdam, Germany
(kaban@gfz-potsdam.de, rothacher@gfz-potsdam.de)

Structure and properties of the crust and upper mantle are closely related to the human habitat, but these layers are the most complicated layers of the Earth and are still far from completely understood. We use the new satellite gravity models from CHAMP and GRACE and other available geophysical information to construct a new global density model of the lithosphere and upper mantle. An improved global model of the crust serves as a basis for this study. Contrary to the existing low-resolution global crustal models, the current model is principally improved for North America and Eurasia, where the difference with CRUST5.1 and CRUST2.0 e.g. in Moho depth reaches 15 km. The new residual mantle gravity anomalies and residual topography are estimated based on these data. We invert these fields jointly with seismic tomography data to image density distribution within the crust and upper mantle. The inversion technique accounts for the fact that the residual gravity and residual topography are controlled by the same factors but in a different way, e.g. depending on depth. This provides a possibility for remarkably better vertical resolution of the resulting density models. In the final stage we separate the effect of mantle temperature variations, which is estimated from seismic tomography models (e.g. Goes and Van der Lee, 2002) and geothermal modeling (Artemieva and Mooney, 2001). Some features of the mantle structure are detected for the first time. For example, we find a horizontal shift of the deepest parts of several low-density continental roots (e.g. Canadian Shield), which could be a result of basal drag. Several high-density anomalies are found in the upper mantle, which are invisible in the seismic tomography data. First of all, these are anomalies under some deep sedimentary basins (e.g. Gulf of Mexico) and continental collision zones (e.g. Alpine fold belt).