Geophysical Research Abstracts
Vol. 15, EGU2013-5414, 2013
EGU General Assembly 2013

Global gravity model of the crust and upper mantle

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Recent advances in integration of available geophysical data provide excellent possibilities for construction of a new generation global gravity model, which describes density distribution in the crust and upper mantle. One of the most difficult problems of the deep gravity modelling is determination of the crustal contribution to the observed gravity field. We use an updated crustal model, which is principally improved based on recent data compilations. The improvements are made for most of the parameters, especially for the Moho depth, thickness and density of sediments as well as for the crystalline crust structure. This model is used to eliminate crustal effects from the observed gravity field and topography. We pay special attention to selection of the reference model, which is used in the gravity calculations. This approach provides a possibility for a consistent analysis of tectonic structures over the whole Earth. The effect of the deep mantle heterogeneity is also estimated based on recent global dynamic models. In this way, the residual mantle gravity anomalies and residual topography are estimated. These fields provide information about density structure of the upper mantle, which plays a key role in tectonic processes shaping the Earth surface. The calculated residual mantle anomalies are remarkably different from the tomography images in many areas. This indicates that density and seismic velocity variations are controlled by different factors (e.g. temperature and composition). Therefore, only a joint analysis of the gravity and seismic tomography results may provide a comprehensive knowledge about structure of the Earth.