



Mantle Heterogeneity Beneath Europe Resolved from GOCE Satellite Gravity

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Mantle Heterogeneity Beneath Europe Resolved from GOCE Satellite Gravity

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Abstract Text:

The objectives of this study is to construct a continent-scale model of density variations in the European upper mantle. The residual mantle gravity anomalies are derived from the GOCE satellite gravity data, from which gravitational effects of the deep mantle and the crust are removed.

We take advantage of a recently released seismic model EUNaseis for the crustal structure of the European continent and the adjacent regions. We examine the propagation of crustal model uncertainties into determinations of lithospheric mantle density. Given a relatively small range of expected density variations in the lithospheric mantle, knowledge on the uncertainties associated with incomplete knowledge of density structure of the crust is of utmost importance for further progress in density heterogeneity studies.

Our model of mantle density structure has lateral resolution of ca. 100 km, which allows to distinguish small-scale mantle anomalies and to link them to regional geodynamic processes. To understand better geodynamic causes of mantle density heterogeneity, we compare mantle residual gravity anomalies for the European upper mantle with regional upper mantle velocity structure constrained by high-resolution seismic tomography studies, and compare our regional upper mantle density model with petrological studies of mantle-derived xenoliths from the Baltic shield, the Arkhangelsk region, and worldwide.

Session Selection: Density structure of the lithosphere and upper mantle – a key for tectonics.

Title: Mantle Heterogeneity Beneath Europe Resolved from GOCE Satellite Gravity

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