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Direct solution to the gravimetric inverse problem for fining Moho depths

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The gravimetric inverse problem for finding the crust-mantle (Moho) density contrast is formulated in this study based on the assumption that the crust density structures and the crust thickness are a priori known, for instance, from results of seismic studies. The functional relation between the refined gravity data and the Moho density contrast is defined by means of the Fredholm integral equation of the first kind. The refined gravity data used for solving the gravimetric inverse problem should (optimally) comprise only the gravity signal attributed to the Moho geometry. This assumption is still restricted by the limited knowledge about the density structures within the lithosphere and sub-lithosphere mantle. The expressions for computing the refined gravity data and the Moho density contrast are defined in spectral domain utilizing various spherical functions, which describe globally the crustal density structures and the Moho density interface. The functional model is formed for the density contrast defined relative to the adopted homogenous crustal density model. A more refined formulation of the inverse problem is also given using additional constraining parameters. These parameters are based on empirical models, which describe theoretical spatial variations of the Moho density contrast. In particular, the density changes due to the mantle convection (i.e. ocean-floor spreading) are utilized within the oceanic lithosphere, while the depth-dependent density model is adopted within the continental lithosphere.