

Abstract Details

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Regression parameters between topography and gravity as proxies of crustal densities on Earth and other planets

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The statistical evaluation of the correlation between gravity and topography bears information on the isostatic state and the density inhomogeneities of the lithosphere. In appropriate spectral bands, the relation between gravity and topography is linear, and the coefficients depend on the underlying crust and subcrustal densities. We first explore the mutual linear gravity-topography spectral-dependent relations with synthetic lithosphere models, considering different geodynamic situations involving lateral crustal density variation, superficial density changes in topography, and different types of isostatically compensated models. We demonstrate the sensitivity of the regression parameters to the subsurface structure. A second important application is the residualization of the gravity field, useful in areas in which other geophysical constraints are scarce. On other planets topography and gravity field are globally available, and the regression analysis can be used for subsurface exploration and structural characterisation. We demonstrate the usefulness on the African and South American continent, and across the Atlantic ocean, using the gravity data of GOCE. One focus are the Greenstone belts, which are geologically interesting structures to which often mineralizations are associated.