Geophysical Research Abstracts
Vol. 17, EGU2015-12273, 2015
EGU General Assembly 2015

Correct assessment of distant topography for correction of satellite gravity (gradient) data

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Topographic correction is commonly conducted with a standard radius of 167 km (∼1.5 °) around each station. It is a long standing question, whether this radius is appropriate in all cases. In areas of rugged topography the standard radius of 167 km can introduce long-wavelength artefacts from neglecting topography beyond this distance. Both very small (tens of km) and very large (up to global correction) radii have been used in past studies. New data derived from satellites missions (e.g. GOCE) - which also provide gravity gradients - introduce additional questions. First, it is unclear if the same radius can be used for observations which are above topography (e.g. 255 km for the GOCE satellite). Second, it is not investigated which radius is appropriate for correction of the full gravity gradient tensor.
In our study, we analysed how the choice of correction radius affects gravity and gravity gradients systematically. We also account for isostatic effects and estimate how topographic and isostatic effects compensate each other. We estimate the effect on satellite-derived grids and suggest an approach for optimal topographic correction for lithospheric modelling.