

Improving modeling of GOCE data using reduced point mass or multipole base functions

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Abstract:

Spherical harmonic are not the only harmonic functions which may be used when approximating the anomalous gravity field. One of a few other harmonic functions, which may be used as base functions when approximating anomalous gravity field, are point mass or multipole functions. In this study reduced point mass functions are used for the local modelling of GOCE data.

Point mass or multipole base functions may be expressed by closed expressions or as sums of Legendre series. In both cases at least the two first terms must be removed since they are not present in anomalous gravity field. Generally, for local applications the effect of a global gravity model is first removed (and later restored). For calculations discussed here contribution from EGM96 up to degree 36 has been subtracted.

In order to improve modeling of gravity data, more terms, than just effect of a global gravity model, need to be removed. Even better solution could be to substitute them by terms that uses small wavelength but also includes information representing the variances of the reference field that was removed. This assures that the model in an appropriate manner weights the regional frequencies with respect to the used global model. For point mass or multipole functions we have tried to find (unitless) terms representing the power in the frequencies which the global model has not removed, corresponding to error-degree variances, and use them as the terms up to the lowest degree of the reference potential (the global model).