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Optimized regional gravity field solutions from GOCE

Judith Schall, Annette Eicker, Torsten Mayer-Gürr, and Jürgen Kusche
Astronomical, Physical and Mathematical Geodesy Department, Bonn University

The satellite mission GOCE will provide an improvement of the static gravity field with unprecedented accuracy and resolution. However, one of the lessons from GRACE is that in order to exploit the signal information present in the satellite and sensor data to full content, it is reasonable to complement global solutions by regional recovery strategies. One reason is that, in particular in the high frequency part, the smoothness of the gravity field varies for different geographical areas. Therefore the recovery procedure should be adapted according to the characteristics in the respective area. For the GOCE mission this aspect is of particular interest due to its strength in recovering the high resolution part of the gravity field.

In our approach, as a first step a global gravity field represented by a spherical harmonic expansion up to a moderate degree has to be derived from precise orbit information and from gradiometry measurements. This global representation is then refined by space localising basis functions, accounting for residual signal in the satellite observations. Here we will investigate statistical techniques that allow us to optimize the position of the basis function nodal points jointly with the basis function coefficients. The method is analysed theoretically, followed by a demonstration of its applicability and performance for GOCE gravity recovery.