Geophysical Research Abstracts,
Vol. 11, EGU2009-9696, 2009
EGU General Assembly 2009

Gravity field refinement by radial basis functions from satellite data

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The new satellite gravity missions provide a significant gain in accuracy in gravity field recovery. To exploit the signal information present in the satellite and sensor data to full content, it seems reasonable to improve global solutions by regional recovery strategies. Especially in the higher frequency part of the spectrum the gravity field features differ in different geographical areas. Therefore the recovery procedure should be adapted according to the characteristics in the respective area.
In the approach presented here in a first step a global gravity field represented by a spherical harmonic expansion up to a moderate degree has to be derived. It is then refined by regionally adapted high resolution refinements being parameterized by splines as space localizing base functions.
On the one hand the presentation focuses on the theoretical considerations involved in a regional parameterization, on the other hand the method is demonstrated by the analysis of real satellite data. The theoretical issues include firstly the design of the basis functions and convergence issues emerging from it and secondly the optimal choice of the nodal point pattern applied for the location of the basis functions on the sphere. In the real data analysis part, a regionally refined global solution of the latest GRACE model calculated in Bonn (ITG-Grace03s) is presented. The improvements demonstrate the benefit of the regional refinement procedure.