Global and regional gravity field models from GOCE data

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ESA's GOCE satellite delivers accurate data of very high resolution and nearly global coverage. Global gravity models derived from these data have enabled a wealth of new applications in oceanography, geophysics and geodesy. Yet, it can be suspected that the traditional spherical harmonics modelling fails to exploit the full information contained in the GOCE gradiometer data. We strongly believe a regional representation to better deal with the inhomogeneous data set. Particularly, a regionally adapted regularization process enables optimal damping of both, regions featuring rough signal and rather smooth areas, at the same time. This is of special interest for GOCE because of its strength in observing the high frequency part of the spectrum.

In this contribution, we provide a comparison between global and regional models from GOCE data. Apart from the different parametrization (spherical harmonics vs radial base functions), the underlying processing strategy, the standards and data time span have been chosen identical to ensure comparability. We will demonstrate that the short arc approach yields global models that are in good agreement with the official GOCE models published by ESA. Moreover, we will show that regional models perform even better compared with global models in a number of case studies carried out in the Pacific Ocean and in the area around the South Sandwich Trench: a comparison with EGM2008 reveals the reduction of noise in smooth areas (up to 50% over the open ocean) and the ability to extract additional information in regions with strong high frequency signal.