Geophysical Research Abstracts
Vol. 13, EGU2011-8796-1, 2011
EGU General Assembly 2011

Artificial effects in regional gravity field representation caused by point grids of input data and localizing base functions

Katrin Bentel (1), Gabriel Goebel (2), Michael Schmidt (2), Christian Gerlach (1,3)

(1) Norwegian University of Life Sciences, Dept. of Mathematical Sciences and Technology, Ås, Norway (katrin.bentel@umb.no), (2) Deutsches Geodätisches Forschungsinstitut (DGFI), Munich, Germany, (3) Bayerische Kommission für die Internationale Erdmessung, Bavarian Academy of Sciences and Humanities, Munich, Germany

Satellite missions provide important contributions to Earth gravity models. These models can be refined by airborne and terrestrial gravity observations. Most common, global gravity fields are represented in spherical harmonic base functions. However, the main drawback of this representation is that regional signals are not necessarily represented in an optimal way. Spherical harmonics have global support, thus, the gravity models are globally optimized best-fit solutions. That means, it is difficult to represent small spatial details, they can even be masked in the solutions. Additionally, data gaps cannot be handled appropriately.

In order to exploit the highest degree of information from the data, a more adequate modeling is required. Therefore we propose a multi-scale representation (MSR). The MSR provides a simple hierarchical framework for identifying the properties of a signal. Decomposition into frequency-dependent detail signals is performed. This also allows for data compression and filtering.

In our investigation the MSR is applied to a signal given in a specified region related to a sphere. The MSR means representing the signal in localizing radial base functions. The distribution of these individual base functions, i.e. scaling functions of a specific resolution level, follows a predefined point grid, presumably a Reuter grid, but also others are possible. The type of the grid, number of points, area boundaries and point density play an important role in the representation of the signal.

Depending on the type of grid and grid parameters, artificial structures occur. In this study we present some of these typical structures and investigate in detail various effects of different point grid parameters on the representation of the gravity field.