

SG 2.2 High-Resolution Forward Gravity Modeling for Improved Satellite Gravity Missions Results

Chair: **Michael Kuhn** (Australia)

Terms of Reference and Objectives

With the launch of the new satellite gravity missions CHAMP, GRACE and in future GOCE a new era of modeling the static as well as time-variable Earth's gravity field has begun. Currently, GRACE time-variable gravity observations attract enormous interest across all geo-sciences, which is due to the unprecedented spatial and temporal resolution and precision on a global and regional scale. However, local gravity field modeling still requires additional high-resolution information such as from terrestrial gravity observations or local topography data. Especially, for the latter high-resolution global, regional and local digital elevation models (DEMs) are available with resolutions down to about 100 m by 100 m on a global scale (e.g. 3-arc-sec by 3-arc-sec SRTM-derived terrain models) or well below the 100 meter-level for regional and local DEMs. Furthermore, the DEM data are complemented with an increasing number of geological and geophysical information describing mass-density variations within the Earth's interior. Today these data allow for the use of forward gravity modeling techniques (direct application of Newton's integral) in order to recover high-resolution gravity field information on a local, regional and global scale.

This IAG Study Group (SG) focuses on the application of forward gravity modeling techniques for high-resolution gravity field recovery with the specific aim to assist in processing data from current and future satellite gravity missions. This can be two-fold either introducing the high-resolution gravity information to results of the gravity missions or the removal of the same from satellite gravity observations. The SG will mostly focus on the following topics:

- Derivation and analysis of the Earth's gravity field's high-resolution content on a local, regional and global scale. This involves the use and analysis of high-resolution DEMs and mass-density information of mostly the topographic masses.
- Provision of high-resolution gravity field corrections/reductions and anomalies to the geodetic and wider research community. In a longer-term this could result into a special gravity field service.
- Review of forward gravity modeling techniques in the space domain with particular view on fast algorithms not requiring the introducing of considerable approximations. Such algorithms are vital for the derivation and provision of global forward gravity modeling results.

- As an application the SG will also focus on the construction of high-resolution synthetic Earth gravity models (SEGMs) partly or completely based on forward gravity modeling.

The SG can be seen as a logical continuation of IAG SSG 3.117 and IAG SG 2.2. While the former mostly looked into the construction of SEGMs the latter had a broad view on forward gravity modeling. The proposed SG will build on the experience of these study groups and focuses on a rather narrow application of forward gravity modeling, which is of great importance to the processing and analyzing of observations and results from current and future satellite gravity missions.

The SG is open to researchers of any discipline who feel that are able to actively contribute to its aims. Furthermore, members should be prepared to participate in special focus groups looking into particular aspects within the SG. It is aimed that the SG meets on a regular basis (e.g. once a year) during major conferences of the IAG or other related societies. Apart from these formal meetings communication within the SG will be mostly by e-mail and the setup of a designated webpage.

Membership

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