IC-WG 2.2 Evaluation of Global Earth Gravity Models
(Joint with IGFS)
Chair: **Jianliang Huang** (Canada)

Terms of Reference and Objectives

The US/German GRACE satellite gravity mission, launched in 2002, has succeeded in determining the Earth's gravity field with an average accuracy of tens microGals, equivalent to a few centimeters in the geoid height signal, at a spatial resolution of about 250 km. In the meantime, the coverage and quality of surface gravity and elevation data over land and ocean areas has been also improving significantly with a number of airborne gravity campaigns in Arctic and Asia, several ongoing terrestrial gravity surveys worldwide, and a US space shuttle mission for the past decade. Due to these advances, the National Geospatial-Intelligence Agency, US, has been undertaking a revolutionary project to upgrade its benchmark Earth Gravity Model (EGM96) to a new improved version EGM07, with an expected average geoid accuracy of better than 20 cm and a spatial resolution of 10 km, in order to meet the requirements from various scientific and industrial sectors.

The upcoming European GOCE mission will be mapping the Earth's gravity field with the same level of accuracy and a spatial resolution of about 100 km. A series of GOCE-based global gravity models are expected to be available in the next few years, contributing additional and valuable knowledge to global gravity field mapping. The evaluation of such EGMs is commonly based on comparisons with other "external" data sets that depend on the same gravity field. The EGM07 development team and various other centers responsible for the development of global gravity field models routinely perform such comparisons using a variety of validation data sets, such as geoid heights from GPS and spirit leveled heights, airborne and surface gravity measurements, marine geoid heights from mean oceanographic sea surface topography models and altimetry observations, orbits from other geodetic and altimetry satellites etc.

In response to the call of having an independent, coordinated and inclusive team for the evaluation of the new EGMs, a Joint Working Group (JWG) was established between IGFS and the IAG Commission 2 in 2005. The main objective of the JWG is to develop standard validation/calibration procedures, and to perform the quality assessment of GRACE-, CHAMP- and GOCE-based satellite-only and combined solutions for the static Earth's gravity field, especially EGM07. For the past three years, many members of this group had conducted intensive evaluations for the CHAMP- and GRACE-based released models. Their contribution to the quality analysis and improvement of these models has been well recognized in the international geodetic community. Significant progress has been made in developing new validation/calibration methods as well. Due to the ongoing demand for most of its objectives, the group will continue to work during the next four years towards the evaluation of global Earth gravity models, using existing and new validation procedures.

Another equally important EGM evaluation topic is with respect to the temporal variation of the Earth's gravity field features derived from GRACE monthly solutions. The repeated absolute/relative gravity measurements and super-conducting gravity observations provide the most accurate temporal variation on the ground level. As part of the initiative, validation/calibration methods for temporal gravity variation will be explored.

Program of Activities

1. The JWG creates opportunities through communication and workshops/conferences for international co-operation to develop and propose standard methods for evaluating global EGMs using external geodetic and oceanographic data. A specific research area of interest will be the issue of how to handle the different spectral content of satellite-based global gravity field models and terrestrial gravity data.
2. The JWG conducts evaluation of new global EGMs, especially EGM07.
3. The JWG compiles a global set of high-quality GPS-leveling data.
4. The JWG explores evaluation methods for temporal gravity variation.
5. The WG encourages active participation and contribution from its members through email contact, conferences/meetings, scientific presentations and publications.
6. A WWW site will be maintained to facilitate communication, information and data exchanges.

The Joint Working Group reports to IGFS and the Commission 2.

Membership

Jianliang Huang (Chair) (Canada)
Christopher Kotsakis (Vice-Chair) (Greece)
Benahmed Daho Sid Ahmed (Algeria)
Hussein Abd-Elmotaal (Egypt)
Ågren Jonas (Swden)
Denizar Blitzkow (Brazil)
Minkang Cheng (USA)
Ellmann Artu (Estonia)
Heiner Denker (Germany)
Will Featherstone (Australia)