

Status report 2003-7 International Gravity Field Service

Rene Forsberg
Danish National Space Center
Juliane Maries Vej 30, DK-2100 Copenhagen Oe, Denmark
rf@space.dtu.dk

Structure, working groups and mission

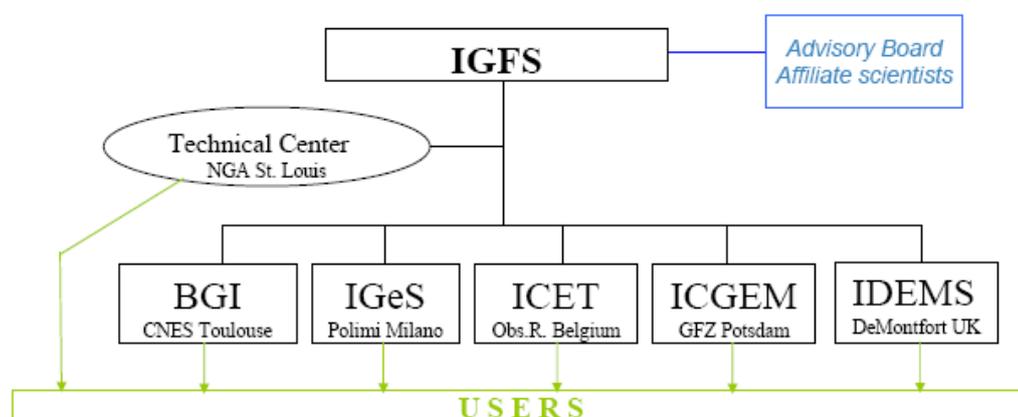
The International Gravity Field Service (IGFS) was established at the IUGG in Sapporo 2003. The purpose of the IGFS is to act as an “umbrella” service over the existing gravity field services:

- BGI (Bureau Gravimetrique International)
- IGeS (International Geoid Service)
- ICET (International Center for Earth Tides)

New gravity field services and project groups would be set up as required. Since Sapporo the following services has been initiated:

- ICGEM - International Centre for Global Earth Models
- IDEMS - International DEM Service

The new services are both online, and information can be linked via the IGFS home page, www.igfs.net. The National Geospatial-Intelligence Agency has taken a special role in the IGFS acting in part as a parallel gravity field data service, not least in securing the development of high-resolution gravity field models (EGM07). The overall structure of the IGFS for the start-up phase 2003-7 is shown below:



So far there has been no direct interaction with users via IGFS; this interaction is ongoing via the “Level-1” services and the Technical Center at NGA.

In addition the IGFS has the following working groups:

- Joint Working Group on Evaluation of Global Earth Gravity Models (especially EGM07), joint group with IAG Gravity Field Commission (*chairman: Jianling Huang, NRCan, Canada*).
- Working Group on Absolute Gravimetry (*chairman: H. Wilmes, BKG, Germany*)

The working group on absolute gravimetry was established in Istanbul, September 2006, and will as special role have the coordination and standardization of global absolute gravity campaigns. GGOS has e.g. identified a unified global absolute gravity network as a major element missing in the long-term basic GGOS network.

The advisory board consists of 12 scientists, among them directors of IGFS services and chairman of working groups, as well as members for major regional projects and satellite gravity missions, see www.igfs.net.

The overall long-term goal of IGFS is to coordinate the servicing of the geodetic and geophysical community with gravity field-related data, software and information. The combined data of the IGFS services data will include both satellite-derived global models, terrestrial, airborne, satellite and marine gravity observations, earth tide data, GPS leveling data, digital models of terrain and bathymetry, as well as ocean gravity field and geoid from satellite altimetry. Both the static and the temporal variations of the gravity field will be covered by the IGFS. A special purpose of the IGFS will be to coordinate the gravity field services in relation to GGOS – the Global Geodetic Observing System – and take initiatives to cover missing elements, e.g. the provision of “combination solutions” of gravity field related quantities, analogous to e.g. IERS.

IGFS will make special efforts in trying to secure release of data from national and international institutions holding data on the spatial and temporal gravity variations, geoid and the surface heights of the Earth, to make them widely available to the scientific community. For this purpose the IGFS has also initiated some regional conferences on gravity and geoid.

Activities for 2003-7

The IGFS has set up its web page – www.igfs.net. This is a minimal web page at present. There has been plans to improve the web page with resource information on gravity field science etc, to serve as a more useful entry to the Level-1 services (BGI, IGeS etc.), especially for the non-geodetic user. This has not been done due to limited time resources.

Advisory Board meetings were held at:

- 2004 EGS meeting in Nice, France.
- 2005 IAG General Assembly in Cairns
- 2006 IGFS 1st Symposium in Istanbul

The Advisory Board has approved the activities of the IGFS, such as the arrangement of conferences and workshops, and discussed new initiatives. The Advisory Board meetings were usually only with a limited attendance. Minutes are at www.igfs.net.

Workshops and meetings organized by the IGFS include:

- Workshop on Height Systems, Geoid and Gravity of the Asia-Pacific Ulaanbaatar, Mongolia, June 6-8, 2006.
- 1st International Gravity Field Service Symposium, Istanbul, Aug 28 - Sep 1, 2006.
- International Workshop Gravity and Geoid in South America, Buenos Aires, Sep. 25-29, 2006.

The Mongolia workshop attracted approx. 35 participants from the region, and aided in the future sharing of data across the borders, as well as in the formulation of various new cooperative projects, e.g. cross-border geoid projects and a proposed cooperation between Taiwan and Mongolia on superconducting gravimetry.

The Symposium in Istanbul was a large meeting with more than 220 presentations (oral papers and posters). The presentations was grouped into 10 sessions:

- Gravity field modeling from combinations of local and satellite data
- Regional geoid projects
- Vertical datum and height systems
- New Earth Geopotential Models (EGM06)
- Satellite Gravity Missions
- Satellite Altimetry
- Airborne Gravity
- Global terrain models for physical geodesy
- Absolute Gravity and gravimetric networks
- Geodynamics and gravity change

The Symposium was hosted by the Turkish National Geodesy Commission and Turkish General Command for Surveying and Mapping. The local organizing committee was under the leadership of A. Kilicoglu. Proceedings are currently nearing final production, and will be published as a special volume of Turkish Journal of Surveying.

The South American workshop, hosted by the Instituto Geografic Militar, were attended by about 25 scientists from 6 countries, and were mainly held in Spanish. The discussions focussed very much on local geoid models, the joint South American geoid and the possibilities for defining a unified vertical datum, as well as discussions on improving the gravity data coverage in accessible regions such as the Andes and Amazon, e.g. by airborne gravity projects.

Service cooperation within IGFS

With the individual gravity field services, funded by national funding agencies, the enthusiasm of some “Level-1” services to enter into a more formal cooperation under the IGFS umbrella has – understandably – been somewhat limited, and communication sometimes relatively slow. This has in part been due to changes in the “old” services due to reorganization and the changing of directors. All services have, however, contributed to IGFS meetings and also acknowledged the usefulness of a coordinating body like the IGFS. In addition joint service activities has included “Newton’s Bulletin” (journal of the BGI and IGeS) and de-facto joint schools (geoid and microgravimetry schools).

There seems to be a need for some more formalized cooperation for the upcoming period 2007-11, not least from a general user and GGOS point of view, to truly let the gravity field take the role of a “third pillar” of geodesy, looking into the success of the cooperation of the geometric services (IERS, IGS, ILRS, IVS etc ..). Developments in satellite geodesy should,

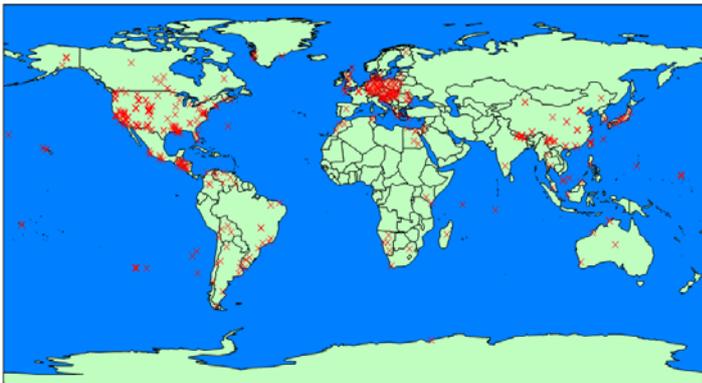
however, make a case for improved cooperation and coordination of gravity field services in the near future, given the need for combining e.g. static and temporal gravity field satellite models, as well as high-resolution combination models, into a single unified “GGOS product”. Other new developments, such as the adaption of a global vertical datum (W_0), and the increased absolute accuracy of satellite-derived geoid models, would also enforce a need for much closer cooperation on standardization of corrections to gravity field data.

There is therefore a clear need for the IGFS also in the coming period (but maybe with a different organization, e.g. a Central Bureau).

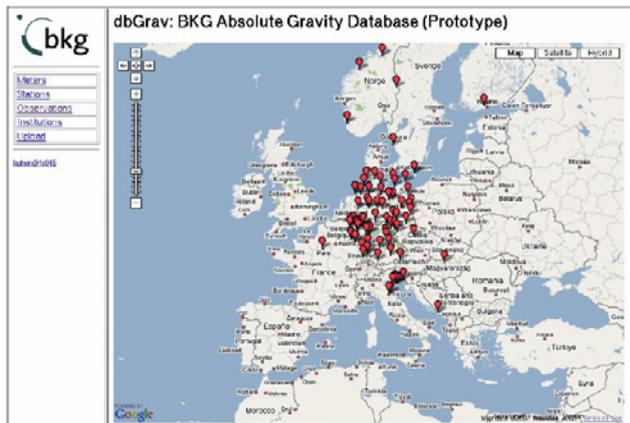
*Rene Forsberg, DNSC
June 28, 2007*

Some examples of gravity field activities, with global coordination via the IGFS??

Coordination of absolute gravity:



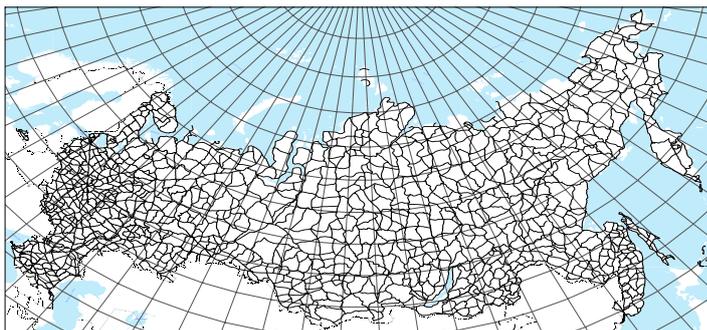
Current NGA global points (courtesy S. Kenyon, NGA)



Absolute gravimetry data base (courtesy H. Wilmes, BKG)

Figure 3: Frontpage of the user interface with interactive map

GPS-levelling global, standardized data sets:



Example of (GPS) levelling of Russia (courtesy G. Demianov)