



## International Gravimetric Bureau (Bureau Gravimétrique International – BGI)

web: <http://bgi.omp.obs-mip.fr>

Director: S. Bonvalot (France)

### Terms of Reference

The Bureau Gravimétrique International (BGI) has been created in 1951 as a service of IAG during the IUGG (International Union in Geophysics and Geodesy) General Assembly. The initial task of BGI was to collect, on a world-wide basis, all gravity measurements to generate a global digital database of gravity data for any public or private user. The technological and scientific evolutions which occurred over the last 50 years in the area of gravimetry (improvements in field, airborne and seaborne gravity meters, development of absolute gravity meters, space gravity missions, etc.) provided significant increases of the number, diversity and accuracy of the gravity field observables. Following these evolutions, the BGI has contributed to provide original databases and services for a wide international community concerned by the studies of the Earth gravity field.

The BGI is an official service of the International Association of Geodesy (IAG) and is coordinated since 2003, with others IAG services (IGeS, ICET, ICGEM, IDEMS) by the International Gravity Field Service (IGFS). It also directly contributes to the activities of the IAG Commission 2 “Gravity Field” and of the IAG Global Geodetic Observing System (GGOS). It is recognized by the International Council for Science (ICSU) successively as one of the services of the Federation of Astronomical and Geophysical Services (FAGS) and of the World Data System (WDS) created in 2008.

### Mission and objectives

The main task of BGI is to collect, on a world-wide basis, all gravity measurements (relative or absolute) and pertinent information about the gravity field of the Earth, to compile them and store them in a computerized data base in order to redistribute them on request to a large variety of users for scientific purposes.

The database of relative measurements contains over 12 millions of observations compiled and computerized from land, marine and airborne gravity surveys. It has been extensively used for the definition of Earth gravity field models and for many applications in geodesy, satellite orbit computation, oceanography, geophysics, etc.

More recently, a database for absolute gravity measurements was set up and put into operation in joint cooperation between BGI and BKG (Bundesamt für Kartographie und Geodäsie, Germany). The database is capable to store information about stations, instruments, observations and involved institutions. By this, it allows the exchange of meta data and the provision of contact details of the responsible institutions on the one hand and the storage and long term availability of gravity data and processing details on the other hand. The database can be accessed by a web based interface which provides publicly available meta-data as well as complete datasets for community of users contributing to the archive. A simple exchange format was selected which includes all relevant information and is known by the majority of users avoiding additional effort. In this way the upload of data to the database is possible, using a web based upload form.

In addition, BGI develops other additional services in the area of gravimetry (data validation for regional or global projects, online access to reference gravity stations, expertise, bibliography database, etc.). It also contributes to research & development activities (software developments, interpretation) and to educational activities (summer schools on gravity data acquisition and processing, provision of tutorials and educational materials in gravimetry).

### Programs / Activities

The current and future activities are dedicated (i) to consolidate the terrestrial gravity databases (relative and absolute measurements) and (ii) to ease the consultation and retrieval of gravity data and products by end-users. BGI will also continue operating with its supporting organizations, in educational, research and development activities with the aim to maintain a high level of competence and to improve the efficiency and the quality of its services.

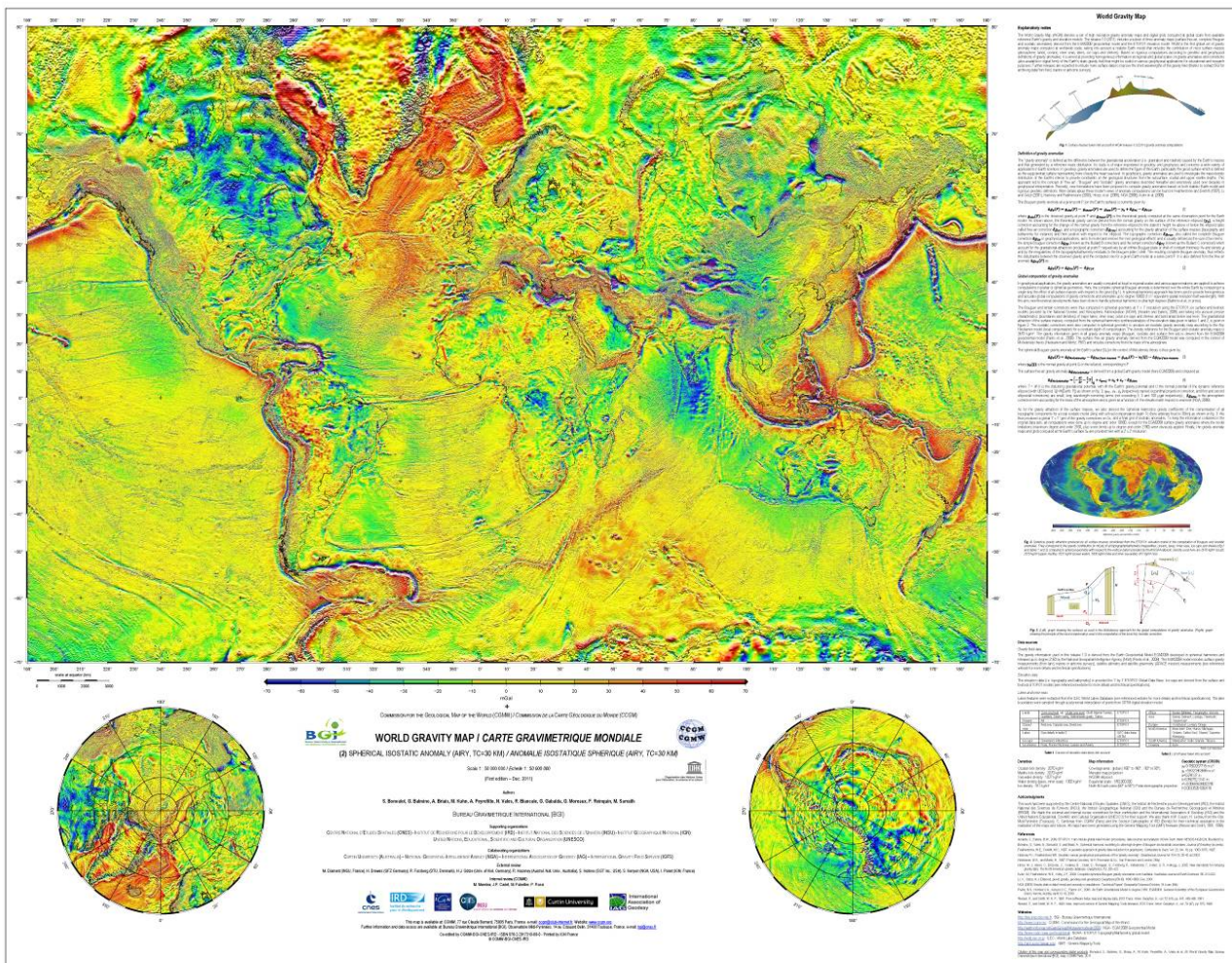
- Gravity databases: The main achievements consist in maintaining and developing the three BGI databases (relative measurements, absolute measurements, reference gravity stations). Collection of new dataset (from field, marine or airborne surveys) will be encouraged in order to improve the global data coverage and accuracy. Incoming datasets are carefully evaluated and validated using protocols and software already developed at BGI. Global data and products derived from satellite altimetry

and gravity missions are to be more and more frequently used to validate land and sea measurements.

- Realization and diffusion of data and products: New functionalities are currently implemented in relation with the database management to improve the BGI services (direct requests and downloads of open-file data or products from the BGI webpage, inter-operability between other sites hosting gravity-related databases). BGI also contributes to the release of updated gravity products (digital maps and grids...) for educational and research purposes. The release of the first global spherical gravity anomaly maps and grids (World Gravity Map) realized for the Geological Commission for the Geological Map of the World (CGMW) and UNESCO

has been achieved in late 2011. It includes complete Bouguer and Isostatic anomaly maps corrected from the topography (1'x1' resolution) and based on the EGM2008 model. Updated versions will be done as soon as new global gravity model will be available.

- Other activities: Publication of the Newton's Bulletin jointly with the International Geoid Service (IGeS) ; Contribution within the IAG commission "Gravity Field" to the definition of a new global absolute reference gravity network; Contribution to research projects involving gravity data acquisition or validation and combination of surface and satellite gravity observations ; Contribution to summer schools and to dissemination of educative materials related to gravimetry.



## Services

The most frequent service BGI can provide is data retrieval over a limited area or over a limited number of observations. Data requests are issued through the BGI website and are processed electronically (email, ftp transfer or direct download).

Data, products or software available at BGI are mostly dedicated to support scientific and academic activities. Digital gravity data or products are usually distributed free of charge to research or academic institutions or to data contributors according to the conditions given below. Other users, individual or private companies, are invited to

specify in their request the expected use of the data and products. See BGI website for diffusion and charging policies.

- Access to non-confidential or non-proprietary relative gravity measurements is provided free of charge to public institutions or data contributors over geographic areas limited to 20°x20° or on the base of a maximum number of 10000 data points (land data) and/or 100000 data points (marine data). Retrieval of full data coverage for a whole country is not included in that case. All other requests (for larger datasets, for extended geographic area or for a whole country) as well as massive data retrieval will be subject to an evaluation by BGI who might require a specific protocol of use of the data or ask authorization of the proprietary Institutions. Charges might be applied
- Access to the Absolute gravity database is provided free of charge without any restriction. Data retrieval is done through the Web interfaces at BGI and BKG mirror sites. Confidential data or proprietary data may appear with restricted information (metadata only).
- Access to the Reference gravity stations database is provided free of charge without any restriction. Please note that reference gravity stations (especially those determined and described decades ago) may have been destroyed or modified.

Other services include: Access to global or regional gravity anomaly grids and maps ; Prediction of gravity value on Earth ; Software ; Documentation, etc.

## Structure and membership

Since 2003, the BGI is one of the services of the International Gravity Field Service (IGFS) which coordinates within the IAG, the servicing of the geodetic and geophysical community with gravity field-related data, software and information.

The BGI central office (management, secretariat and technical staff) is located in Toulouse, France, in the premises of the Observatoire Midi-Pyrénées. Since 1998, BGI is supported by French Institutions, Universities and Laboratories (see below) whose contributions to BGI over four year renewable periods are defined by a covenant. The supporting French organizations are:

- the Centre National d'Etudes Spatiales (CNES),
- the Bureau de Recherches Géologiques et Minières (BRGM),
- the Institut National des Sciences de l'Univers (INSU/CNRS),
- the Institut National de l'Information Géographique et Forestière (IGN),
- the Institut de Recherche pour le Développement (IRD),
- the Service Hydrographique et Océanographique de la Marine (SHOM),

- the Groupe de Recherches en Géodésie Spatiale (GRGS)
- the Institut de Physique du Globe de Paris (IPGP),
- the Ecole et Observatoire des Sciences de la Terre (EOST)
- the Ecole Supérieure des Géomètres et Topographes (ESGT),
- the Université de Montpellier 2 (UM2)

Each supporting organization has a representative member in the BGI Advisory Board. The Advisory Board (who also includes a representative member of IAG) contributes once a year to the orientation and evaluation of the BGI activities. The program of BGI activities is also evaluated and discussed by the IGFS Advisory Board at each IGFS meetings and IUGG General Assemblies. A new partnership has been also established in 2008 between BGI and the Bundesamt für Kartographie und Geodäsie (BKG), Germany, for the realization and the maintenance of the global database of absolute gravity measurements (AGRAV).

## Providing data to BGI

As a service of IAG/IGFS, the final task of BGI is to give access to the largest scientific community to relative and absolute measurements of the Earth gravity field and related information. The permanent archiving of new incoming gravity data sets is crucial to improve the coverage and accuracy of the global gravity database and to improve our knowledge of the Earth gravity field. It also enables BGI to validate the gravity observations in a global reference frame and restore them in standard and unified formats useful for various users.

BGI currently collect & provides information on:

- Relative gravity measurements from land, marine & airborne surveys
- Absolute gravity measurements
- Reference gravity base stations
- Software for gravimetric applications (data processing, modeling, etc.)
- Other gravimetry-related information (printed or digital maps, bibliography, etc.)

The contribution of scientists, agencies or institutions involved in these fields is welcome to ensure the best service to the community. Contributors interested in archiving their gravity observations as non-confidential or as proprietary data (to be defined by the contributors themselves) are invited to contact BGI. For relative gravity observations, all kind of data from land, marine or airborne surveys can be sent to BGI. ASCII data files containing all necessary information and quantities are preferred (station coordinates, gravity measurements and accuracies; gravity corrections; reference geographic, height and gravity systems, etc.). For absolute gravity observations, the data-

base is maintained on two mirror sites located in Toulouse (France), at BGI and in Frankfurt/Main (Germany), at the Federal Agency for Cartography and Geodesy (BKG). Scientists interested to upload their observations or meta-data only (site positions and approximated values for instance) in the international Absolute Gravity database AGRAV are invited to contact either BGI (<http://bgi.omp.obs-mip.fr>) or BKG (<http://agrav.bkg.bund>). For any contribution (relative or absolute gravity data), it is reminded that BGI will keep the status of diffusion (with or without restrictions of redistribution) as specified by the proprietary institution.

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