

Gravity Field Services of the International Association of Geodesy: *Measuring Earth's Changing Gravity*

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The Scientific Services of the International Association of Geodesy (IAG) are the backbone of the Global Geodetic Observing System (GGOS). They provide observations, analysis, standards, and high-quality products that enable accurate and consistent monitoring of Earth's geometry, gravity field, and rotation. By integrating these technique-specific services, GGOS transforms individual observations into a coherent global picture of our changing planet. The IAG Gravity Field Services provide a wide range of gravity-related observations and products, including terrestrial gravity measurements, geoid models, digital elevation models, superconducting gravity observations, tidal products, global geopotential models, and potential values for the realisation of the world height system. These data and products serve a broad range of geodetic, geophysical, and oceanographic applications. Accuracy, robustness, quality control, timeliness, and state-of-the-art quality are essential characteristics of the products provided by the IAG Gravity Field Services, ensuring that they meet the needs of both the scientific and wider user communities.

IAG Gravity Field Services

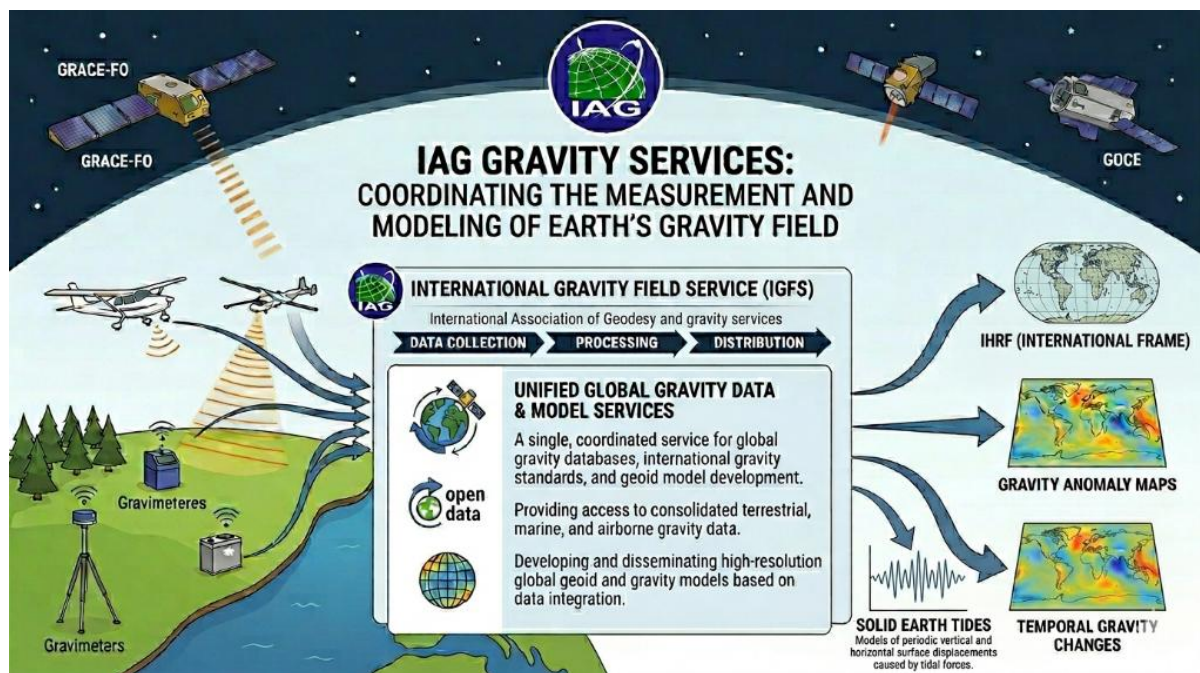
The Gravity Field Services operate under the umbrella of the *International Gravity Field Service* (IGFS) and focus on observing and understanding the Earth's physical surface and gravity field. Through GGOS, IGFS supports the consistent integration of geometric and physical geodesy, linking measurements of Earth's geometry with its gravity field.

IGFS coordinates five IAG Gravity Services:

- ICGEM: *International Centre for Global Earth Models*
- ISG: *International Service for the Geoid*
- IGETS: *International Geodynamics and Earth Tide Service*
- IDEMS: *International Digital Elevation Models Service*
- BGI: *International Gravimetric Bureau*

In addition, IGFS coordinates the COST-G (*International Combination Service for Time-variable Gravity Fields*) and the Coordination Centre of the *International Height Reference Frame* (IHRF-CC) as Product Centres.

Together, they provide gravity-related data, models, software, and information to the global geodetic and geophysical community. The combined resources include satellite-derived global gravity models; terrestrial, airborne, marine, and satellite gravity observations; Earth tide measurements; GNSS/levelling data; digital terrain and bathymetric models; and ocean gravity and geoid information derived from satellite altimetry. The Services cover both the static gravity field and its variations over time, providing essential information for geodesy, geophysics, oceanography, and Earth-system science.



The IAG Gravity Field Services, coordinated by the International Gravity Field Service (IGFS), bring together global gravity models and terrestrial, airborne, marine, and satellite observations to monitor Earth's gravity field and its changes over time. These complementary data and products support geodesy, geophysics, oceanography, and Earth-system science.



IGFS – International Gravity Field Service

IGFS is a global umbrella organisation that coordinates Earth's gravity field data, research, and services to serve the geodetic and geophysical communities as well as society in general. Its primary activities include:

- Collecting, validating, and disseminating gravity data and products.
- Providing educational outreach and information materials regarding the Earth's gravity field.
- Homogenising, describing and unifying gravity products for GGOS.

Find out more <https://igfs.topo.auth.gr/>



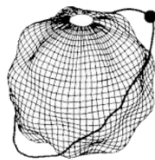
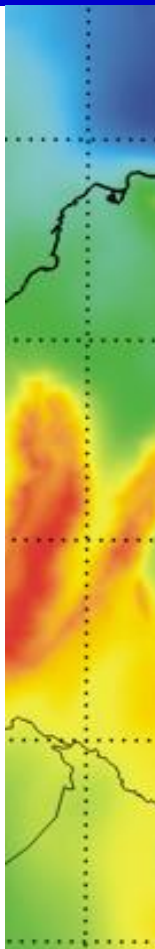


ICGEM – International Centre for Global Earth Models

ICGEM is a global scientific service that collects, archives, and provides public access to Earth's gravity field models. Its primary activities include:

- Archiving Global Models: Maintaining a comprehensive repository of static, temporal, and topographic global gravity field models.
- Providing Standardised Access: Offering web-based distribution of models with DOI assignment to ensure traceable and professional citations.
- Operating Calculation Services: Maintaining a web interface for calculating gravity field functionals on user-defined grids and specific points.
- Facilitating 3D Visualisation: Utilising interactive tools for the detailed analysis of geoid undulations and gravity anomalies.
- Ensuring Quality Assurance: Validating models through spectral domain comparisons and verification against GNSS/leveling data.
- Developing Educational Resources: Providing documentation, theoretical manuals, and tutorials for global gravity modelling.

Find out more <https://icgem.gfz.de/home>



ISG

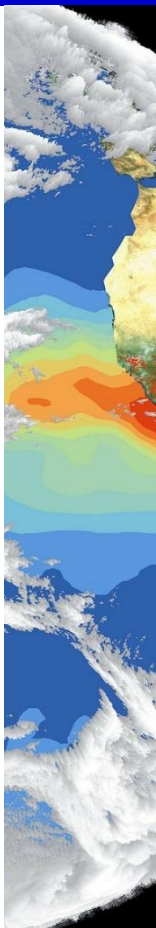
ISG – International Service for the Geoid

ISG is a global scientific service that collects, analyses, and distributes local, regional, and continental geoid models. Its primary activities include:

- Maintaining a Geoid Data Hub: Collecting, validating, and disseminating worldwide geoid models and auxiliary data.
- Providing a Software Repository: Offering tested software for geoid determination and training users in its application.
- Advancing Methodological Research: Defining optimal procedures for merging data and models for precise geoid computation.
- Leading Capacity Building: Organising International Schools on Geoid Determination and providing specialised training for developing countries.
- Producing Technical Publications: Focusing on applied gravity and geoid research to support the geodetic community.
- Ensuring Resource Distribution: Maintaining a centralised website for geoid models, lecture notes, and scientific publications.

Find out more <https://www.isgeoid.polimi.it/>



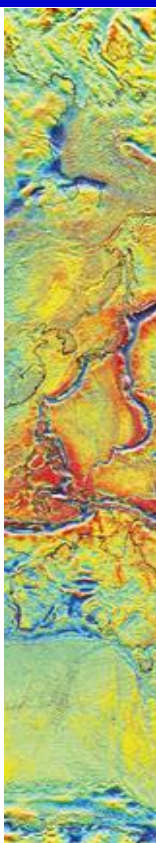


IGETS – International Geodynamics and Earth Tide Service

IGETS is a global scientific service that monitors temporal variations in the Earth's gravity field and surface deformation using long-term data from ground-based sensors. Its primary activities include:

- Monitoring Gravity Changes: Providing a continuous service to monitor variations in the Earth's gravity field through long-term ground records from superconducting gravimeters, tiltmeters, strainmeters, and other sensors.
- Ensuring GGP Continuity: Supporting geodetic and geophysical research using high-precision superconducting gravimeter data within the Global Geodynamics Project (GGP) network.
- Operating the Earth Tide Data Center: Continuing the mission of the International Center for Earth Tides (ICET) by collecting, archiving, and distributing long-term tidal records.
- Integrating Research Products: Providing standardised data products to study Earth's geodynamics, including tidal and non-tidal gravity variations.

Find out more <http://igets.u-strasbg.fr/>



Bureau Gravimétrique International
International Gravimetric Bureau

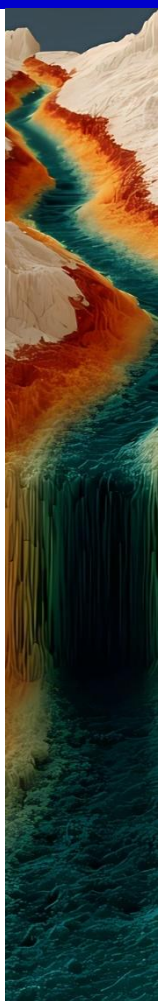
BGI – International Gravimetric Bureau

BGI is a global scientific service that collects, validates, archives, and distributes surface gravity measurements of the Earth. Its primary activities include:

- Providing Global Access: Ensuring access to gravity data, reference stations, products, software, and technical documentation for the international community.
- Archiving and Validating Datasets: Managing the secure storage and quality control of gravity datasets and products submitted to the BGI.
- Assigning Traceable References: Attributing data providers with a Digital Object Identifier (DOI) to ensure professional and traceable international citations.
- Developing Global Models: Coordinating the realisation and evaluation of global models, such as the World Gravity Map, as well as regional data compilations for gravity and geoid studies.

Find out more <https://bgi.obs-mip.fr/>



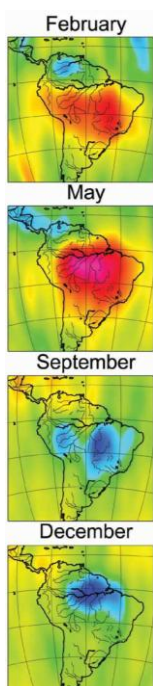


IDEMS – International Digital Elevation Model Service

IDEMS is a global scientific service that collects, distributes, and provides information on digital elevation models. Its primary activities include:

- Compiling and Maintaining Global DEM Information: Providing tutorial-style documentation and consistent updates on global gridded Digital Elevation Models.
- Curating National Elevation Datasets: Compiling available national datasets, including details on resolution, generation methods, and links to official providers.
- Generating Topographic and Bathymetric Models: Developing and disseminating spherical-harmonic models of Earth's global topography and bathymetry.
- Synthesising Geodesy-Relevant DEM Research: Compiling and reviewing specialised studies on the application of elevation models in geodetic research.
- Expanding to Planetary Topography: Extending the service focus from Earth to the Moon and other terrestrial planets by compiling information on available planetary topography models.

Find out more <https://idems.maps.arcgis.com/home/index.html>



COST-G – Combination Service for Time-Variable Gravity Fields

COST-G is a global scientific service that merges separate gravity data maps to create unified, highly accurate models of how Earth's gravity changes over time. Its primary activities include:

- Combining Global Gravity Models: Merging monthly global gravity field solutions from various analysis centres to create unified products.
- Distributing high-quality gravity field products derived from GRACE, GRACE-Follow On (GRACE-FO), and Swarm missions.
- Managing the dissemination of time-variable gravity data through various platforms and official IAG channels.
- Validating and harmonising temporal variations in the Earth's gravity field for geodetic and geophysical research.

Find out more <https://cost-g.org/>





IHRF-CC – International Height Reference Frame Coordination Centre

IHRF-CC is the central management body responsible for coordinating the realisation, maintenance, and global standardisation of the International Height Reference System (IHRF) and its realisation, the International Height Reference Frame (IHRF). Its primary activities include:

- Ensuring the maintenance, improvement, and global availability of the IHRF/IHRF through global and regional collaboration.
- Standardising data processing and guidelines for consistent global geopotential number computation.
- Managing the reference network of core stations to ensure vertical datum stability.
- Facilitating the accurate determination of physical heights worldwide: Advancing geodesy and Earth sciences through the standardisation of global physical height reference frames
- Ensuring quality control by validating geopotential values provided by regional centres.

Find out more <https://ihrfcc.topo.auth.gr/>



RECAP

Why the IAG Services Matter

The IAG Services are an essential component of the international geodetic infrastructure. They coordinate observations, standards, analysis, and data from organisations around the world and transform them into consistent, reliable, and openly accessible geodetic products. Without the IAG Services, geodetic activities would become increasingly fragmented. Global reference frames would be harder to maintain and connect, long-term observations could lose continuity, and geodetic products would become less consistent and interoperable. This would directly affect our ability to monitor changes in the Earth system and support applications ranging from climate and sea-level monitoring to geohazards, positioning, satellite missions, and Earth Observation. The joint work of GGOS and the IAG Services ensures that geodesy functions as a global observing system; not simply as a collection of individual observations and isolated, technique-dependent products.

Find out more

Web geodesy.science/ggos/services/
LinkedIn [iag-ggos](#)
YouTube [@iag-ggos](#)
Facebook [InternationalAssociationOfGeodesy](#)

X [iag_geodesy](#)
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