

Draft for Approval - 2007
Terms of Reference
Global Geodetic Observing System (GGOS)
2007

*(Terms of Reference to be officially adopted at
IUGG/IAG Meeting July 2007 Perugia)*

*These Terms of Reference are modifications to the existing GGOS Terms of
Reference approved by the IAG
Executive Committee in September 2006. The primary changes here reflect
the harmonization of these
GGOS ToR with the changes in the IAG Bylaws 2007.*

Preamble

The proposal for the Global Geodetic Observing System (GGOS) was developed by the GGOS planning group from 2001 to 2003 according to bylaws of the International Association of Geodesy (IAG). The proposal was accepted by the IAG Executive Committee and the IAG Council at their meetings during the XXIII IUGG General Assembly in Sapporo in July 2003. GGOS was endorsed by the IUGG through Resolution No. 3 at the same General Assembly. During the IAG General Assembly held at Cairns in August 2005, the GGOS implementation plan was accepted as a draft, the Chair (Prof. Ch. Reigber) retired, and the IAG appointed a new Chair (Prof. M. Rothacher) and two supporting Vice-Chairs (Ms. R. Neilan and Prof. H.-P. Plag) to lead the next phase of GGOS development through 2009.

Changes in the IAG bylaws in 2007 result in GGOS being recognized as an integral component of IAG along with Services and Commissions. As a historical note, this transforms the status of GGOS from that of an IAG Project to an IAG component. Specific to the GGOS is IAG bylaw number 15.

These revised GGOS Terms of Reference are to be approved by IAG Executive Committee at the IUGG General Assembly in Perugia, Italy July 2 – 13, 2007.

GGOS provides the basis on which future advances in geosciences can be built. By considering the Earth system as a whole (including the geosphere, hydrosphere, cryosphere, atmosphere and biosphere), monitoring Earth system components and their interactions by geodetic techniques and studying them from the geodetic point of view, the geodetic community provides the global geosciences community with a powerful tool consisting mainly of high quality services, standards and references, theoretical and observational innovations.

According to the IAG bylaws:

“The Global Geodetic Observing System works with the IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and global change research.”

The Vision of GGOS

- **Integrate different techniques, different models, and different approaches in order to achieve a better consistency, long-term reliability and understanding of geodetic, geodynamic and global change processes;**
- **Provide the scientific and infrastructure basis as geodesy's significant contribution to global change research in Earth sciences;**
- **View the Earth system as a whole by including the solid Earth as well as the Fluid components, and the static and time-varying gravity field;**
- **Provide geodesy's contribution (products and discoveries) to Earth sciences and to the other scientific and application disciplines, and thus to assert the position of geodesy in geosciences;**
- **Integrate the work of IAG and to emphasize the complementarities of the broad spectrum of geodetic research and application fields.**

Mission of GGOS

- To become the *collective voice for IAG*;
- Promote the data and products of the Services;
- Ensure the stability and monitoring of the three fundamental fields of geodesy, namely *geometry and kinematics, Earth orientation and rotation, and the gravity field and its variability*;
- Work through the Services, Commission and their participating organizations to collect and archive geodetic observations, products and models, and to ensure their reliability, consistency and availability;
- Identify a consistent set of geodetic products and establish the requirements concerning the products' accuracy, time resolution, and consistency;
- Identify IAG service gaps and develop strategies to close them;
- Stimulate close cooperation between existing and new IAG Services;
- Promote and improve the visibility of the scientific research in geodesy;
- Achieve maximum benefit for the scientific community and society in general.

The key components of GGOS to accomplish this mission are the IAG Services and Commissions. The Services provide the infrastructure and products on which all contributions of GGOS will be based. The IAG Commissions provide expertise and support for the scientific development within GGOS. In summary, GGOS is geodesy's central interface to the scientific community and to society in general.

Objectives of GGOS

(In order to fulfill its mission)

- Aim at maintaining the stability of and provide open access to the geometric and gravimetric reference frames as well as time series of data and products, by ensuring the generation of uninterrupted state-of-the-art global observations related to the three fundamental aspects of geodesy;
- Focus *in the first phase* on all aspects relevant to ensure the *consistency of geometric and gravimetric products*, which includes space-borne and terrestrial aspects;
- Target an overall accuracy and consistency of GGOS products of the order of 10⁻⁹ or better;
- Work to ensure the consistency between the different geodetic standards used in the Services and the geosciences community, in agreement with the international unions;
- Aim at improving the geodetic models at the level required by the observations.

IAIG is a participating organization of the Group on Earth Observations (GEO) – GGOS acts on behalf of the IAIG in GEO and actively contributes to the Global Earth Observation System of Systems (GEOSS).

GGOS is established as an official partner in the United Nations Integrated Global Observing Strategy Partnership – IGOS-P (effective May 25, 2006).

Science Theme and Rationale

The theme of GGOS is *Earth System Dynamics*, focusing on global deformation and mass exchange processes in the System Earth. The theme and rationale must be scientifically sound, broad and include all the activities that GGOS will aggregate today, and envisage in future. The GGOS Science Plan, defining the GGOS science rationale, is prepared by the Science Panel and approved by the GGOS Steering Committee; the plan will guide the Steering Committee tasks. The Science Plan shall provide a logical framework within a broader science and application context, including an analysis of the state-of-art in the science and technology fields, strength and deficiencies, and recommendations of what should be done.

Under the GGOS umbrella of *geometry*, *Earth rotation*, and *gravity field* this theme of *Earth System Dynamics* coordinates virtually all facets of geodesy. In addition, it may easily be translated and understood through tangible, individual sub-themes and a wide variety of service products. GGOS will bring together the following scientific questions and focus areas:

- Global patterns of tectonic deformation (with densification realized at regional scales) including inter-plate and intra-plate deformation,
- Global patterns of height changes (in one datum, on all time scales, of geodynamic as well as of anthropogenic origin) on land, of ice covers (including glaciers), and of sea level,
- Deformation (loading as well as expansion) due to the mass transfer between atmosphere, hydrosphere including ice and solid Earth,
- Separation of effects of mass changes from motion and from thermal expansion,
- Separation of ocean effects from solid earth effects (e.g., sea-level estimation),
- Quantification of angular momentum exchange and mass transfer,
- Assessment of the angular momentum and mass balances in the Earth system model, and Quantification of mass exchange between the components of the system Earth.

The above list is not meant to be final and can be further developed.

Science Theme and Rationale

GGOS and its related research and Services' products will address the relevant science issues related to geodesy and geodynamics in the 21st century, but also issues relevant to society (global risk management, geo-hazards, natural resources, climate change, severe storm forecasting, sea-level estimations and ocean forecasting, space weather, and others). It is an ambitious program of a dimension that goes beyond IAG, requiring a strong cooperation within the geodetic, geodynamic and geophysical communities, and externally, to related endeavors and communities.

The GGOS Science Plan will serve as the basis for the implementation of GGOS with a derived work plan. Furthermore, the Plan should become an attractive document for presentation to potential future partners, sponsors, and clients.

Current Structural Elements

- **GGOS Steering Committee** – is the central oversight entity;
- **GGOS Executive Committee** – serves at the direction of the Steering Committee to accomplish day-to-day activities of GGOS tasks;
- **GGOS Science Panel** – advises the Steering Committee and represents the geodetic and geoscience community;
- **Services, Commissions and relevant Inter-Commission Committees** – building blocks upon which GGOS is built;
- **Working Groups and Committees** – address overarching issues common to several or all IAG components, and are a mechanism to bring the various Services' and Commission activities together, or to link GGOS to external organizations (especially the Group on Earth Observations (GEO) and its related committees and working groups).

Additional Proposed Elements:

- **GGOS Coordination Office** – to provide support to GGOS, the GGOS Chair(s) and Executive Committee. This office will coordinate the work within GGOS, support the Chairs, the Executive Committee and the Steering Committee to represent GGOS externally, and foster participation of regional geodetic programs to augment the GGOS global coverage. Funding for this entity must be secured on a long term basis;
- **Bureau of Standards & Conventions** – to be created in cooperation with the IERS and IGFS to ensure consistency of the GGOS products on the 10-9 level or better, to keep track and make available a detailed and concise list of geodetic conventions, constants, and procedures.
- **Communications & Networks Entity** – to be established through cooperation with the IAG Services operating the technique-specific networks and in cooperation with the IERS and IGFS). The multi-technique network design as a whole will be considered including communication and data flow.
- **Satellite and Space Missions Entity** – will develop scenarios for uninterrupted series of geodesy-related space missions based on scientific and societal needs, working in close partnership with the space agencies.