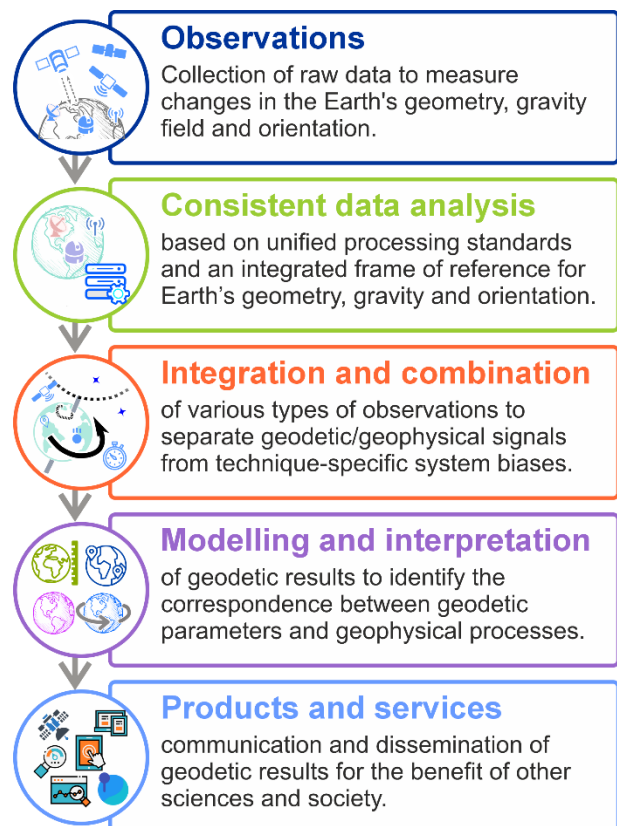


Building blocks of the Global Geodetic Observing System

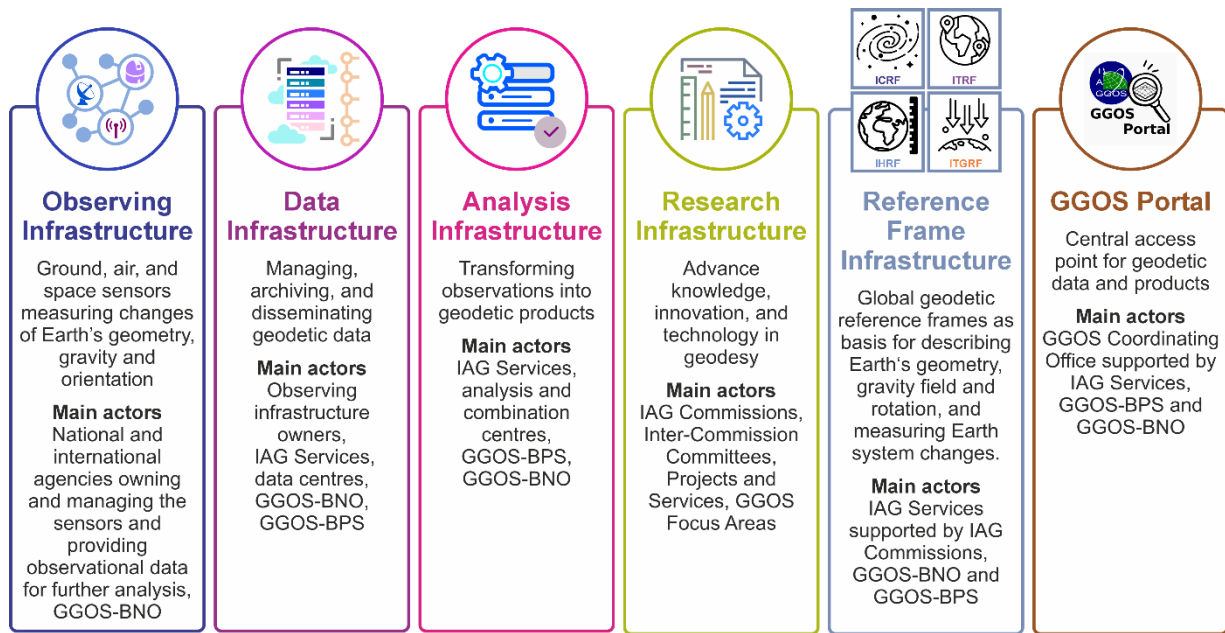
The Global Geodetic Observing System (GGOS) is the response of the international geodetic community, organised under the International Association of Geodesy (IAG), to the need to continuously monitor the Earth system. GGOS observes the time-varying shape, rotation and gravity field of the Earth with respect to precise and long-term stable geodetic reference frames. Changes to these characteristics are inherently related to changes occurring within and between the Earth's components: the geosphere, atmosphere, hydrosphere, cryosphere and biosphere. Geodesy is therefore an essential discipline for Earth system monitoring. GGOS aims to raise awareness of this new role of geodesy and to move from the provision of usual geodetic products (station coordinates, geoid, Earth orientation parameters, satellite orbits) to a consistent modelling and interpretation of Earth system processes and interactions, ensuring an integrated observing system.

The central principle of GGOS is to observe the Earth's geometry, gravity field and rotation; process, combine and integrate these observations consistently; model, interpret and separate Earth system signals from geodetic parameters; generate results that are understandable and usable by both geodesists and non-geodesists; and disseminate geodetic results appropriately. To achieve this, the following building blocks are essential:

- **Observing Infrastructure** covers space and terrestrial instruments that collect observations for monitoring the shape, gravity field and orientation of the Earth. Observing stations, sensors and satellites are owned and operated by a variety of national and international agencies. Most of these agencies work with the Services of the International Association of Geodesy (IAG), which have consolidated as collaborative hubs to co-ordinate international measurements and data analysis activities.



From geodetic observations to Earth system monitoring



Building blocks of the Global geodetic Observing System – GGOS

- **Data infrastructure** consists of facilities for data transfer, data management and archiving, and data and product dissemination. The owners of the observing infrastructure ensure the integrity and continuity of their systems and provide raw and processed data at various levels. The IAG Services maintain and operate their own data and product centres for data collection, archiving and dissemination.
- **Analysis infrastructure** covers the complete data processing chain from the initial acquisition and analysis of observations to the combination and validation of technique-specific products. The IAG Services operate their own analysis and combination centres.
- **Research infrastructure** corresponds to resources, facilities, and services needed to advance scientific knowledge, drive innovation, and address complex science challenges. In the context of GGOS, this infrastructure is based on a strong synergy between the IAG Services and the IAG Commissions, Inter-Commission Committees and Projects, which in turn bring together scientists from universities, research institutes, space agencies, national geodetic agencies, etc.
- **The reference frame infrastructure** is provided by the global geodetic reference frames. They are essential for assigning time-dependent coordinates to points or objects on or near the Earth's surface and for describing the Earth's motion in space. The global reference frames in use are the International Celestial Reference Frame (ICRF), used to describe the position of objects in space; the International Terrestrial Reference Frame (ITRF), used to describe the geocentric position of objects at or near the Earth's surface; the International Terrestrial Gravity Reference Frame (ITGRF), used to determine the gravity acceleration at points on the Earth's surface, and the International Height Reference Frame (IHRF), used to describe the physical height of points or objects with respect to a global equipotential surface. The latter two are complemented by global or regional gravity field models, typically represented by the geoid. The geodetic reference frames are a prerequisite not

only for numerous everyday applications (positioning, navigation, timing, geodata systems, telecommunications, etc.), but also for the quantitative measurement of changing processes in the Earth system and for operating early warning systems to protect against natural hazards.

- **The GGOS Portal** is defined as a unique search and access point (one-stop-shop) for geodetic data and products. The IAG Services provide a variety of important and valuable geodetic data, information, and products that are increasingly relevant for Earth system research, geospatial data management and sustainable development. Currently, it is difficult for many people to get an overview of all available geodetic data and products. The GGOS Portal aims to fill this gap. It is configured to describe geodetic data products through detailed metadata, while remaining physically located in their original data centres.

To provide a comprehensive framework for these various actors, the IAG has established the following operational elements dedicated solely to GGOS issues. These elements are essential for the smooth organisational workflow of GGOS.

- **The GGOS Bureau of Networks and Observations (GGOS-BNO)** identifies and addresses key technological requirements for the GGOS observing, data, and analysis infrastructures.
- **The GGOS Bureau of Products and Standards (GGOS-BPS)** addresses key tasks related to the analysis and reference infrastructures as well as to the GGOS Portal.
- **The GGOS Coordinating Office (GGOS-CO)** acts as the Secretariat of GGOS, coordinates the administrative work, and is responsible for the GGOS Portal, outreach and communication.

Find out more

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