GGOS IberAtlantic

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ENGLISH VERSION

ggos IberAtlantic

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Introduction

Global Geodetic Observing System and GGOS affiliates

<< GGOS is the Global Geodetic Observing System of the International Association of Geodesy (IAG). GGOS was established with the main objective of integrating and optimising data analysis resources, procedures and dissemination of results performed by the different IAG components, namely the IAG Services, Commissions, Inter-Commission to provide unique, mutually consistent, and easily accessible geodetic products (including the geodetic reference frames and the gravity field models) and the relevant geodetic constants for science and society. GGOS works in concert with Commissions, Inter-Commission Committes and dedicated projects concerning new developments, and it keeps all IAG components informed of the work in GGOS. This interaction is essential to understand the critical components of the Earth system, and advance geodetic knowledge as well as technology development. The societal benefit of integrated, consistent and high-quality geodetic products is wide-reaching, including improved navigation systems, better understanding of climate and environmental change, reliable Earth surface deformation modelling, precise monitoring of mass transport within the Earth's system, accurately determining changes in the rotation of the Earth, etc. >> **GGOS Strategic Plan**

Fig. 1. GGOS representation.

Geodesy is fundamental to climate change research, as it provides precise measurements and observations that enable scientists to monitor and understand a range of climate-related and planetary processes. Observing these processes over extended periods is essential for developing accurate models and comprehensive insights into long-term changes. Consequently, geodesy must extend beyond data acquisition, requiring a well-coordinated global geodetic infrastructure and supply chain, which includes:

- Geodetic Infrastructure: Global Navigation Satellite Systems (GNSS), Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS), satellite gravity missions, gravimeters on ground, and other technologies.
- Data Collection: International and regional data centers.
- Data Analysis: International, regional, and national analysis centers.
- Product Development: Creation of products such as clock and orbit solutions, atmospheric and gravity models.
- Product Transmission: Reliable real-time data streams.
- Data and products validation and standardization.
- Research: Enables the advancement of observation methods, improvement of data analysis, and development of new products.

These components must function cohesively to generate continuous and reliable observations. Additionally, these observations require consistent reference frames—specifically, the international terrestrial, celestial, and geopotential reference frames—to be meaningful and accurately interpretable.

In the global geodesy supply chain, countries and organizations play a foundational role. They are responsible not only for constructing and maintaining geodetic infrastructure but also for ensuring the continued advancement of geodesy by developing the necessary capacities and expertise. These entities train the workforce that sustains the global geodesy supply chain, enabling the analysis, computation, and maintenance of reference frames, as well as the cultivation of human resources critical to every aspect of this process.

Recognizing this, the Global Geodetic Observing System (GGOS) relies on national and local entities and actively encourages collaboration among countries and organizations. GGOS provides a unifying framework that supports countries in building and sustaining their own geodetic infrastructure, even though it does not possess infrastructure itself. However, infrastructure alone is not sufficient; equally crucial are the human resources, which are increasingly scarce. GGOS plays an important role in raising public awareness of geodesy and ensuring its significance reaches decision-makers. A central component of GGOS's mission is its network of GGOS affiliates.

A GGOS affiliate is a national or regional organization that collaborates with GGOS to strengthen global geodetic infrastructure and further GGOS's overarching objectives.

Affiliates support GGOS by supplying geodetic data, engaging in research and development, and promoting the integration and interoperability of geodetic systems worldwide.

These affiliates typically include national geodetic agencies, research institutions, universities, and international scientific projects dedicated to geodesy and related fields. They are instrumental in enhancing understanding of Earth's shape, rotation, and gravity field by providing critical data and expertise. Through this partnership, GGOS affiliates contribute to the continuous improvement and accuracy of global geodetic observations, which are essential for addressing a wide range of scientific, environmental, and societal challenges. Essentially, the GGOS Affiliates enable the development of synergies between national capabilities and international geodetic goals.

> ***"Decisions made today will determine the well-being of future generations. GGOS seeks to fortify informed, Earth observations-based decision making."***
>
> **GGOS website**

GGOS IberAtlantic: Goals

GGOS IberAtlantic embodies the creation of a GGOS affiliate spanning the Iberian Peninsula and the Atlantic region, initially comprising Spain and Portugal. This affiliate builds upon the longstanding collaboration between the two countries, addressing shared challenges in Spanish and Portuguese geodesy and jointly advancing GGOS objectives.

As a regional GGOS affiliate, GGOS IberAtlantic follows in the footsteps of similar affiliates in Japan and the Germany-Austria-Switzerland (D-A-CH) region. Formally approved in April 2024 with the support of geodetic experts and national geodetic agencies from both countries, GGOS IberAtlantic aims at involving national geodetic agencies, research institutions, universities, and other scientific organizations in its operations.

GGOS IberAtlantic's mission is to promote research and the development of geodetic technologies to enhance scientific understanding and applications across the Iberian Peninsula and the Atlantic region. It also aims to raise awareness in Spanish and Portuguese societies about the role of geodesy in understanding Earth's dynamics.

Fig. 2. GGOS serves as a translator of geodetic data for society.

Currently, however, geodesy in these regions faces a precarious situation. Despite its foundational role across a wide range of applications, geodesy is often underappreciated. Its data are indispensable for Earth studies and for defining reference systems used daily in numerous applications. These data must be highly accurate, of consistent quality, and available in long time series to enable the detection of subtle planetary changes. National mapping or cartographic agencies typically provide this data freely, but the lack of a price tag is often mistakenly equated with lack of value—an assumption far from accurate.

This low visibility of geodesy leads to two pressing issues:

1. **Human Resources:** Limited public awareness makes it difficult to attract new talent to the sector, resulting in a significant challenge for Spanish and Portuguese geodetic agencies and organizations to recruit the next generation of experts.
2. **Material Resources:** Geodetic infrastructure requires substantial investment for maintenance, updates, and operational costs. When decision-makers lack awareness of geodesy's significance, securing adequate funding becomes a challenge. This lack of resources hampers the improvement of geodetic models and applications, which are integral to ongoing scientific research.

GGOS IberAtlantic aims to serve as a unified voice to communicate scientific findings in an accessible way, allowing the public and policymakers to better understand changes occurring on our planet. By highlighting geodesy's contributions, GGOS IberAtlantic seeks to address these challenges, helping attract new projects, funding, and skilled professionals to the field.

GGOS IberAtlantic: Structure

The proposal to establish GGOS IberAtlantic originated from the ongoing collaboration between Spain and Portugal, particularly through the RAEGE (*Red Atlántica de Estaciones Geodinámicas y Espaciales / Rede Atlântica de Estações Geodinâmicas e Espaciais*) project, a joint initiative of *Instituto Geográfico Nacional de España* and *Governo dos Açores*. RAEGE's primary aim is to strengthen geodetic infrastructure within the IberAtlantic region while contributing to the Global Geodetic Observing System. This project involves the establishment, maintenance, and operation of four fundamental geodetic observatories (GGOS Core Sites) in the region.

The concept of creating an affiliated group arose from these collaborative activities, especially given the challenges faced by geodetic organizations in the area.

In Spain, the Spanish Geodesy and Geophysics Commission, the supreme authority in the field, tasked a group of geodesy experts to assess the feasibility of the GGOS Affiliate. Experts from *Instituto Geográfico Nacional de España*, *Real Observatorio de la Armada*, *Universidad de Alicante*, and *Universidad Complutense de Madrid* developed a proposal report, which received approval from the commission. The commission also nominated three representatives to join the GGOS IberAtlantic Governing Board.

Fig. 3. GGOS IberAtlantic logo

In Portugal, *Direção-Geral do Território*, the country's leading geodetic body, also approved the establishment of the group and proposed three additional members for the governing board. This structure is formalized in the group's Terms of Reference, which stipulate a board composed of six directly elected members along with six representatives from specific thematic areas: GNSS (Global Navigation Satellite System), VLBI (Very Long Baseline Interferometry), SLR (Satellite Laser Ranging), Gravimetry, Combination/Multi-technique, and Outreach.

These thematic areas reflect the immediate technical priorities of GGOS IberAtlantic, but the configuration remains adaptable to incorporate other areas based on the group's progress, member interests, and emerging needs. The current governing board, depicted in Figure 3, reflects this structure.

This initiative, while led by the organizations mentioned, is open to participation from any relevant organization within the region. Broad inclusion is considered essential for

the group's success, as is the expansion of membership to other interested countries. Although initially rooted in Spain and Portugal, GGOS IberAtlantic invites any nation in the region to join and contribute to its mission.

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GGOS activities lead to GGOS affiliates

GGOS has identified updated long-term goals and cross-cutting community needs, which are outlined in the new GGOS Strategic Plan 2024–2034: Geodesy for Science and Society. This Plan is informed by an extensive community survey that included six multiple-choice questions and seven SWOT (Strengths, Weaknesses, Opportunities, Threats) questions. Conducted from July 11 to September 30, 2022, the survey received input from 70 participants across 32 countries.

The Strategic Plan's long-term goals center on four key areas:

1. Visibility and Engagement
2. Science-Policy Networking
3. Capacity Enhancement and Sustainability
4. Comprehensive and Cross-Cutting Analysis

These goals guide the identification of Community Needs, which are framed as part of a holistic approach to support the geodetic community and elevate geodesy's role for public benefit. Through a focus on innovation, advocacy, communication, and integration, the Plan aims to advance the visibility, utility, and impact of geodesy.

An accompanying Implementation Plan details the steps needed to achieve the Strategic Goals. This Plan emphasizes the processes of identifying, allocating, executing, and tracking progress, acknowledging that some actions will require sustained multi-year efforts. Comprising 64 specific activities, the Implementation Plan adheres to SMART (Specific, Measurable, Achievable, Relevant, Time-bound) criteria, ensuring clarity and feasibility in each action. Several activities are designated to be led by GGOS affiliates (GGOS-A), aligning local and regional efforts with the broader strategic framework.

Activities	Lead [Contributors]	Timeframe	Performance indicators
Action 2.1 Raise awareness of IAG Services for Earth observation and societal needs			
2.1.a Popularise the importance of geodesy (observations, products, community) and the IAG Services through the GGOS webpage, videos, and social media campaigns.	CO [BPS, BNO, SP, EC, **GGOS-A**]	Continuous	◊ One new GGOS video a year. ◊ Continuous social media posts on GGOS and IAG related activities ◊ Four dedicated social media campaigns a year on geodetic products (every three months a different geodetic product will be promoted through social media posts, synchronised with Activity 2.1.c). ◊ Statistics on the website or in social media.
2.1.c Compile the observation and product descriptions in ggos.org into summary factsheets that can be made available online to everyone through GGOS and can also be translated into national languages by appropriate national agencies.	CO [GGOS-P, BPS, BNO, SP, EC, **GGOS-A**]	Continuous	◊ Four factsheets a year (synchronised with Activity 2.1.a)
Action 2.3 IAG´s scientific foundation in complement to UN-GGCE policies			
2.3.a Support outreach and capacity building activities as well as public awareness campaigns initiated by the UNGGCE (on demand).	GGOS-P, CO [EC, BNO, BPS, SP, GB, **GGOS-A**]	On demand	◊ On demand
2.3.d Prepare geodesy capacity development materials useful in providing evidence to support decision makers in moving towards a robust global geodesy supply chain.	GGOS-P, CO [EC, BNO, BPS, SP, GB, FAs, **GGOS-A**]	On demand	◊ On demand
Action 2.4 Recognising geodesy as a strategic area in national and regional development plans			
2.4.a Popularise the inverted geospatial pyramid. [Bevis et al., 2022]	GGOS-P [CO, BNO, BPS, SP, EC, **GGOS-A**, GB]	2025	◊ An outreach package on the inverted geospatial pyramid.
2.4.c Presentations/contributions to regional conferences on development, land management and natural disaster mitigation showing the importance of geodesy	EC prepares a standard (oral or poster) presentation to be given by any colleague involved in GGOS, in particular, in the **GGOS-A**.	On demand	◊ On demand
Action 3.3 Geodesy as a career			
3.3.a Communicate the importance of geodesy to young people (pupils) in order to attract them to geodesy as future university students.	CO, **GGOS-A**, IAG ECS group.	2025/2026/2027	◊ Outreach material on geodesy in plain language (see Actions 1.1.a, 2.1.a, 2.1.c, 2.4.a).
3.3.b Advocate for the integration of geodetic concepts	CO, **GGOS-A**, IAG ECS group.	On demand	◊ IAG or GGOS presentations at dedicated meetings (on demand).

into educational curricula at the national and regional levels.			
3.3.c Approach educational institutions to promote geodesy as a key discipline and highlight its role in addressing global challenges.	CO, **GGOS-A**, IAG ECS group.	On demand	◊ IAG or GGOS presentations at dedicated meetings (on demand).
3.3.e Encourage and facilitate the participation of early career researchers in GGOS activities.	GGOS-P [CO, IAG-P, EC, FAs, **GGOS-A**]	Continuous	◊ Early career scientists in the different GGOS components. ◊ Solicited presentations by early career scientists at GGOS meetings. ◊ Facilitating travel grants for early career scientists.
Action 3.4 Promotion of IAG and global networking for capacity building and knowledge transfer			
3.4.g Seek opportunities/possibilities for further communication/collaboration among GGOS Affliates	**GGOS-A**	Continuous	◊ Joint meetings and initiatives between different GGOS Affiliates.
Action 4.4 GGOS portal and web presence			
4.4.b Revise and update the GGOS webpage contents regularly.	CO [All GGOS components]	Continuous	◊ Regular content updates.
4.4.e Promote FAIR, TRUST and CARE practices and communicate their benefits.	CO [All GGOS components]	Continuous	◊ An outreach package describing the FAIR, TRUST and CARE practices and the benefits of their use in geodetic data and products.
4.4.f Promote the benefits for using digital object identifers and related guidelines	CO [C-DOI, All GGOS components]	2025/2026/2027	◊ A section on the GGOS Website with information on DOIs (general information, benefit, examples, how-to, link to CDOI). ◊ Addition of relevant information about DOIs in the GGOS Portal. ◊ Further development of the metadata recommendations for geodetic data to support all IAG Services (ongoing). ◊ Overview on DOI activities for each IAG Service.

GGOS IberAtlantic Lines of Work

With the aim of developing and fulfilling the activities proposed by GGOS for the GGOS affiliates, presented in the previous section, the following work actions are defined for GGOS IberAtlantic for the period 2024-2028. The GGOS IA Governing Board will meet annually to evaluate the progress of the work plan and, if necessary, redefine or refine the proposed activities or identify new ones.

Activity	GGOS related action number	Timeframe	Description
GGOS IberAtlantic leaflet	2.1.a	On demand	Create a leaflet for GGOS IberAtlantic detailing its goals, the locations of GGOS stations in Spain and Portugal, and the significance of GGOS.
Support for Translation of GGOS Materials	2.1.a; 2.1.c	On demand	Provide translation services for any materials from GGOS, including documents, social media posts, and videos, into Spanish and Portuguese.
Social media campaign	2.1.a; 2.3.d	Two per year	Develop content for GGOS social media platforms, drawing inspiration from initiatives like GGOS Japan, such as videos highlighting local ties at observatories or applicable regional topics.
Establish GGOS IberAtlantic Email Distribution Channel	2.3.a	2025	Create a distribution channel to disseminate important announcements from GGOS in English, Spanish, and Portuguese.
Create an article of the importance of Geodesy to publish in governmental newspaper.	2.3.d	2025	Write and publish an article in governmental newspapers, such as the Spanish ministries' publications, to raise awareness about geodesy.

Create an article of the importance of Geodesy to natural risk monitoring	2.3.d	2025-2026-2027-2028	Write an article on the main risks related to geodesy in the regional areas of Spain and Portugal, such as seismic activity, extreme meteorological events, desertification, risk of tsunamis, volcanic eruptions, climate change related phenomena, etc. This document could be useful for raising awareness among institutions and society about the importance of geodesy.
Prepare virtual workshops about the importance of geodesy for climate change monitoring, in order to promote it in universities.	2.4.a; 3.3.a	2025-2026-2027-2028	Organize virtual workshops in collaboration with universities to popularize the concept of the inverted geospatial pyramid, explaining the role of geodesy and its impact on climate change.
GGOS IberAtlantic presentation or workshop at Spanish-Portuguese Assembly	2.4.c	Biannual	Promote GGOS IberAtlantic at the Spanish-Portuguese assembly through presentations, with potential for future workshops or sessions.
Study the viability and encourage Universities to Develop Geodesy Programs	3.3.b	2025-2026-2027-2028	Investigate the feasibility of encouraging universities to create geodesy-related qualifications, such as micro-courses or master's programs, to increase accessibility and attract students.
Explore Funding Opportunities for GGOS IberAtlantic Activities	All	On demand	Investigate national and European funding options to support GGOS IberAtlantic initiatives.
Outreach Campaign for GGOS Awareness and Engagement	3.3	On demand	Conduct a campaign to reach out to organizations and universities to raise awareness about the

			work of GGOS and GGOS IA among directors and students. Engage in forums or participate in career fairs to increase visibility.
GGOS IberAtlantic Annual Contest	3.3	Annual (starting in 2026)	Organize a hackathon focused on geodesy challenges, encouraging collaboration on innovative solutions
Grants for the Spanish-Portuguese Assembly	3.3.e	Biannual	Investigate funding opportunities to support students for participating in the Spanish-Portuguese Assembly
GGOS IberAtlantic Summer School	3.3.a	Biannual (alternate years with the Spanish-Portuguese Assembly)	Organize an annual summer school focused on geodesy to engage and educate participants on related topics.
Promotion of existing geodetic data and products in the area	-	2025-2026-2027-2028	Create a Geodesic Project Database: develop a platform to showcase key geodesic projects in Portugal and Spain, serving as a resource for researchers, institutions and professionals.
Advisory body providing scientific advice to those who request it in the region.	?-	On demand	Provide advice to the relevant national bodies on the status and opportunities of development of the geodetic infrastructures and the whole supply chain to better meet societal needs

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