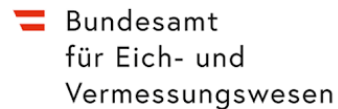


GGOS: Ensuring a Coherent Earth Observation System

L. Sánchez, M. Pearlman, D. Angermann, M. Sehnal, T. Gruber, B. Soja, A. Riddell, K. Elger,
R. Gross, K. Heki, J.M. Ferrandíz, M. Schmidt, T. Melbourne, A. Craddock, B. Miyahara



A **Global Observing System** consists of

- numerous individual terrestrial and space-based observing networks/sensors
- that collect data essential for monitoring specific characteristics of the Earth.

These observing networks/sensors are **owned and operated** by a variety of

- national and international agencies
- with different funding lines, affiliations, overall priorities, and management processes.

To define the requirements for **what, where, when and how** to observe,

- **essential variables** are introduced as the
- common focus of the observing system components.

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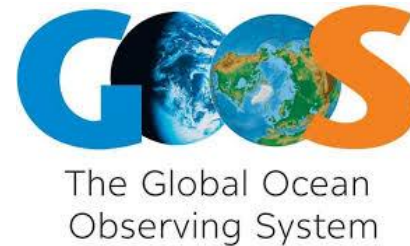
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Global Climate Observing System

- Observes **physical, chemical and biological properties of climate system.**
- 55 Essential Climate Variables (ECVs).



Global Ocean Observing System

- Observes the **physical, bio-geochemical and ecosystem properties** of the oceans.
- 31 Essential Ocean Variables (EOVs), (19 ECVs).

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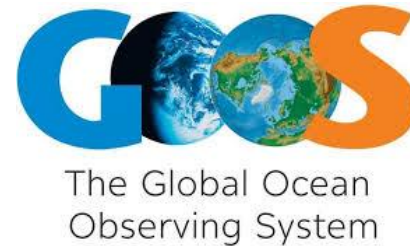
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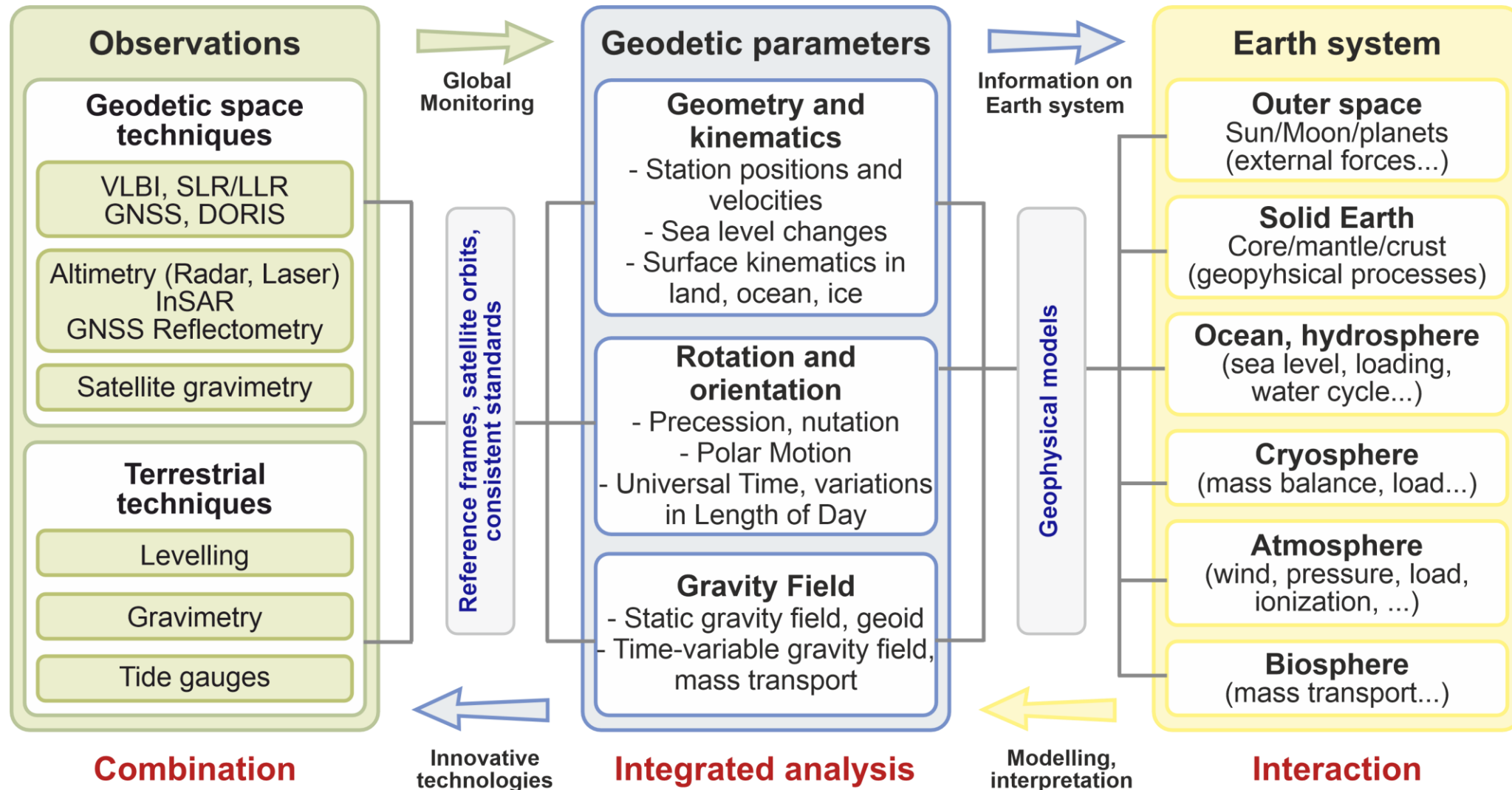
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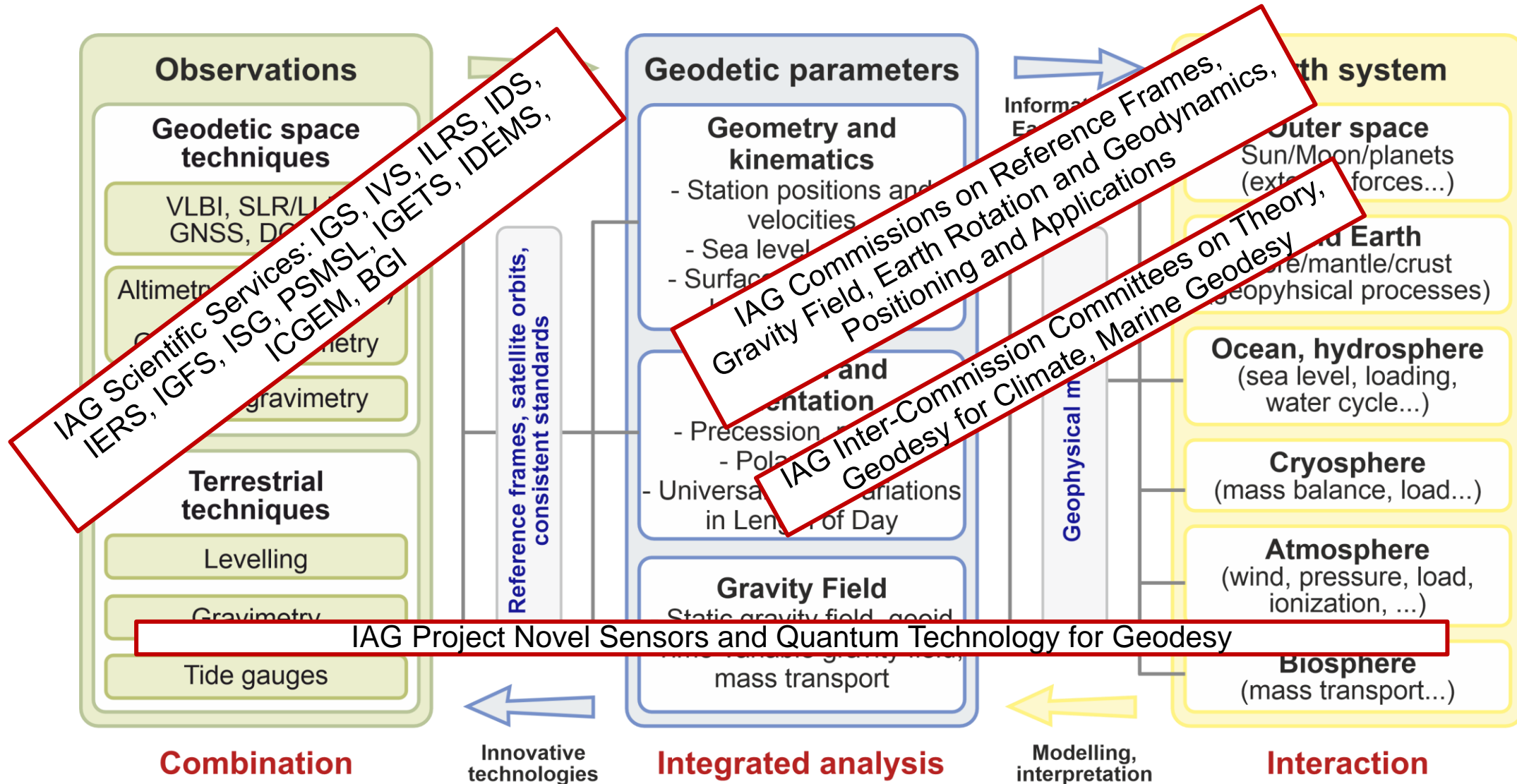
Global Geodetic Observing System

- Observes the **time-varying size, shape, rotation and gravity field of the Earth** with respect to **precise and long-term stable geodetic reference frames.**
- 18 Essential Geodetic Variables (EGVs) based on 51 geodetic products (8 ECVs, 3 EOVs) – **under discussion.**

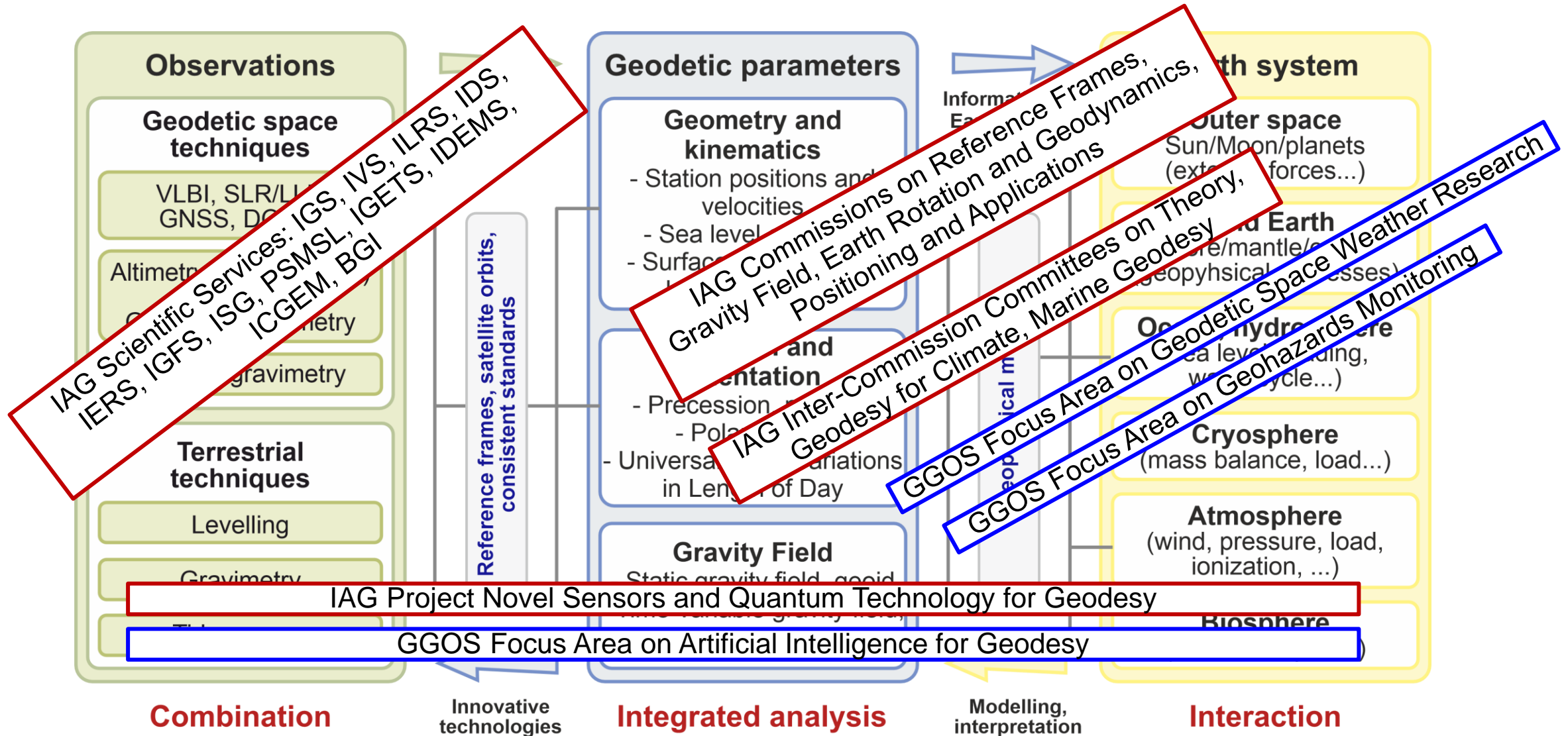
The rationale behind GGOS



The rationale behind GGOS



The rationale behind GGOS



GGOS objectives

GGOS serves as an **integrating framework for all IAG components** (services, commissions, inter-commission committees and projects)

- To move from the provision of basic geodetic products (station coordinates, geoid, Earth orientation parameters) to a level of **consistent modelling and interpretation of Earth system processes and interactions**; and
- To ensure an **integrated observing system** rather than a flood of technique-specific products.



**Integrated observing
networks/sensors**



Standardization



**Consistent
data analysis**

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- To ensure an **integrated observing system** rather than a flood of technique-specific products.

This requires:

- Use of the **same standards, conventions, models and parameters** in all data analyses.
- Combining **geometric, gravimetric and Earth rotation observations** in data analysis and assimilation.
- Identify **scientific and societal needs that can be addressed by (new) geodetic products** and define the accuracy, time resolution and consistency requirements of these products.
- Identify **service gaps** and develop strategies to fill them.
- Promote and increase the **visibility of geodesy** by improving the accessibility of geodetic observations, information and products to the widest range of users.



Integrated observing networks/sensors



Standardization



Consistent data analysis



Modelling and interpretation



Reliable products



Operational services to provide data and products

Essential Geodetic Variables (EGVs)



Objective: To create a catalogue of geodetic observations and products that are **crucial to characterise the geodetic properties of the Earth** (geometrical and physical shape and its orientation in space) and that are needed to understand the dynamics of the Earth system in all its components and their interaction.

Main actors: [GGOS Committee on EGVs](#), [GGOS Bureau of Products and Standards](#).

Status: (1) Release of a White Paper with the concept for the definition and classification of EGVs including related products (18 EGVs, 51 geodetic products); (2) Review of the White Paper by the GGOS Science Panel, GGOS Governing Board and IAG Executive Committee (Timeframe – October 2024).

Next: If consensus is reached, definition of requirements for EGVs, needs assessment, preparation of fact sheets and consultation with the global geodetic community (Timeframe – March 2025).

White Paper: Definition of Essential Geodetic Earth Observation Variables

Authors:

Thomas Gruber¹, Detlef Angermann², Laura Sánchez³

Draft Version: 3.0 (08-04-2024)

¹ Chair of the GGOS Committee „Definition of Essential Geodetic Variables“, Technical University Munich, Germany

² Director of the GGOS Bureau of Products and Standards, Technical University Munich, Germany

³ GGOS President, Technical University Munich, Germany

X2.16 | EGU24-10228 | G2.3 ★
GGOS Bureau of Products and Standards: Recent activities and future plans ▶
Detlef Angermann, Thomas Gruber, Gerstl Michael, Heinkelmann Robert,
Hugentobler Urs, Sanchez Laura, and Steigenberger Peter ✉

Review of the requirements for GGOS



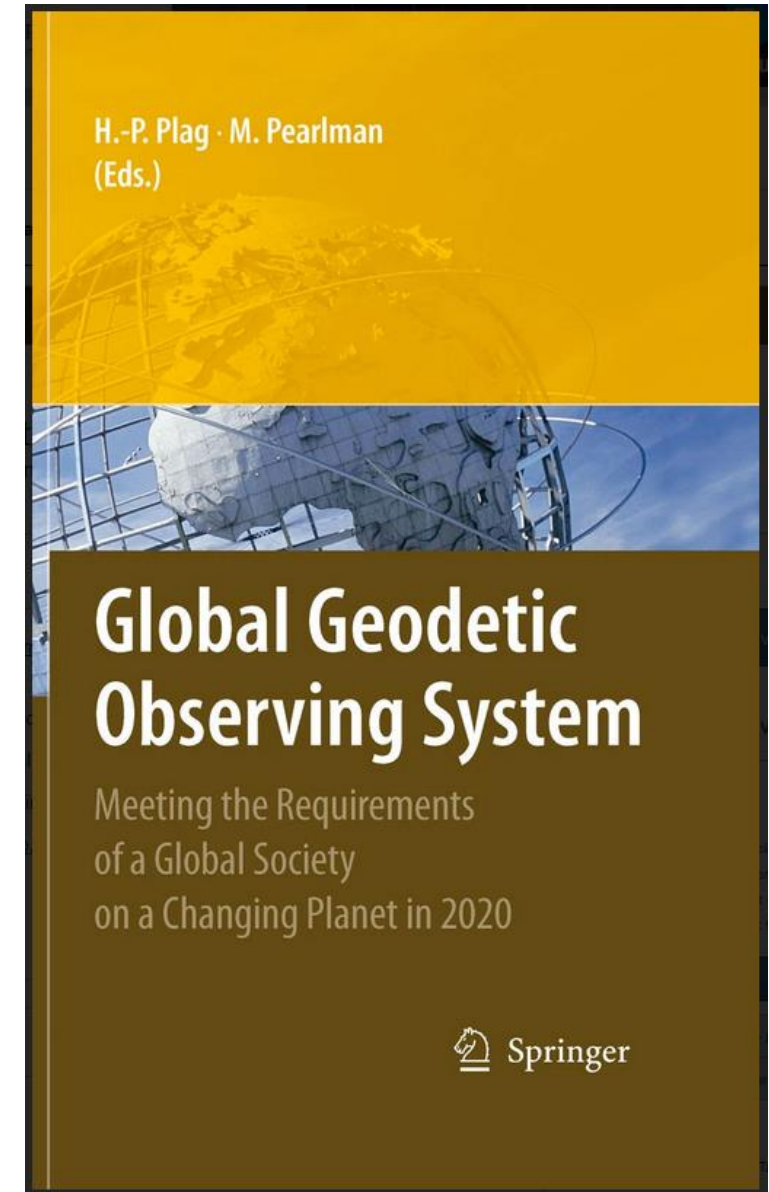
Objective: To review and update the contents of the GGOS2020 Book (it was published in 2009, its content reflects ~ 2007 status).

Main actor: GGOS Science Panel.

Status: Science Panel members are reading the various chapters of the book to identify missing topics or recent developments (Timeframe – June 2024).

Next:

- Define the pool of co-authors to write an “updated summary” for each chapter and new chapters if needed.
- Depending on the scope, decide where to publish the updated version (a supplement, a special issue of a journal, or a paper).
- Timeframe 2025/2026.



GGOS Portal



Objective: To provide a single search and access point for geodetic data and products (one-stop shop). Data and products will be described by detailed metadata and will remain physically located in their original data/product centres. The GGOS Portal will rely on the synchronisation of metadata and incorporate them into its platform to ensure better discoverability. .

Main actors: GGOS Coordinating Office, GGOS Committee on “DOIs for Geodetic Data Sets”, GGOS Committee on “Data and Information Systems”, GGOS Bureau of Products and Standards, GGOS Bureau of Networks and Observations

Status:

- Development of a concept for the use of DOI numbers in geodetic observations, data and products.
- Community survey in April – March 2023 to identify requirements for a comprehensive and user-friendly GGOS Portal.
- Evaluation of different digital platforms to implement the GGOS Portal.
- System design.
- Timeframe: 2025/2026



14:55–15:05 | EGU24-19106 | [G2.3](#) ★ | [Highlight](#) | On-site presentation
[Metadata recommendations for geodetic data](#) ▶
Kirsten Elger and the GGOS Committee on DOIs for Geodetic Data Sets [✉](#)

X2.14 | EGU24-1314 | [G2.3](#) ★ | [Highlight](#)
[GGOS Portal - The future Metadata Platform for Geodetic Data - Feasibility Study and Perspectives](#) ▶
Martin Sehnal and Lena Steiner [✉](#)

Interdisciplinary collaboration and novel topics



GGOS Focus Area on Geodetic Space Weather Research (GSWR): Joint project between IAG and the **International Association of Geomagnetism and Aeronomy (IAGA)** to establish a multidisciplinary network of scientists to **integrate geodetic and geophysical technologies** for comprehensive monitoring of the **ionised atmosphere** with respect to essential Earth observation variables.

GGOS Focus Area on Geohazards Monitoring: Use of GNSS techniques for Tsunami Early Warning Systems (GTEWS), close collaboration with the IUGG Commission on **Geophysical Risk and Sustainability** and the **Geodesy4Sendai** activity of the **Group on Earth Observations (GEO)** to develop support and resources to assemble a GTEWS Consortium.

GGOS Focus Area on Artificial Intelligence for Geodesy (AI4G): Development and evaluation of **improved geodetic products based on AI and machine learning** in particular for GNSS remote sensing, gravity field and mass change, Earth orientation parameter prediction, and geodetic deformation monitoring.

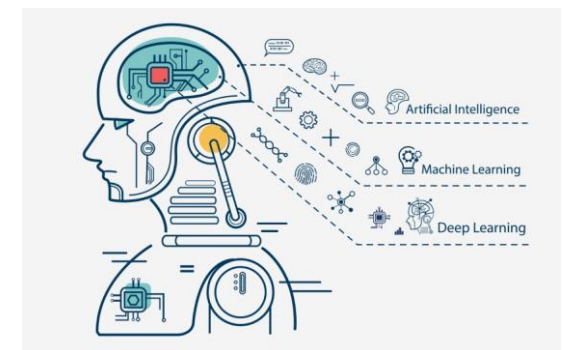
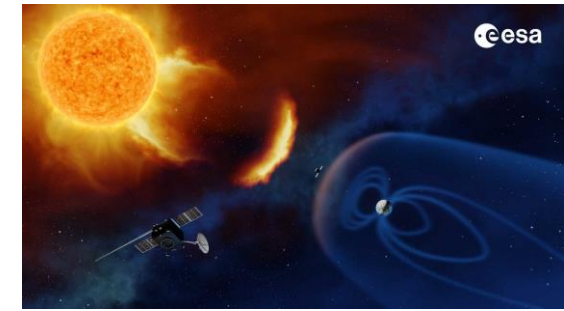
G1.3 **EDI**★

[Data science and machine learning in geodesy](#) ▶

Convener: Benedikt Soja | Co-conveners: Maria Kaselimi^{ECS} , Milad Asgarimehr^{ECS} , Sadegh Modiri^{ECS} , Alex Sun^{ECS}

▶ [Orals](#) ★ | Tue, 16 Apr, 14:00–15:45 (CEST) Room -2.91

▶ [Posters on site](#) ★ | Attendance Mon, 15 Apr, 10:45–12:30 (CEST) | Display Mon, 15 Apr, 08:30–12:30 Hall X2



Interaction with the UN Global Geodetic Centre of Excellence (UN-GGCE)

Objective: Close cooperation with the UN-GGIM on

- Outreach activities
- Survey on needs and challenges of the IAG Services (status, needs, products, users, and costs related to the running of the geodesy supply chain)
- Input for Needs Assessment and Joint Global Geodesy Development Plan

Main actors: IAG Services, GGOS Coordinating Office, GGOS Bureau of Networks and Observations, GGOS Bureau of Products and Standards.

Status: Regular meetings, timeframe: continuous.



Summary

- GGOS is the response of the international geodetic community, organised under the umbrella of the International Association of Geodesy (IAG), to the need to monitor changes in the Earth system continuously
- The operability and sustainability of GGOS is only possible with the contribution of all IAG components: Services, Commissions, Inter-Commission Committees, Projects.
- GGOS provides the interface between the scientific expertise of the IAG and society to demonstrate the fundamental value of geodesy and to facilitate access to geodetic data and products needed to detect, locate, understand and warn of changes in terrestrial ecosystems.
- More information at <https://ggos.org/>

Latest GGOS Blog Posts

- New Director of Bureau of Networks and Observations
- GGOS Strategic Plan 2024 – 2034: Geodesy for Science and Society
- International Height Reference Frame IHRF – Coordination Centre
- Call for Nomination – Director of the Bureau of Networks and Observations
- Recent Achievements and Future Perspectives in Geodesy – Scientific Colloquium
- GGOS Days 2024 & GGOS Focus Areas Topical Meeting
- Geodesy: It's about Time
- EGU 2024 Abstract Submission
- UN-GGCE "Listening World Tour" – IAG
- Report of the GGOS Days 2023
- Symposium on Gravity, Geoid and Height Systems – GGHS2024
- The Importance of Geodetic Reference Frames
- GGOS Japan – Awarded with the Tsuboi Prize
- New GGOS Video
- GRACE Hackweek 3
- GGOS DAYS 2023