

# Role and Activities of the GGOS Bureau of Products and Standards

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## Introduction

The Bureau of Products and Standards (BPS) is a key component of the Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG). It supports IAG in its goal to provide consistent geodetic products needed to monitor, map, and understand changes in the Earth's shape, rotation, and gravity field (Fig. 1). This contribution presents the role of the BPS and it highlights some of the recent activities.

## Mission and overall objectives

- To serve as contact and coordinating point for homogenization of IAG standards and products
- To keep track of the adopted geodetic standards and conventions across all IAG components
- To motivate the development of new geodetic products, needed for Earth sciences and society
- To describe and promote geodetic products

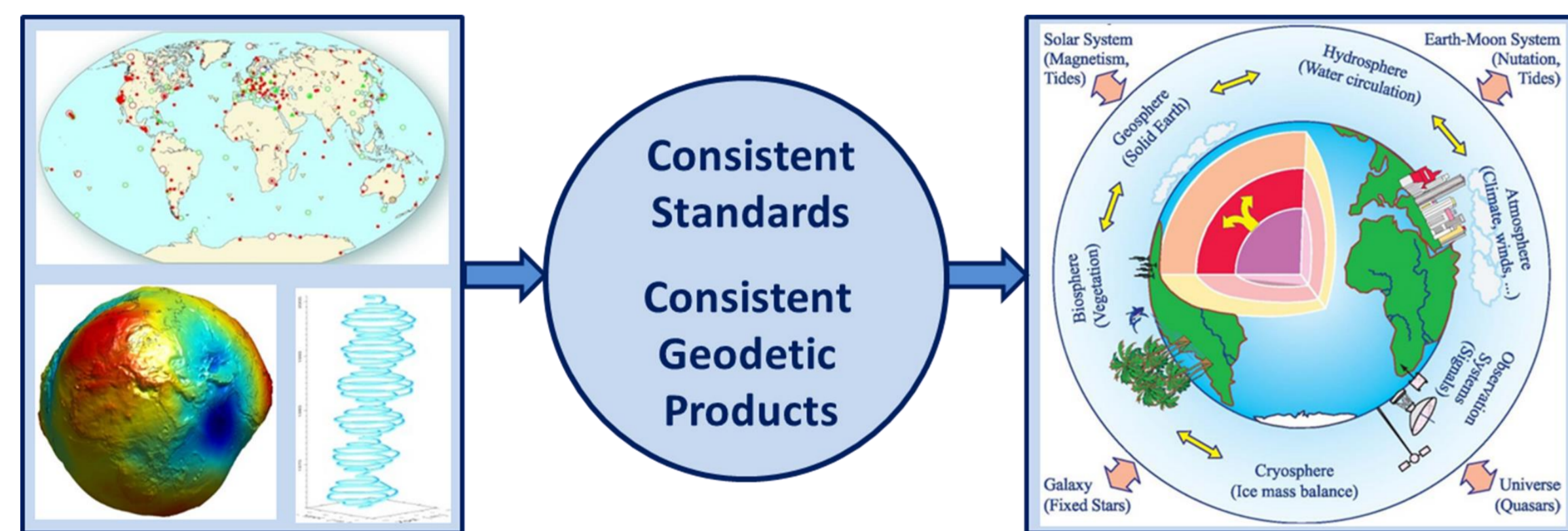


Figure 1: The key role of standards and conventions for consistent geodetic products as the basis for Earth system research, for studying interactions between its sub-components and for precisely quantifying global change phenomena (e.g., sea level rise, ice melting, global water cycle)

## BPS organizational structure

The BPS is chaired by DGFI-TUM and jointly operated with TUM's Chair of Astronomical and Physical Geodesy. Further involved partners are GFZ (German Research Centre for Geosciences, Potsdam) and DLR (German Aerospace Centre, Oberpfaffenhofen).

The following GGOS components are associated to the BPS:

- Committee "Contributions to Earth System Modeling", Chair: Maik Thomas, GFZ, Germany
- Committee "Definition of Essential Geodetic Variables", Chair: Richard Gross, JPL/NASA, USA
- Working Group "Towards a consistent set of geodetic parameters for the definition of a new GRS", Chair: Urs Marti, swisstopo, Switzerland

## BPS activities

Figure 2 gives an overview and schedule of the BPS tasks as specified in the BPS implementation plan 2020-2022. The activities of the BPS are divided into three main categories: Coordination activities, specific tasks, and outreach activities. Currently, GGOS is developing a refined strategy and new implementation plans for its components for the term 2023-2026.

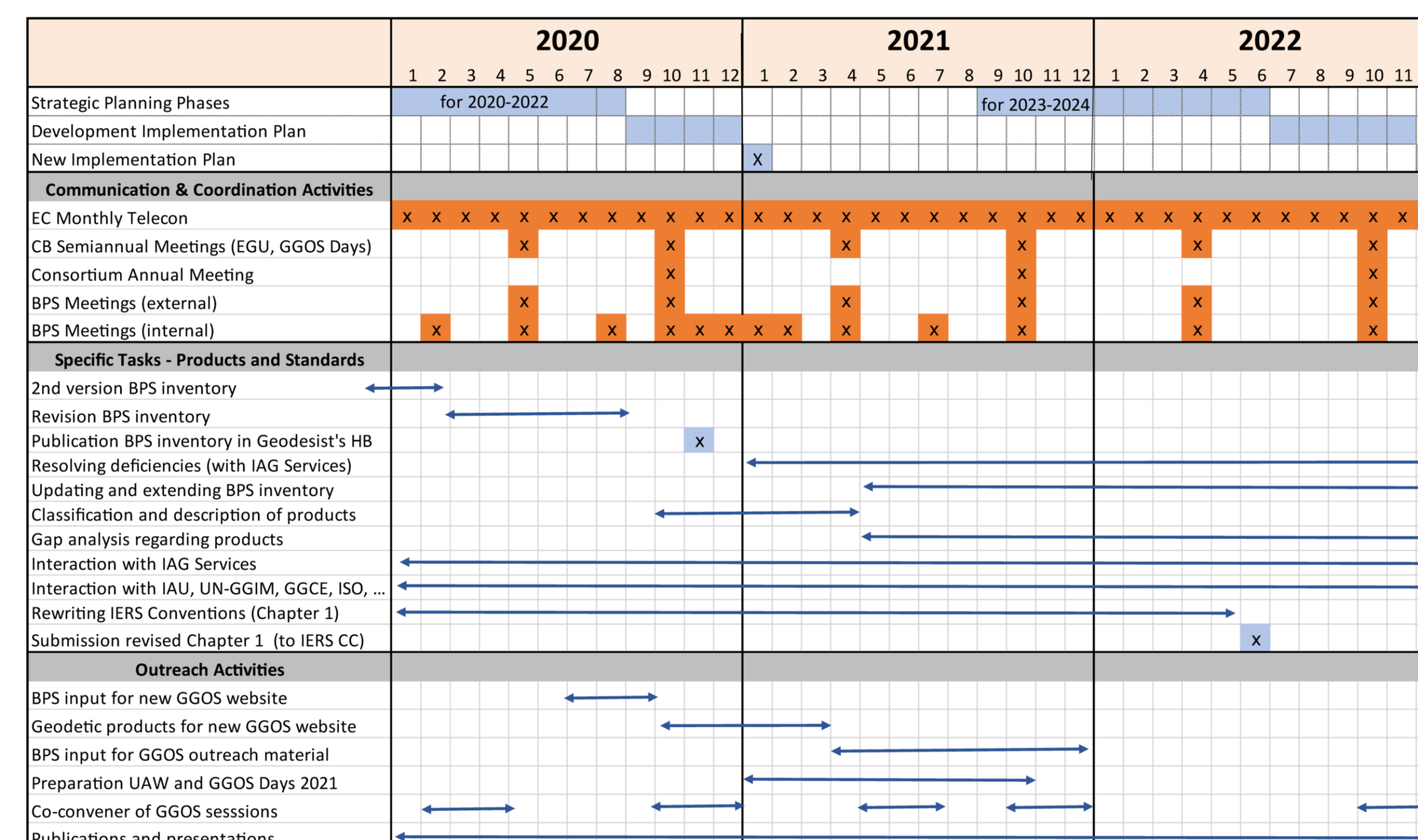


Figure 2: Overview and schedule of BPS activities

## Description and representation of geodetic products

In cooperation with the IAG Services, other data providers and the GGOS Science Panel members, user-friendly descriptions of geodetic products have been generated and implemented at the GGOS website (www.ggos.org). These products are classified into two categories (Fig. 3).

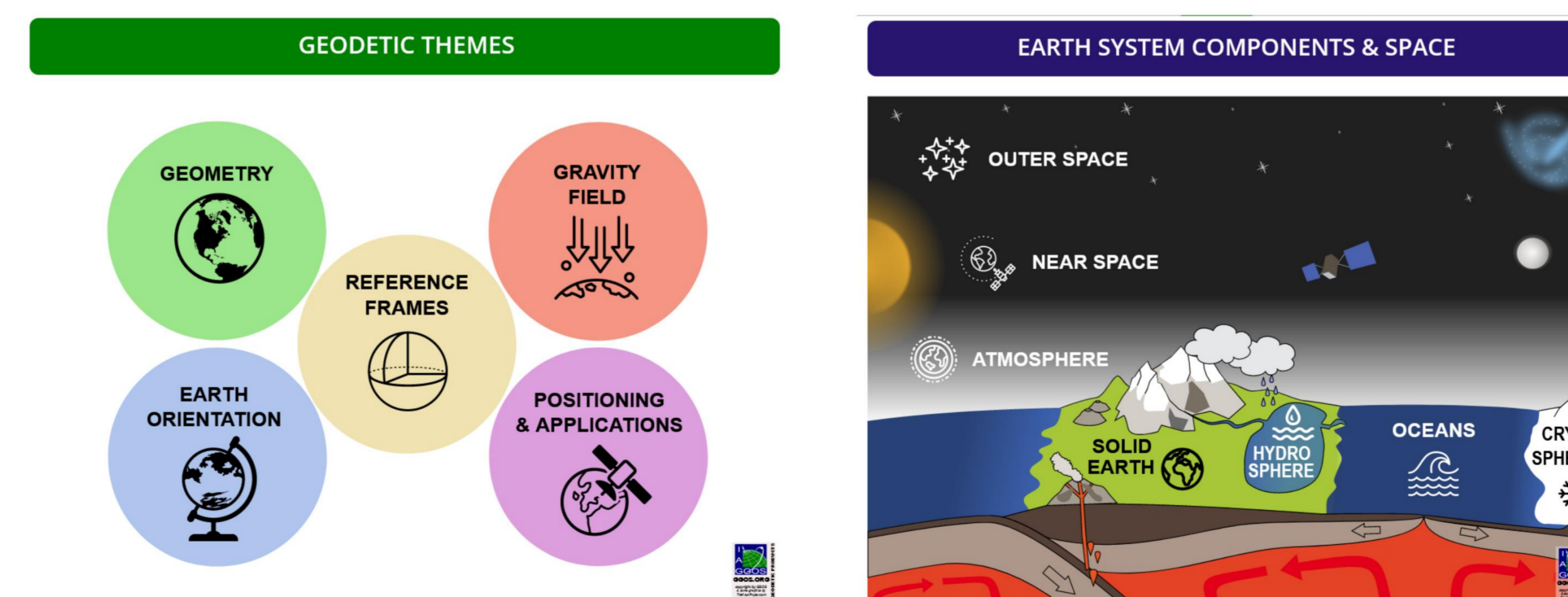


Figure 3: Screenshot of the GGOS website for the two classifications (geodetic themes; Earth system components & space) of geodetic products (www.ggos.org)

## List of geodetic product descriptions

Reference Frames		
	Terrestrial reference frame	How can we provide a stable reference for measuring changes of our planet?
	Celestial reference frame	How can we link Earth and space?
	Gravity reference frame	How to refer gravity measurements at the Earth surface to a uniform reference?
	Height reference frame	What is a height above sea level?
Geometry		
Land surface	Station positions & variations	Why do we need precise positioning and navigation on Earth and in space?
	Digital elevation model	How can the Earth's surface be represented?
	Surface deformation models	Why is the Earth's surface in constant change?
Ocean surface and lakes	Sea surface heights	How can the height of oceans be observed?
	Ocean topography models	What are dynamic ocean topography models and why are they needed?
	Sea level change	How fast is the sea level rising?
	Tide gauge records	What is the best sea level reference along the coasts?
Ice surface	Ice sheets and glaciers - variations	How fast is the ice being lost in Greenland and Antarctica?
Gravity field		
	Global gravity field models	How and why does the Earth's gravity change with location?
	Gravity field temporal variations	Why is the gravity field variable?
	Regional / local geoid models	What is a geoid and why is it needed?
	Terrestrial gravity data	What is the purpose of measuring gravity on the Earth's surface?
	Ice sheets and glaciers - variations	How fast is the ice being lost in Greenland and Antarctica?
	Height systems	Why are height systems so important?
Earth Orientation		
	Earth orientation parameters	Why are days getting longer and Earth is wobbling?
Positioning and Applications		
Atmosphere	Atmospheric products	How can space geodetic techniques observe the atmosphere?
	Lower neutral atmosphere	How can geodesy contribute to weather prediction?
	Ionosphere	How does electron density affect positioning and navigation?
	Thermosphere	How does the atmosphere influence low-flying satellites?
GNSS products	GNSS satellite orbits and clocks	How positioning benefits from precise satellite orbits and clocks?

Figure 4: Product descriptions that are currently displayed at the GGOS website (www.ggos.org), including an "appetizer question" for each particular product

## BPS contributions to the updating of the IERS Conventions

The BPS Chair has been nominated by the IERS Conventions Centre as Chapter Expert for Chapter 1 of the IERS Conventions "General definitions and numerical standards". As outcome of the "Standards' Session" of the Unified Analysis Workshop 2022, the two following recommendations have been provided:

- REC-1:** The BPS recommends that the used numerical standards including time and tide systems must be clearly and consistently documented for all geodetic products (IAG/GGOS)
- REC-2:** The BPS recommends that the necessity of a new Geodetic Reference System (GRS) should be further clarified (WG: Urs Marti)

## Acknowledgements

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## Reference

Angermann D., Gruber T., Gerstl M., Heinkelmann R., Hugentobler U., Sánchez L., Steigenberger P., Gross R., Heki K., Marti U., Schuh H., Sehnal M., Thomas M.: GGOS Bureau of Products and Standards: Description and Promotion of Geodetic Products. In: Freymueller J., Sánchez L. (Eds.), IAG Symposia, 10.1007/1345\_2022\_144, 2022

