

# EGU24-7548

European Geosciences Union  
General Assembly 2024  
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## Objectives

The International Combination Service for Time-variable Gravity Fields (COST-G) is the Product Center of the International Gravity Field Service (IGFS) for time-variable gravity fields. COST-G continues the activities of the H2020 project European Gravity Service for Improved Emergency Management (EGSIEM, 2015-2017) to realize a long-awaited standardization of gravity-derived mass transport products.

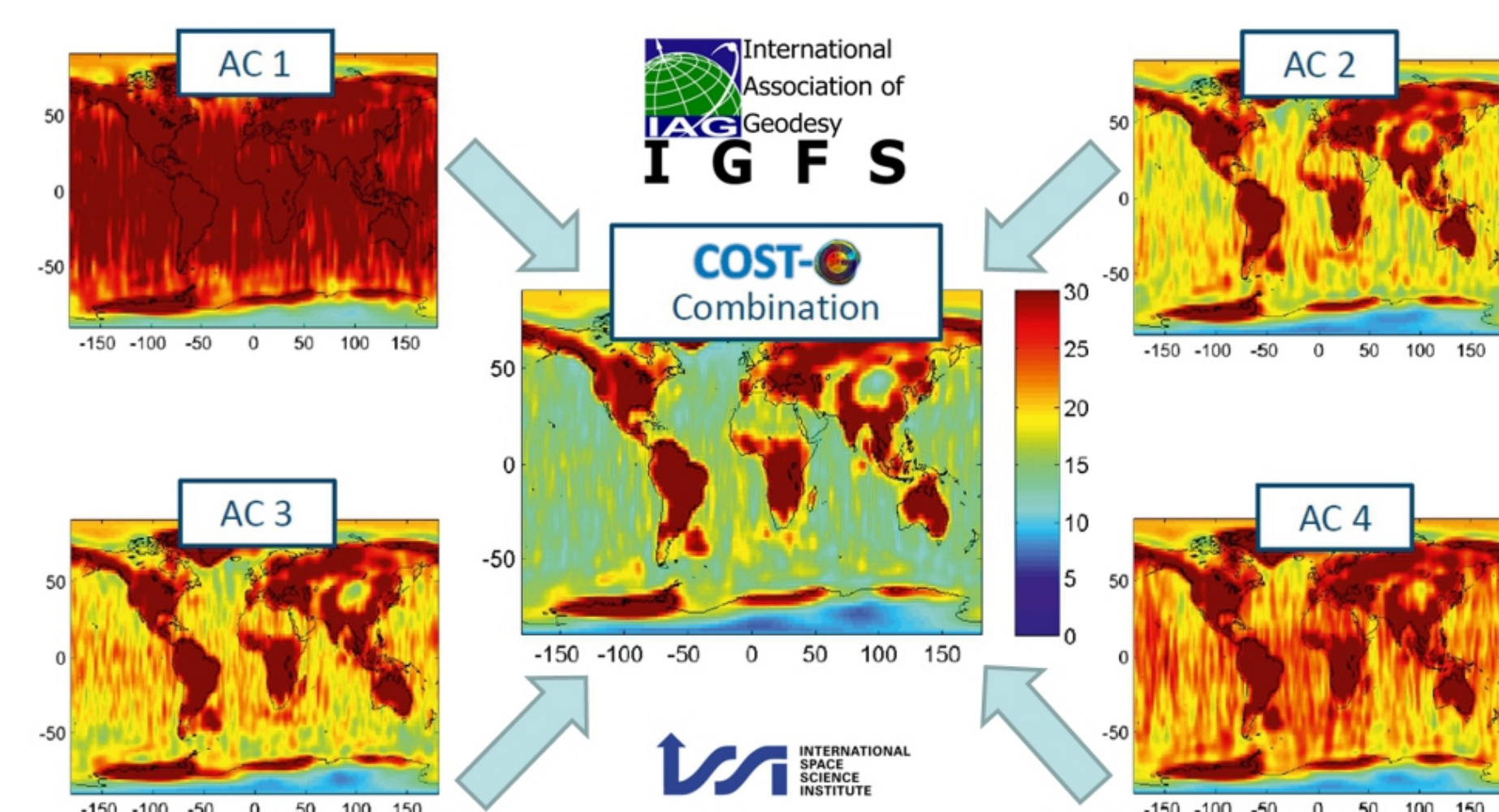
The products of COST-G are:

- **Combined gravity field solutions** in SH coefficients (Level-2 products) derived from a weighted combination of individual solutions generated by different Analysis Centers (ACs),
- **Spatial grids** (Level-3 products) of the combined solutions for hydrological, oceanic and polar ice sheets applications.

## COST-G Team Members



## COST-G Principle



COST-G provides consolidated monthly global gravity models in terms of spherical harmonic (SH) coefficients and thereof derived grids by combining solutions from individual ACs. The ACs adopt different analysis methods but apply agreed-upon consistent processing standards to deliver time-variable gravity field models, e.g. from GRACE-FO low-low satellite-to-satellite tracking (ll-SST).

## Link to Copernicus

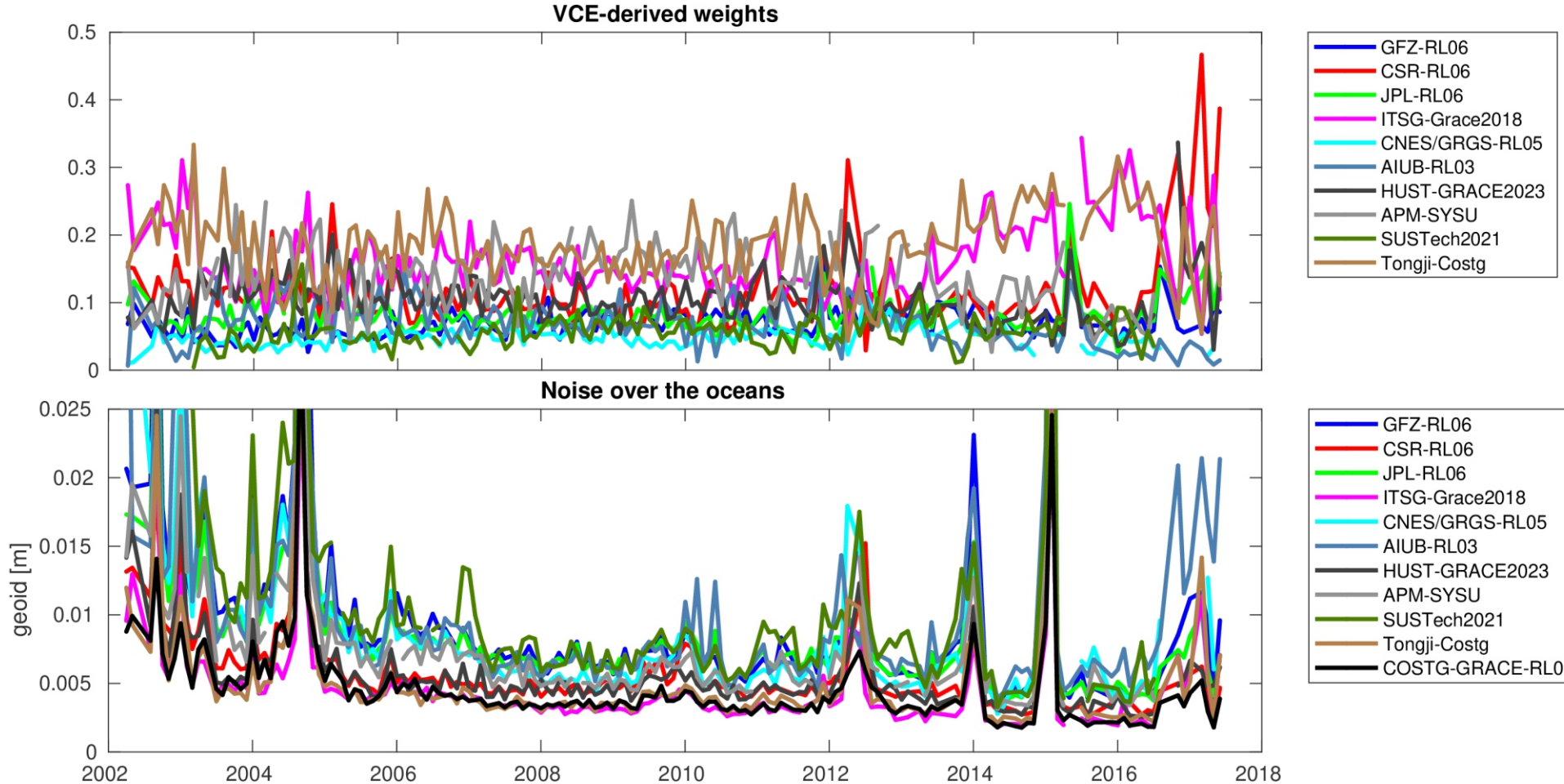
The H2020 project Global Gravity-based Groundwater Product (G3P, 2020-2022) was developing a product of groundwater storage variations with global coverage and monthly resolution by a cross-cutting combination of GRACE/GRACE-FO COST-G solutions with water storage data based on the existing portfolio of the Copernicus services for a later operational implementation of the Essential Climate Variable (ECV) Groundwater into the Copernicus Climate Change Service. Information about G3P: <https://www.g3p.eu>

# COST-G

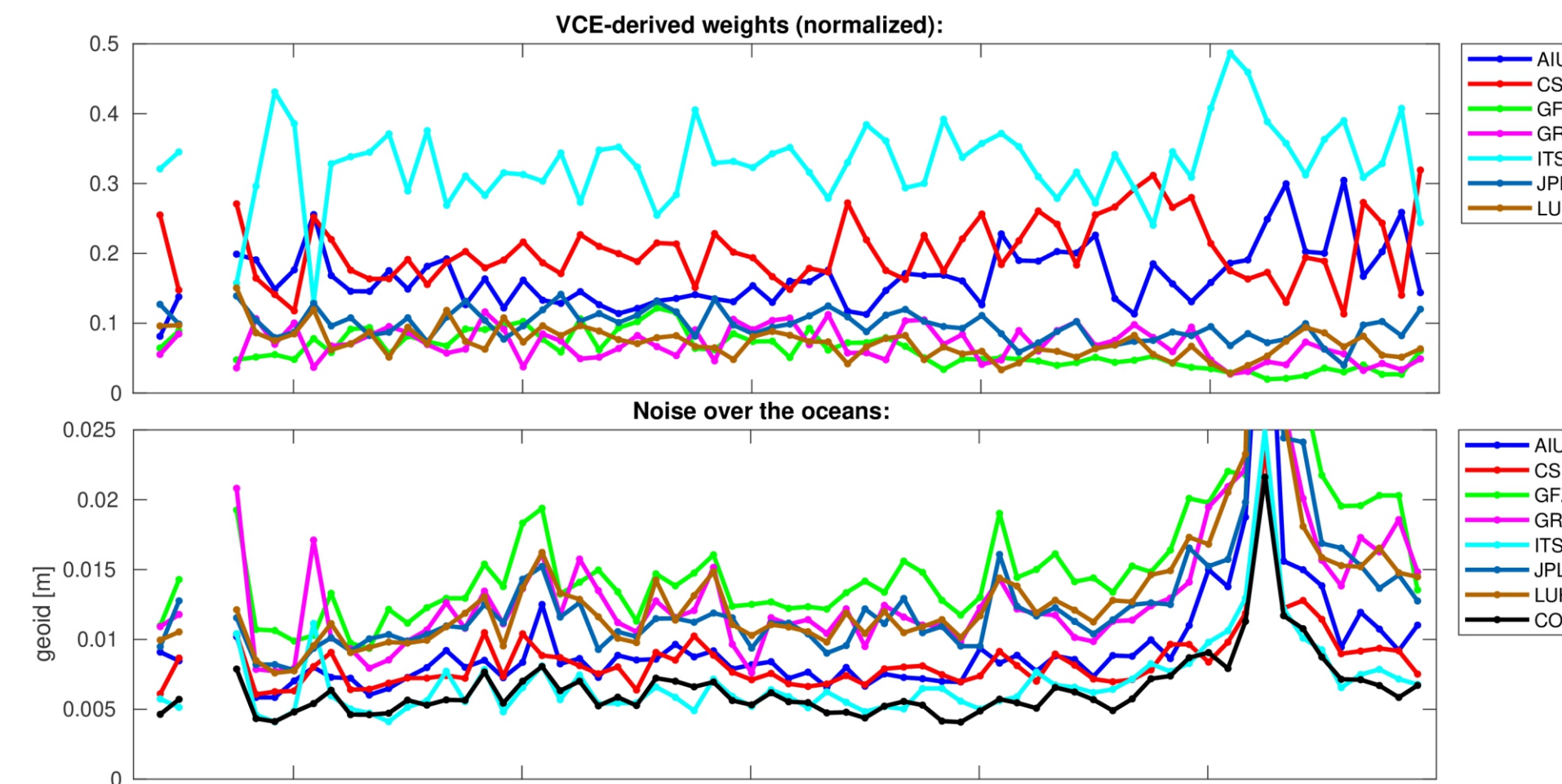
## GRACE Release 02

## Level-2 Products

Adopting rigorous and independent processing approaches, each AC delivers unregularized and consistent gravity field solutions. This enables a meaningful combination of gravity field solutions.



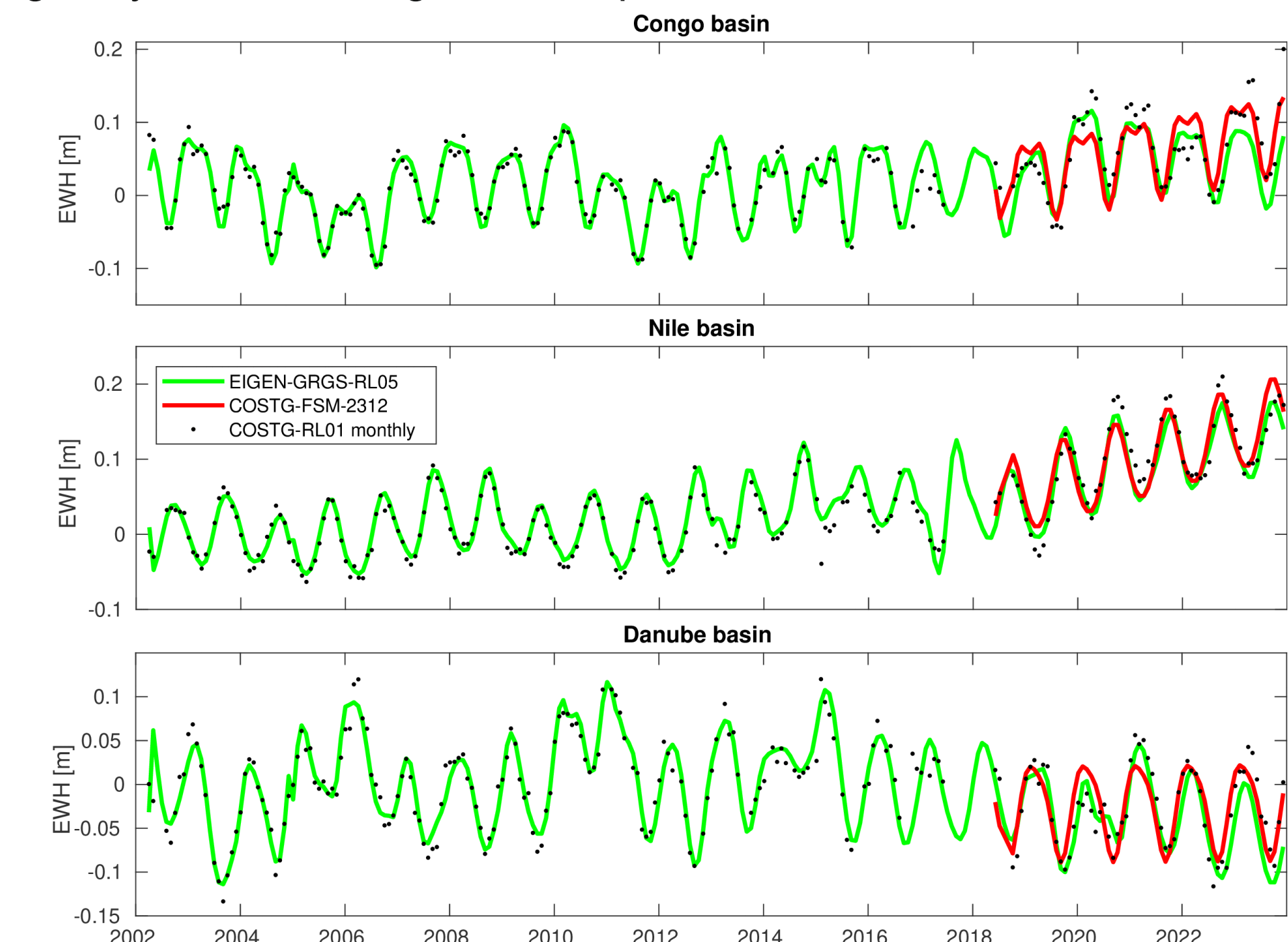
Top: Weights of the combination of monthly GRACE solutions that are adopted for the COST-G GRACE Release 02.  
Bottom: Noise over the oceans of the monthly GRACE solutions and the combined COST-G solution (labelled COMB).



Top: Weights of the combination of monthly GRACE-FO solutions that are adopted for the COST-G GRACE-FO Release 02.  
Bottom: Noise over the oceans of the monthly GRACE-FO solutions and the combined COST-G solution (labelled COMB).

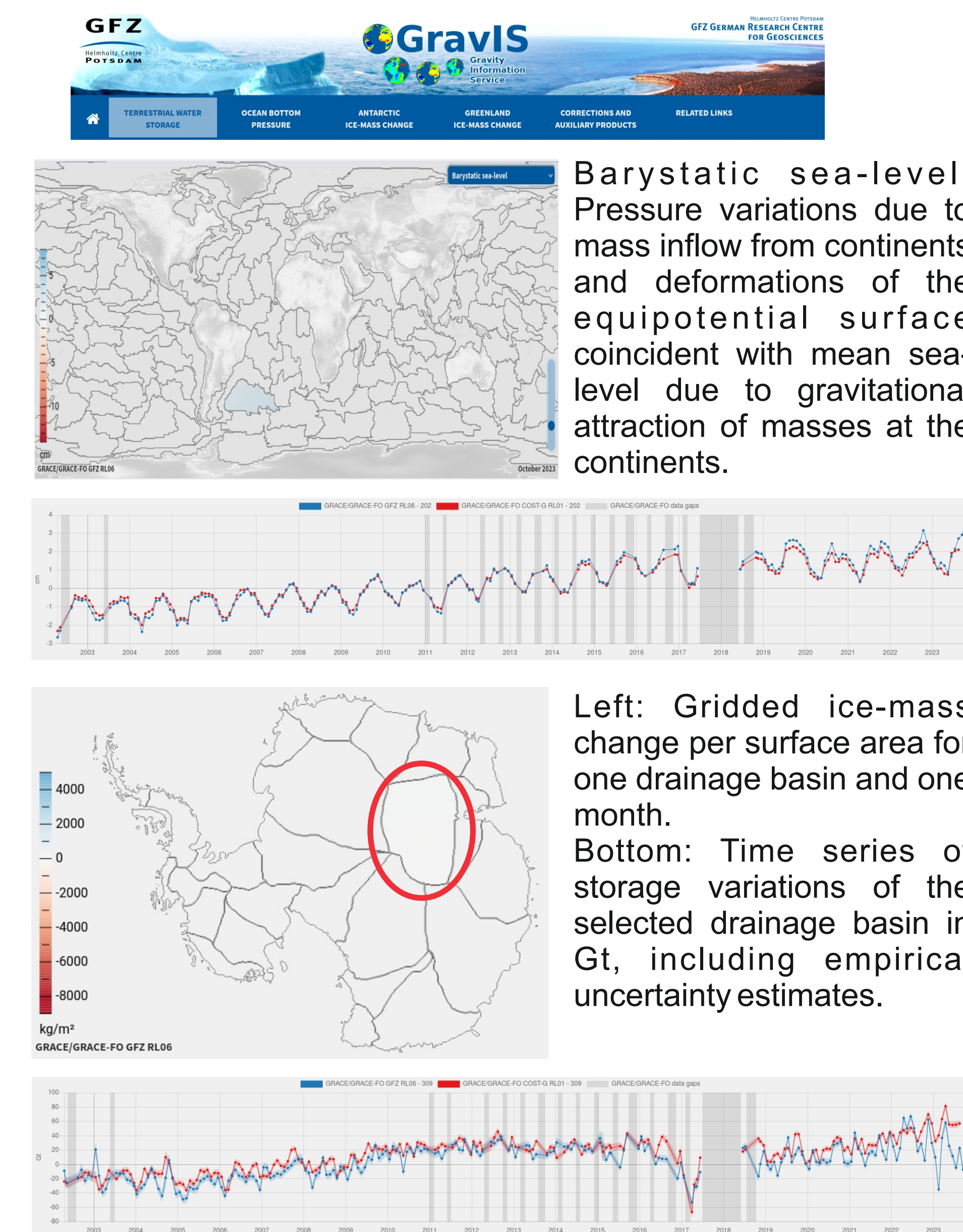
## Fitted Signal Models

COST-G monthly solutions are fitted by a simple parametric model (offset, trend, seasonal signal) to provide fitted signal models (FSM) that are used since July 2023 by ESA's Copernicus POD Service for gravity field modelling in all the operational chains.



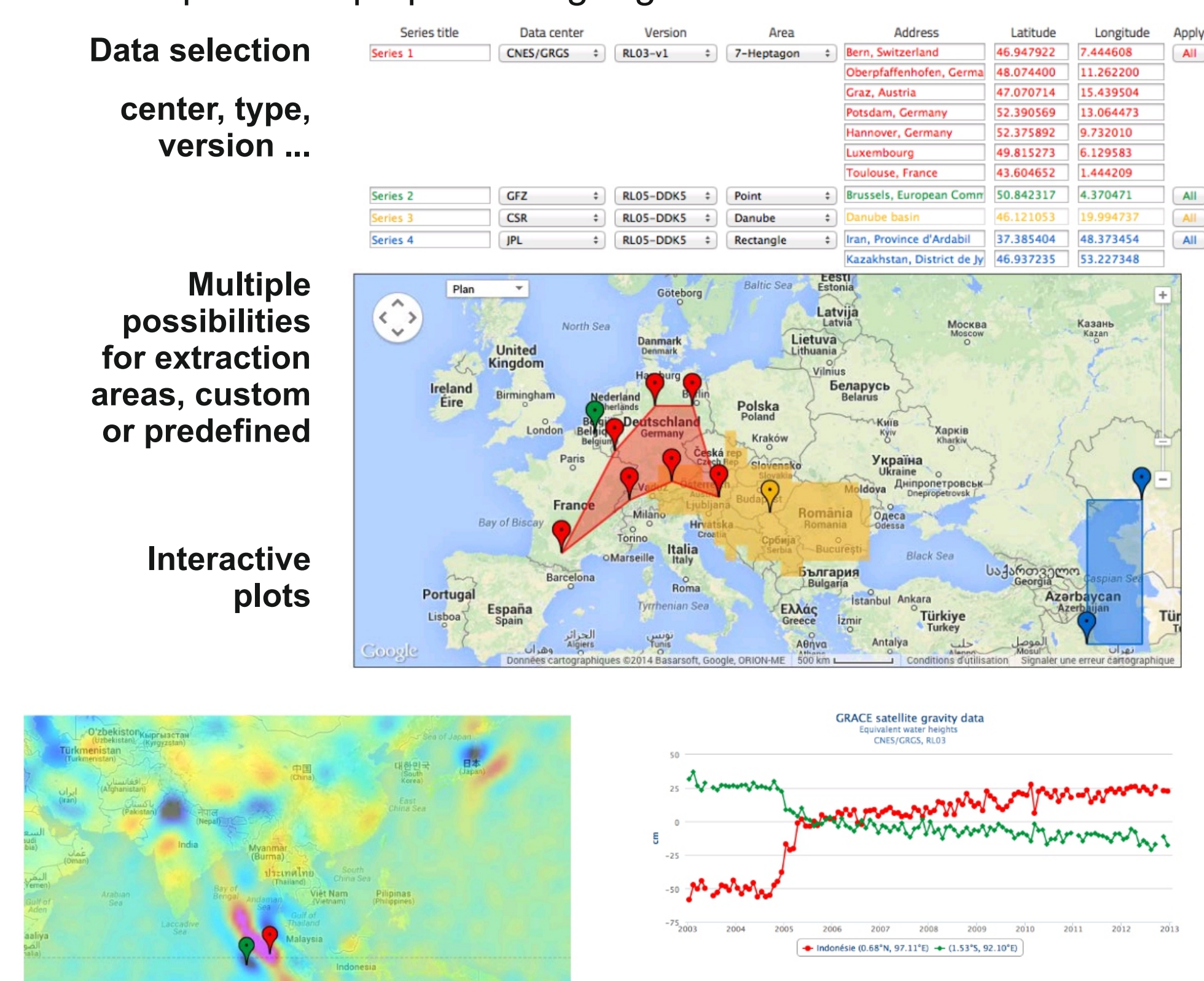
## Level-3 Products

Terrestrial Water Storage (TWS) variability, ocean bottom pressure (OBP) variability, mass changes of the Antarctic and Greenland Ice Sheets are provided in terms of different Level-3 products at the portals GravIS and ISDC:



## Public Outreach

COST-G plotter: <http://plot.cost-g.org>

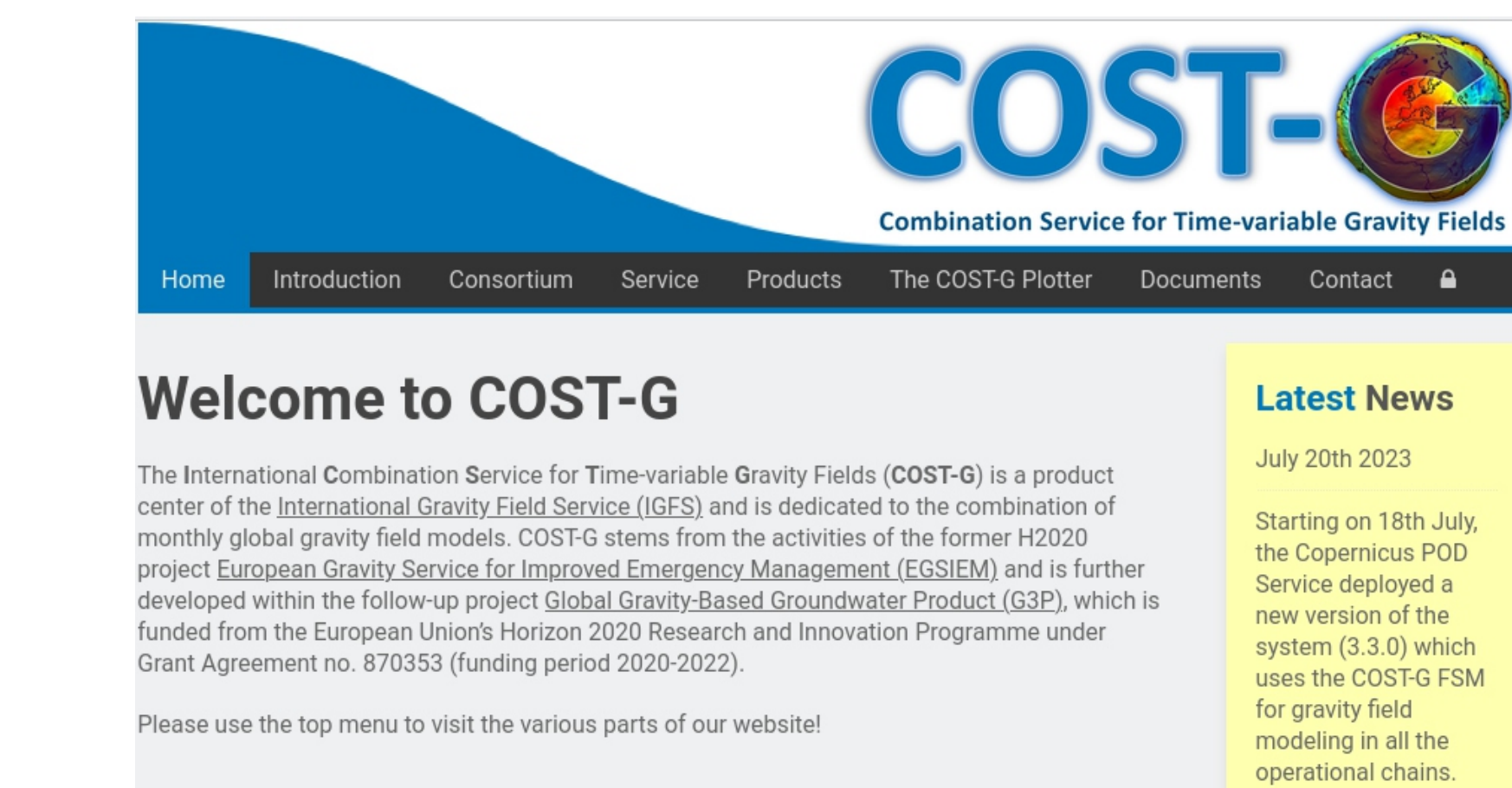


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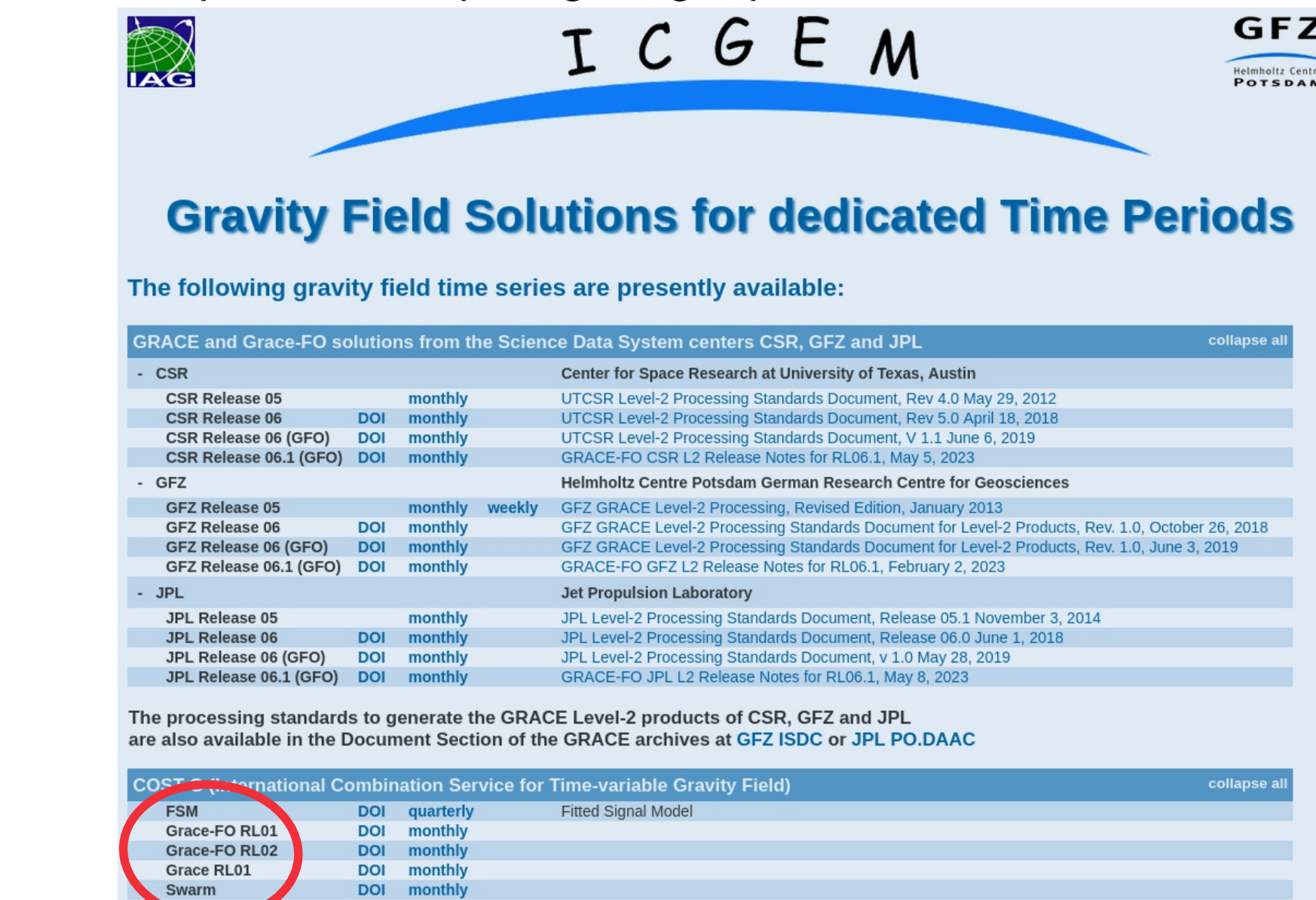
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- (9) Tongji University, China
- (10) Chinese Academy of Sciences
- (11) Sun Yat-sen University, China

## Dissemination

Information about COST-G: <http://cost-g.org>



Level-2 products: <http://icgem.gfz-potsdam.de>



## Summary

- COST-G was established at the IUGG 2019.
- COST-G operates under the umbrella of the International Gravity Field Service (IGFS) of the International Association of Geodesy (IAG).
- COST-G operationally provides monthly gravity field solutions from GRACE-FO data and from Swarm data with a latency of about 3 months.
- COST-G operationally provides fitted signal models with quarterly updates.
- COST-G provides reprocessed monthly gravity field solutions in irregular batches.
- COST-G has included several GRACE/GRACE-FO ACs from China for the COST-G GRACE RI02 combination.

## In collaboration with and supported by



## Acknowledgement

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