

EGU23-4993

European Geosciences Union
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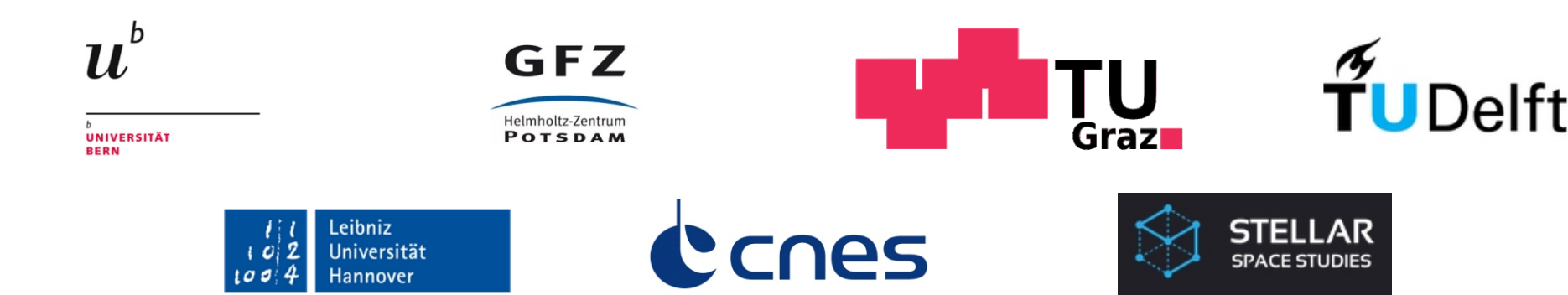
Objectives

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.

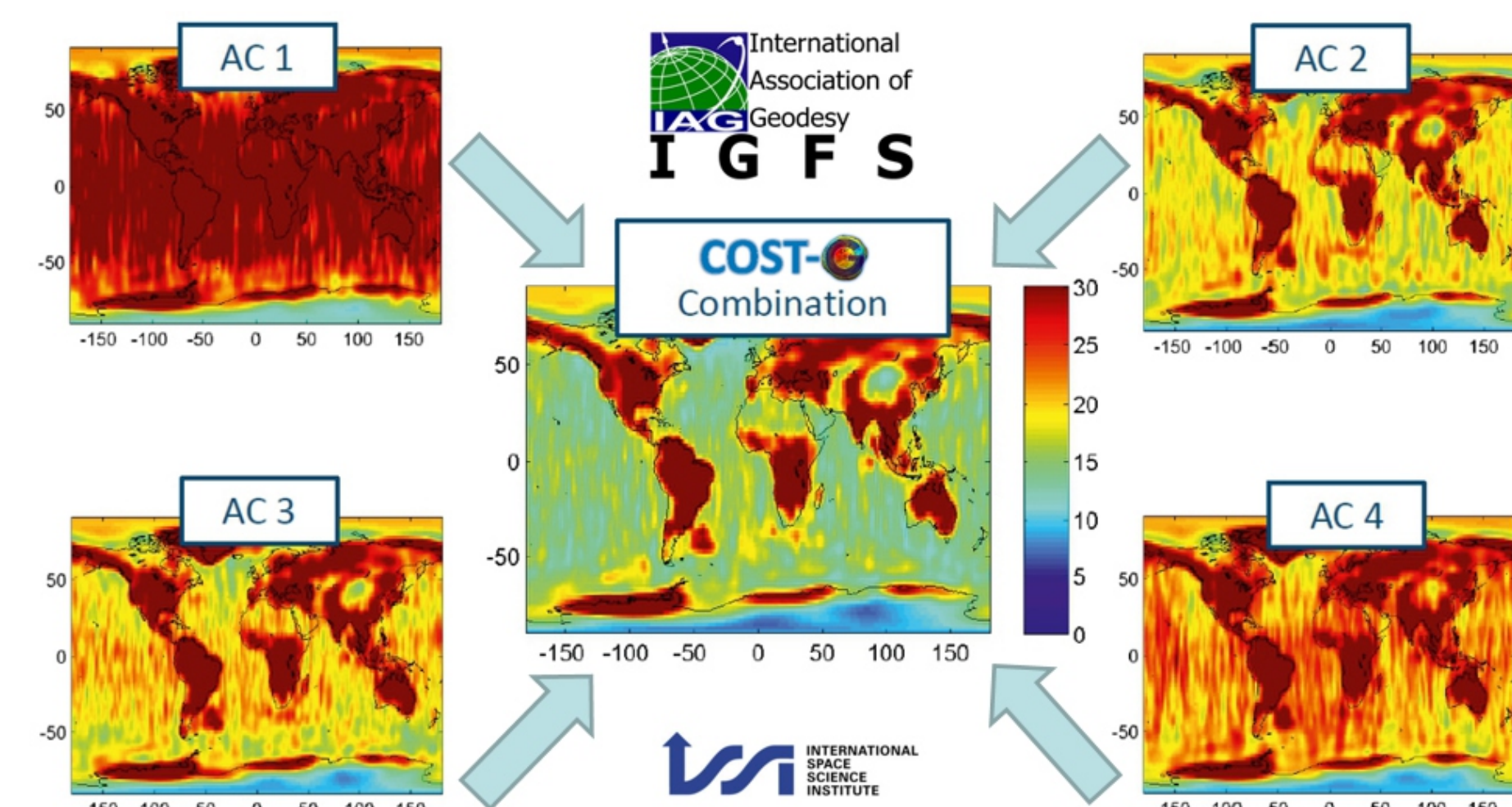
The products of COST-G are:

- **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 (II-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>

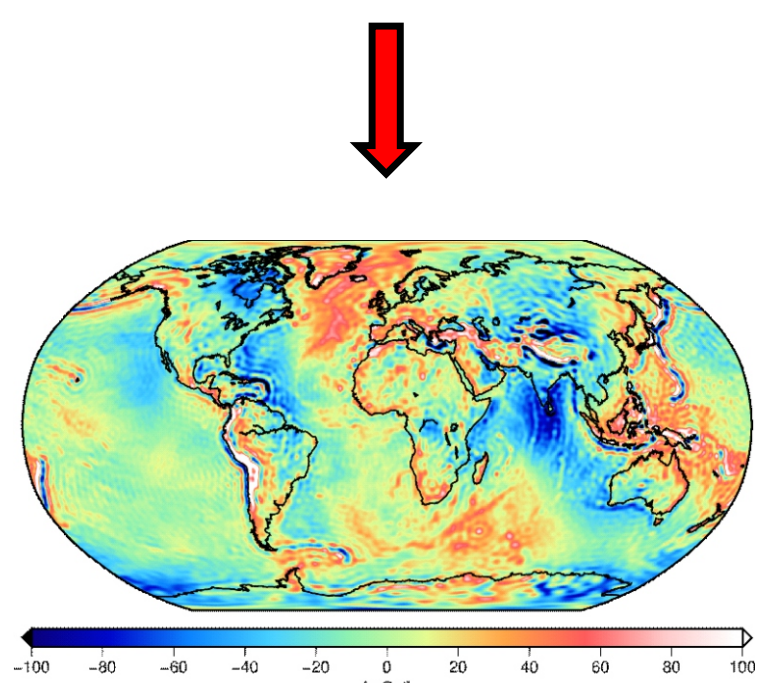
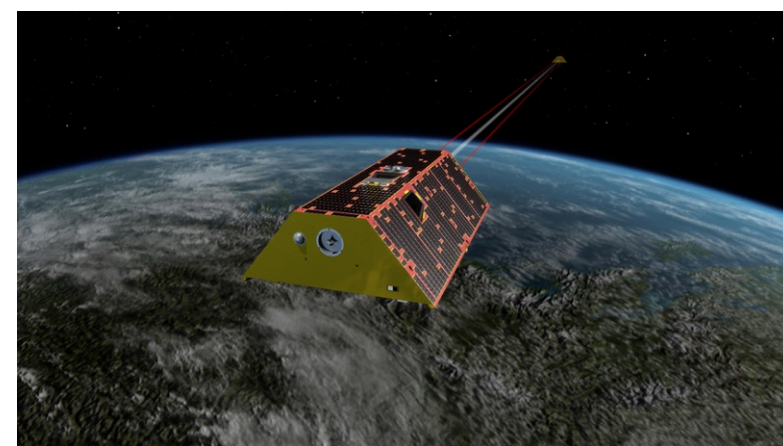


GRACE-FO Release 02

Level-2 Products

In the frame of COST-G different groups generate gravity field solutions based on independent software packages:

- GFZ**: EPOS software
 - CNES**: GINS software
 - AIUB**: Bernese software
 - ITSG**: GROOPS software
 - LUH**: GRACE-SIGMA software
- and Partner Analysis Centers

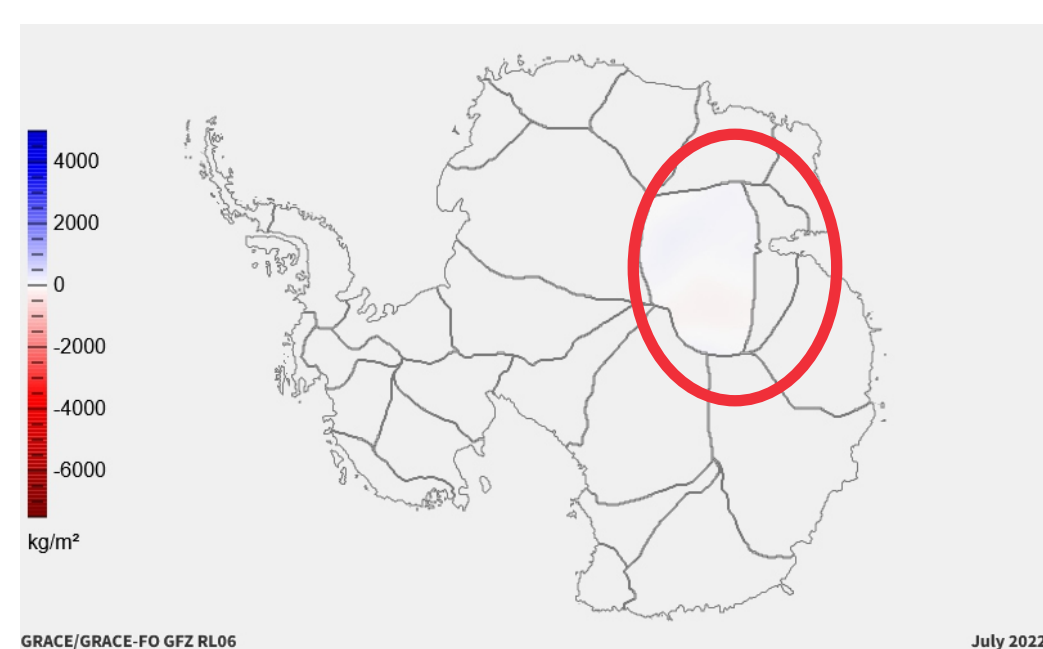
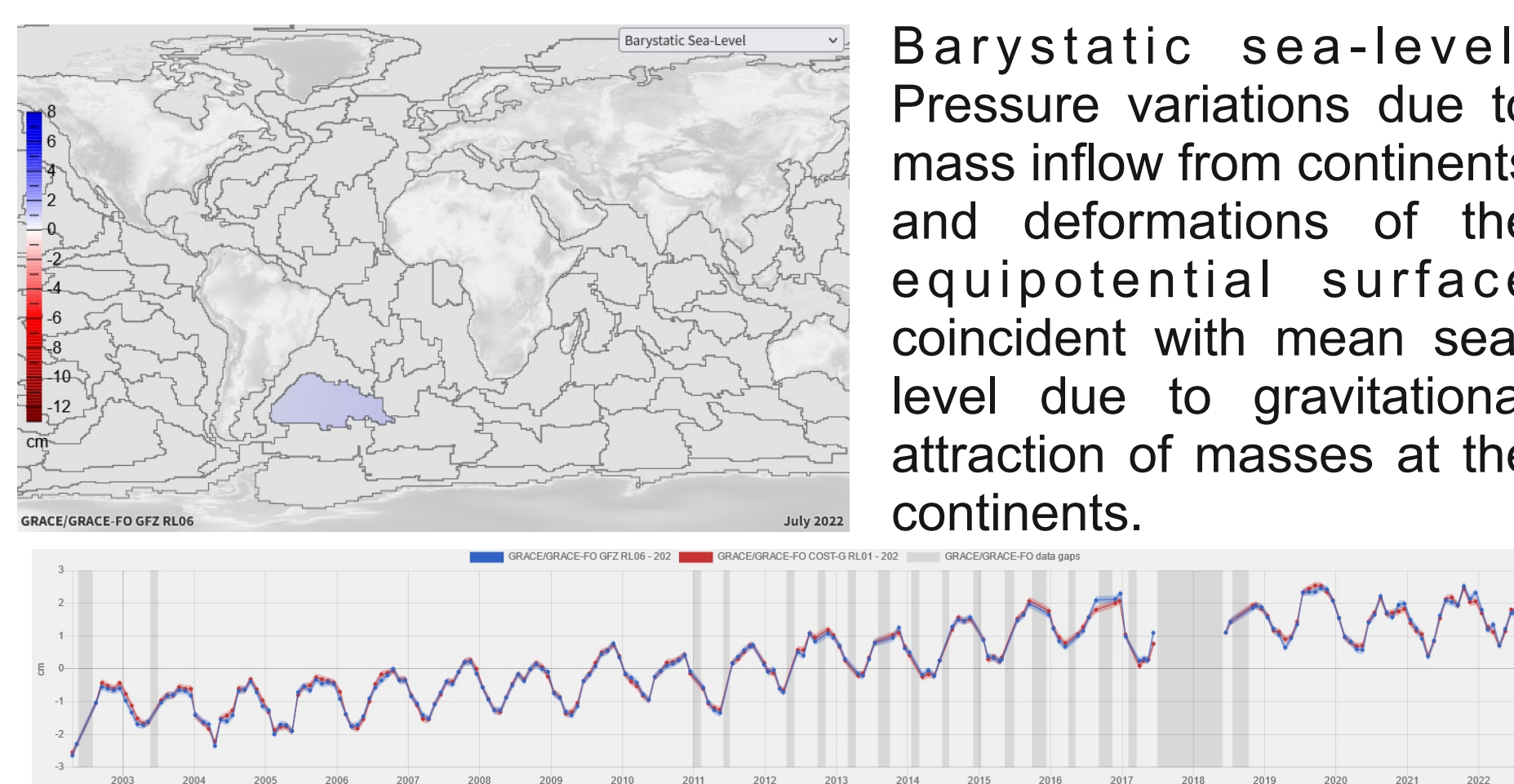


Level-3 Products

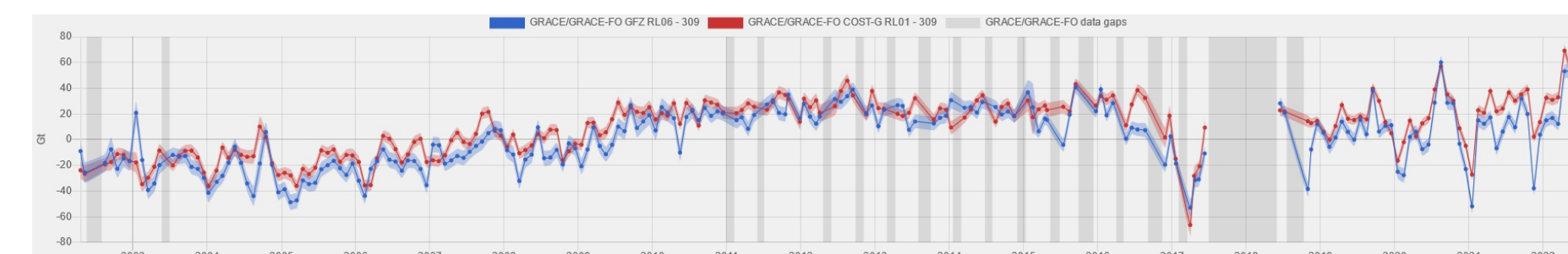
Terrestrial Water Storage (TWS) variability, ocean bottom pressure (OBP) variability, mass changes of the Antarctic and Greenland Ice Sheets are provided in terms of different Level-3 products at the portals GravIS and ISDC:



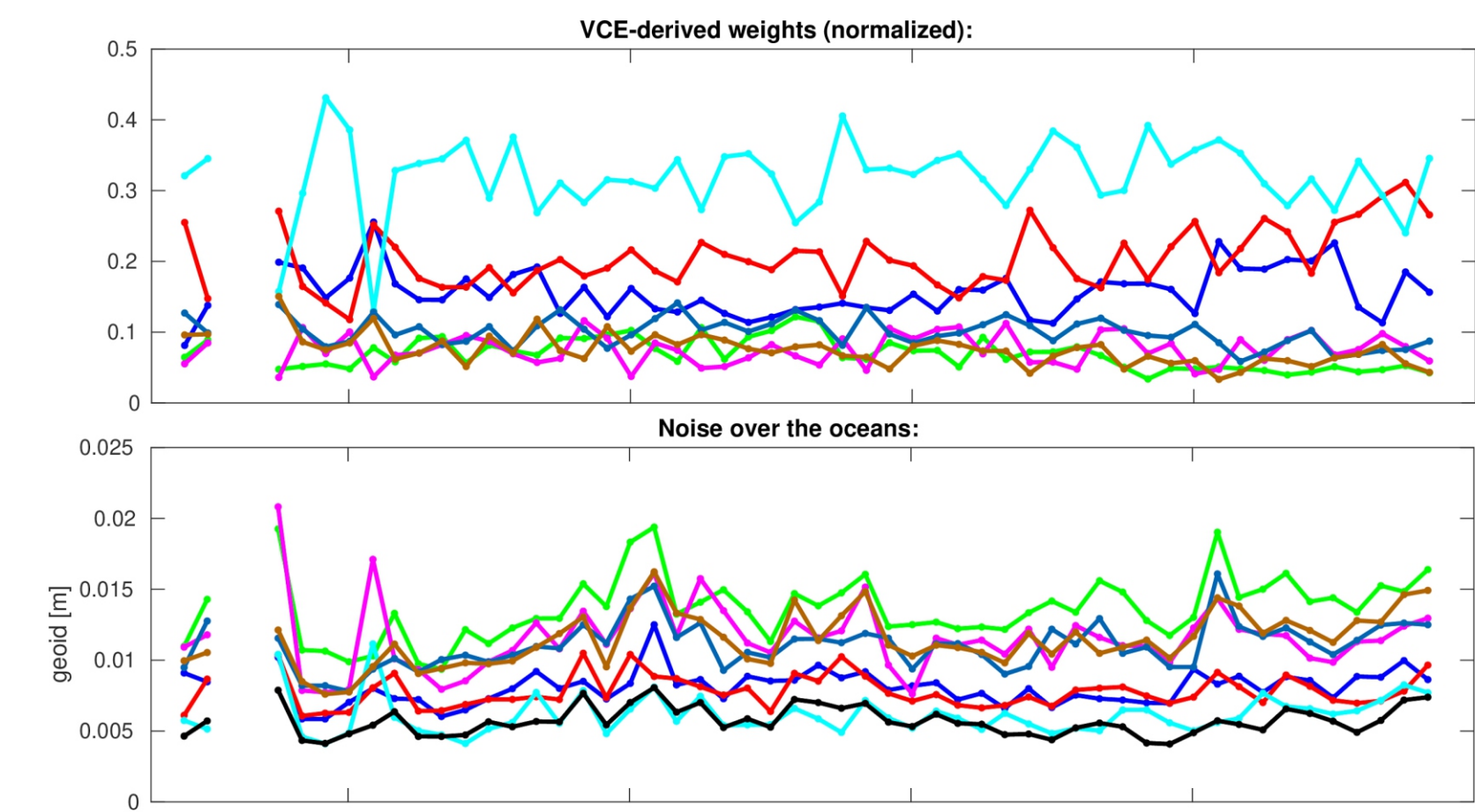
Barystatic sea-level: Pressure variations due to mass inflow from continents and deformations of the equipotential surface coincident with mean sea-level due to gravitational attraction of masses at the continents.



Left: Gridded ice-mass change per surface area for one drainage basin and one month.
Bottom: Time series of storage variations of the selected drainage basin in Gt, including empirical uncertainty estimates.



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

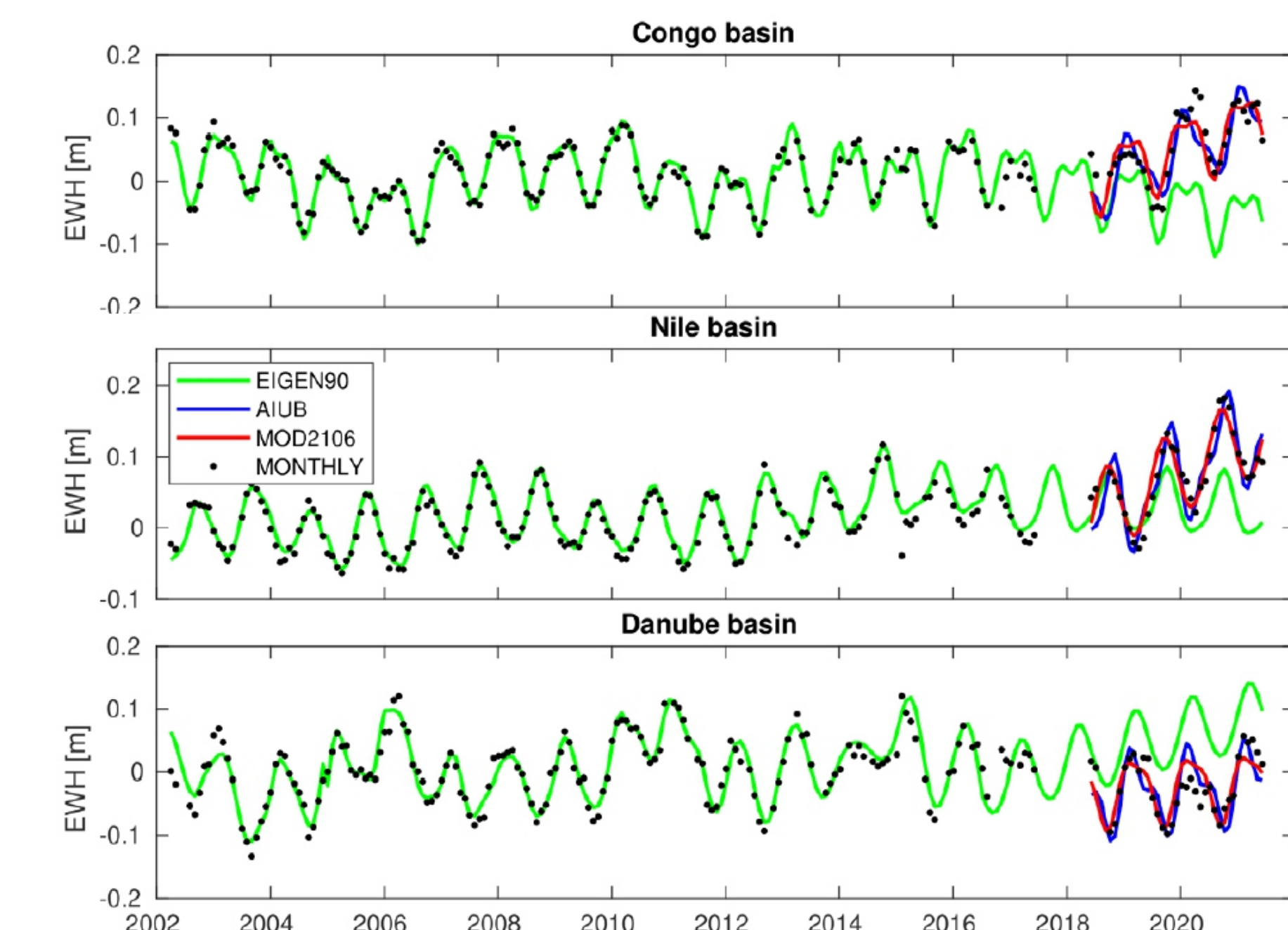


Top: Weights of the combination of monthly GRACE-FO solutions that are adopted for the COST-G Release 02.

Bottom: Noise over the oceans of the monthly GRACE-FO solutions and the combined COST-G solution (labelled COMB).

Fitted Signal Models

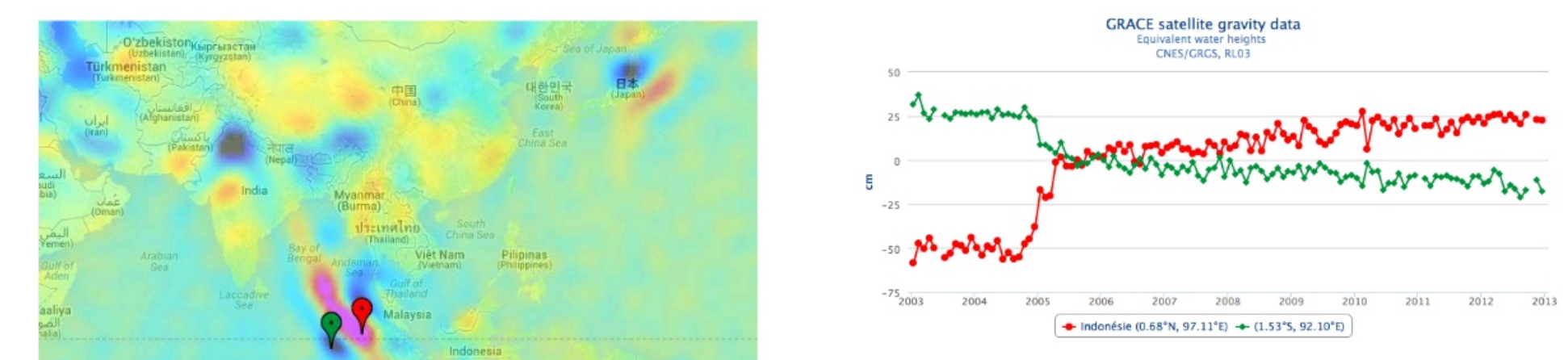
COST-G monthly solutions are fitted by a simple parametric model (offset, trend, seasonal signal) to provide fitted signal models (FSM) that may be used in operational Precise Orbit Determination (POD) activities:



Public Outreach

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

Series title	Data center	Version	Area	Address	Latitude	Longitude	Apply
Series 1	CNES/GRGS	BL03-v1.1	7-hexagon	Bern, Switzerland	46.847622	7.444608	ALL
Series 2	GFZ	BL05-DK05	Point	Oberrathenau, Germany	48.874400	11.262200	ALL
Series 3	CNES	BL05-DK05	Circle	Graz, Austria	47.070714	15.439304	ALL
Series 4	JPL	BL05-DK05	Rectangle	Potsdam, Germany	52.390569	13.064473	ALL
				Hannover, Germany	52.375862	9.752010	ALL
				Luxembourg	49.815173	6.129483	ALL
				Toulouse, France	43.604832	1.444209	ALL
				Brussels, European Centre	50.842317	4.370471	ALL
				Geneva, Switzerland	46.212155	12.056717	ALL
				Iran, Province d'Ardebil	37.385404	48.373454	ALL
				Kazakhstan, District de Jy	46.937235	53.227348	ALL



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- (1) University of Bern, Switzerland
- (2) GFZ Potsdam, Germany
- (3) TU Graz, Austria
- (4) CNES, France
- (5) Stellar Space Studies, France
- (6) Leibniz Universität Hannover, Germany

Dissemination

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



Welcome to COST-G

The International Combination Service for Time-variable Gravity Fields (COST-G) is a product center of the International Gravity Field Service (IGFS) and is dedicated to the combination of monthly global gravity field models. COST-G stems from the activities of the former I2020 project European Gravity Service for Improved Emergency Management (EGSIEM) and is further developed within the follow-up project Global Gravity-based Groundwater Product (G3P), which is funded from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 870353 (funding period 2020-2022).

Please use the top menu to visit the various parts of our website!

Latest News
April 18th 2023
COST-G GRACE-FO RL02 is now available at ICGEM.
New input time-series of RL02 are: GFZ-, JPL-, CSR-RL05.1.

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

Gravity Field Solutions for dedicated Time Periods			
The following gravity field time series are presently available:			
GRACE and GRACE-FO solutions from the Science Data System centers: CSR, GFZ and JPL			colspan=3
CSR	Center for Space Research at University of Texas, Austin		
CSR Release 05	ICGEM Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
CSR Release 06	ICGEM Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
CSR Release 06 (GPO)	ICGEM Level-2 Processing Standards Document, V. 1.1 June 4, 2019		
GFZ	German Research Aerospace Establishment (DLR) Center for Earth System Research		
GFZ Release 05	GFZ (GRACE) Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
GFZ Release 06	GFZ (GRACE) Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
GFZ Release 06 (GPO)	GFZ (GRACE) Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
JPL	Jet Propulsion Laboratory		
JPL Release 05	JPL Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
JPL Release 06	JPL Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
JPL Release 06 (GPO)	JPL Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
The processing standards to generate the GRACE Level-2 products of CSR, GFZ and JPL are also available in the Document Section of the GRACE archives at GFZ, ISDC or JPL PODAAC			
COST-G International Combination Service for Time-variable Gravity Fields			
FSM	ICGEM Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
FSM-FO-RL01	ICGEM Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
FSM-FO-RL02	ICGEM Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		
FSM-RL01	ICGEM Level-2 Processing Standards Document, Rev. 4.0 May 20, 2012		
FSM-RL02	ICGEM Level-2 Processing Standards Document, Rev. 5.0 April 10, 2019		

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 is planning to include several GRACE/GRACE-FO ACs from China in the near future.

In collaboration with and supported by



Acknowledgement

The international COST-G team is receiving support from the International Space Science Institute (ISSI) in Bern, Switzerland, and from the ISSI-Beijing, China. G3P was funded by the European Union's Horizon 2020 Research and Innovation Programme, Grant Agreement no. 870353.

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