

## COST-G combination of Swarm gravity fields of different analysis centers

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### Swarm Data Quality Workshop

Prague, Czech Republic

16 – 20 September, 2019

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Funded by **ESA** Swarm DISC contract SD-ITT-1.1,  
part of contract 000109587/13/I-NB



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# International Association of Geodesy

Int. Gravity  
Field Service



Int. Earth  
Rotation  
Service



Int. Gravimetric  
Bureau



Int. Geoid Service



Permanent  
Service for  
Mean Sea Level



IGS INTERNATIONAL  
GNSS SERVICE



Int. Geodynamics and  
Earth Tide Service

Bureau  
International des  
Poids et  
Mesures



Int. Laser  
Ranging  
Service

Int. Center for Global  
Earth Models



Int. DEM Service




Int. VLBI  
Service



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# COST-G: Products



Combination Service for Time-variable Gravity Fields

Home Introduction Consortium Service **Products** Documents Contact The COST-G Plotter

## Products

COST-G provides a number of products via different platforms and channels:

### GRACE

**Level 2** – Products are sets of spherical harmonic coefficients which stem from the combination on solution or normal equation level. The coefficients need to be processed by a spherical harmonic synthesis in order to derive gridded data. They are available at the International Center for Global Gravity Earth Models (ICGEM): [http://icgem.gfz-potsdam.de/series/03\\_COST-G/GRACE](http://icgem.gfz-potsdam.de/series/03_COST-G/GRACE)

**Level 2b** – Products will be available soon.

**Level 3** – Products will be available soon.

### GRACE Follow-On

**Level 2** – Products will be available soon.

**Level 2b** – Products will be available soon.

**Level 3** – Products will be available soon.

### Swarm

**Level 2** – products are a combination of different kinematic orbit products and various gravity field recovery approaches. Data is available at the International Center for Global Gravity Earth Model (ICGEM): [http://icgem.gfz-potsdam.de/series/03\\_COST-G/Swarm](http://icgem.gfz-potsdam.de/series/03_COST-G/Swarm)

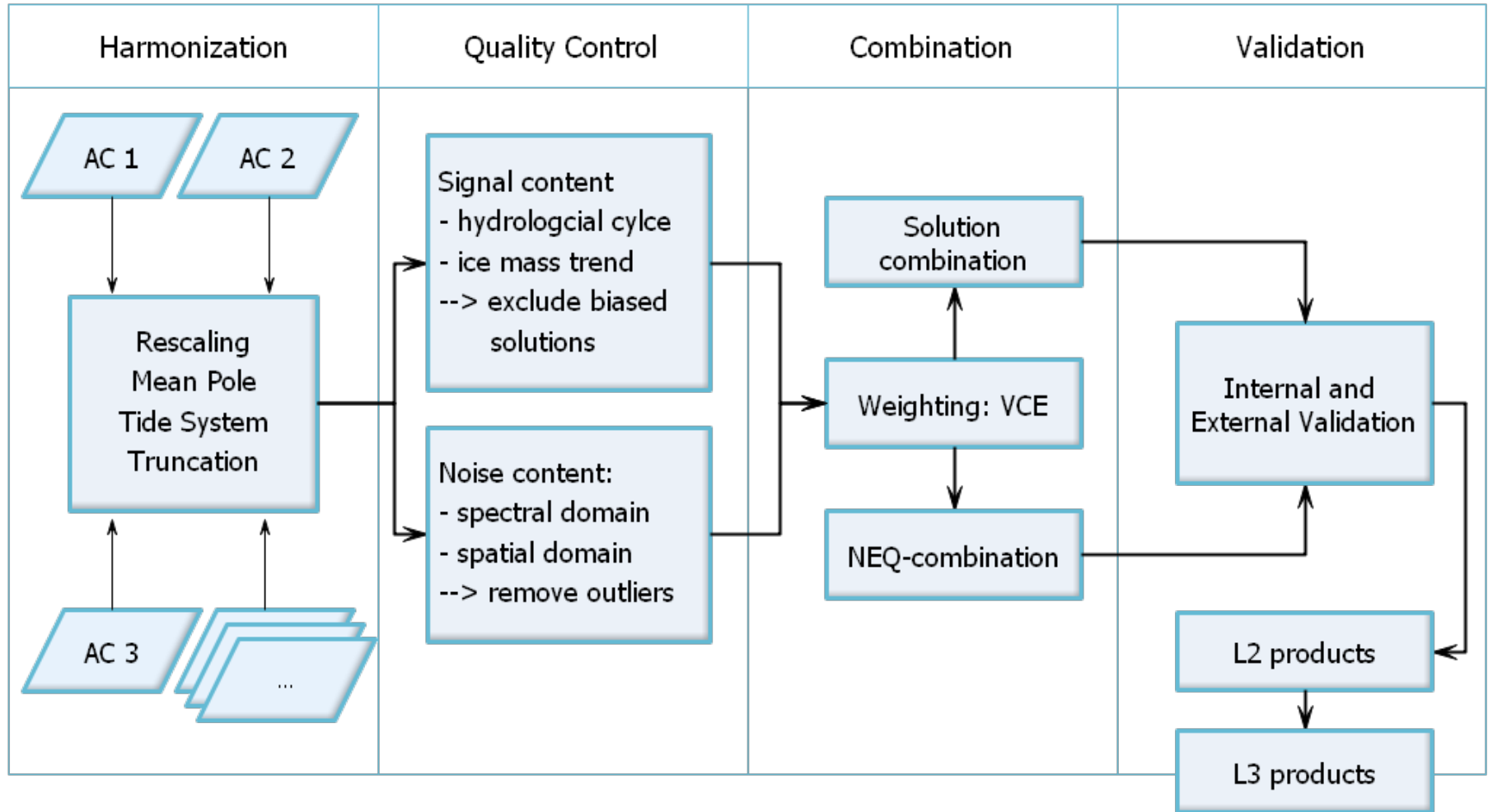


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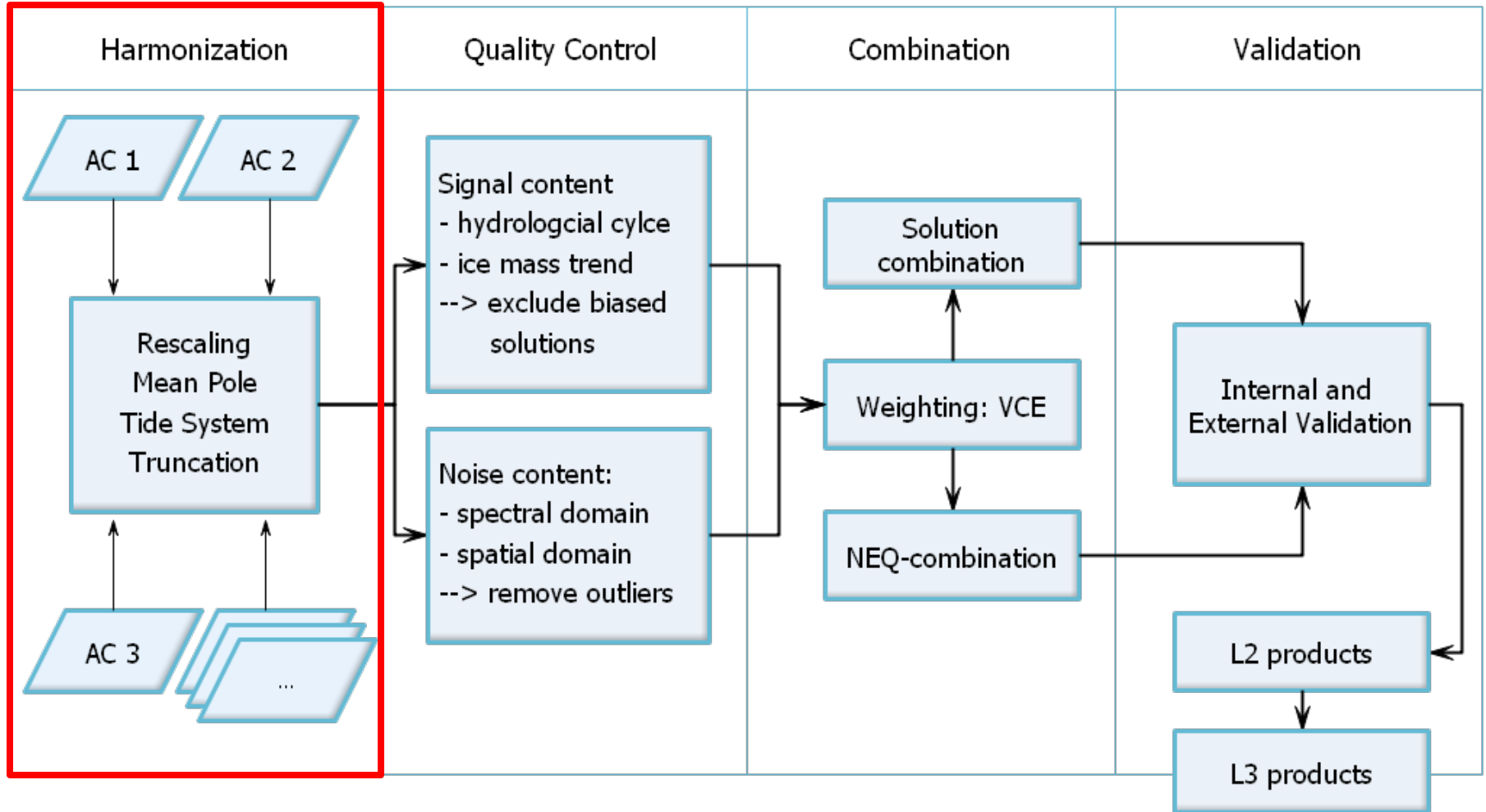
# COST-G: Workflow

## Combination Process



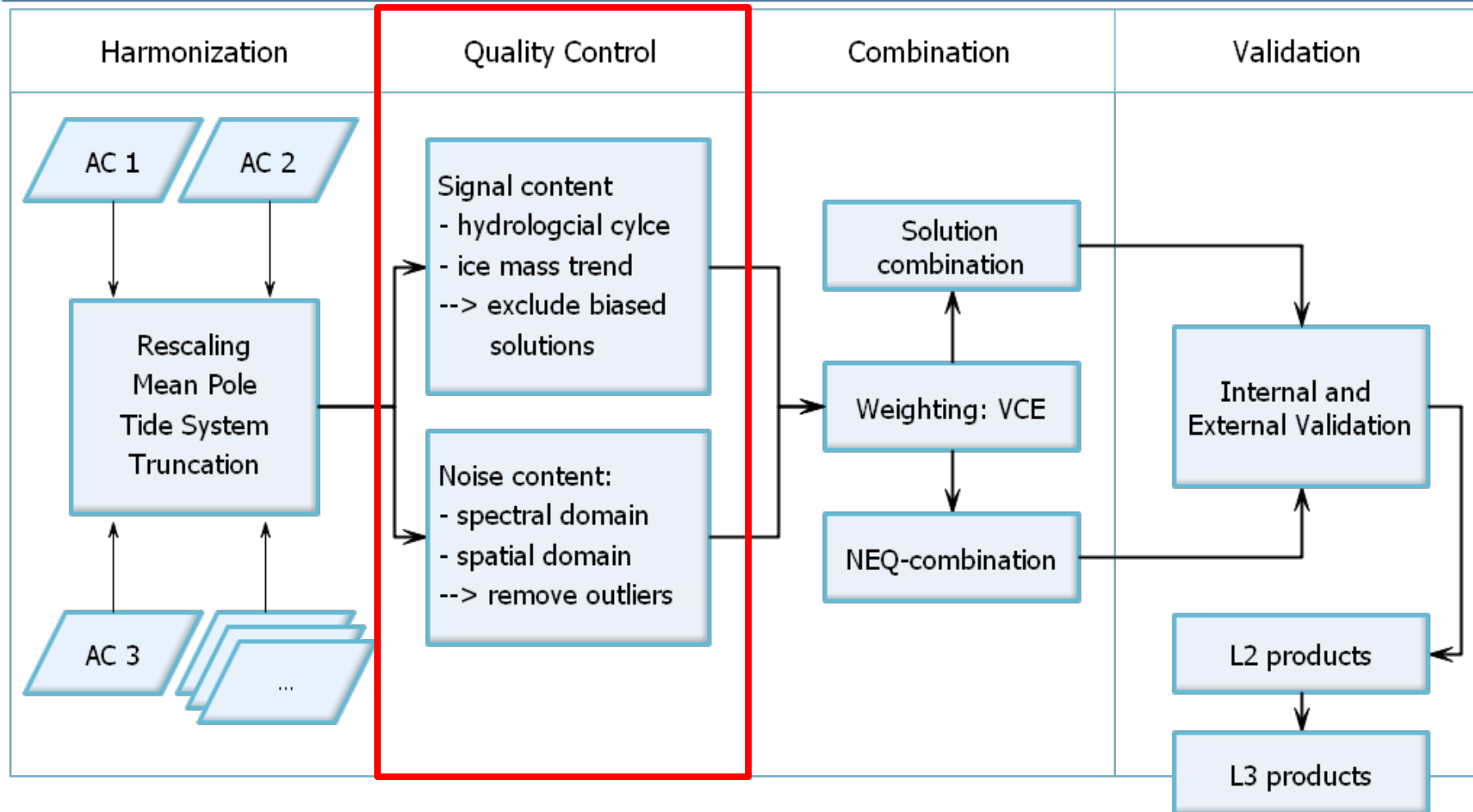
# COST-G: Harmonization

## Combination Process



# COST-G: Quality Control

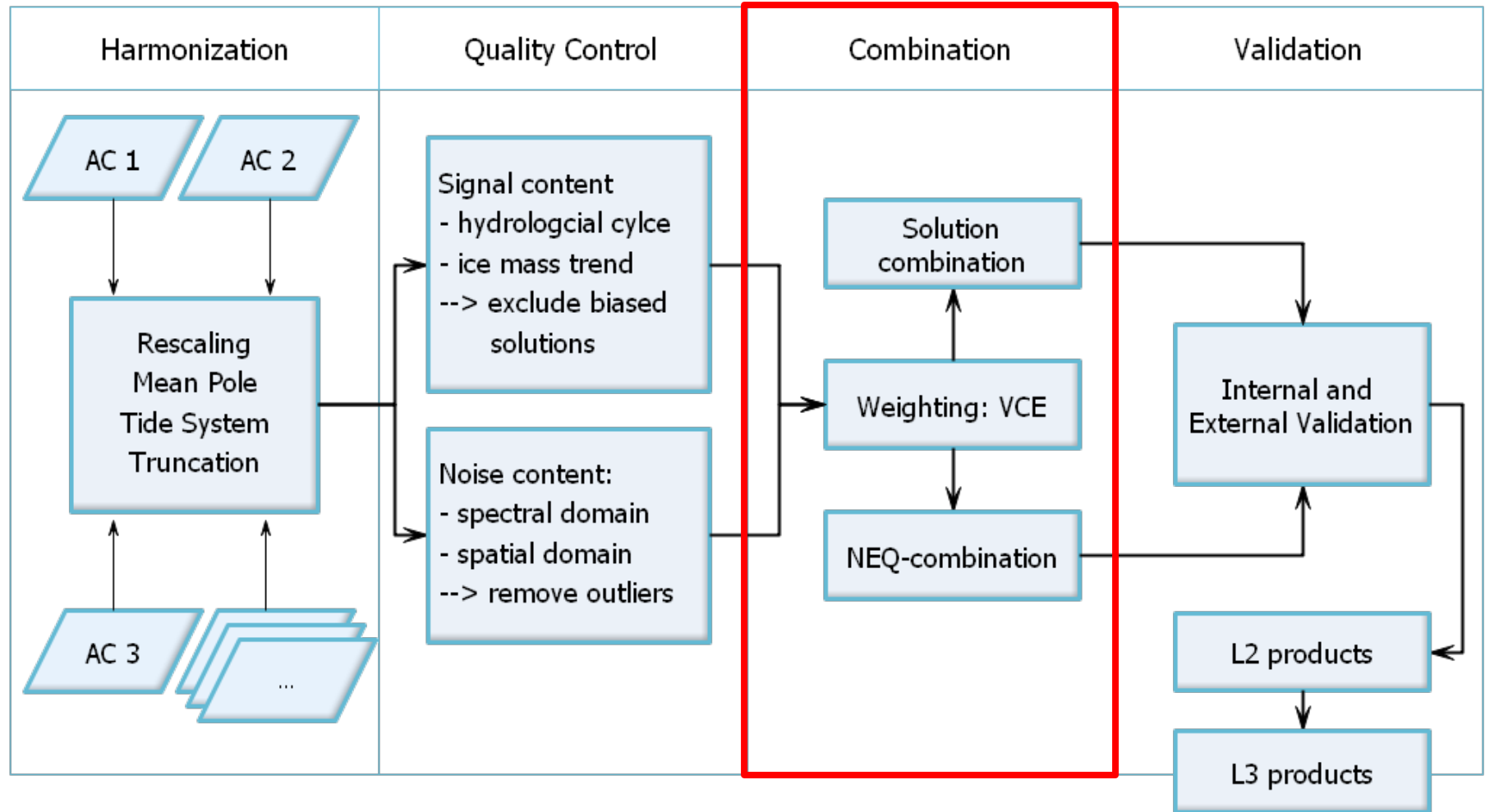
## Combination Process





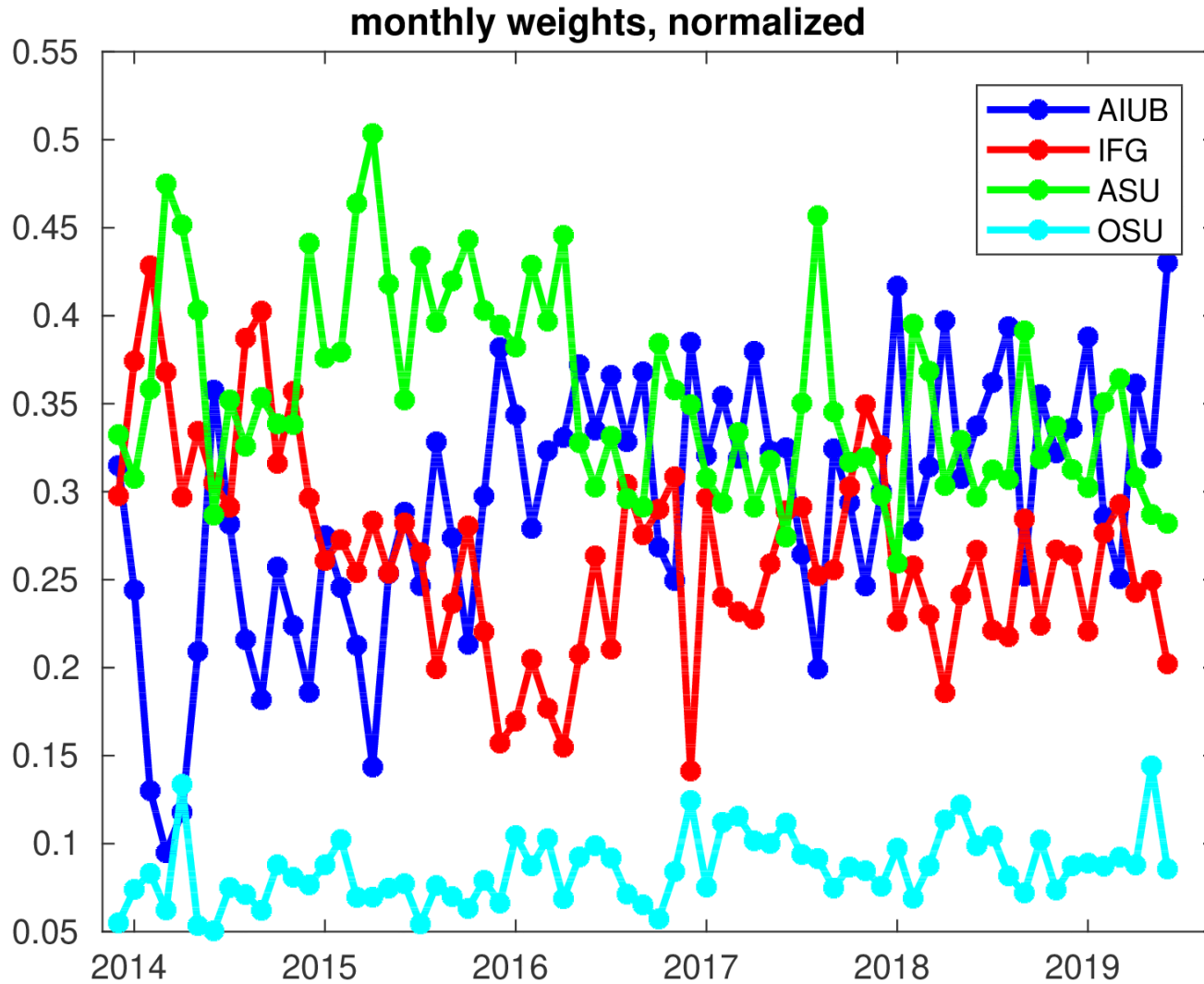
# COST-G: Combination

## Combination Process



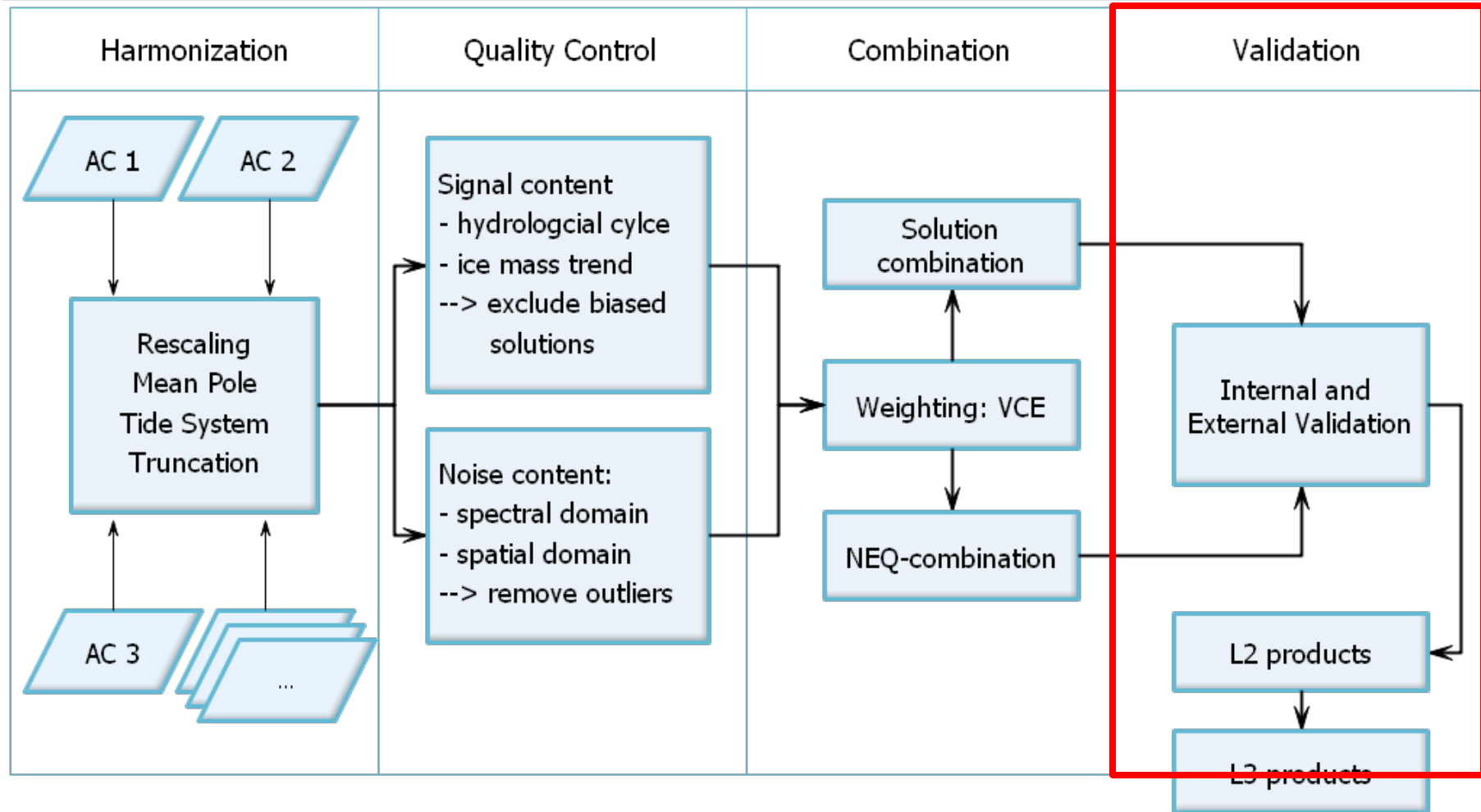


# Variance Component Estimation

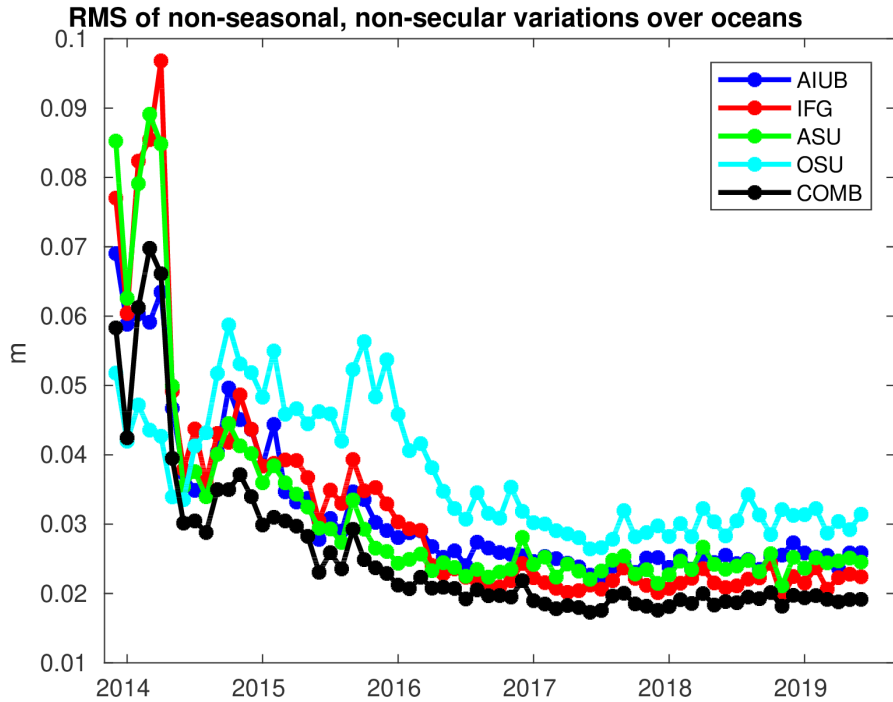


# COST-G: Validation

## Combination Process

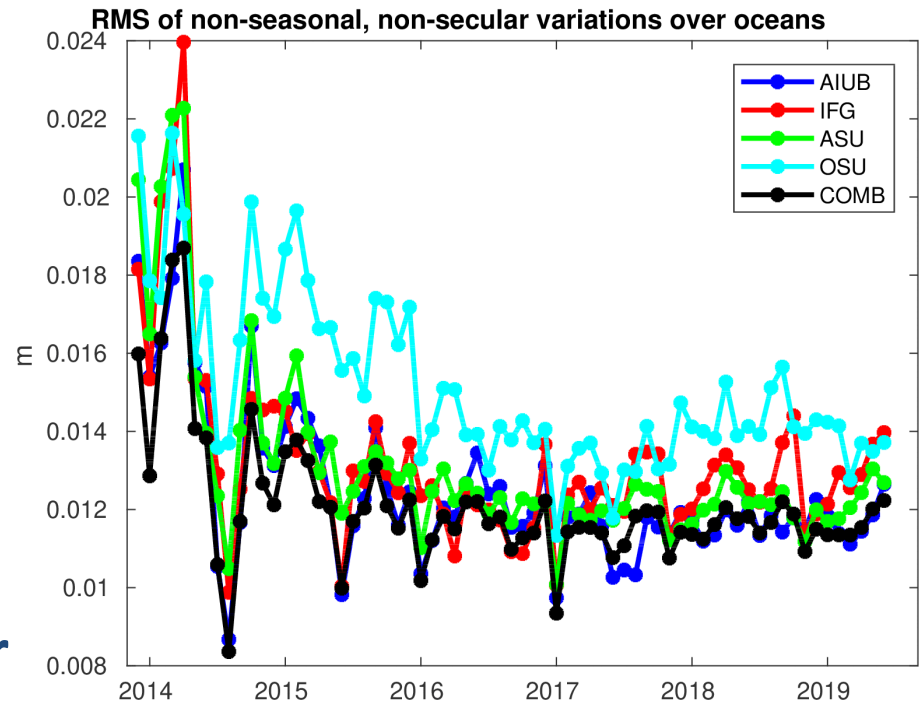


# Noise Levels of Swarm Gravity Fields

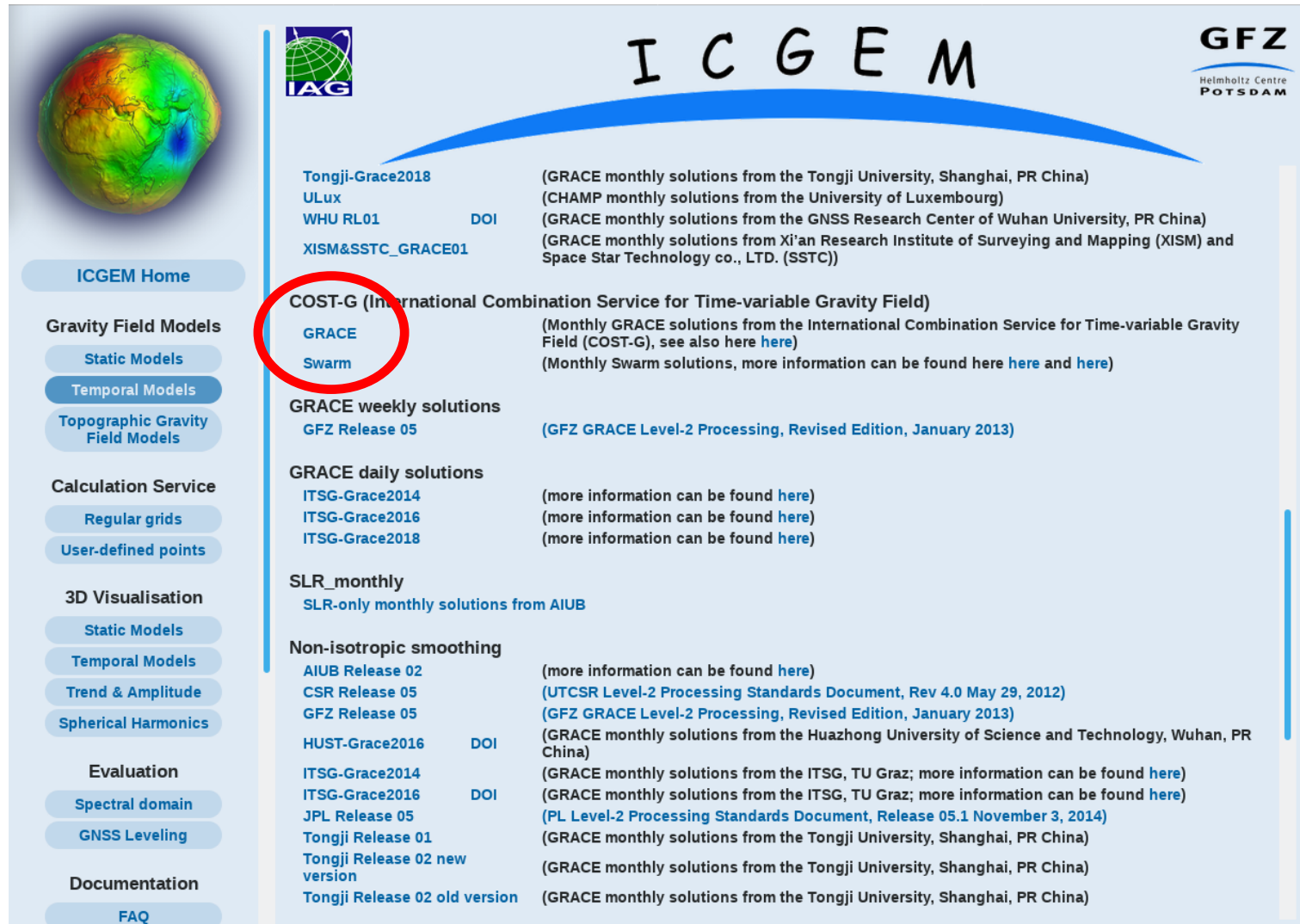


Smoothed by 400 km Gauss filter

Unfiltered



# Product Dissemination



The screenshot shows the ICGEM website interface. On the left is a navigation menu with categories like Gravity Field Models, Calculation Service, 3D Visualisation, Evaluation, and Documentation. The main content area features the ICGEM logo and a list of products. The 'COST-G' link is highlighted with a red circle. The GFZ logo is in the top right corner.

**ICGEM**

**GFZ**  
Helmholtz Centre  
POTSDAM

**Tongji-Grace2018** (GRACE monthly solutions from the Tongji University, Shanghai, PR China)  
**ULux** (CHAMP monthly solutions from the University of Luxembourg)  
**WHU RL01** DOI (GRACE monthly solutions from the GNSS Research Center of Wuhan University, PR China)  
**XISM&SSTC\_GRACE01** (GRACE monthly solutions from Xi'an Research Institute of Surveying and Mapping (XISM) and Space Star Technology co., LTD. (SSTC))

**COST-G (International Combination Service for Time-variable Gravity Field)**  
**GRACE** (Monthly GRACE solutions from the International Combination Service for Time-variable Gravity Field (COST-G), see also here [here](#))  
**Swarm** (Monthly Swarm solutions, more information can be found here [here](#) and [here](#))

**GRACE weekly solutions**  
**GFZ Release 05** (GFZ GRACE Level-2 Processing, Revised Edition, January 2013)

**GRACE daily solutions**  
**ITSG-Grace2014** (more information can be found [here](#))  
**ITSG-Grace2016** (more information can be found [here](#))  
**ITSG-Grace2018** (more information can be found [here](#))

**SLR\_monthly**  
SLR-only monthly solutions from AIUB

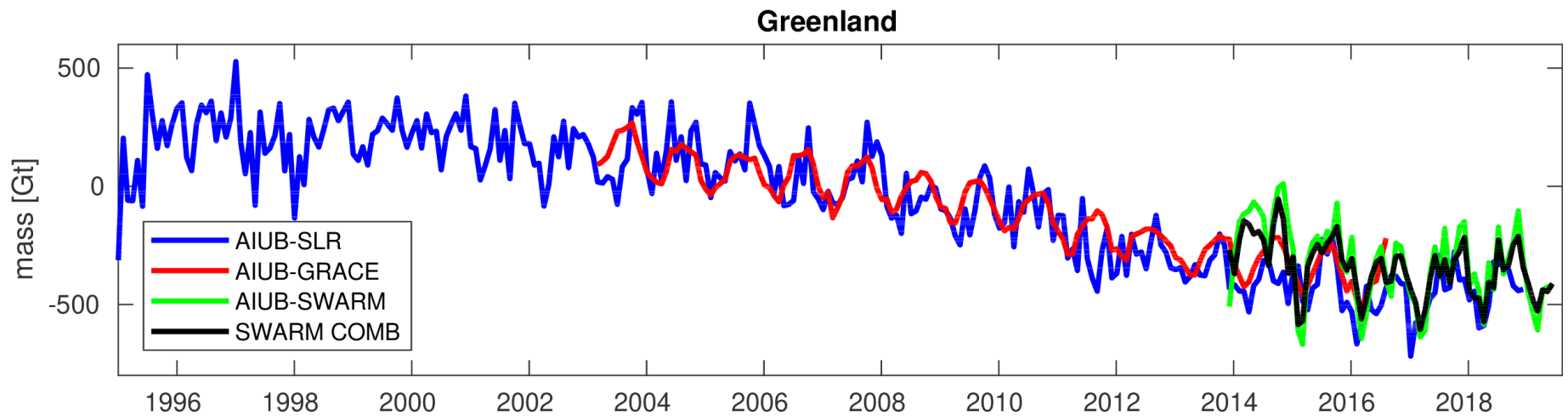
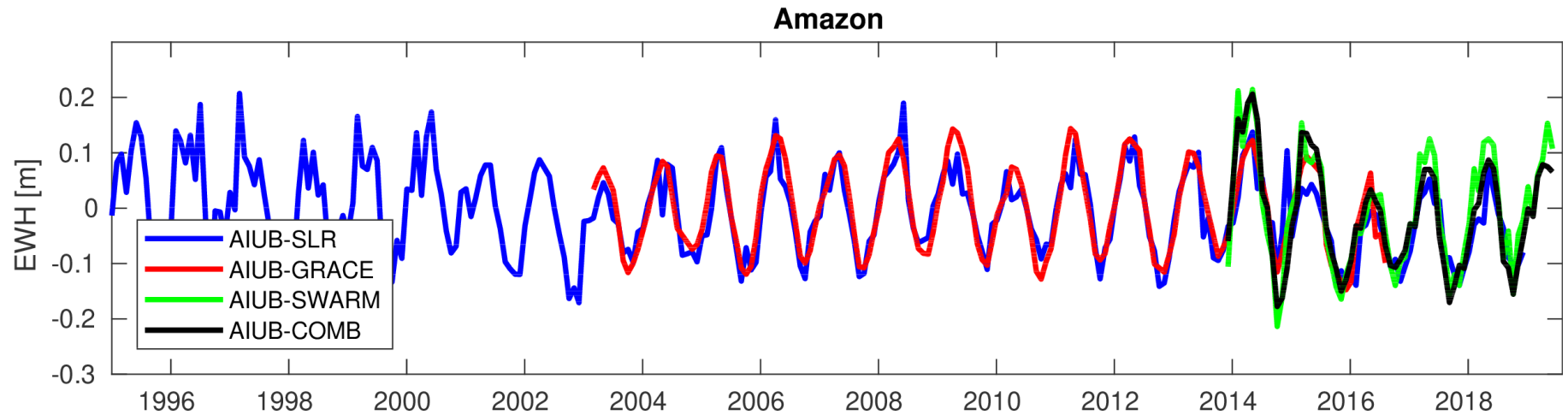
**Non-isotropic smoothing**  
**AIUB Release 02** (more information can be found [here](#))  
**CSR Release 05** (UTCSR Level-2 Processing Standards Document, Rev 4.0 May 29, 2012)  
**GFZ Release 05** (GFZ GRACE Level-2 Processing, Revised Edition, January 2013)  
**HUST-Grace2016** DOI (GRACE monthly solutions from the Huazhong University of Science and Technology, Wuhan, PR China)  
**ITSG-Grace2014** (GRACE monthly solutions from the ITSG, TU Graz; more information can be found [here](#))  
**ITSG-Grace2016** DOI (GRACE monthly solutions from the ITSG, TU Graz; more information can be found [here](#))  
**JPL Release 05** (PL Level-2 Processing Standards Document, Release 05.1 November 3, 2014)  
**Tongji Release 01** (GRACE monthly solutions from the Tongji University, Shanghai, PR China)  
**Tongji Release 02 new version** (GRACE monthly solutions from the Tongji University, Shanghai, PR China)  
**Tongji Release 02 old version** (GRACE monthly solutions from the Tongji University, Shanghai, PR China)



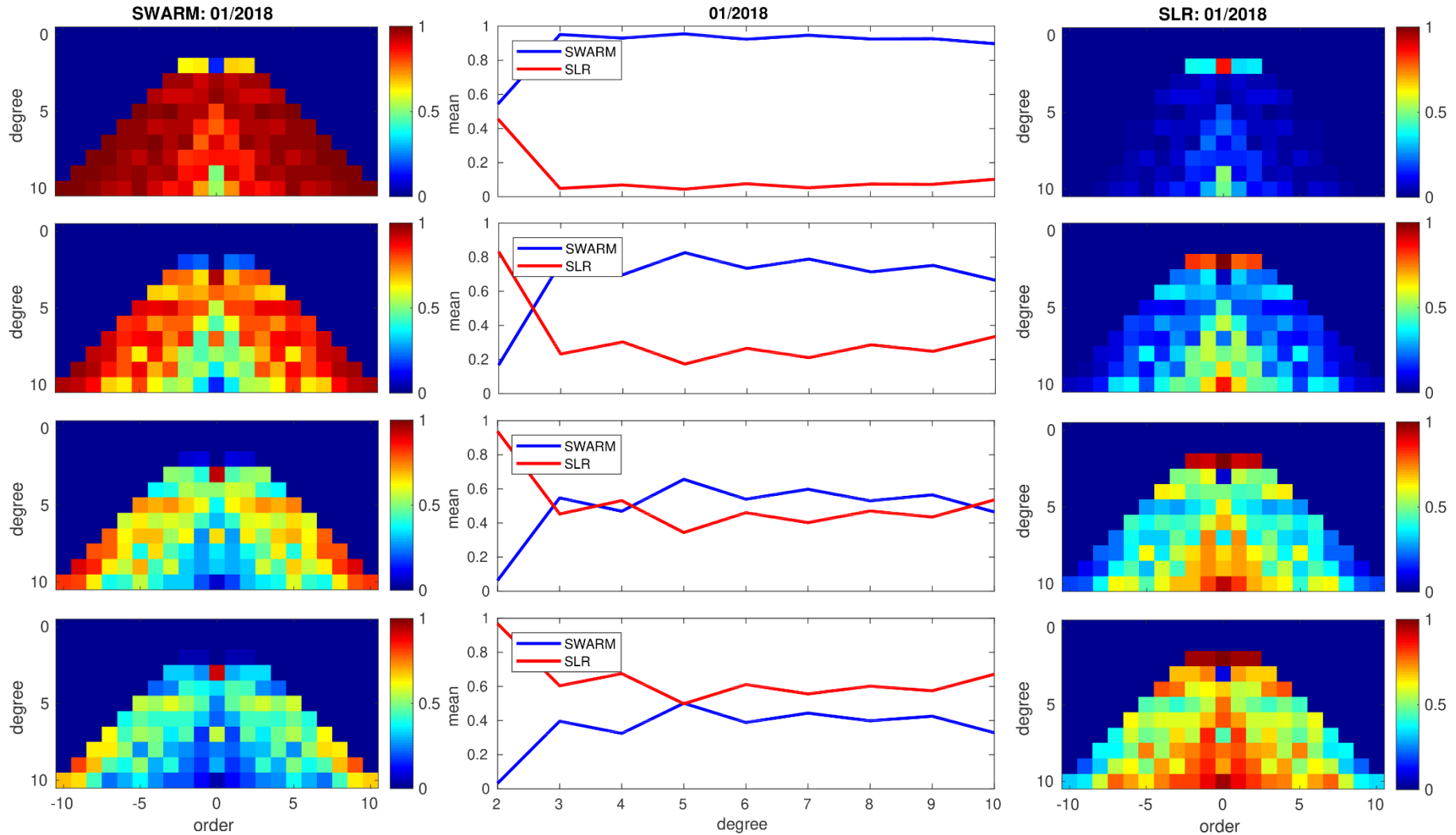
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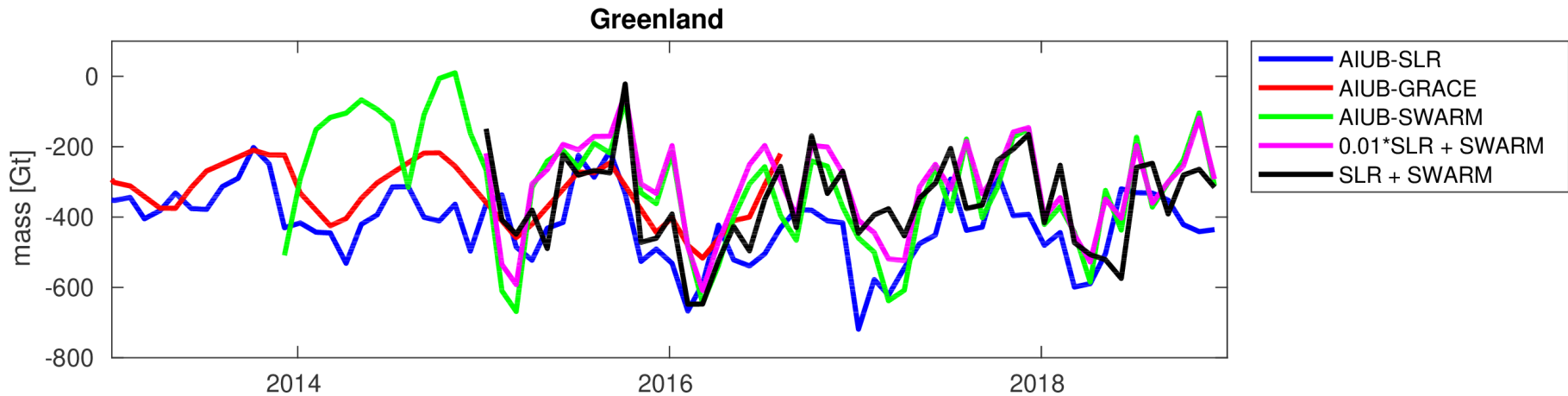
# Application of Swarm Gravity Fields



# Swarm / SLR Combination



# Swarm / SLR Combination



## Conclusions:

- Swarm monthly gravity fields are determined by several analysis centers (AIUB, ASU, IfG, OSU)
- Swarm gravity fields are combined by COST-G, the new product center of the IGFS (IAG)
- L2 products (spherical harmonic representation) are available at ICGEM
- Swarm gravity fields are useful, e.g., to bridge the gap between GRACE and GRACE-FO