

EGSIEM

European Gravity Service for Improved Emergency Management

Title: **Preliminary L3 Products**

Presenter: AK

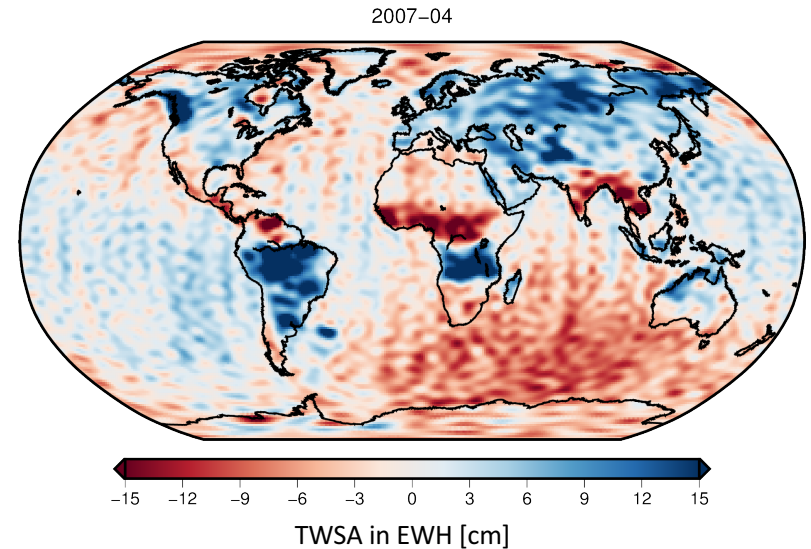
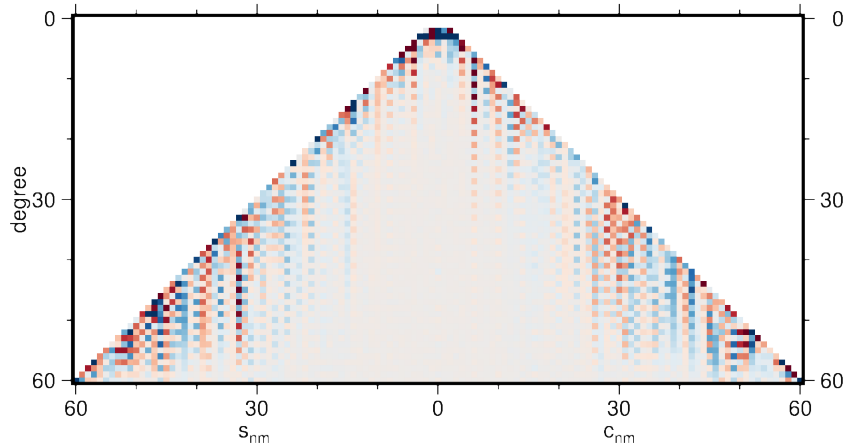
Affiliation: TUG

EGSIEM Meeting Bern,
18.01.2017 - 19.01.2017

Preliminary L3 Products - Overview

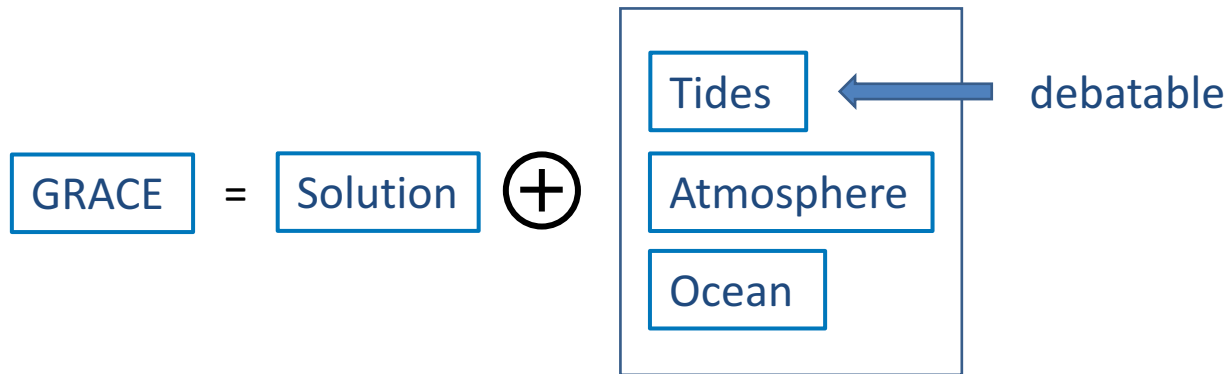
Preliminary L3 Products - Overview

- Definition: user friendly data products derived from potential coefficients
- Generally: gridded mass anomalies (deviations from long term mean) in terms of liquid water equivalent



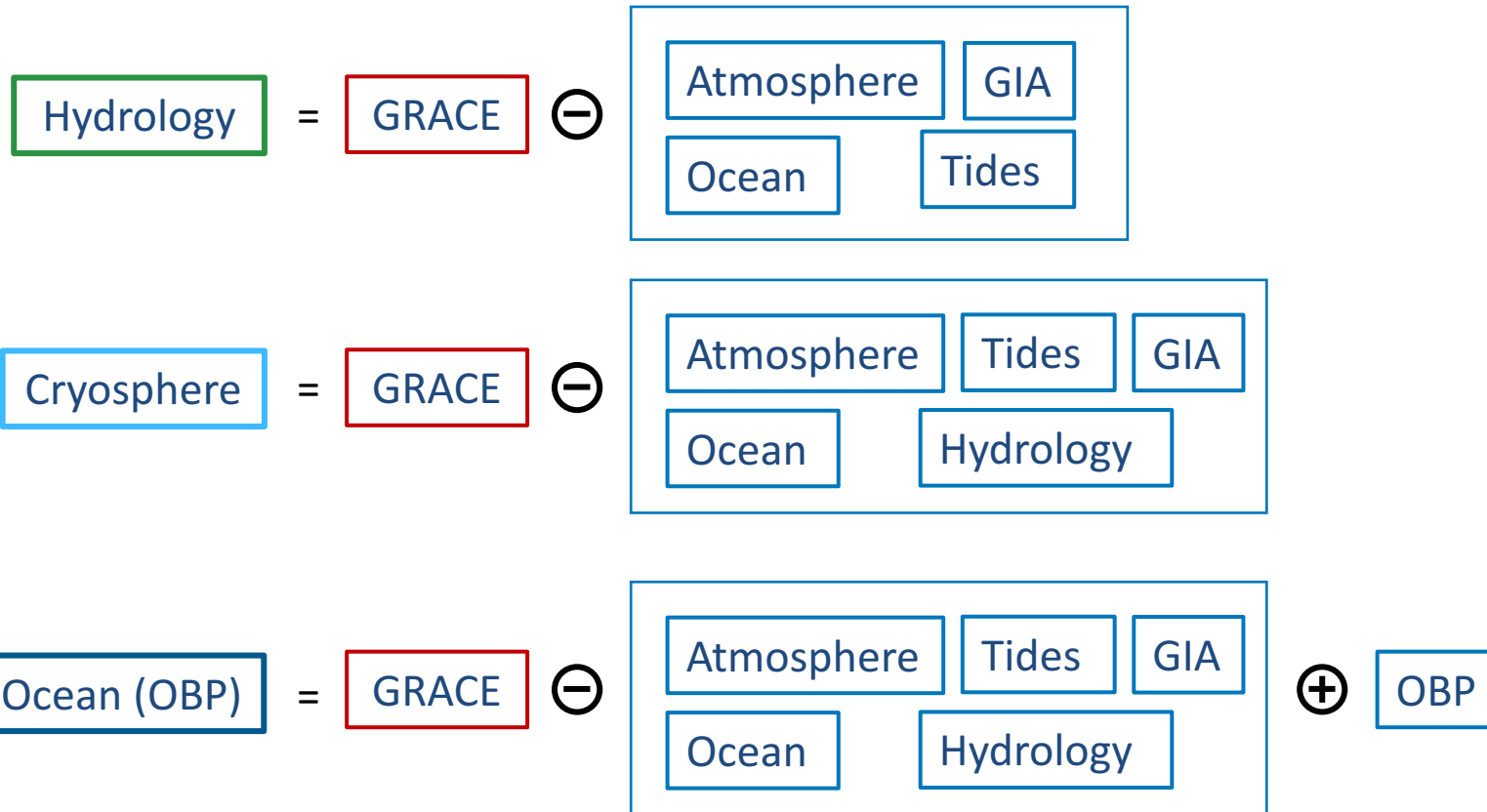
Preliminary L3 Products - Approach

- GRACE measures the total mass change in all geophysical subsystems
 - Signal separation requires models
- GRACE solutions are dominated by high frequency noise
 - Spatial low pass filter required
- GRACE “observation”: estimated monthly solution with all background models restored, transformed to center of figure (CF)



Preliminary L3 Products - Approach

- Gridded mass products will be available for hydrology, cryosphere and ocean applications



Preliminary L3 Products - Used Models

Constituent	Model	Temporal Mean
Hydrology	WGHM	Estimate
Cryosphere	-	-
Ocean	GAB	Estimate
Atmosphere	GAA	Estimate
OBP	GAD	Estimate
GIA	Geruo A (Tellus)	Zero
Ocean Tides	EOT11a	Zero
Pole Tide/Ocean Pole Tide	IERS 2010	Zero
Transformation CM to CF	SLR (AIUB)	Estimate

Preliminary L3 Products – Spatial Filter

Preliminary L3 Products - Spatial Filter

- Anisotropic filter using full GRACE covariance matrix
 - Equivalent to Kaula-constrained monthly solution
- Signal covariance is expressed as Kaula-type function (similar to DDK filters)



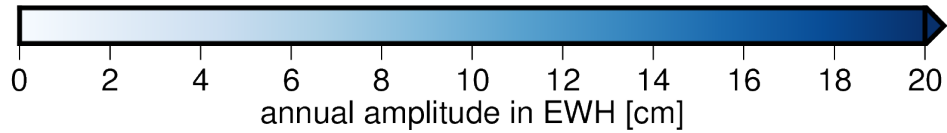
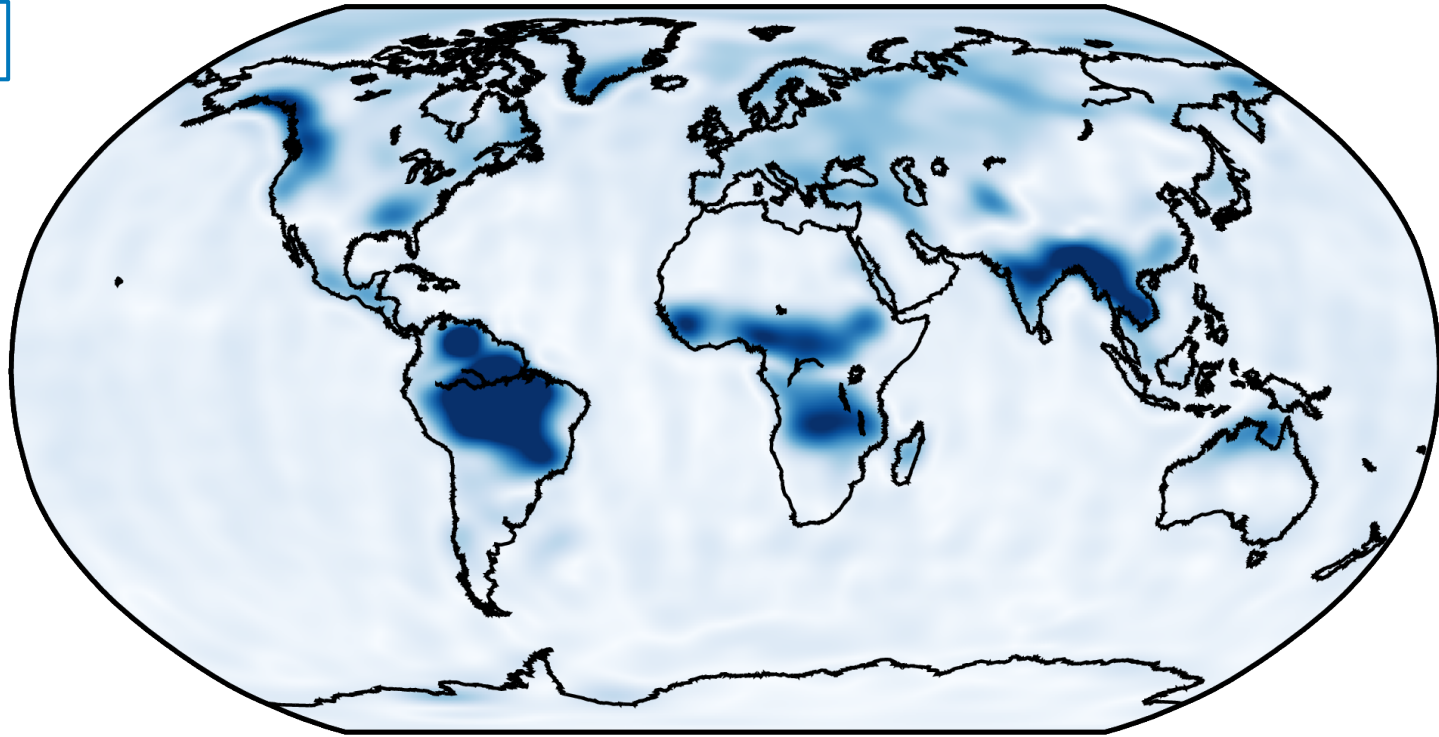
- Time varying
- Takes into account instrument noise, data gaps and orbit



- Time varying
- Large filter matrix (upper triangle ~ 250Mb)

Preliminary L3 Products - Spatial Filter

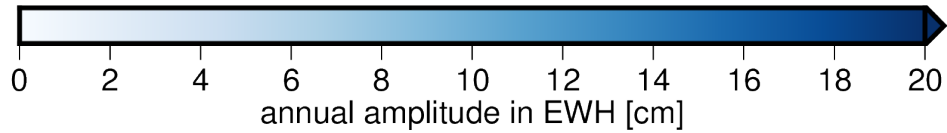
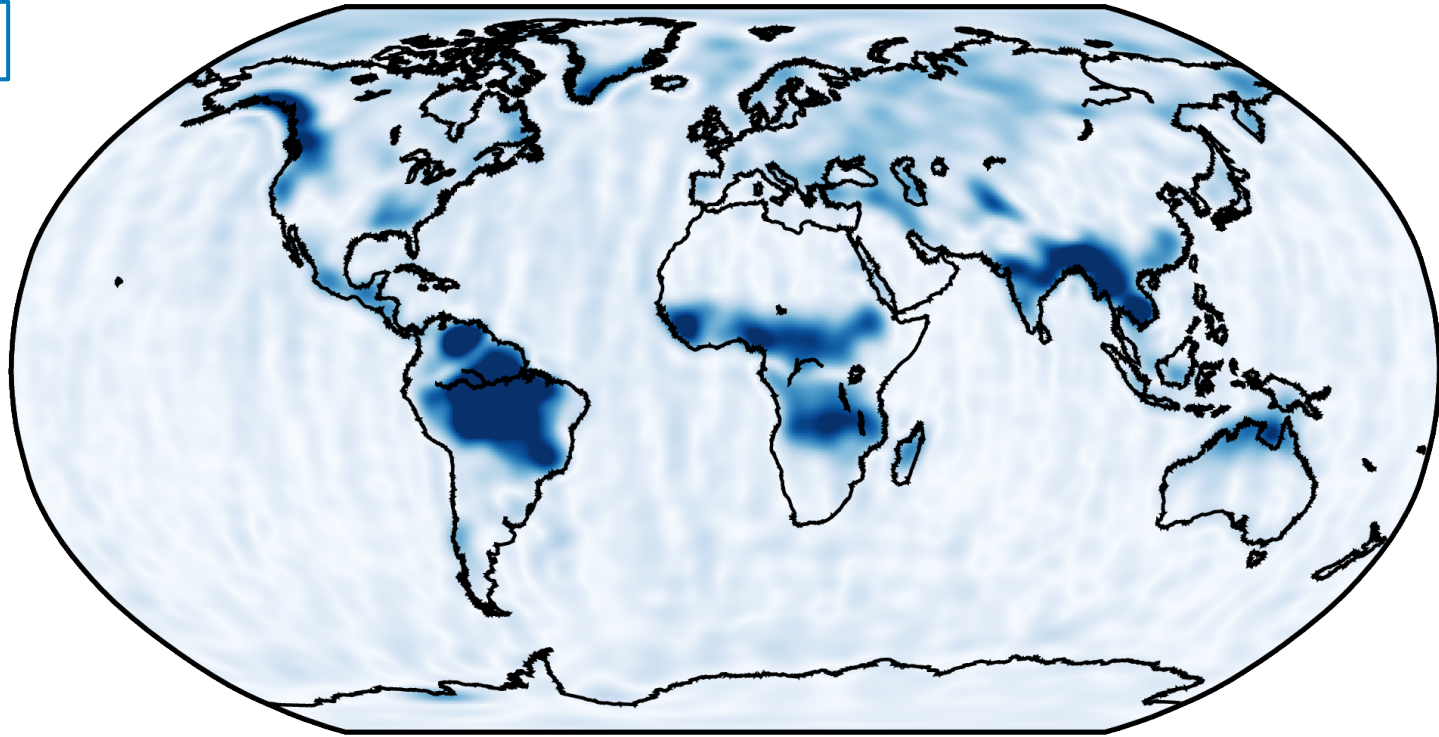
DDK3



max: 59cm

Preliminary L3 Products - Spatial Filter

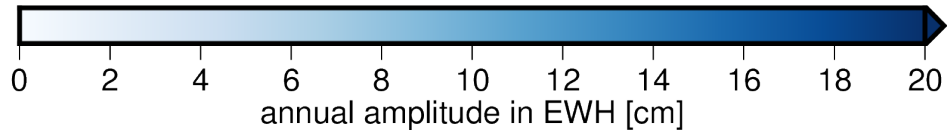
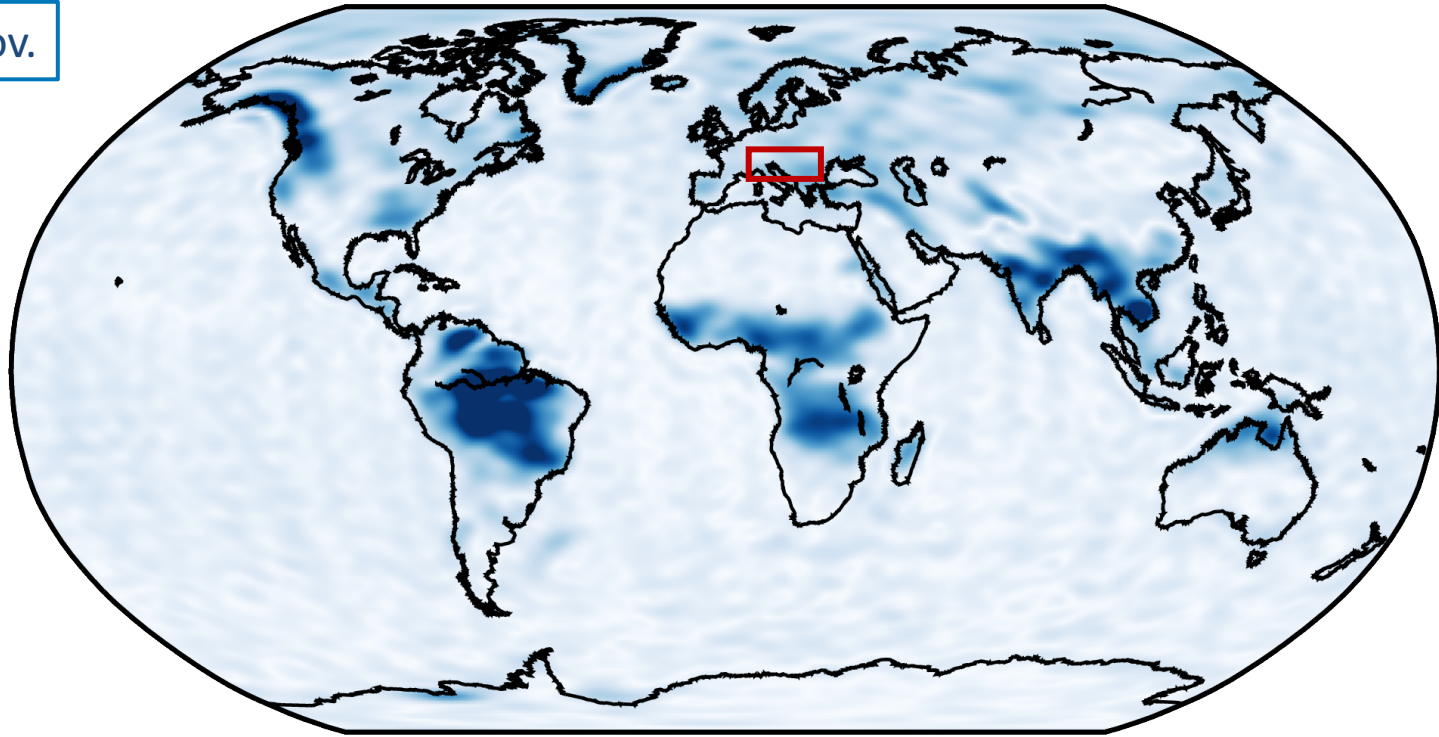
DDK4



max: 60 cm

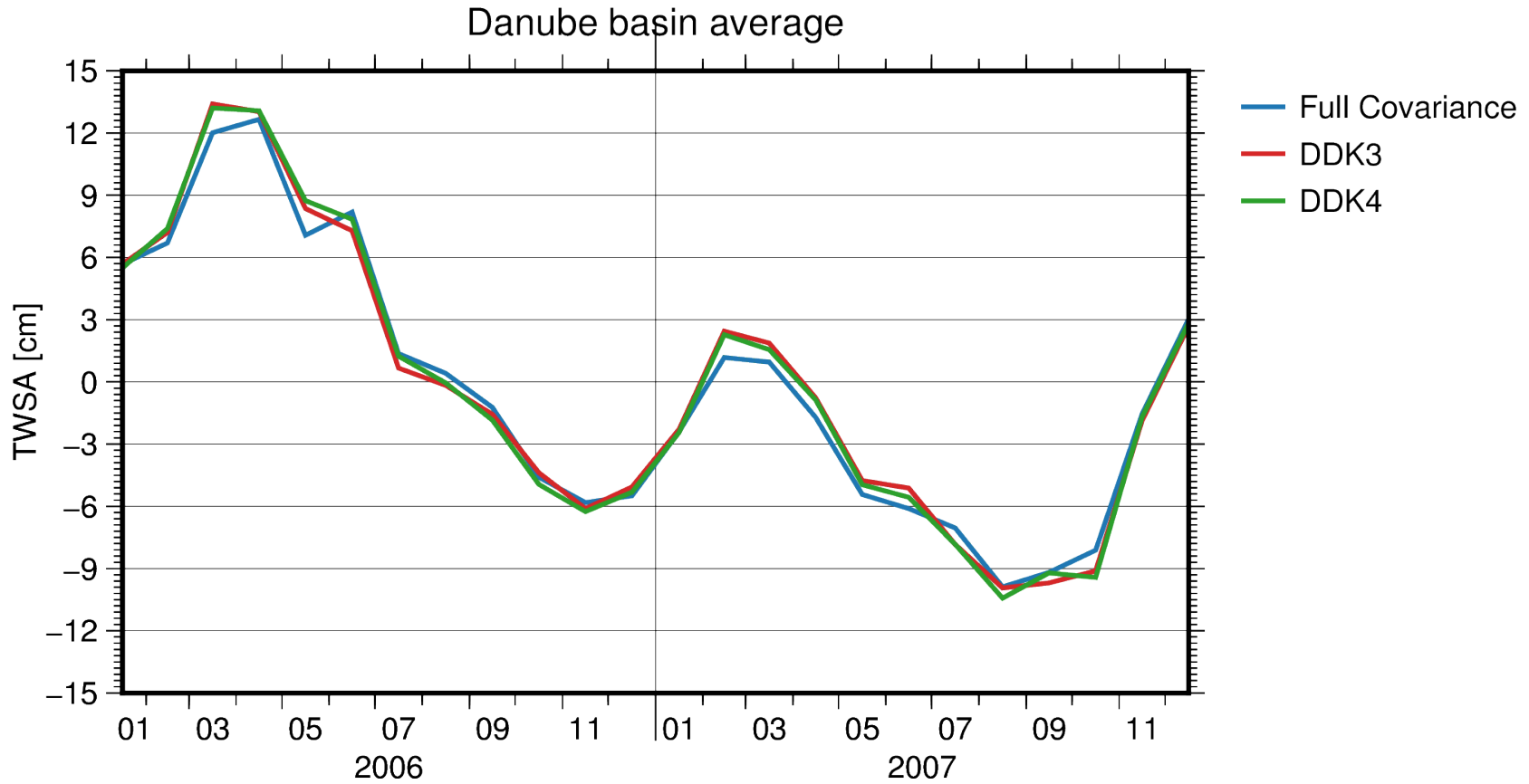
Preliminary L3 Products - Spatial Filter

Full Cov.



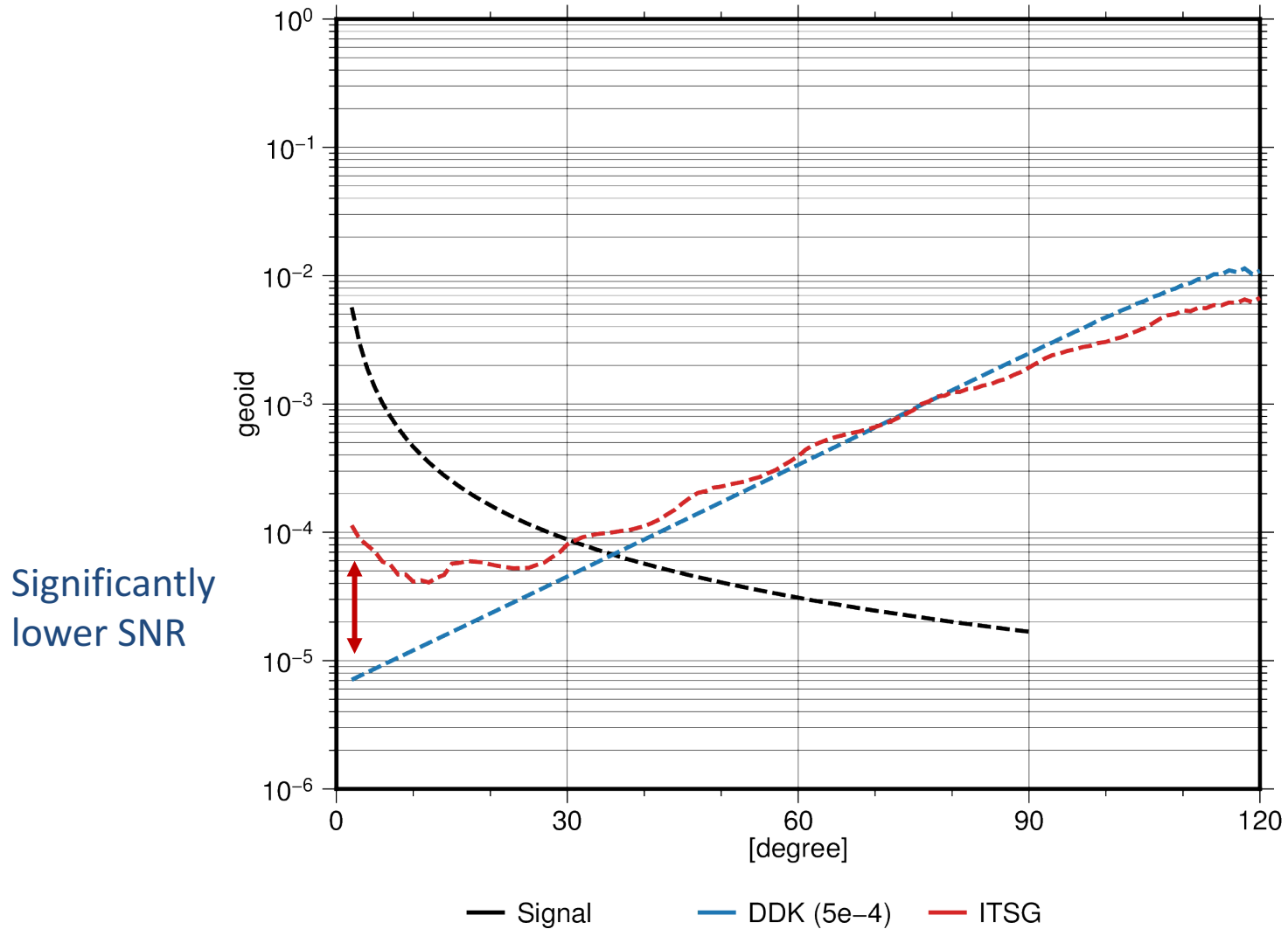
max: 56 cm

Preliminary L3 Products - Spatial Filter



Generally: slightly smaller amplitudes when using full covariance

Preliminary L3 Products - Spatial Filter



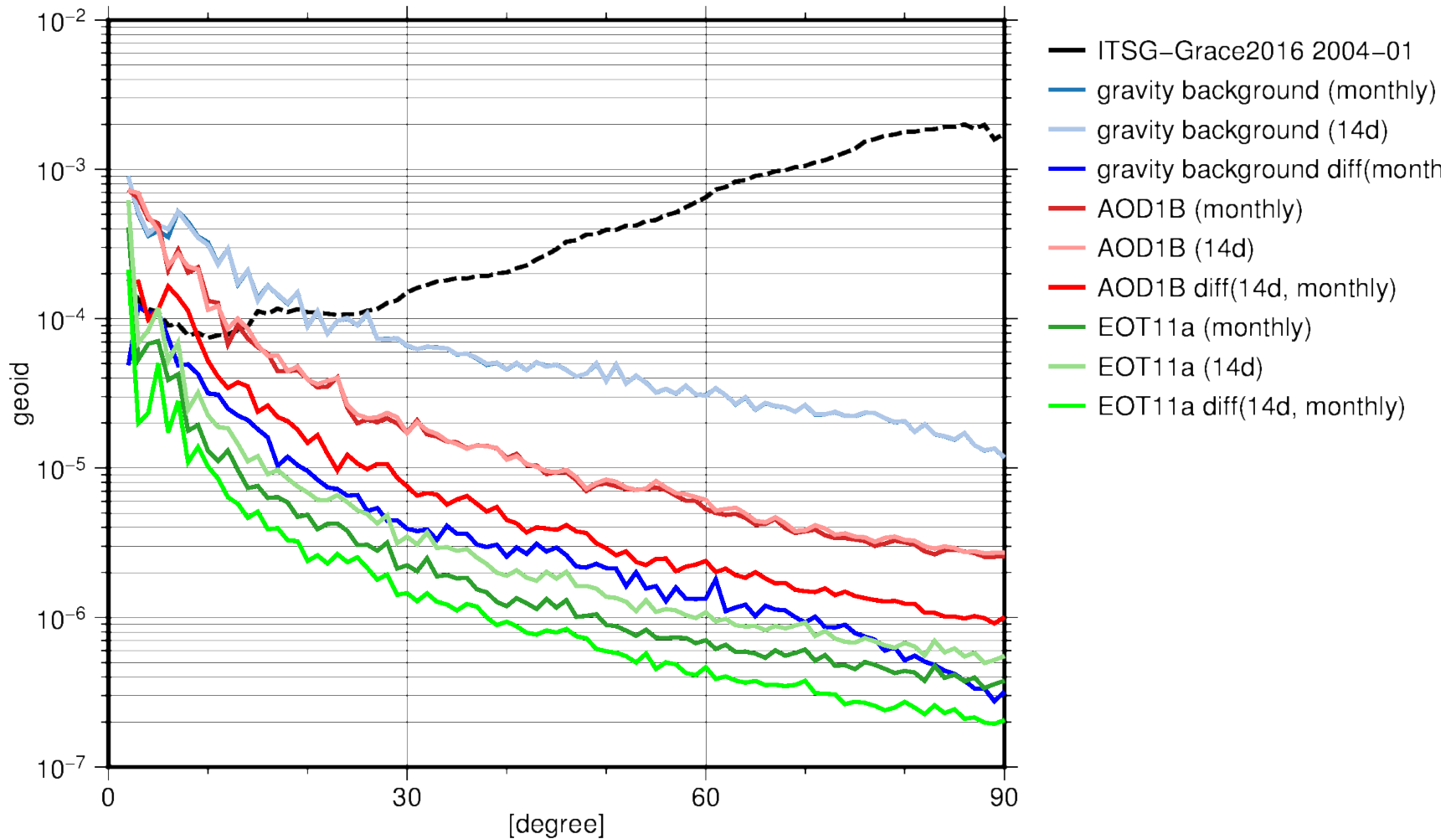
Restoring Background Models

Preliminary L3 Products – Monthly Mean

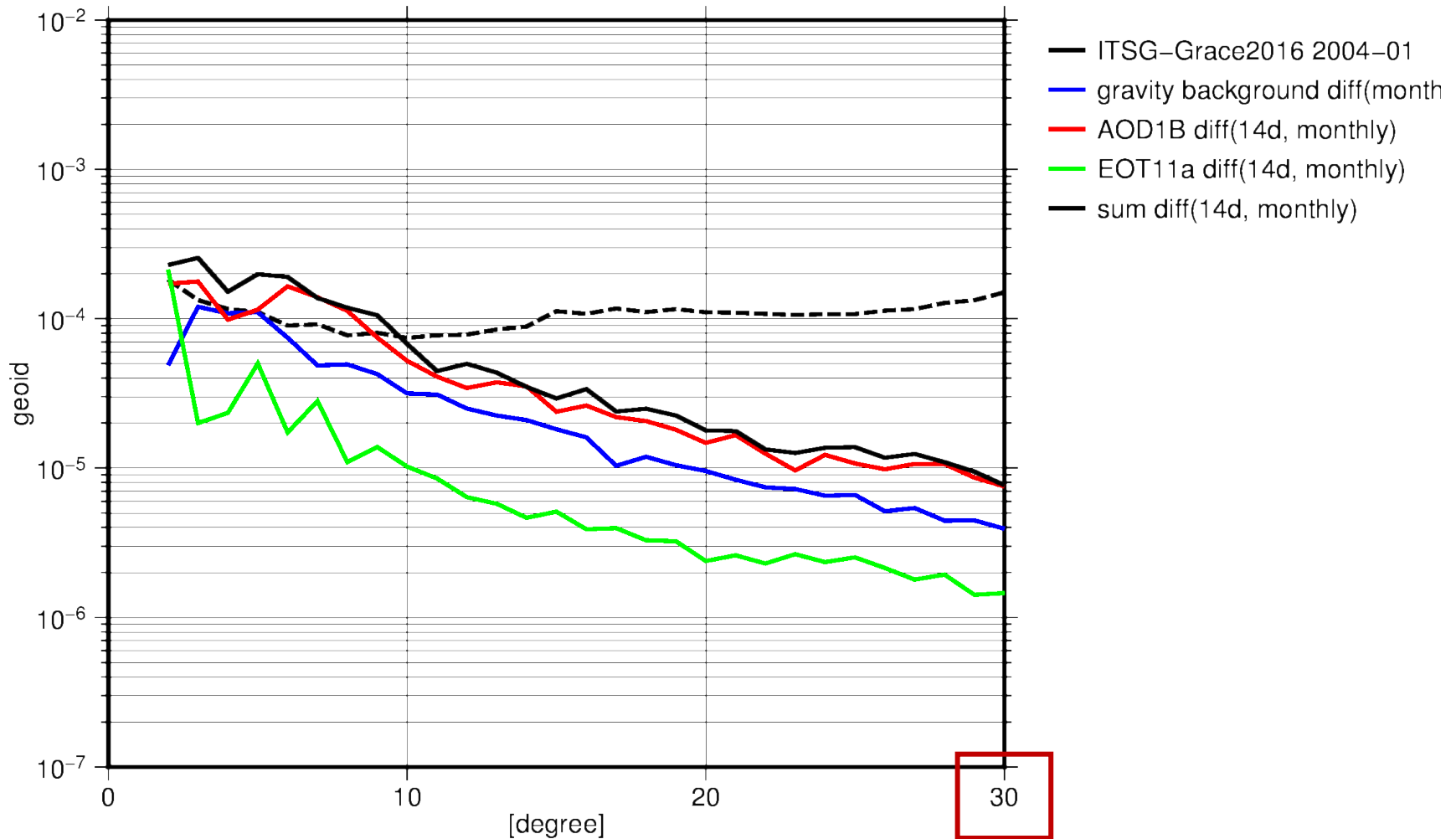
- Multiple ways of restoring background models possible:
 - Whole month
 - Individual days
 - First day with GRACE data till last day with GRACE data (i.e. gaps not considered)

- In extreme cases the difference is significantly higher than the measurement uncertainty

Preliminary L3 Products – Monthly Mean

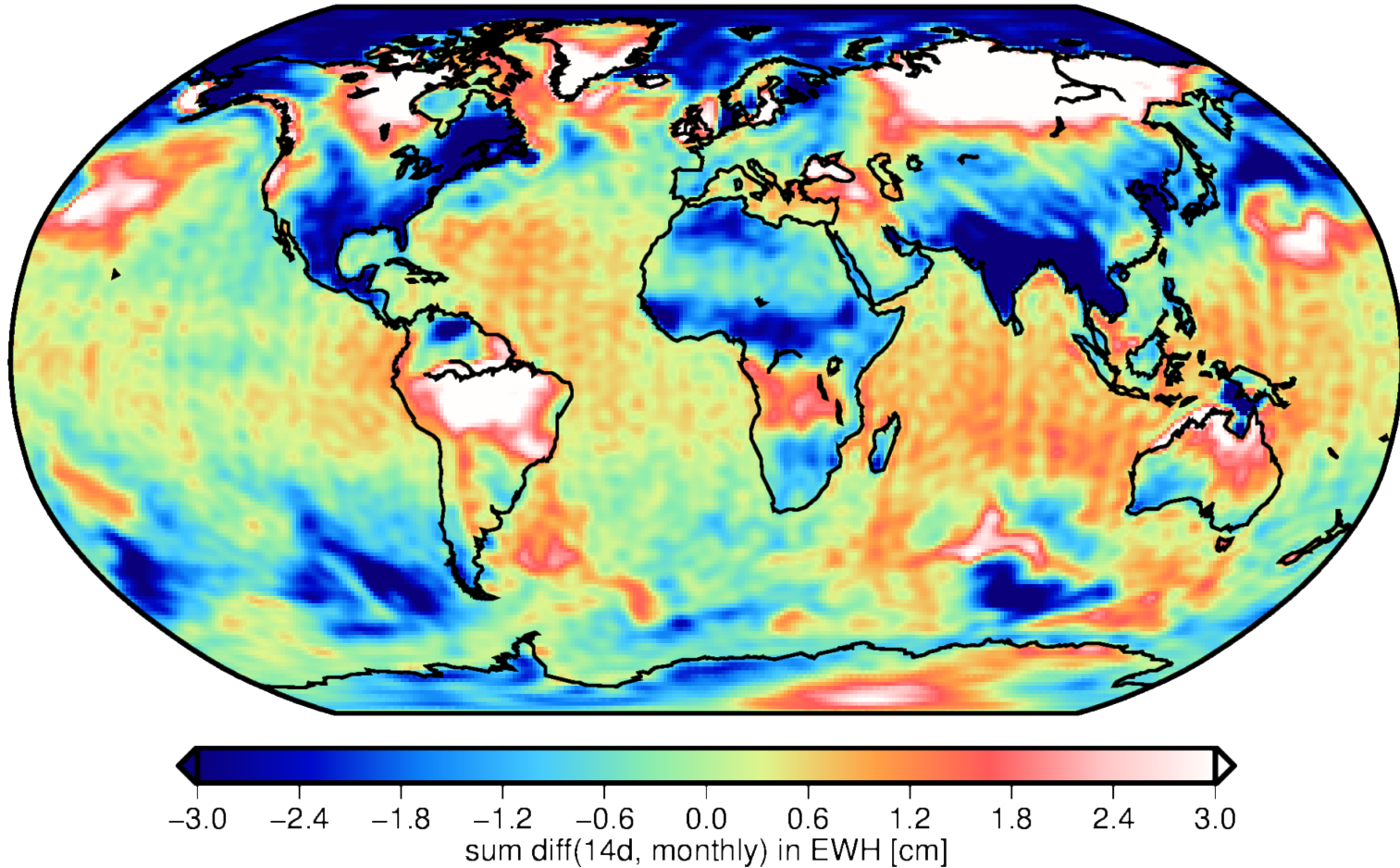


Preliminary L3 Products – Monthly Mean



Preliminary L3 Products – Monthly Mean

grid: min=-8.46183, max=9.76856, mean=0.0003362, rms=1.46251



Summary

Summary

- Gridded mass anomalies are available for terrestrial hydrology, cryosphere and ocean applications
- Data sets are **preliminary**
 - Validation feedback and suggestions are welcome
- Points of discussion:
 - C20 replacement
 - Joint inversion with SLR
 - Restoring background models

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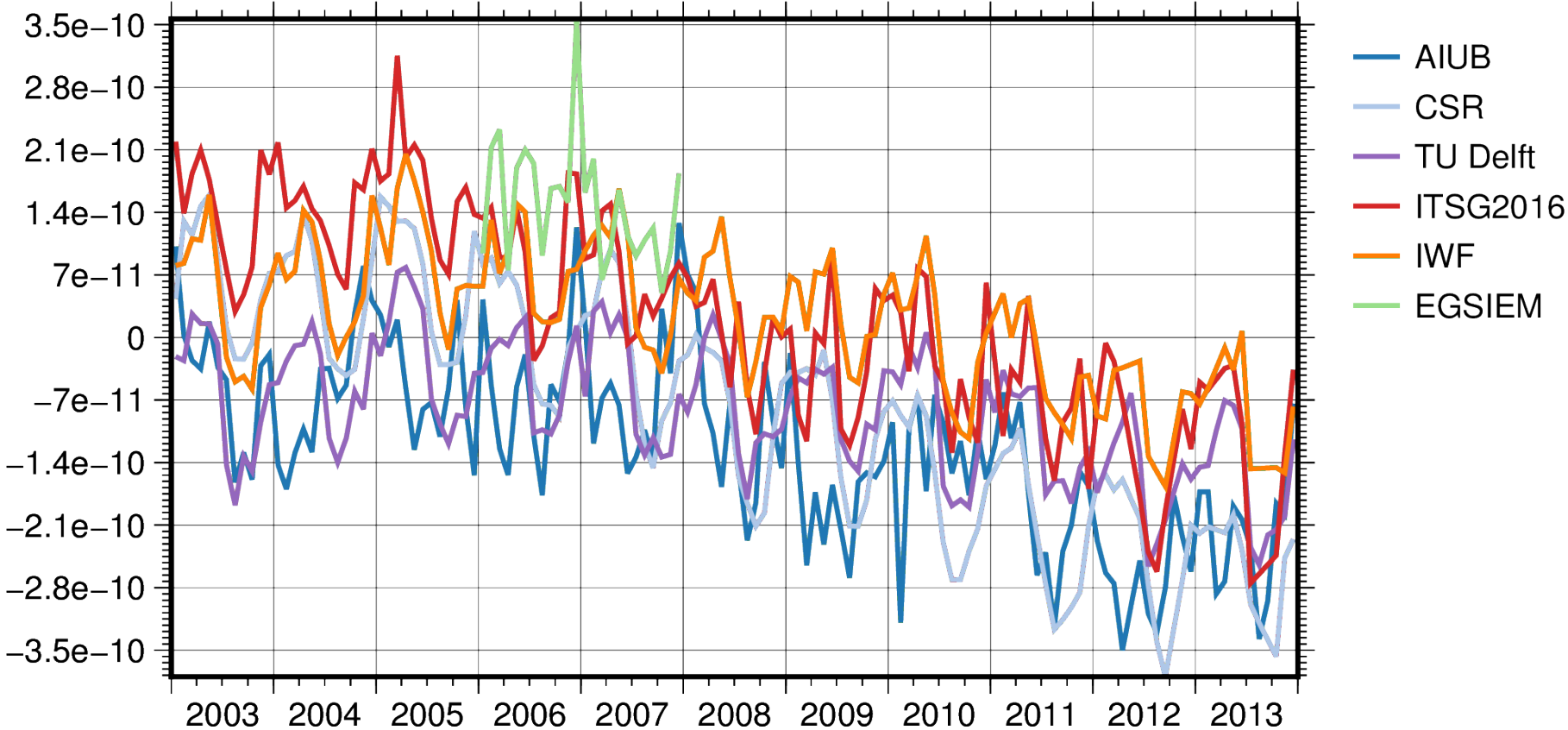
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Preliminary L3 Products – C20

C20 – GOCO05s



Preliminary L3 Products – Degree 1

