Reprocessing of LUH GRACE solutions – current status

Igor Koch, Mathias Duwe and Jakob Flury

Institut für Erdmessung, Leibniz Universität Hannover/Germany

koch@ife.uni-hannover.de

Motivation

two sets of IfE/LUH GRACE(-FO) solutions published:

GRACE time series	Operational GRACE-FO solutions

in terms of noise comparable to RL05 solutions of GFZ and JPL

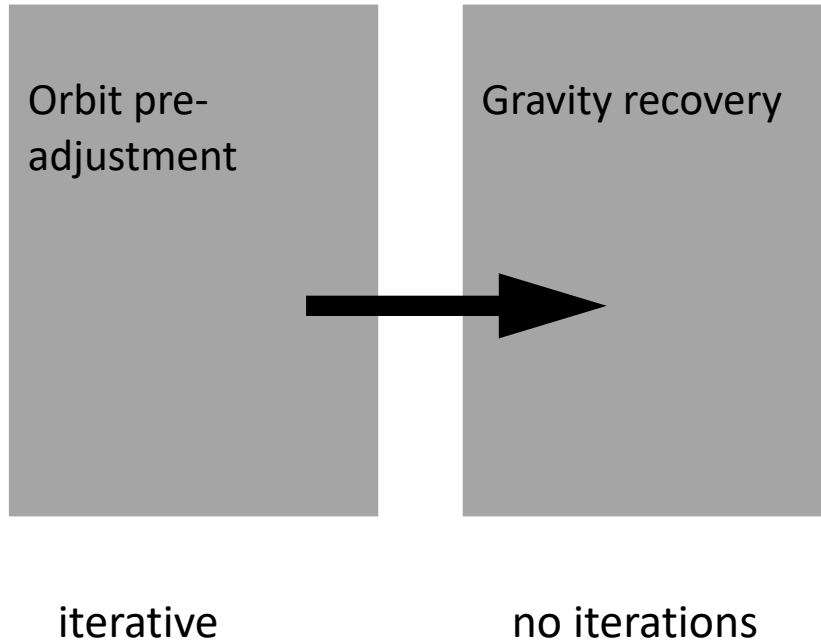in terms of noise comparable to RL06 solutions of GFZ and JPL

Goal of the GRACE reprocessing:

- continuous GRACE(-FO) time series of same quality

Processing

1.

2.

| Orbit pre-adjustment | Gravity recovery |

iterative   no iterations

- generalized dynamic orbit determination (variational equations approach)

- initially all-MATLAB software

- several parts of the software converted to C/C++

Updates in the GRACE processing

- Data

- Background models

- Parametrization

Data updates

	old GRACE solutions	reprocessed solutions
KBRR	RL02	RL03
SCA	RL02	RL03
GNSS positions	GNV1B	kinematic orbits from AIUB

Background models

	old GRACE solutions	reprocessed solutions
Ocean tides	EOT11a	FES2014b
De-aliasing	AOD1B RL05	AOD1B RL06
Atmospheric tides	-	AOD1B RL06
Pole definition	mean	linear

Parametrization

	old GRACE solutions	reprocessed solutions
accelerometer bias	per arc	per arc
accelerometer scale	fixed	full scale matrix per month
initial state	per arc	per arc
empirical KBRR parameters	constant: 90 min periodic: 1.5 h	constant: 90 min periodic: 1.5 h

Evaluation

- Spectral noise

- Spatial noise

- Signal content

- C_{20} coefficients

- Jan. 2003 – Mar. 2016
- Comparison to CSR, GFZ, JPL and ITSG
- Only month considered where solutions from all centers are available
- Solutions using data from two different calendar month are not taken into account
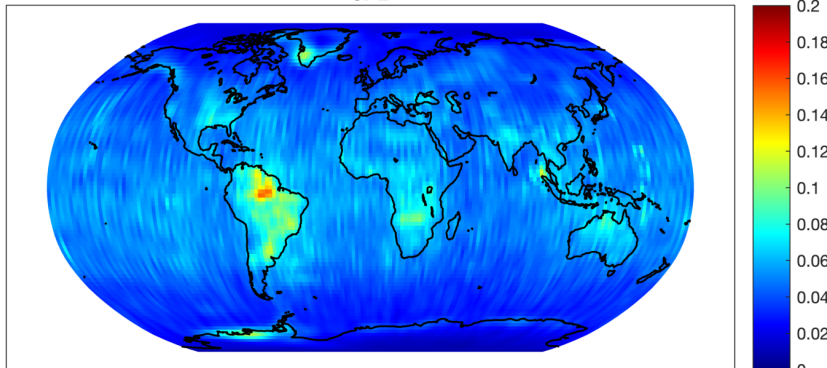
Spectral noise
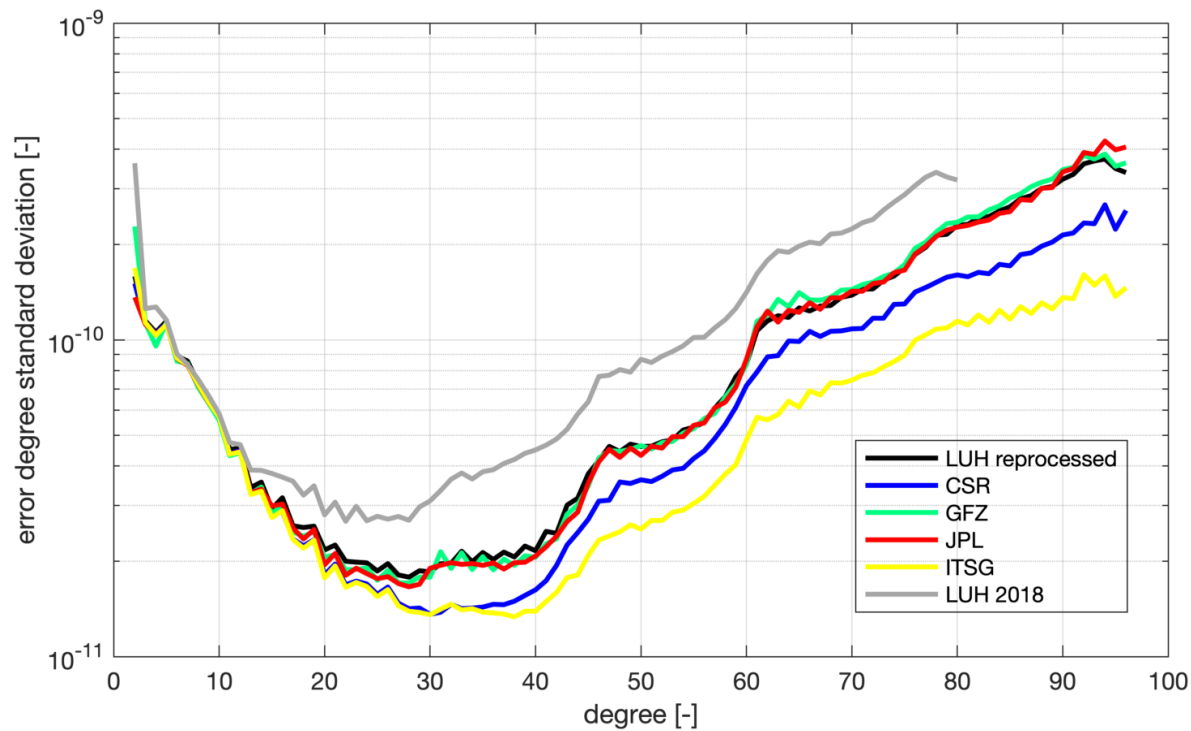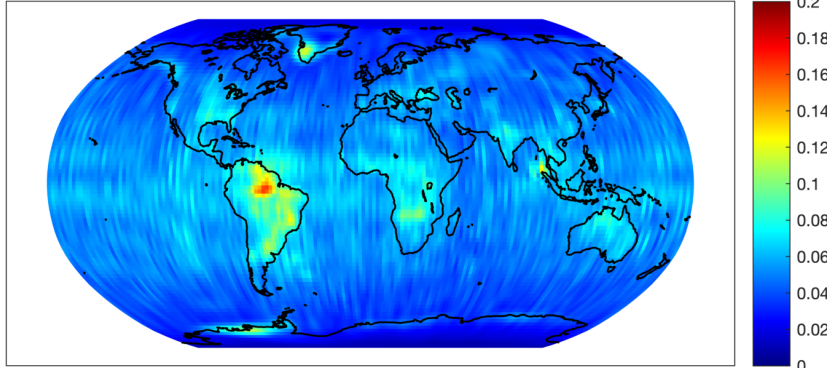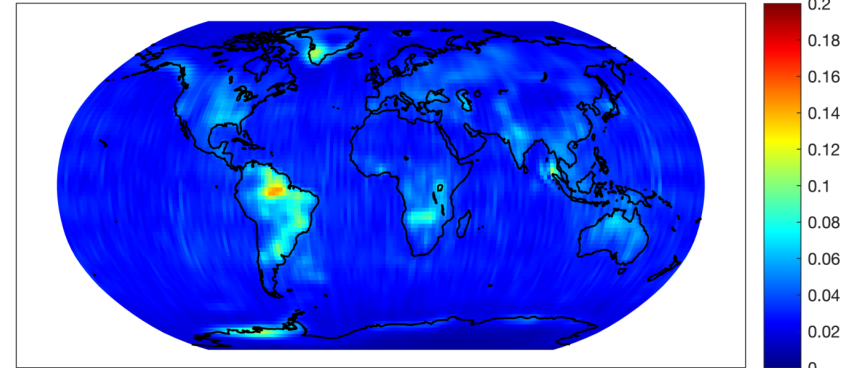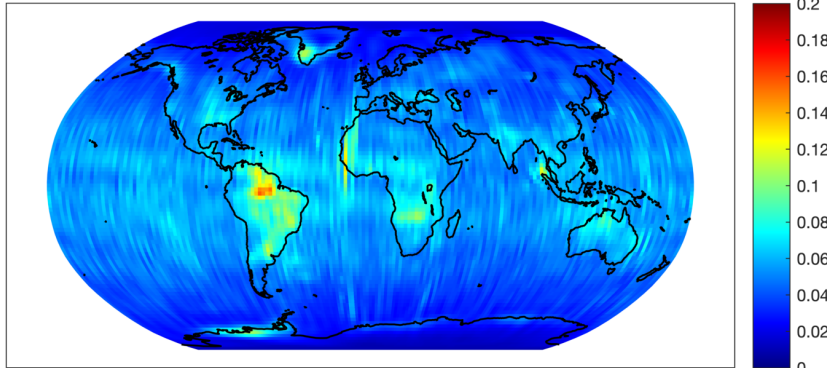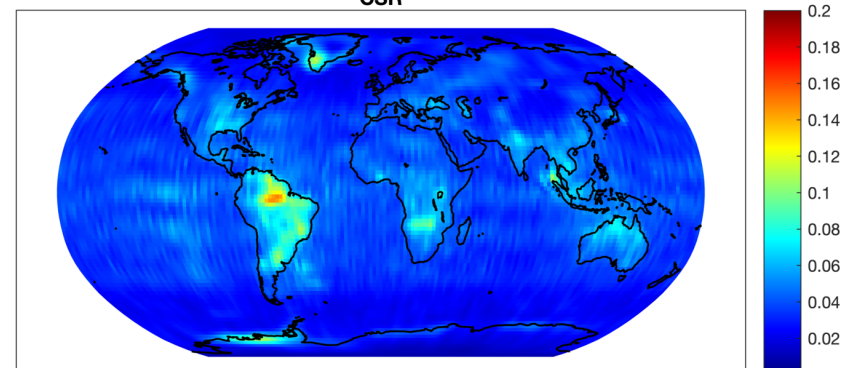
Residual signal RMS

LUH · GFZ · JPL · ITSG · CSR

[m]

- EWH w.r.t. mean solution of all centers
- C20 replaced with SLR
- Gaussian filter (300 km)
- Climatology model subtracted
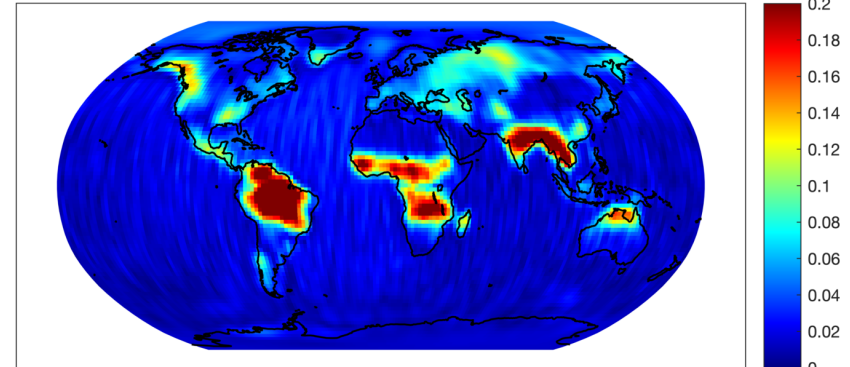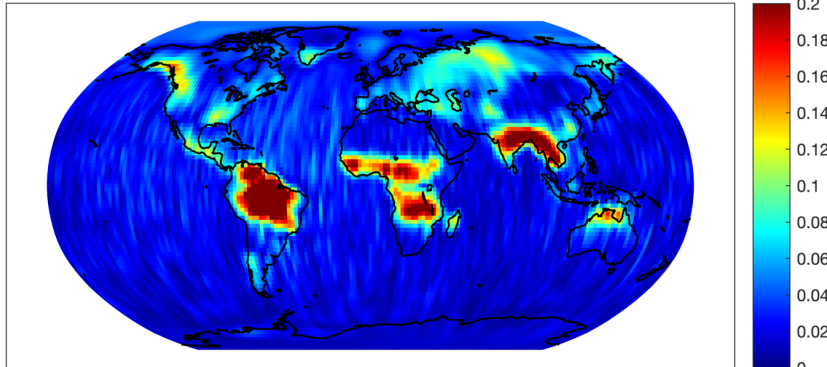- (bias, trend, annual, semi-annual signal)

# Residual signal RMS over the oceans
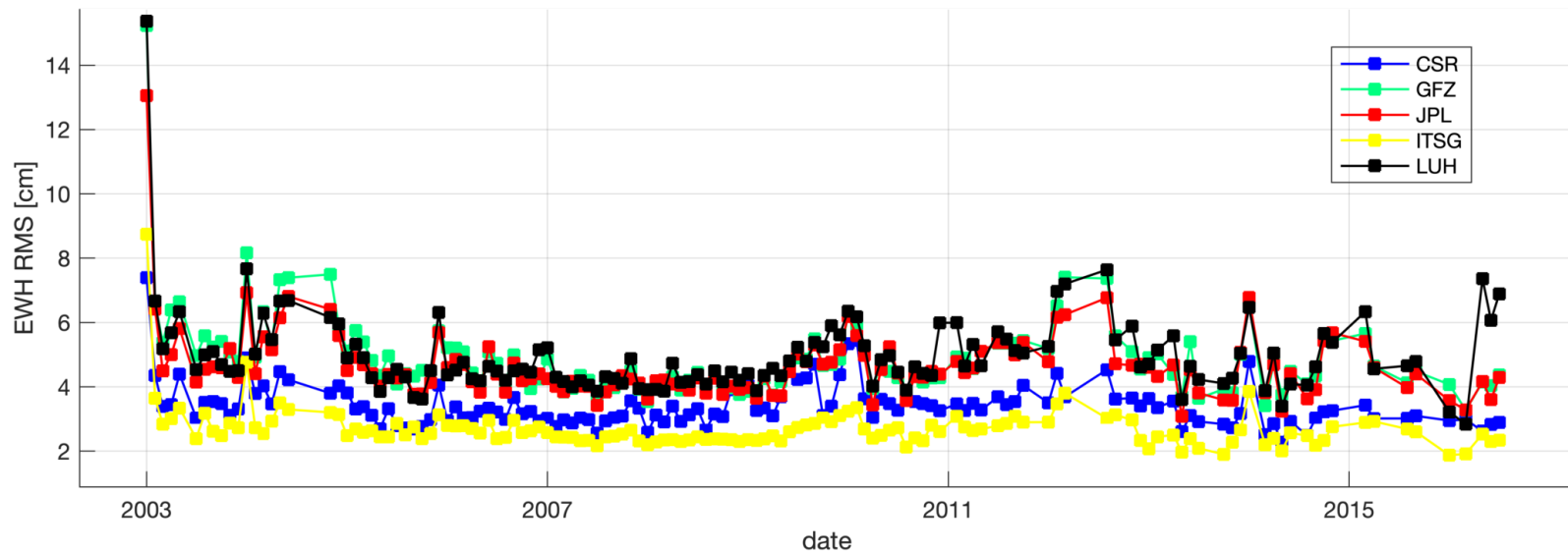
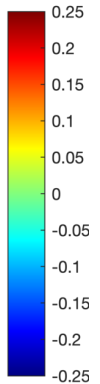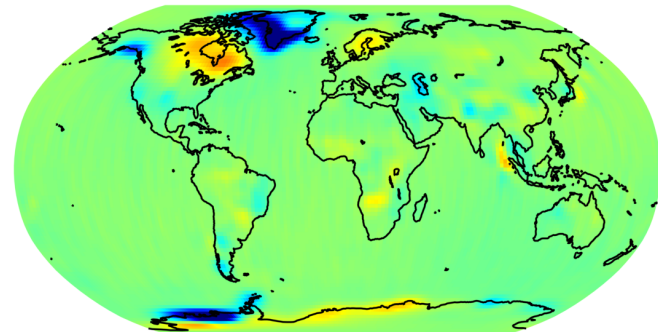| center	mean rms in cm
CSR	3.4
GFZ	4.9
JPL	4.6
ITSG	2.7
LUH	5.0

- EWH w.r.t. mean solution of all centers
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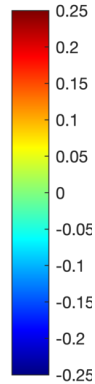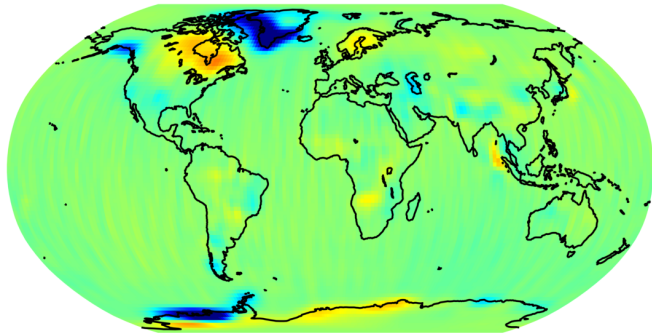# Signal amplitudes

- EWH w.r.t. mean solution of all centers
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- (bias, trend, annual, semi-annual signal)

[m]

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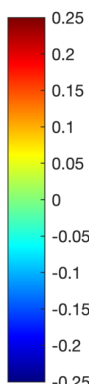# Trend

LUH

GFZ

JPL
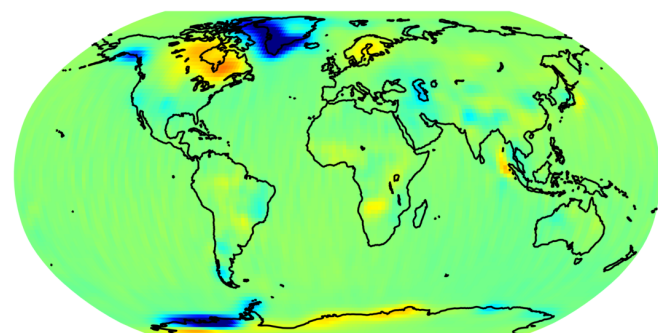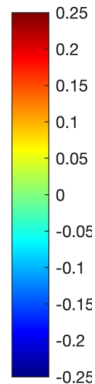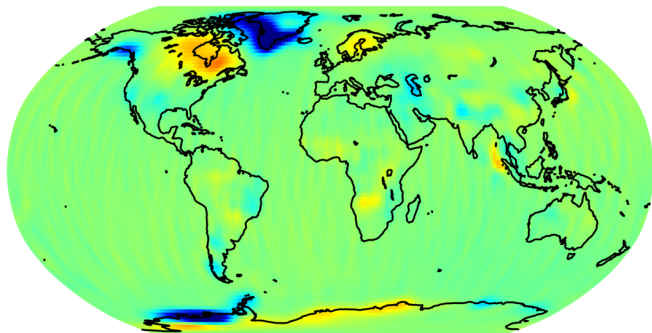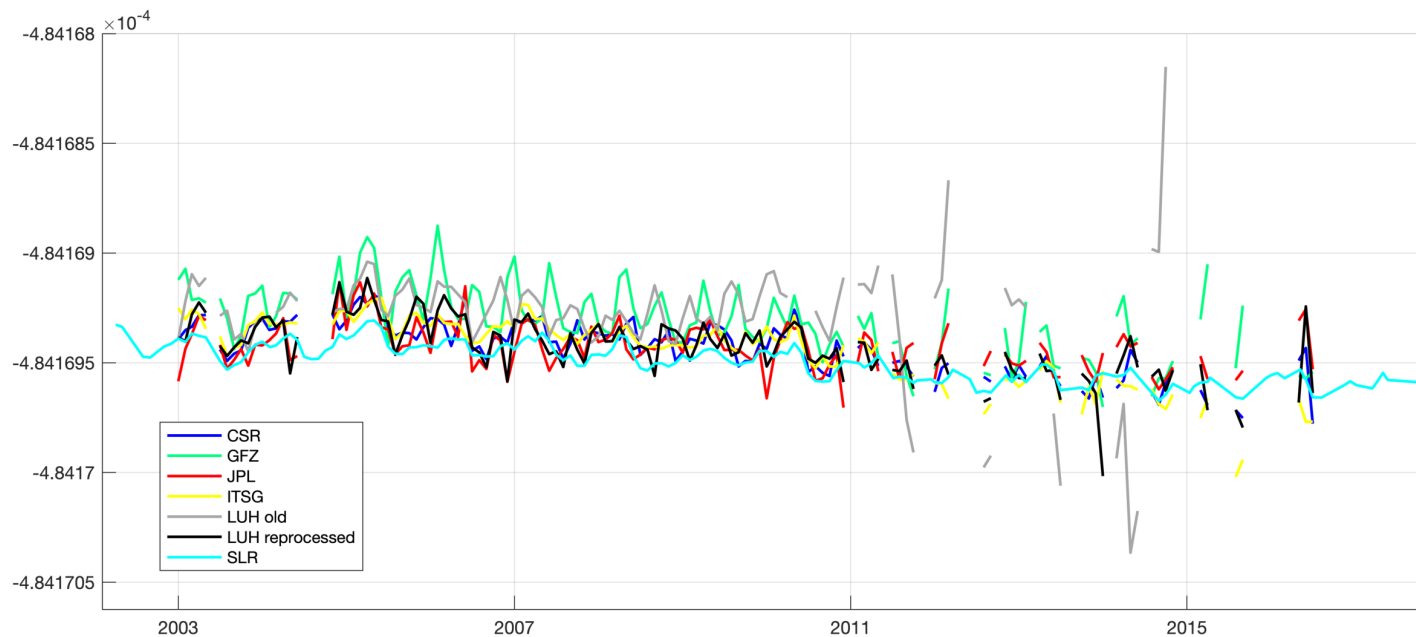
ITSG

CSR
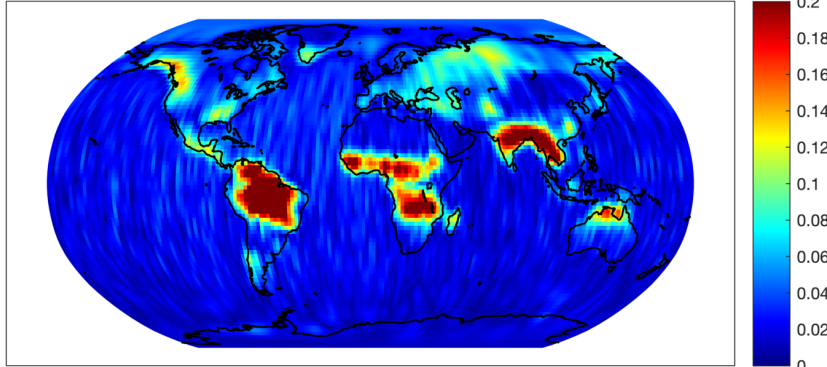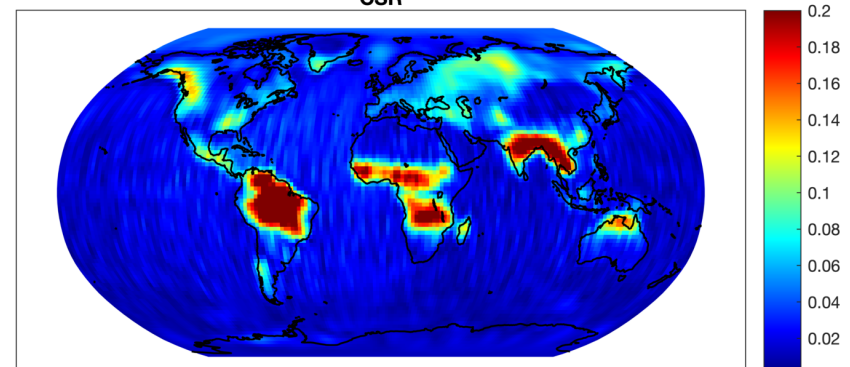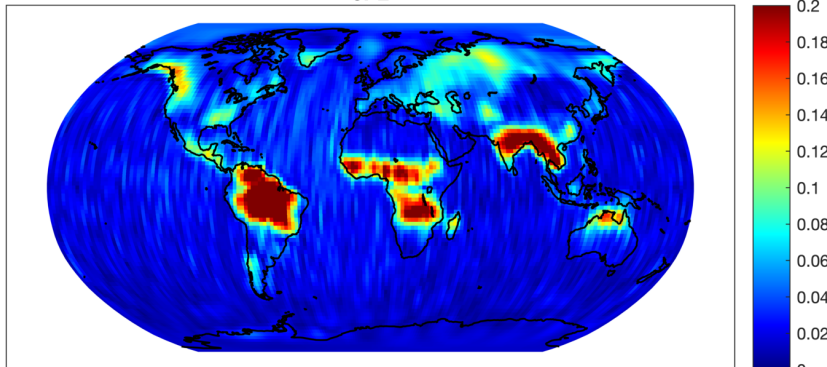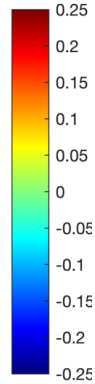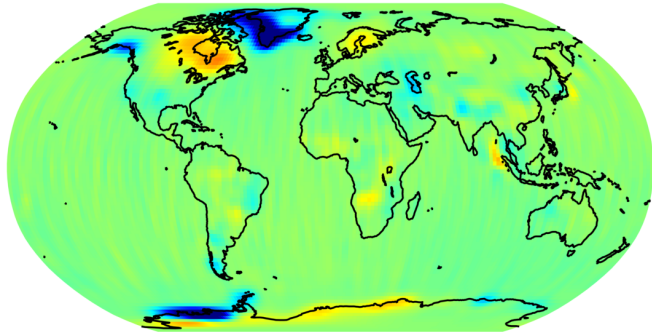
[mm/yr]

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C$_{20}$ coefficients

Conclusions

- New (preliminary) LUH GRACE solutions agree well with the solutions of the SDS and ITSG (amplitudes, trend)

- Processing is on-going and improvements in the noise behavior are expected