

EGSIEM

European Gravity Service for Improved Emergency Management

Title: **Status of NRT & Regional Service at TUG**

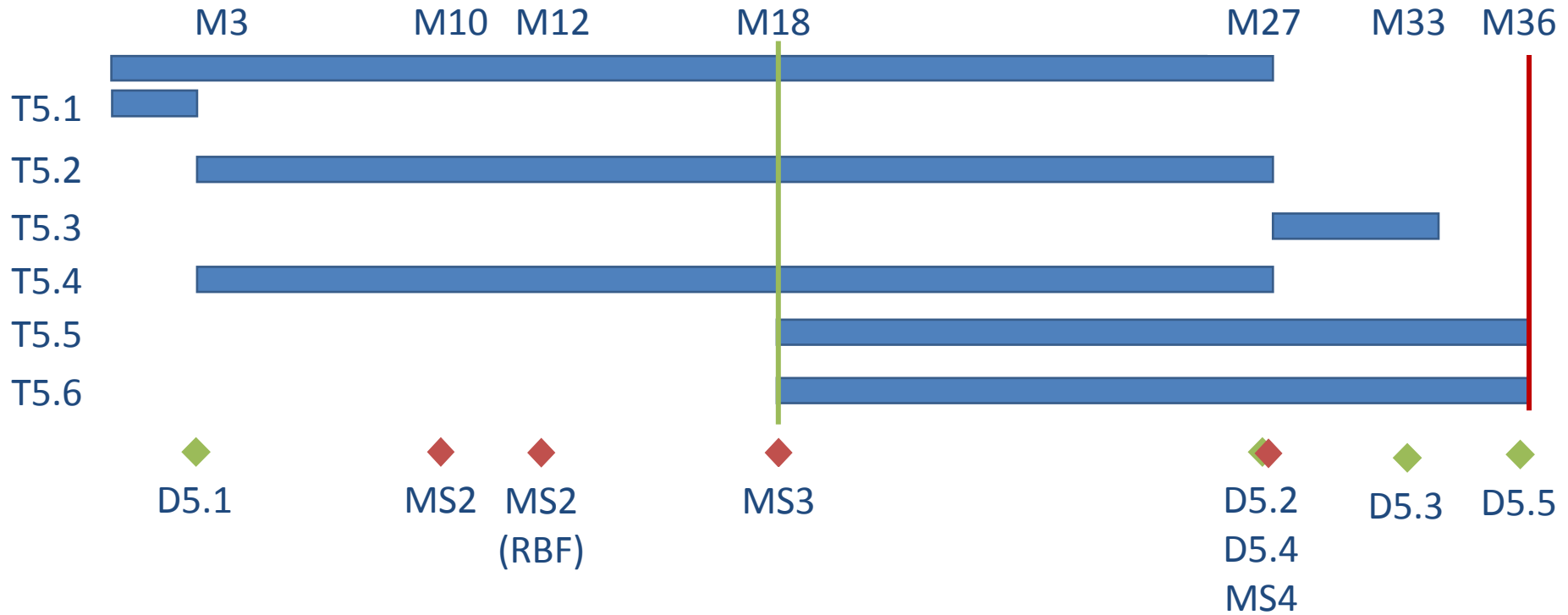
Presenter: AK

Affiliation: TUG

EGSIEM Meeting Potsdam,
02.06.2016 - 03.06.2016

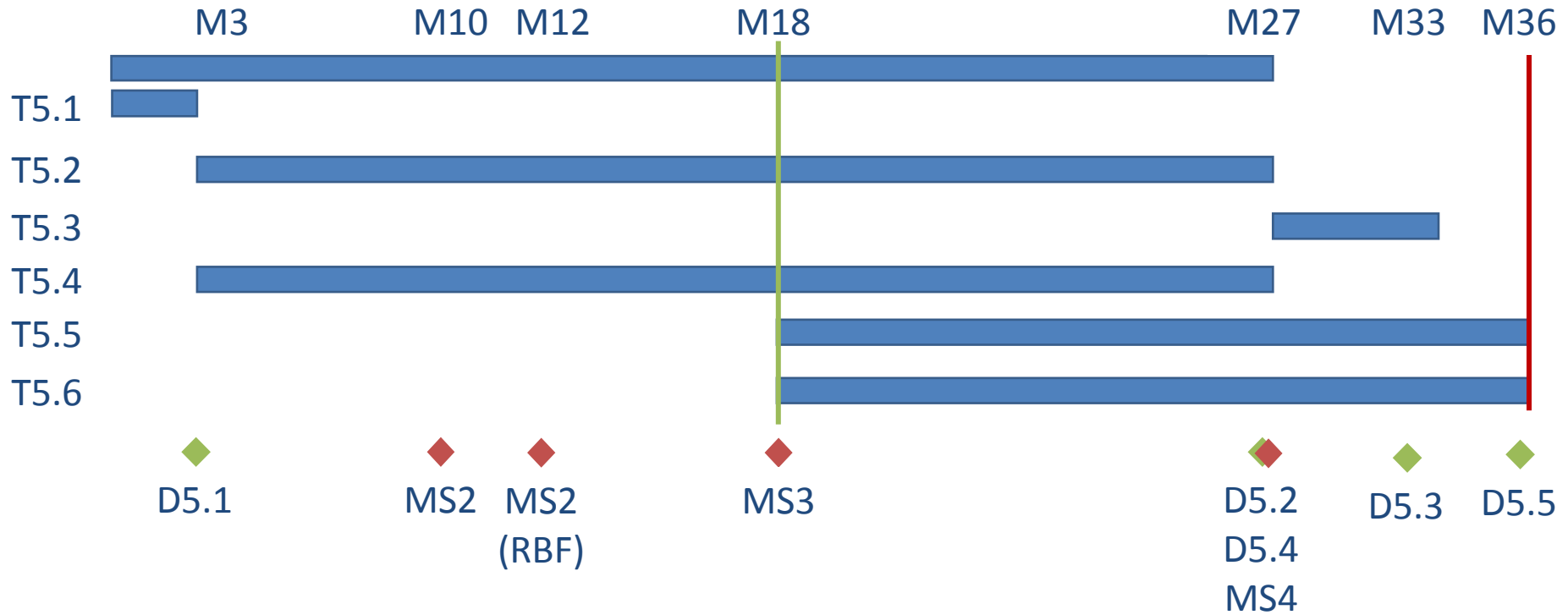
Status of NRT – Time Table and Milestones

Status of NRT – Time Table and Milestones



- Milestone 3: Service Readiness, M18
 - Marks the begin of T5.5 (Generation of Area Mean Values, M19) and T5.6 (Validation/Feedback, M19)
 - Software for NRT capability is implemented

Status of NRT – Time Table and Milestones

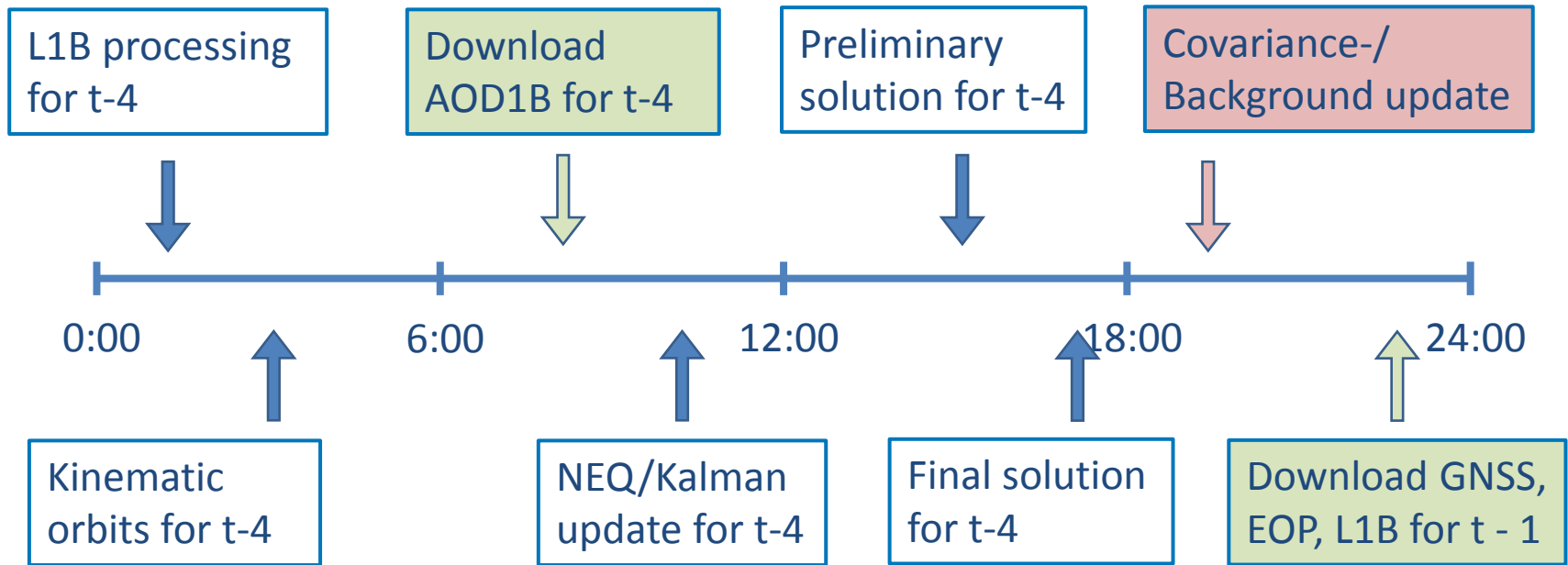


Next milestones/deliverables:

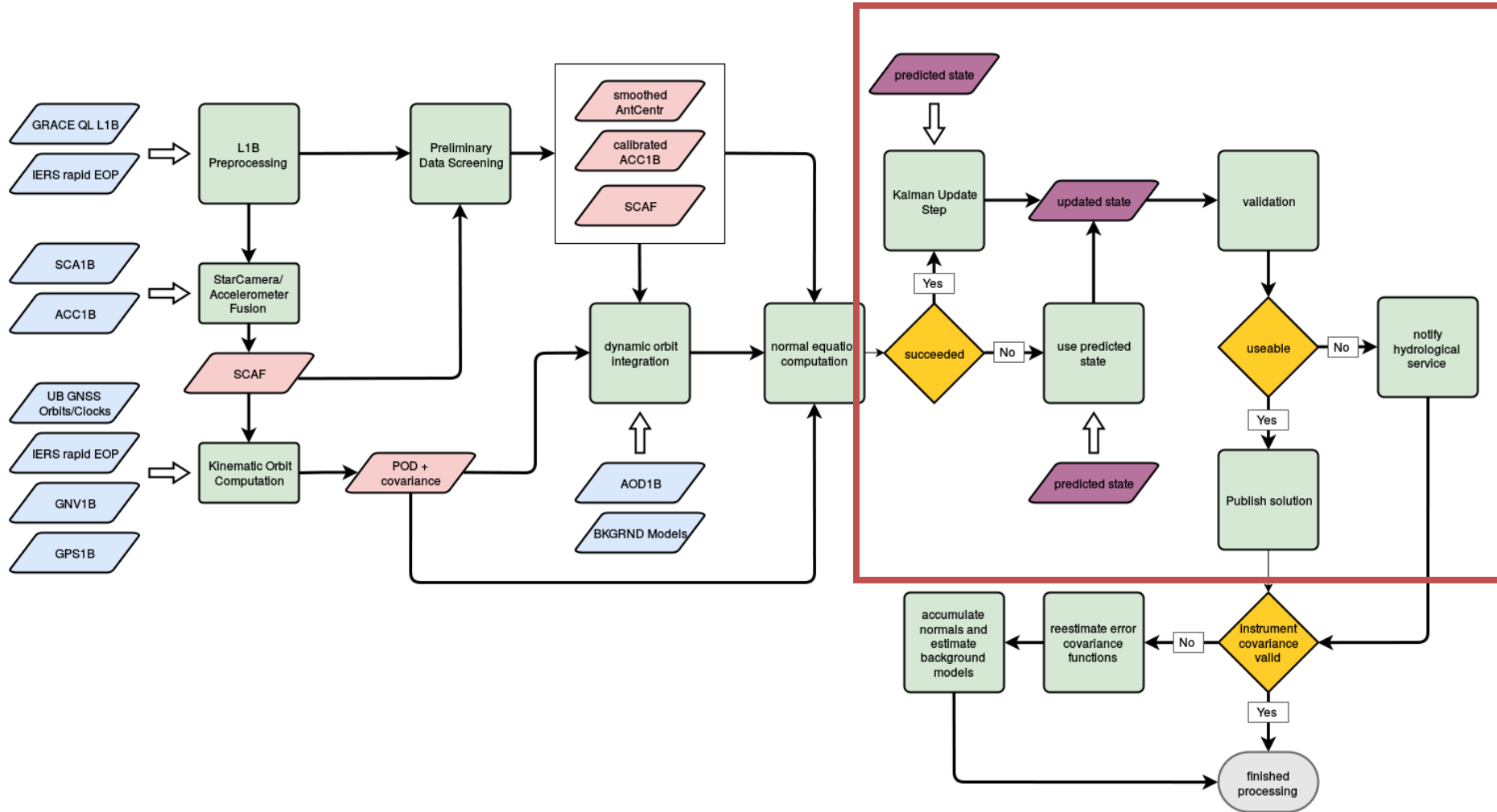
- D5.2: NRT Service Product Report (M27)
- D5.4: Regional Solution Product Report (M27)
- MS4: Operational NRT Service (M27)

Status of NRT – Processing Schedule

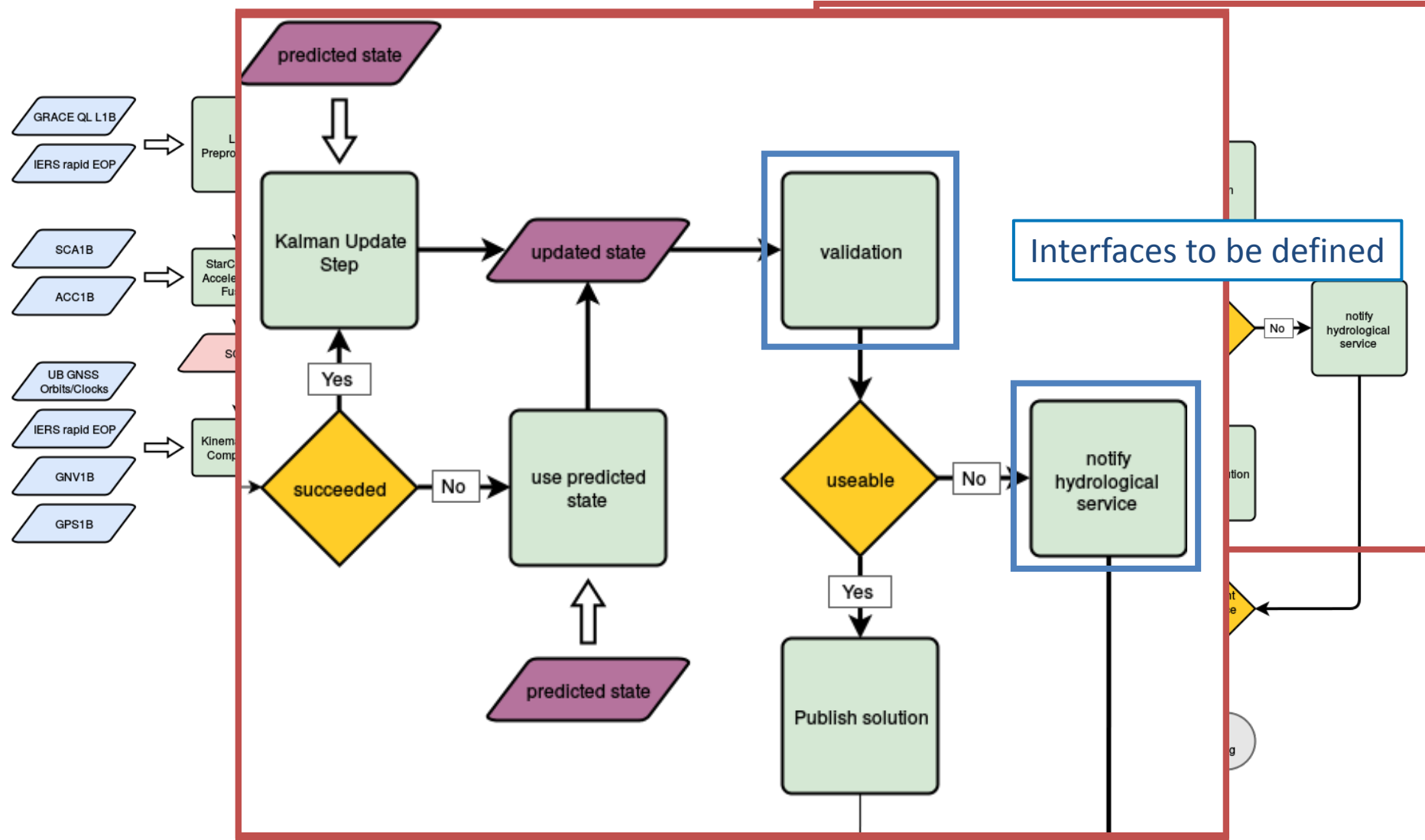
- Processing sequence executed daily
- Slight departure from D5.1:
 - Data acquisition is detached from processing



Status of NRT – Processing Schedule



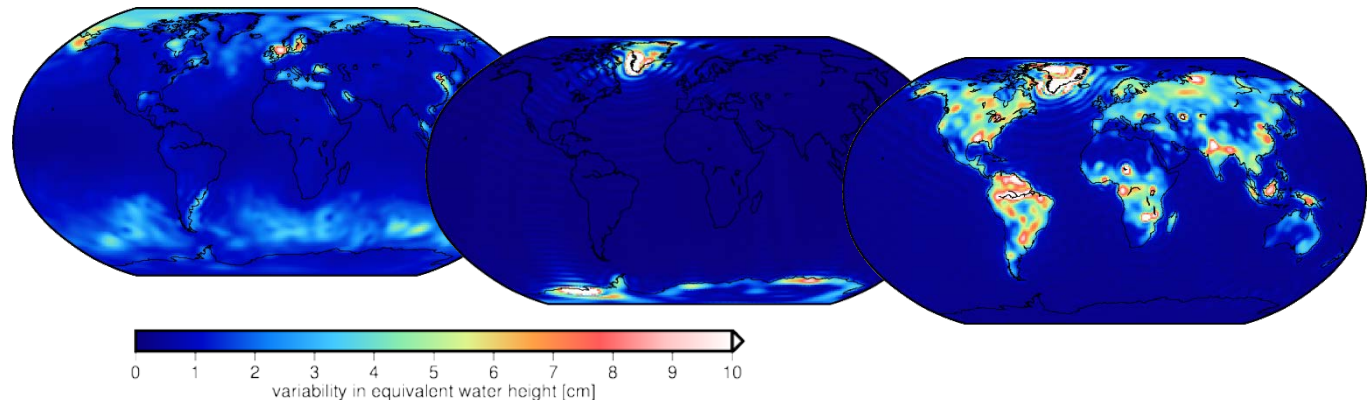
Status of NRT – Processing Schedule



Post Processing Results

Post processing results – ITSG-Grace2016

- GRACE time series (2002 to 2016) processed and continually updated
 - 5053 daily solutions (4258 days with GRACE contribution)
- Process model derived from WGHM (hydrosphere) and ESA ESM (cryosphere, residual atmosphere/ocean)



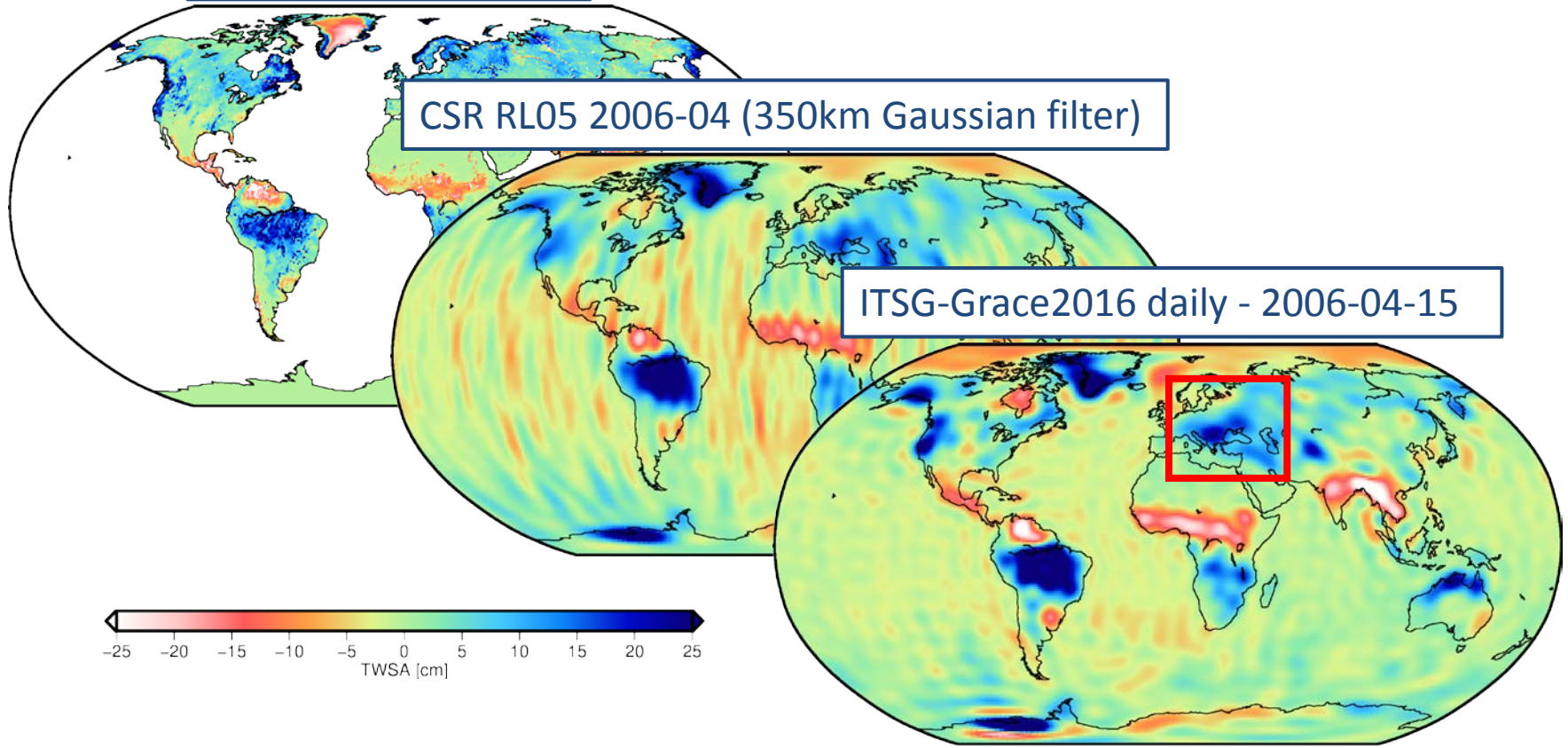
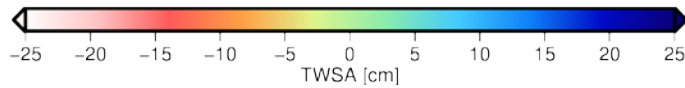
- GRACE processing details: Klinger et al. - Towards a new ITSG-Grace release: improvements within the processing chain, Session G4.2 - Wednesday, 9am

Post processing results – ITSG-Grace2016

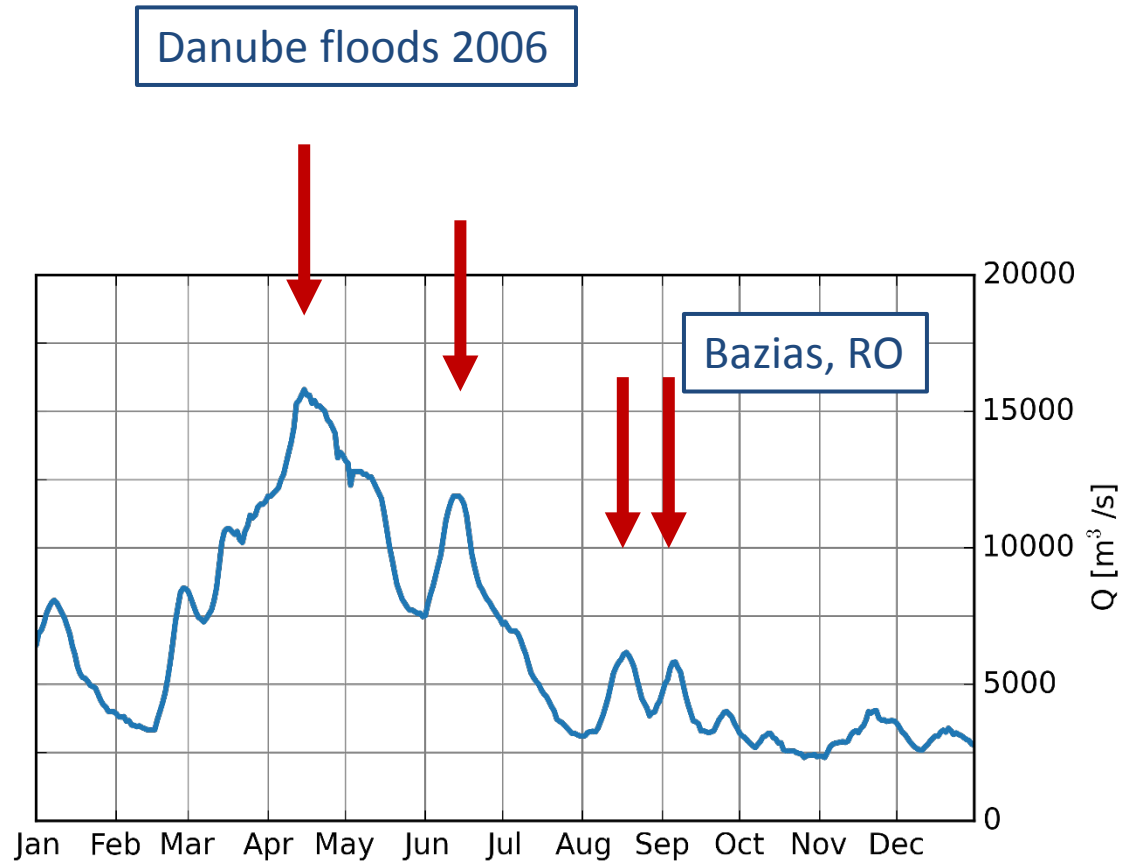
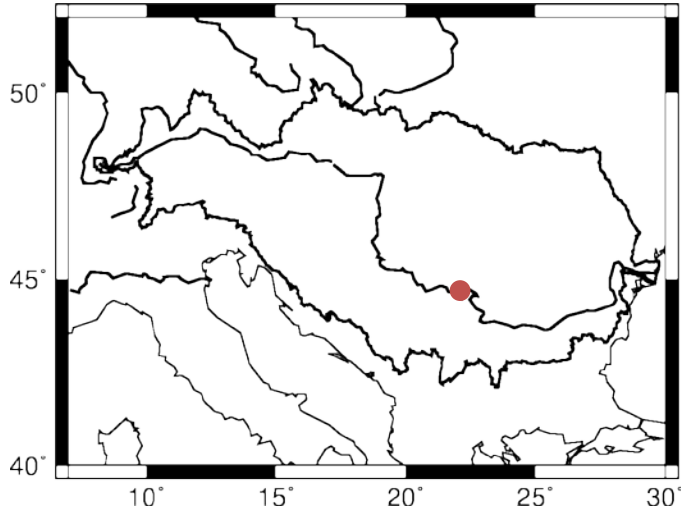
WGHM - 2006-04-15

CSR RL05 2006-04 (350km Gaussian filter)

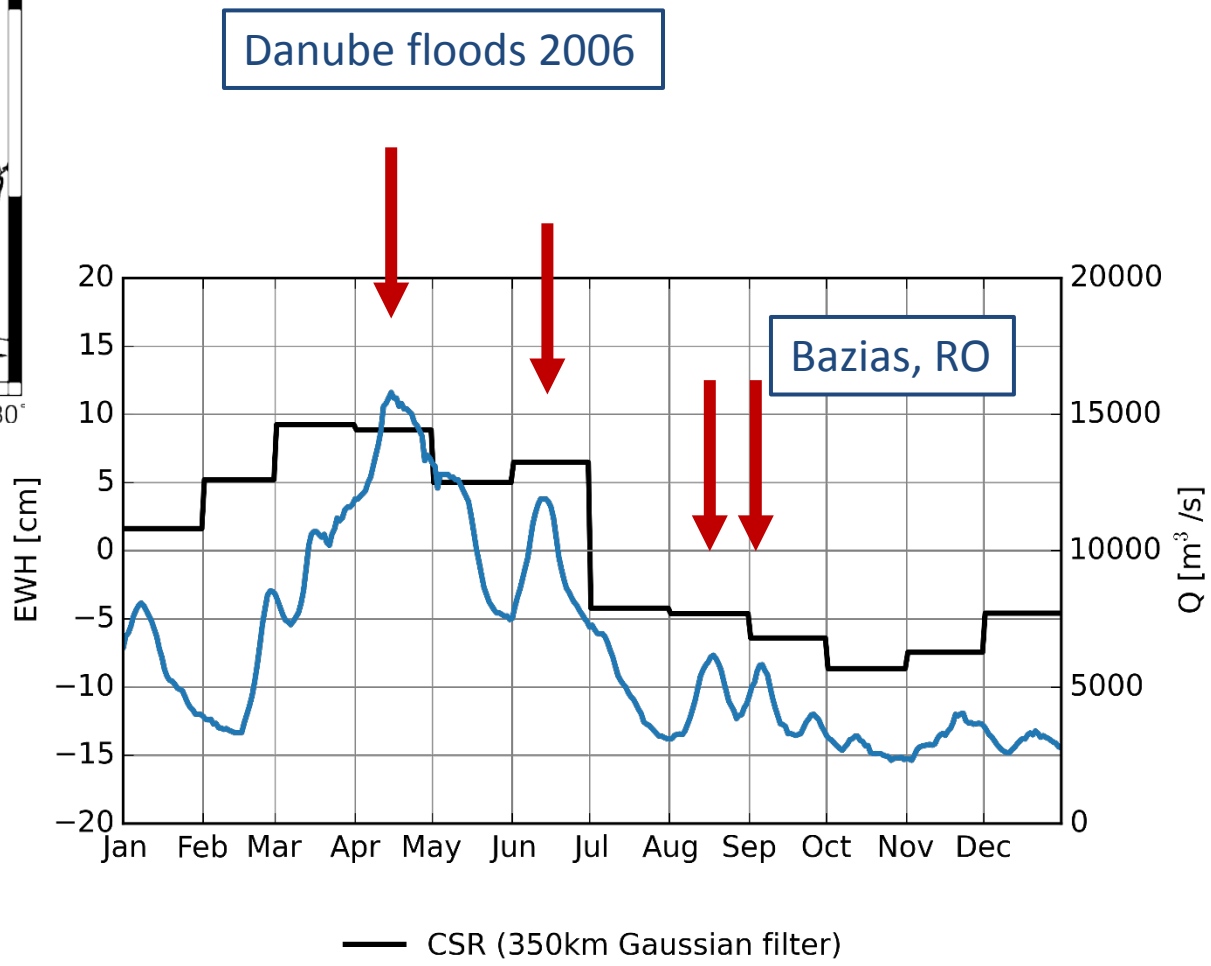
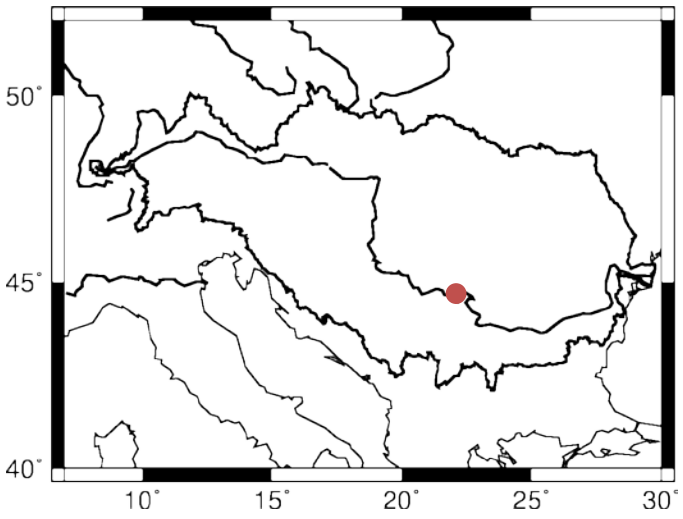
ITSG-Grace2016 daily - 2006-04-15



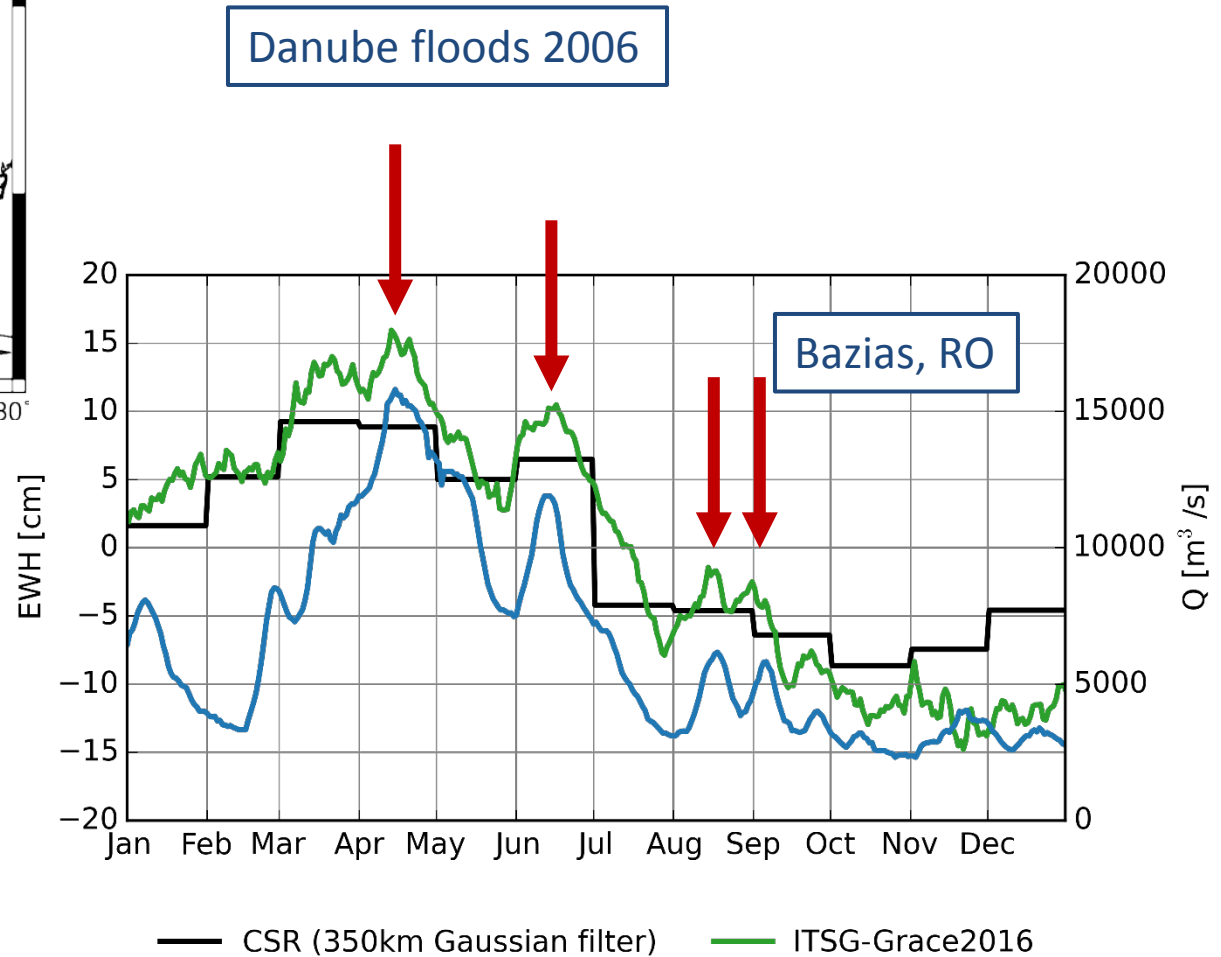
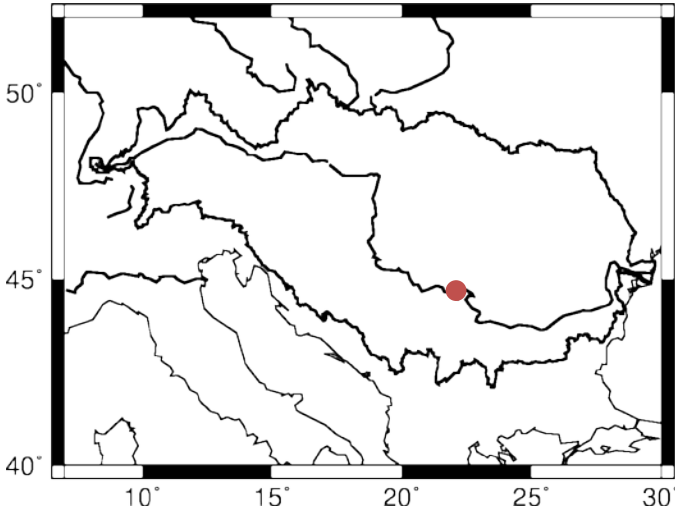
Post processing results – ITSG-Grace2016



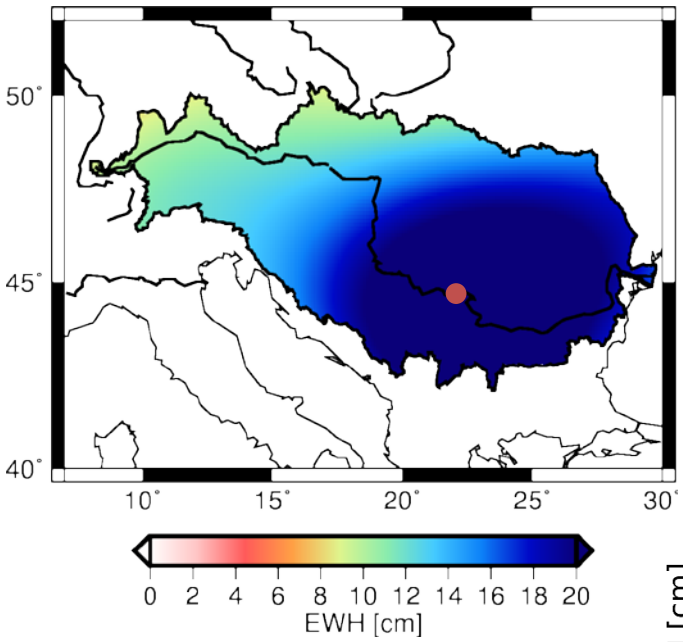
Post processing results – ITSG-Grace2016



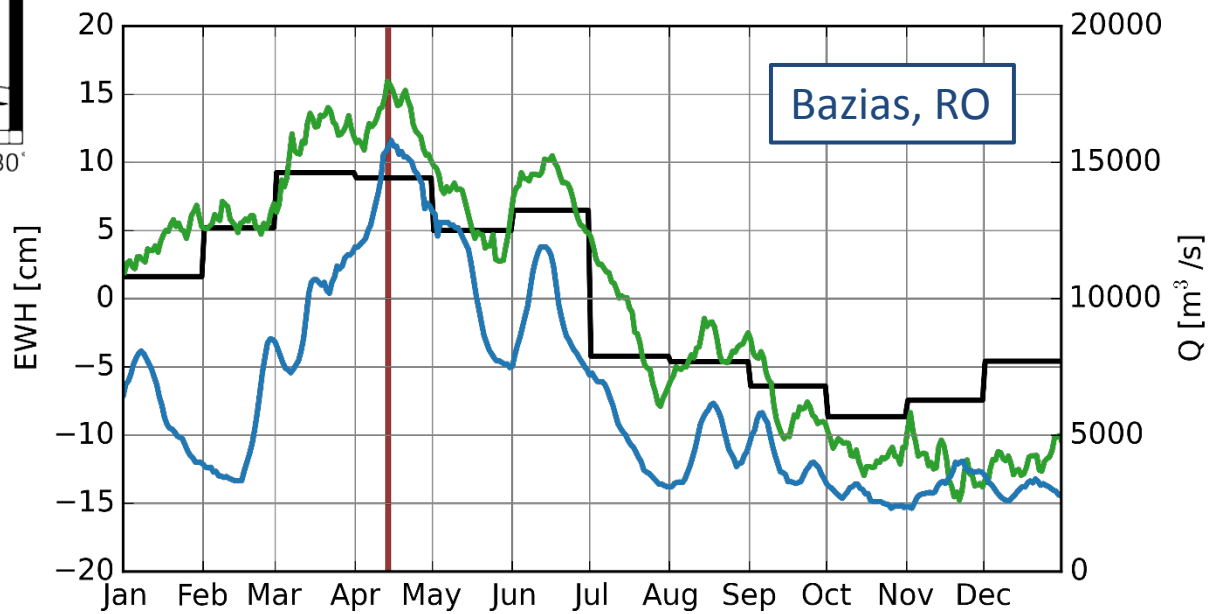
Post processing results – ITSG-Grace2016



Post processing results – ITSG-Grace2016



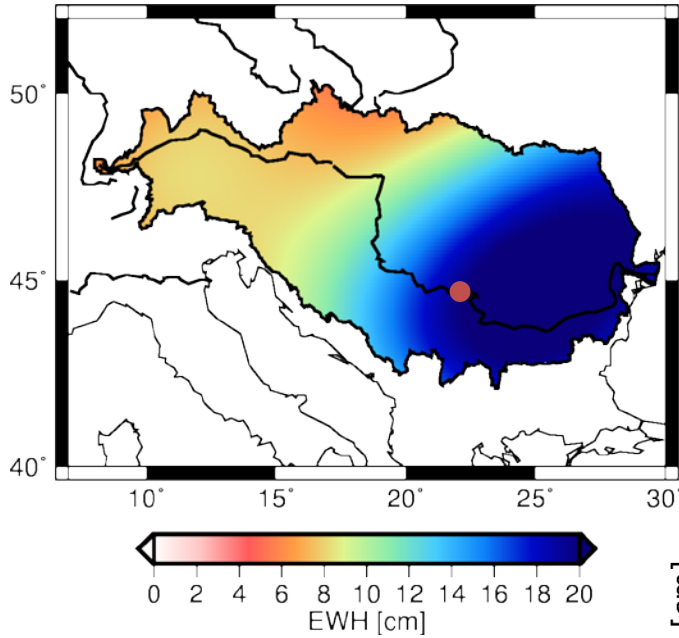
Danube floods 2006



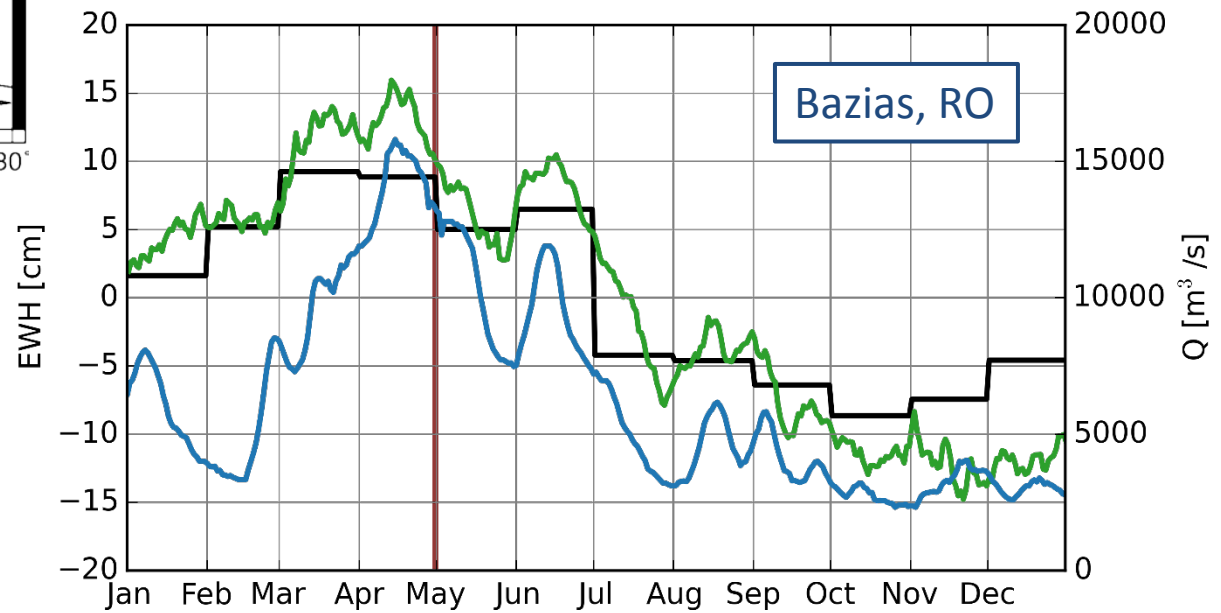
Bazias, RO

— CSR (350km Gaussian filter) — ITSG-Grace2016

Post processing results – ITSG-Grace2016

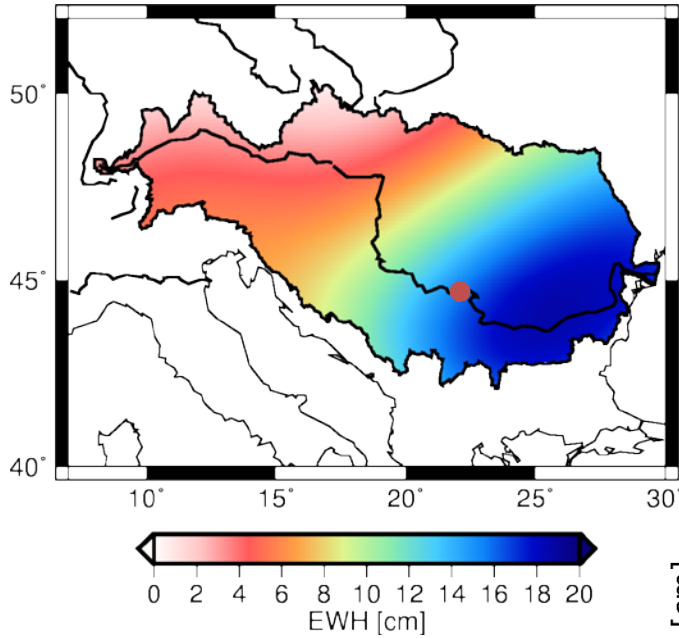


Danube floods 2006

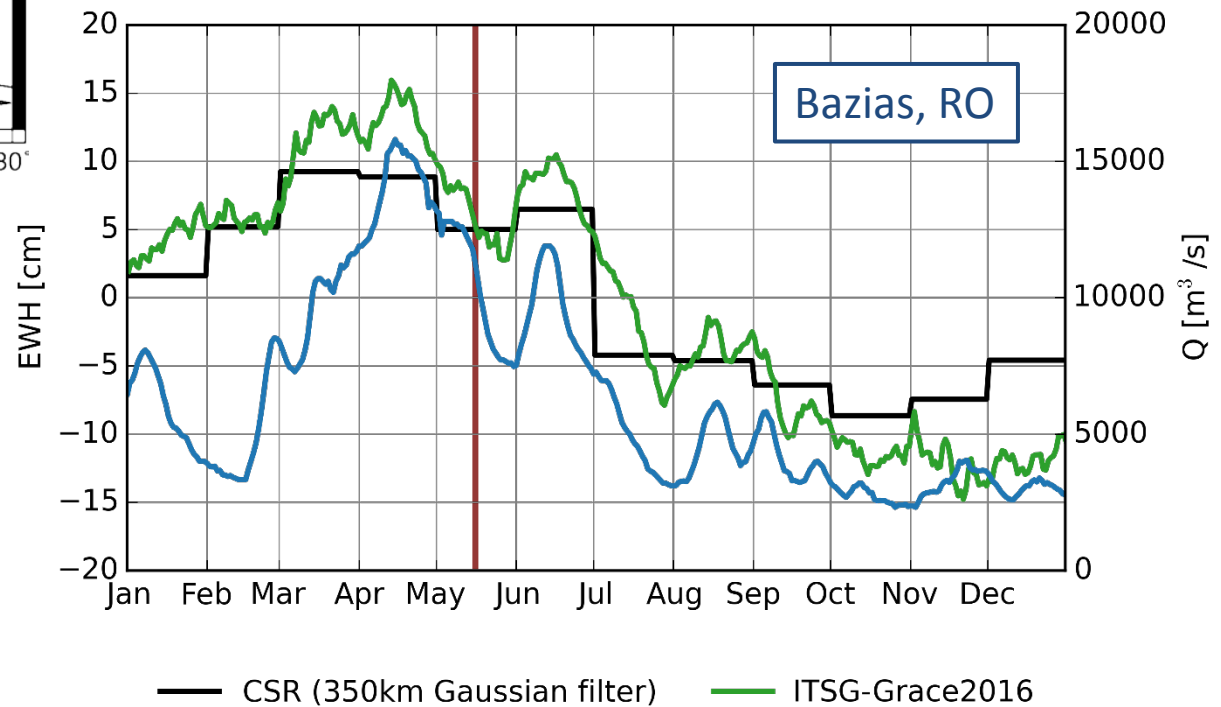


— CSR (350km Gaussian filter) — ITSG-Grace2016

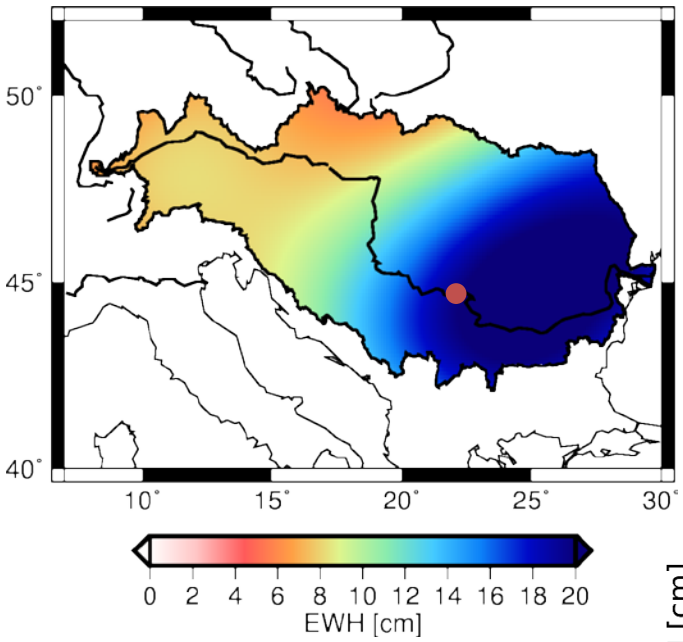
Post processing results – ITSG-Grace2016



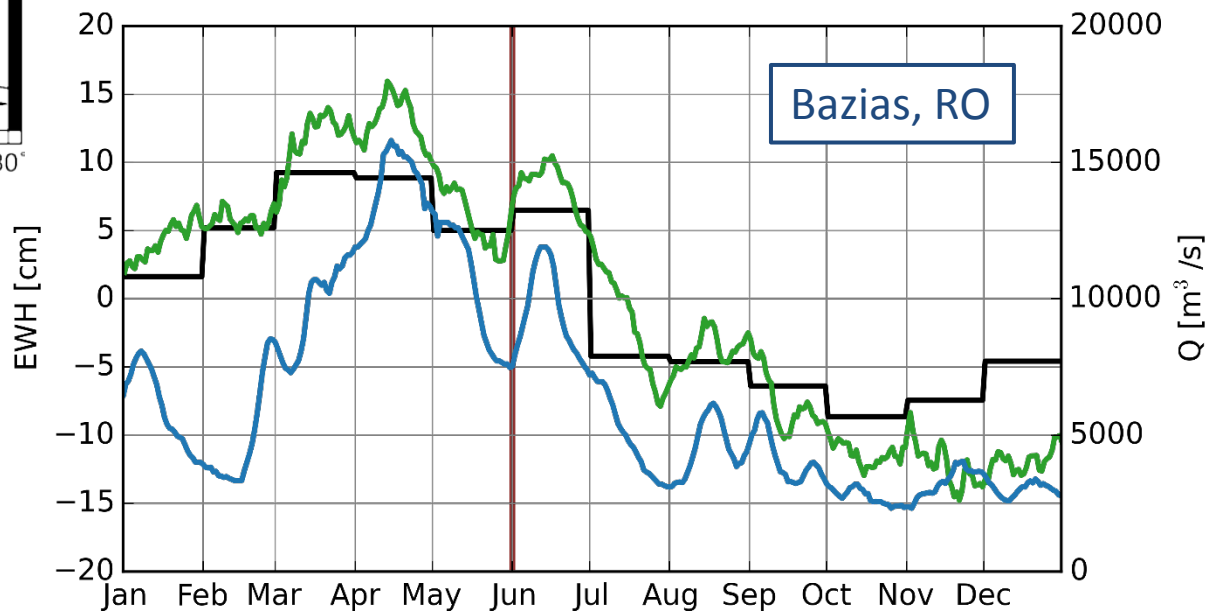
Danube floods 2006



Post processing results – ITSG-Grace2016



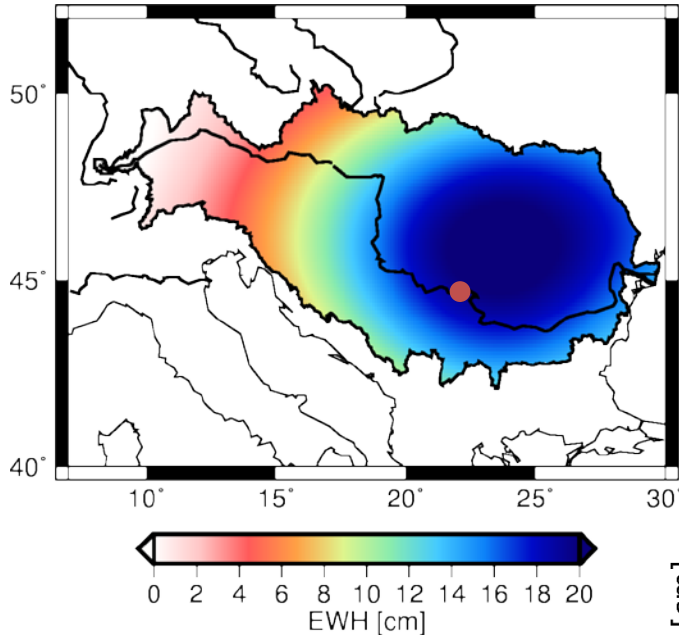
Danube floods 2006



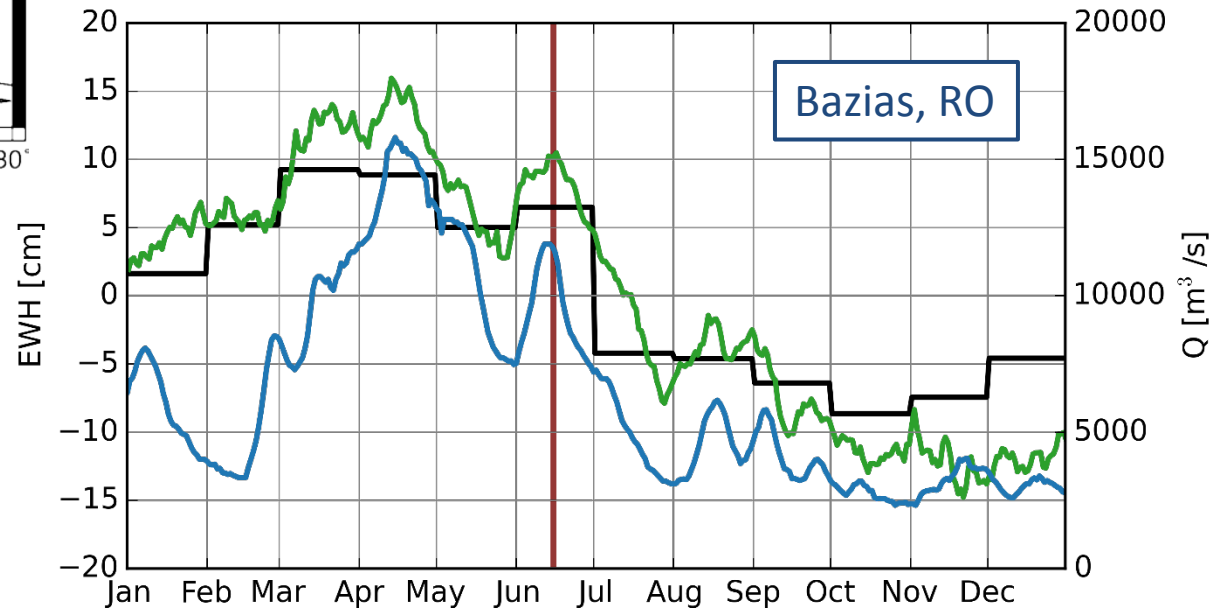
Bazias, RO

— CSR (350km Gaussian filter) — ITSG-Grace2016

Post processing results – ITSG-Grace2016

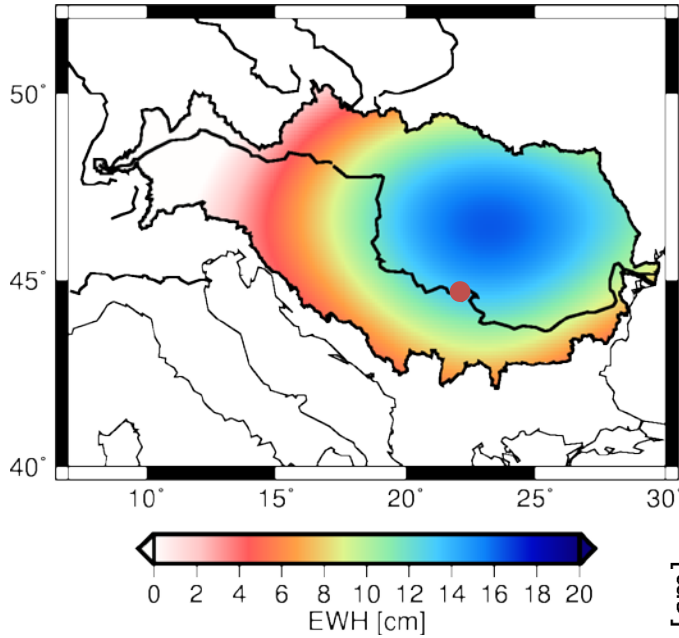


Danube floods 2006

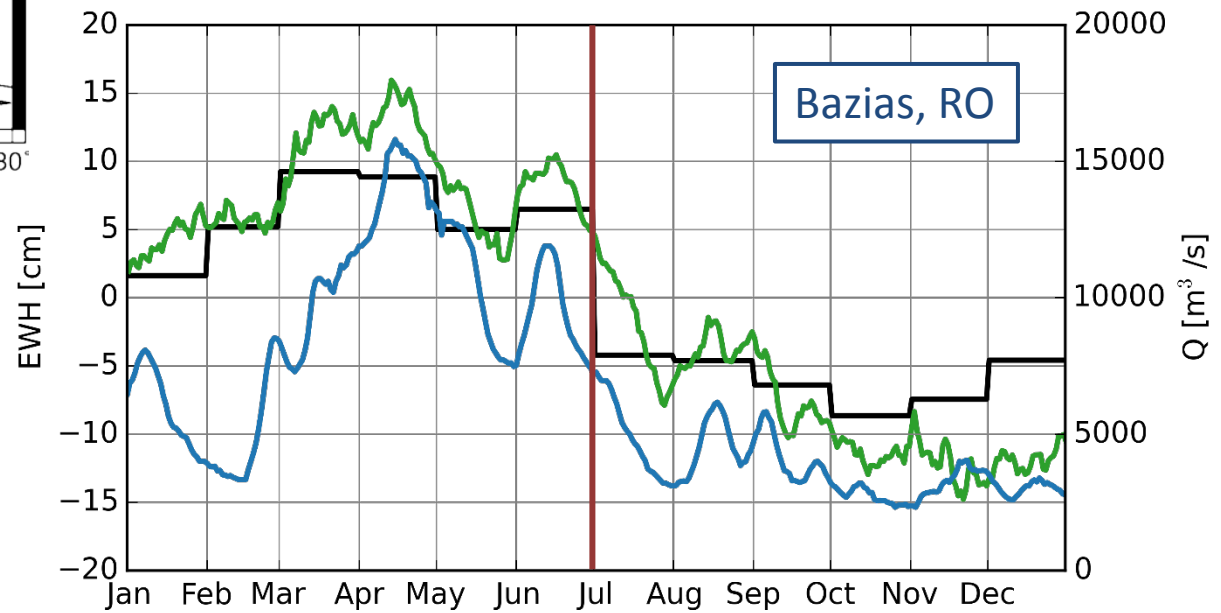


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Post processing results – ITSG-Grace2016



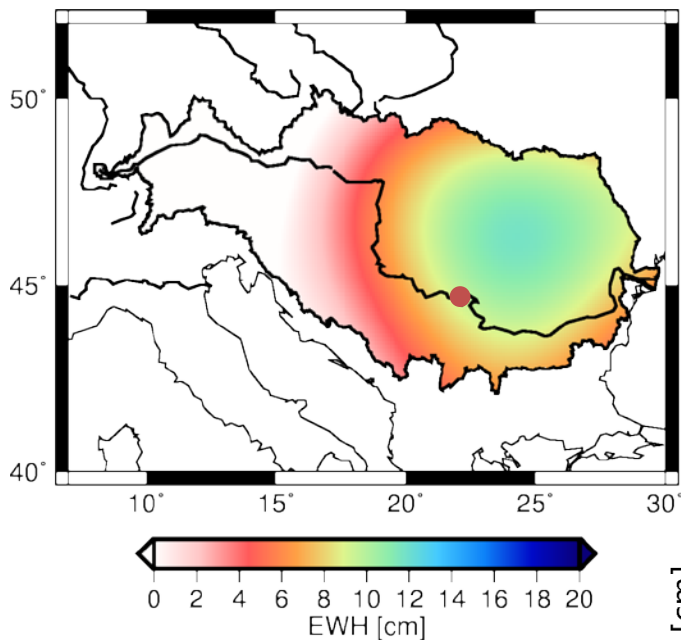
Danube floods 2006



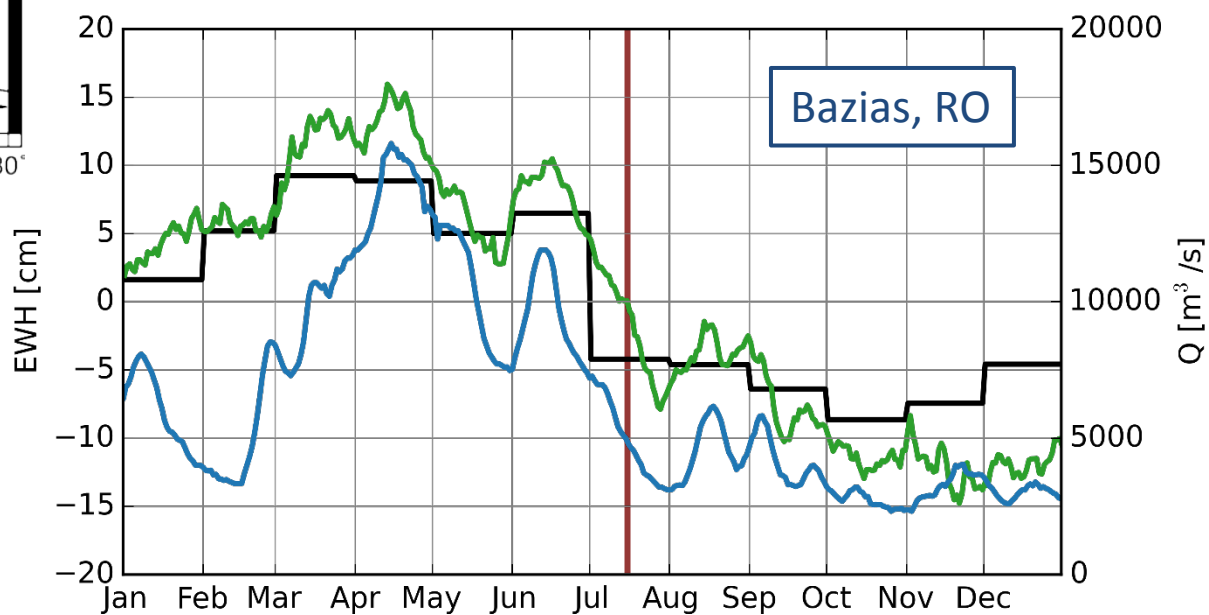
Bazias, RO

— CSR (350km Gaussian filter) — ITSG-Grace2016

Post processing results – ITSG-Grace2016



Danube floods 2006



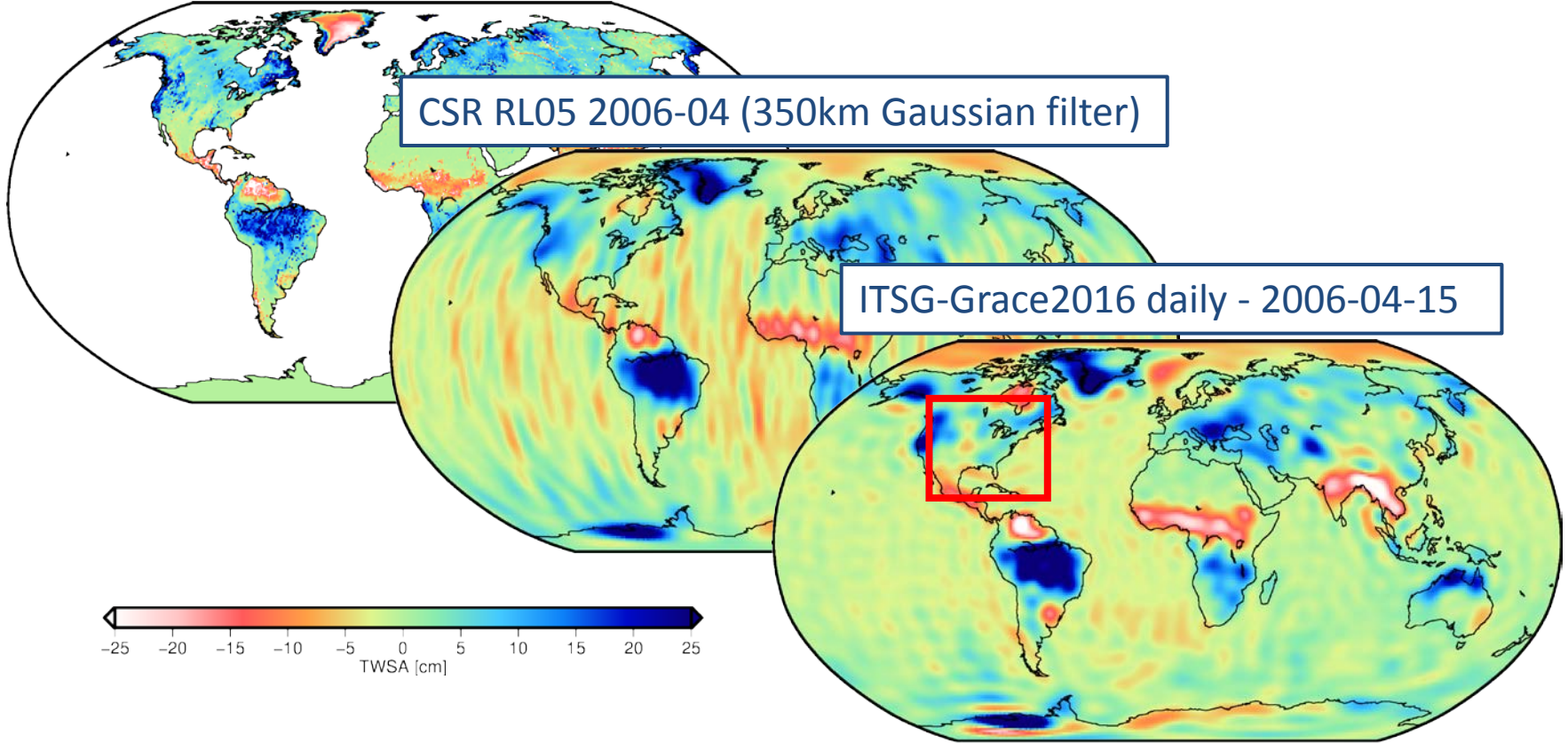
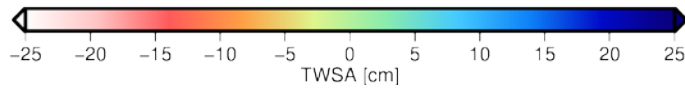
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Post processing results – ITSG-Grace2016

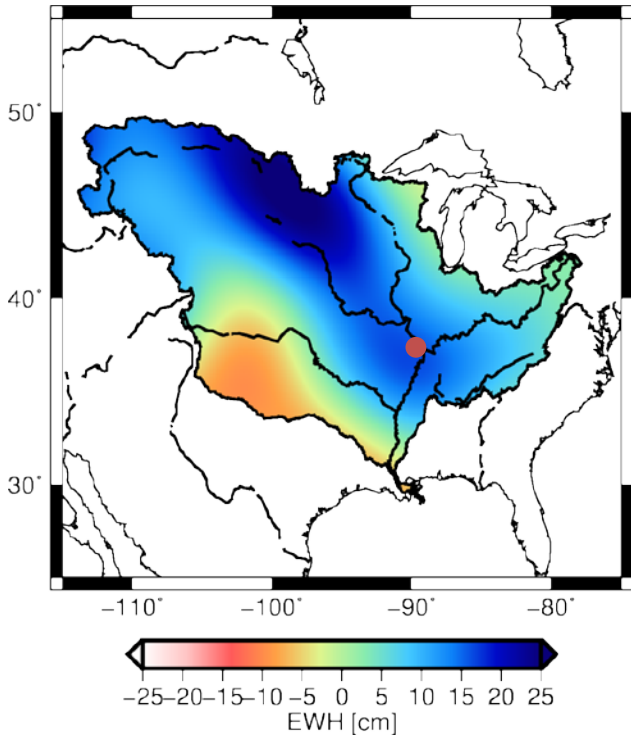
WGHM - 2006-04-15

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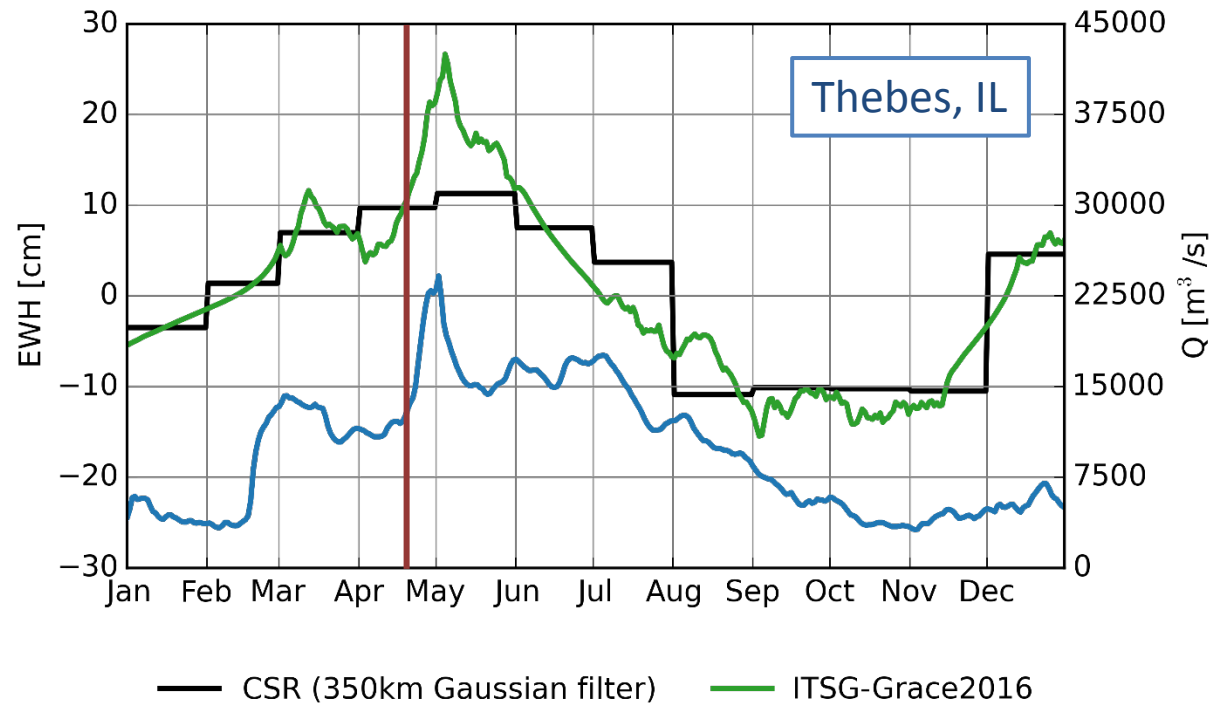
ITSG-Grace2016 daily - 2006-04-15



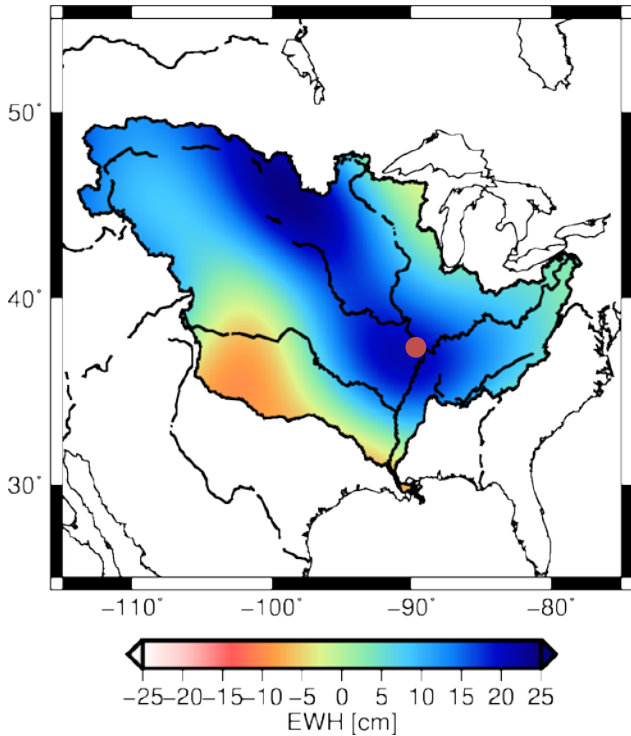
Post processing results – ITSG-Grace2016



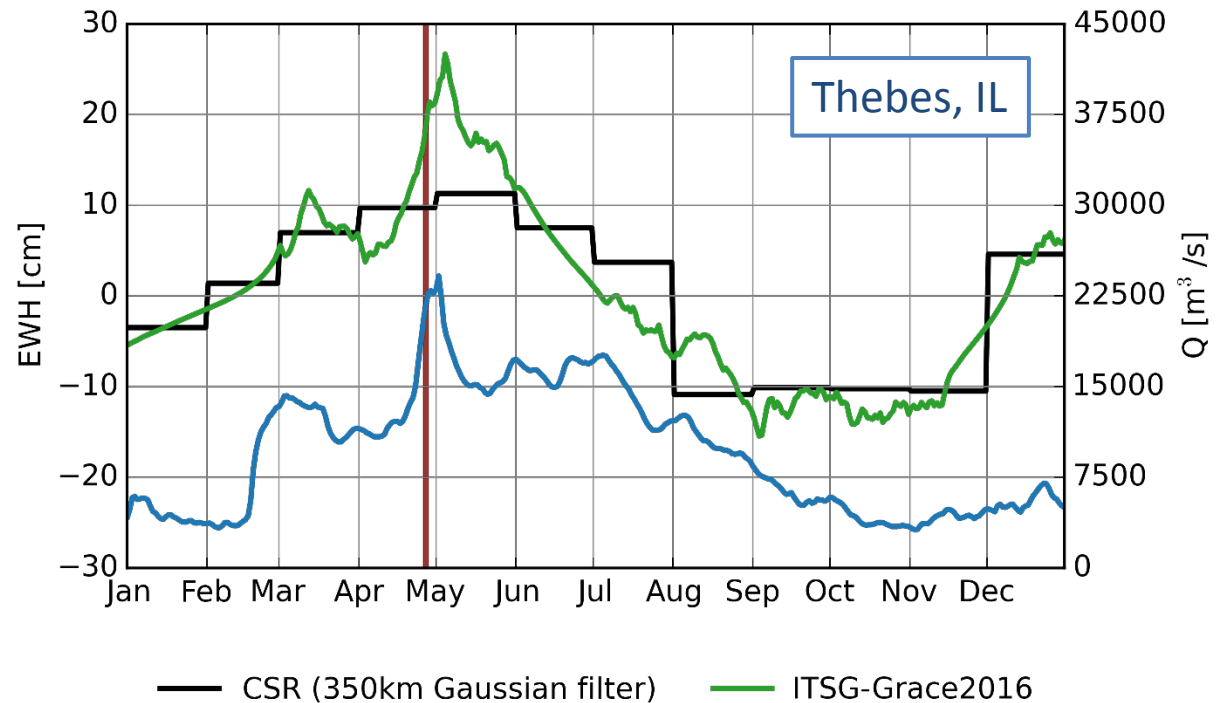
Great Mississippi Flood of 2011



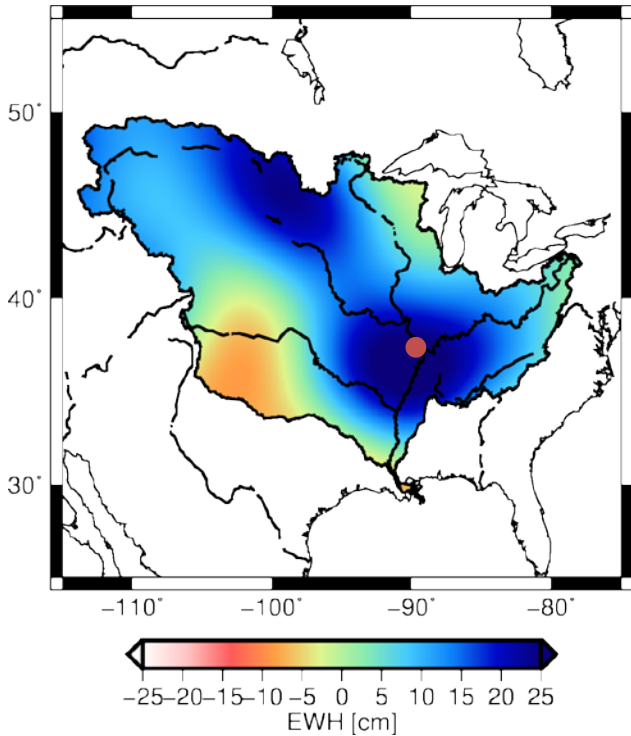
Post processing results – ITSG-Grace2016



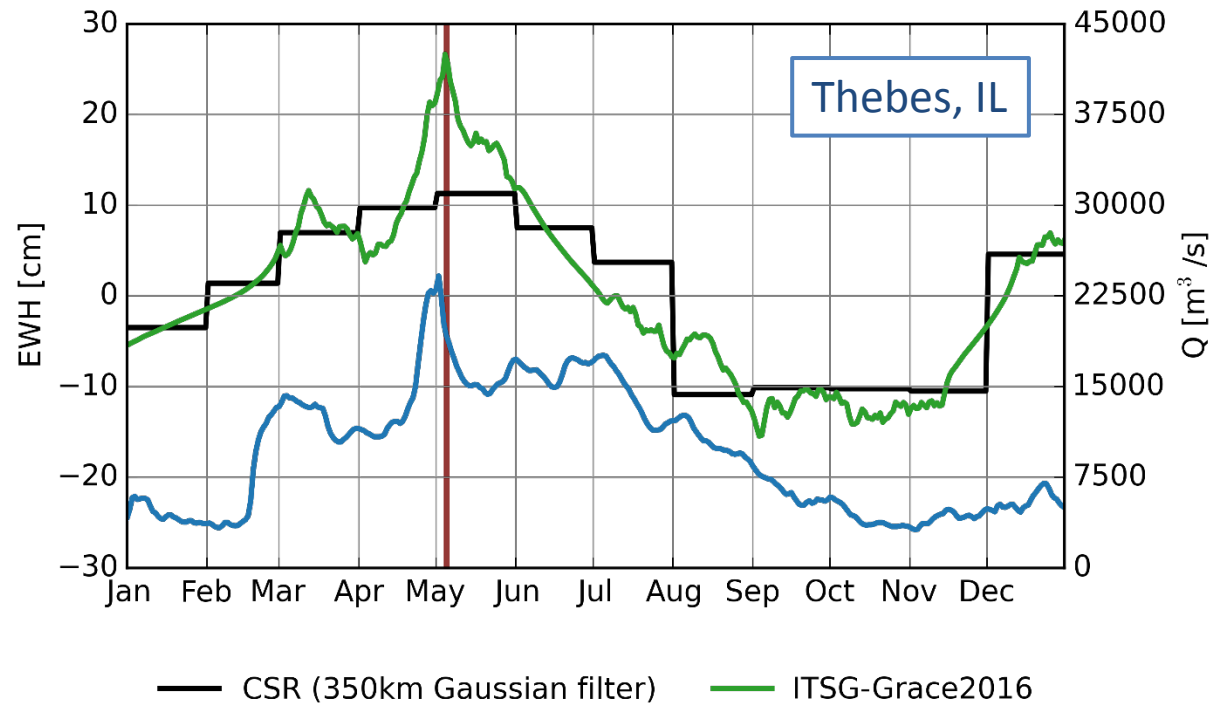
Great Mississippi Flood of 2011



Post processing results – ITSG-Grace2016



Great Mississippi Flood of 2011

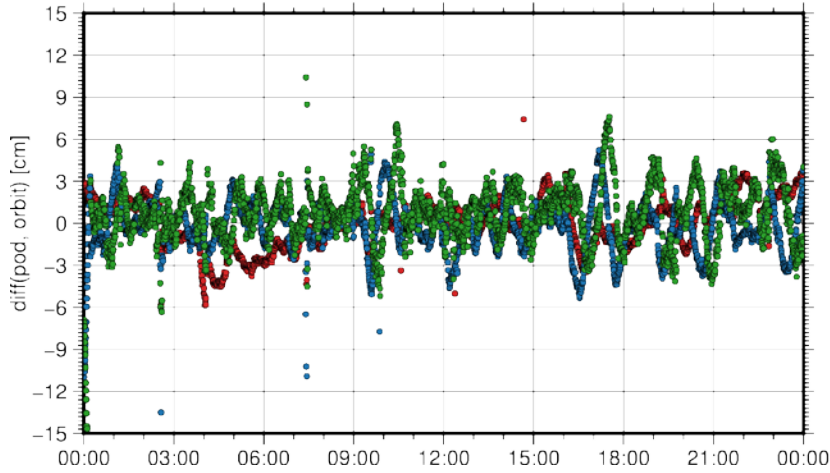


Rapid GNSS Input Data

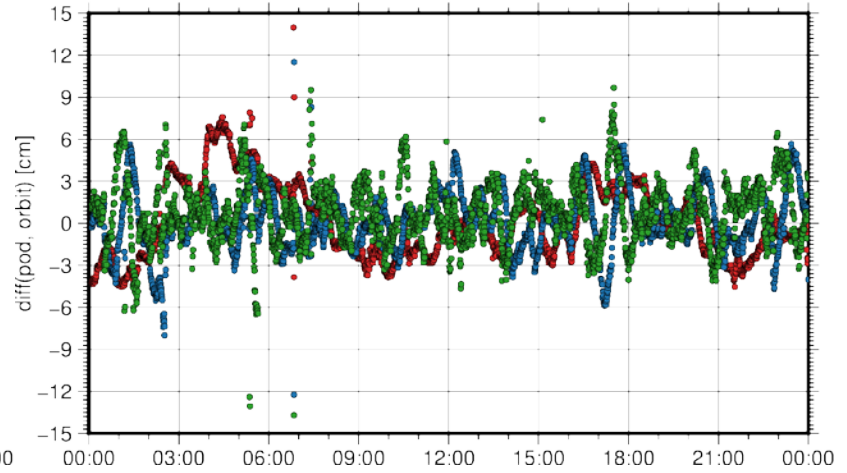
Status of NRT – Rapid Input Data

CODE rapid

GRACE A (2015-09-11)



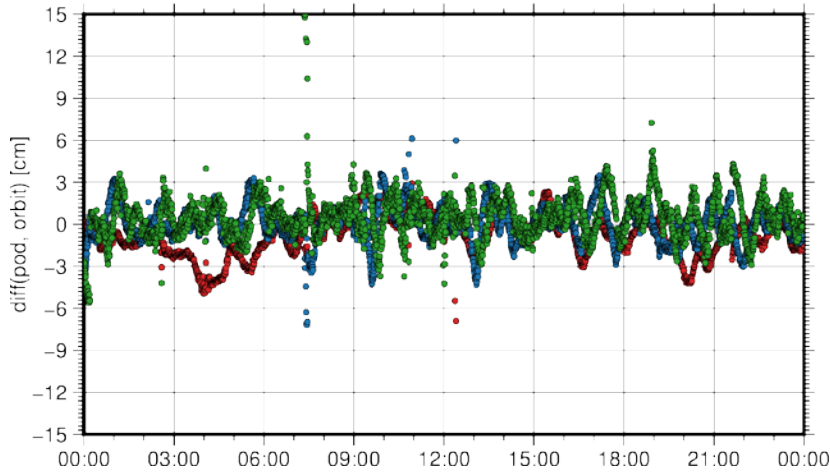
GRACE B (2015-09-11)



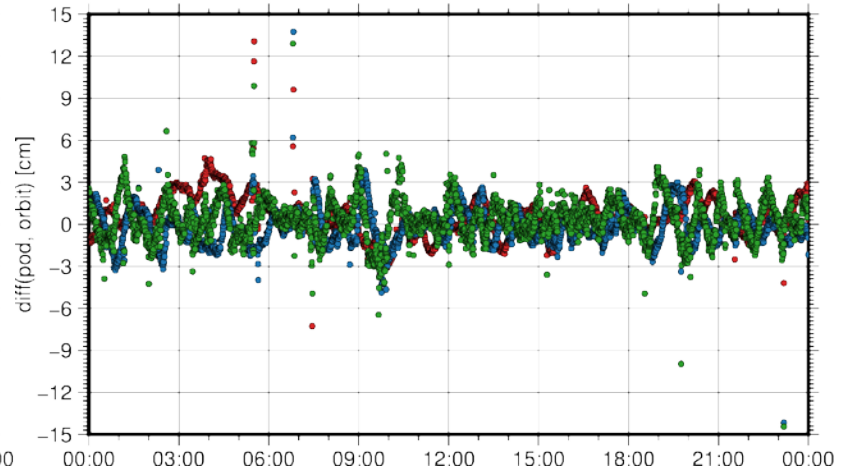
- across
- along
- radial

CODE final

GRACE A (nox) (2015-09-11)

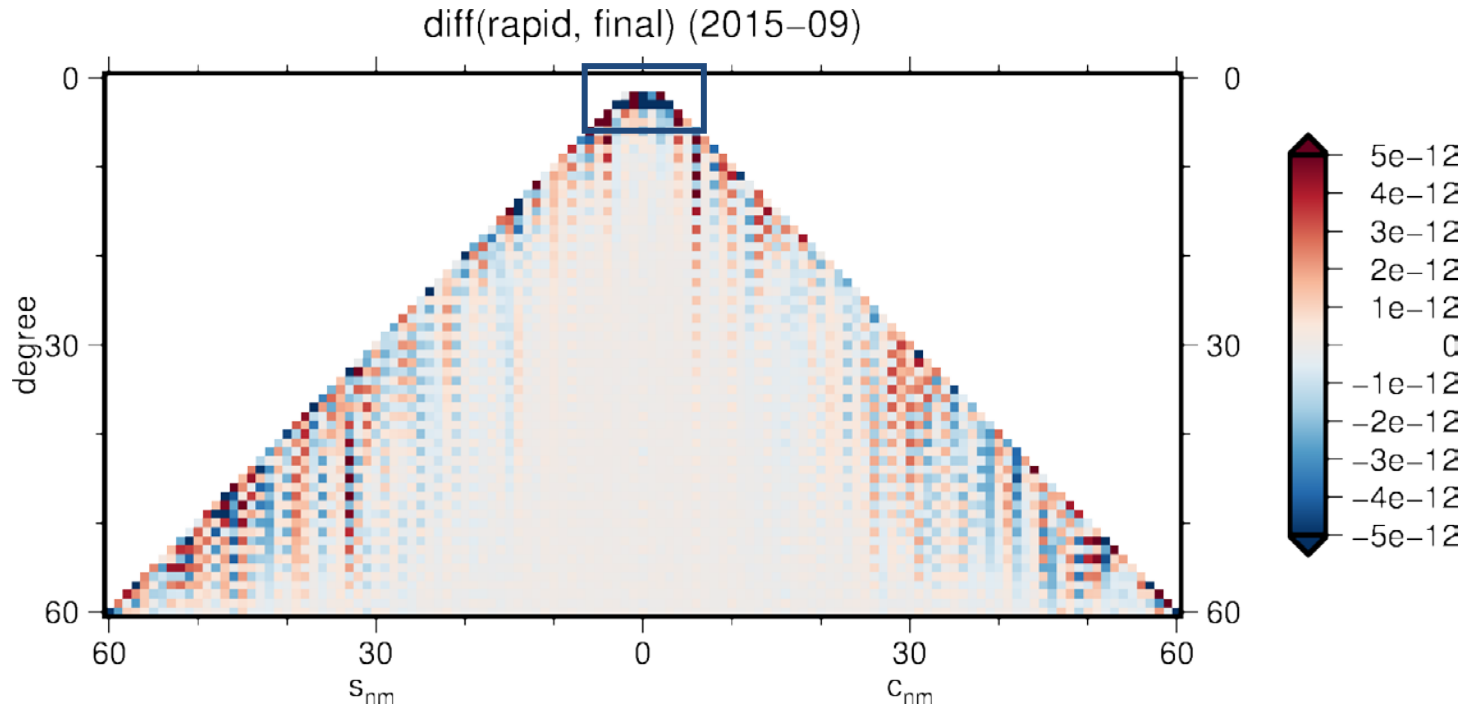


GRACE B (nox) (2015-09-11)

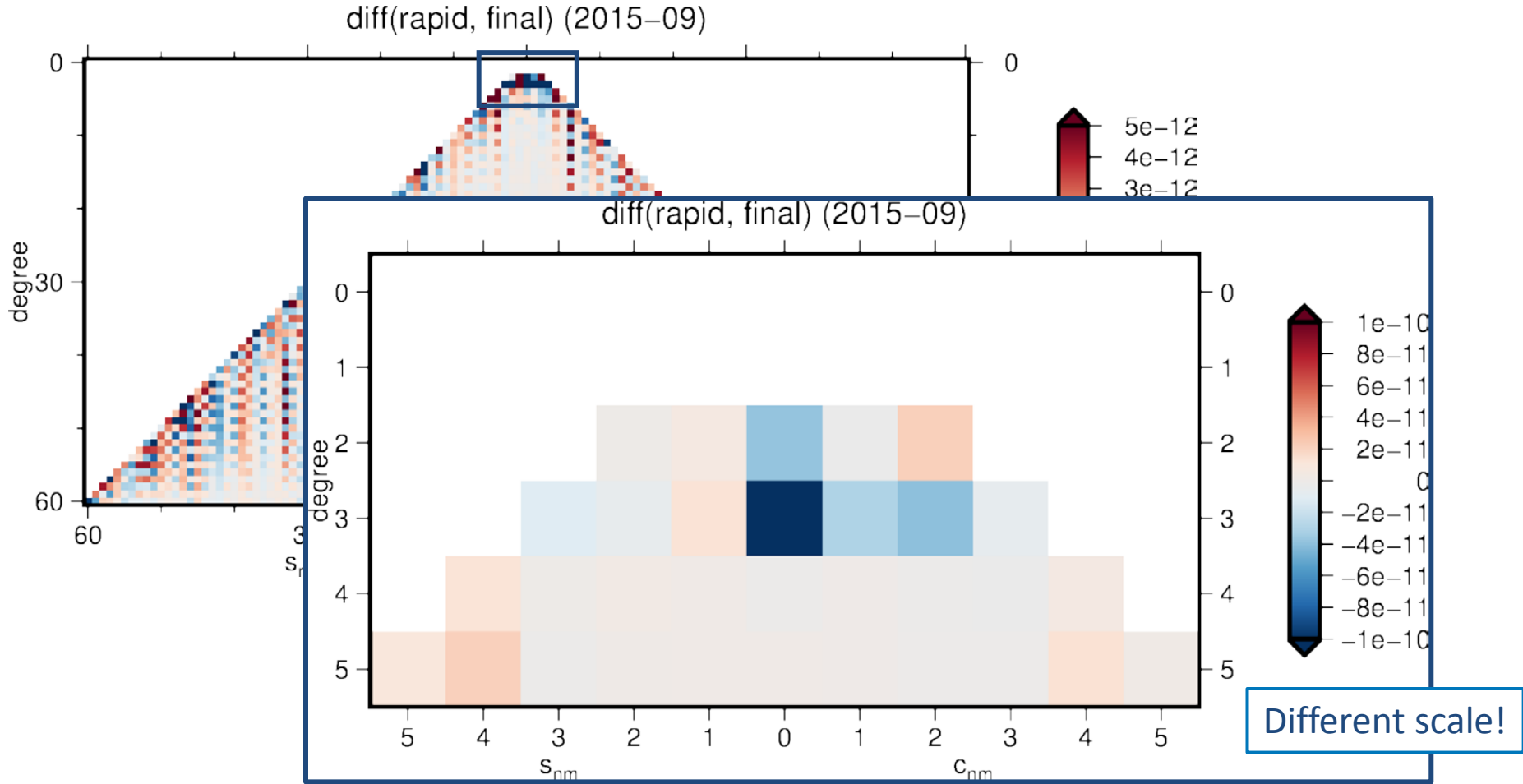


- across
- along
- radial

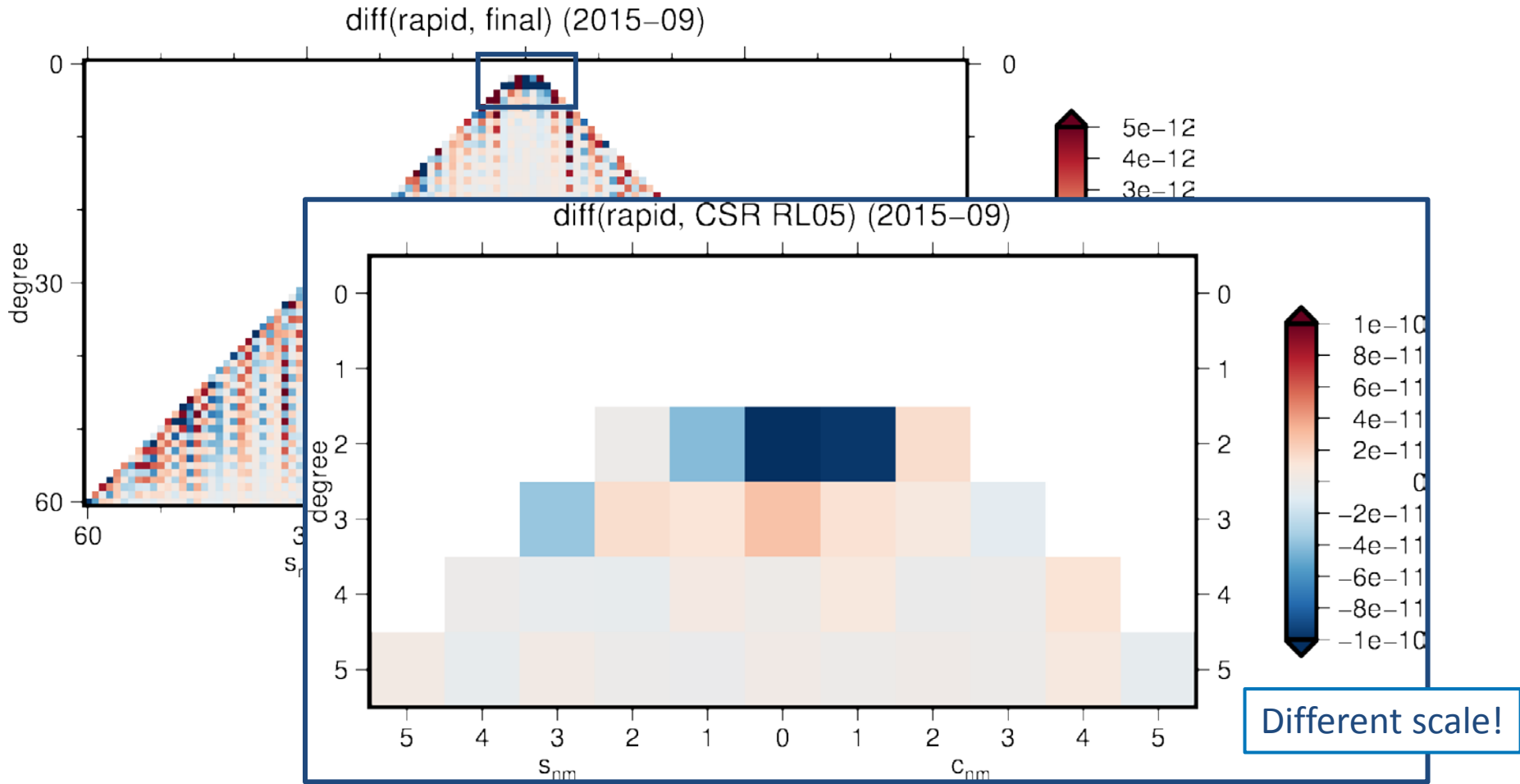
Status of NRT – Rapid Input Data



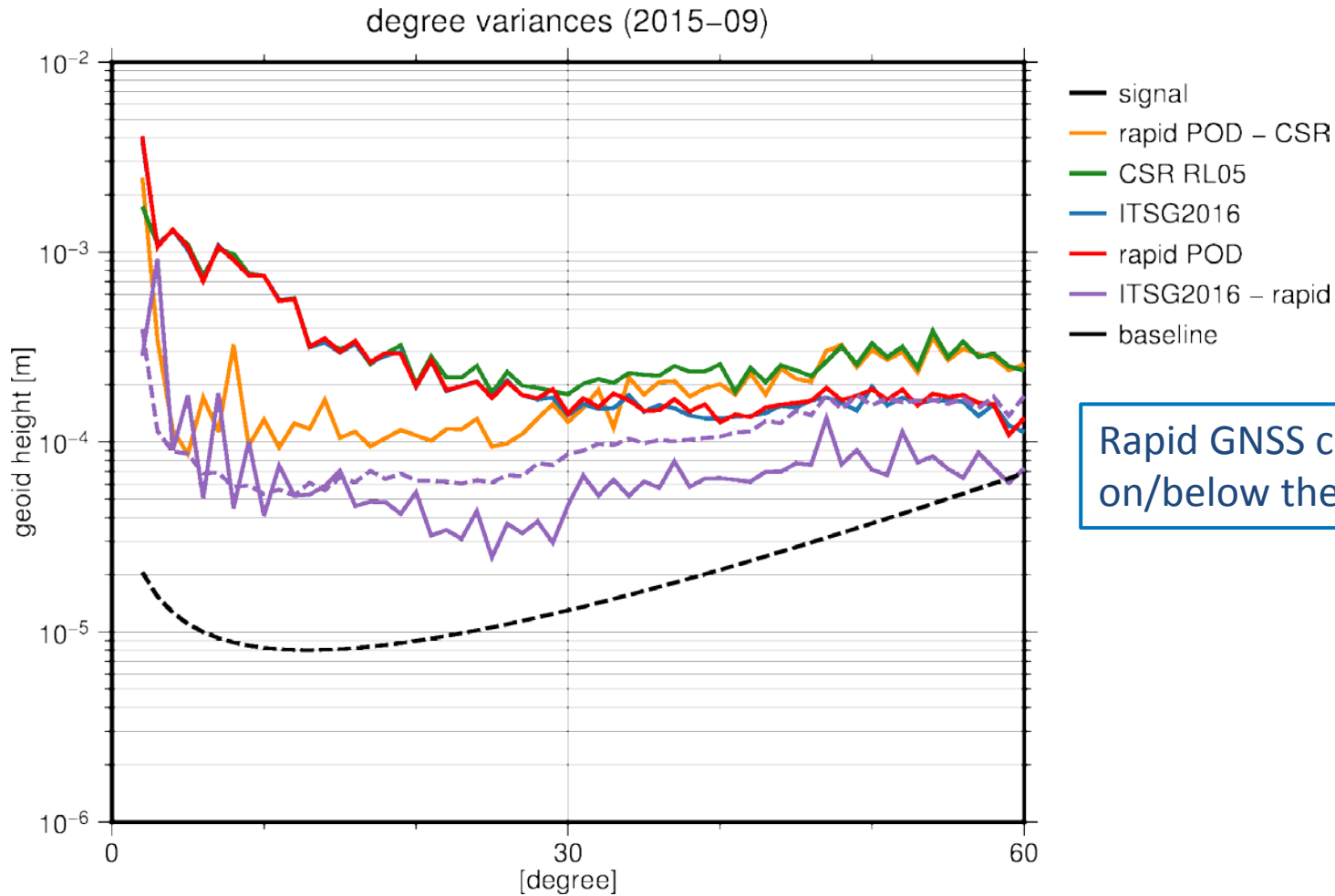
Status of NRT – Rapid Input Data



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Rapid GNSS constellation is on/below the formal errors

Gridded Total Water Storage

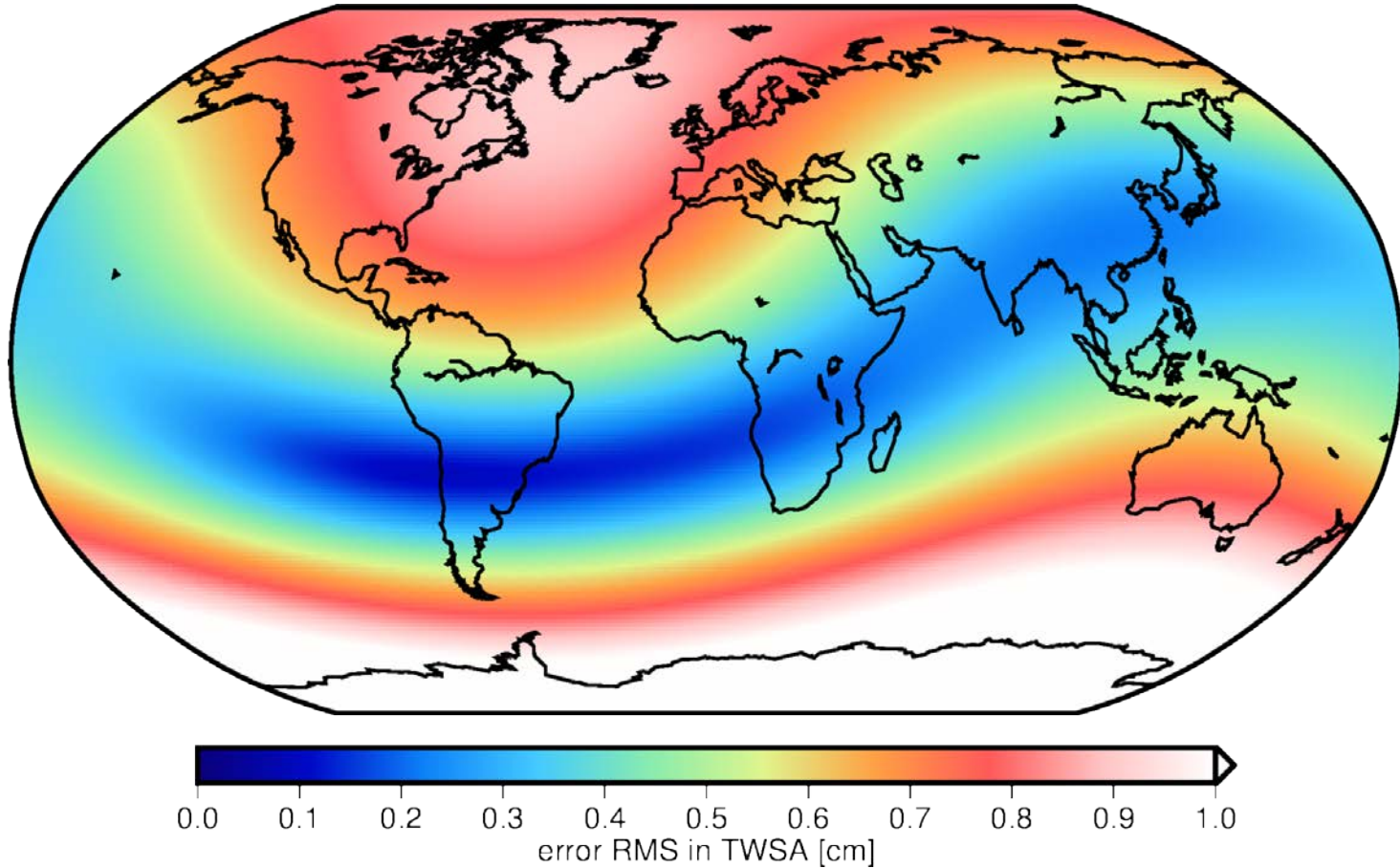
Status of NRT – Gridded Total Water Storage

- Required external input: degree 1 terms (geocenter motion), c20 coefficient
- Mass variations in center of figure required for
 - Hydrological service
 - GNSS validation
- No operational NRT product available (to our knowledge)
- Proposal: extrapolation with major constituents

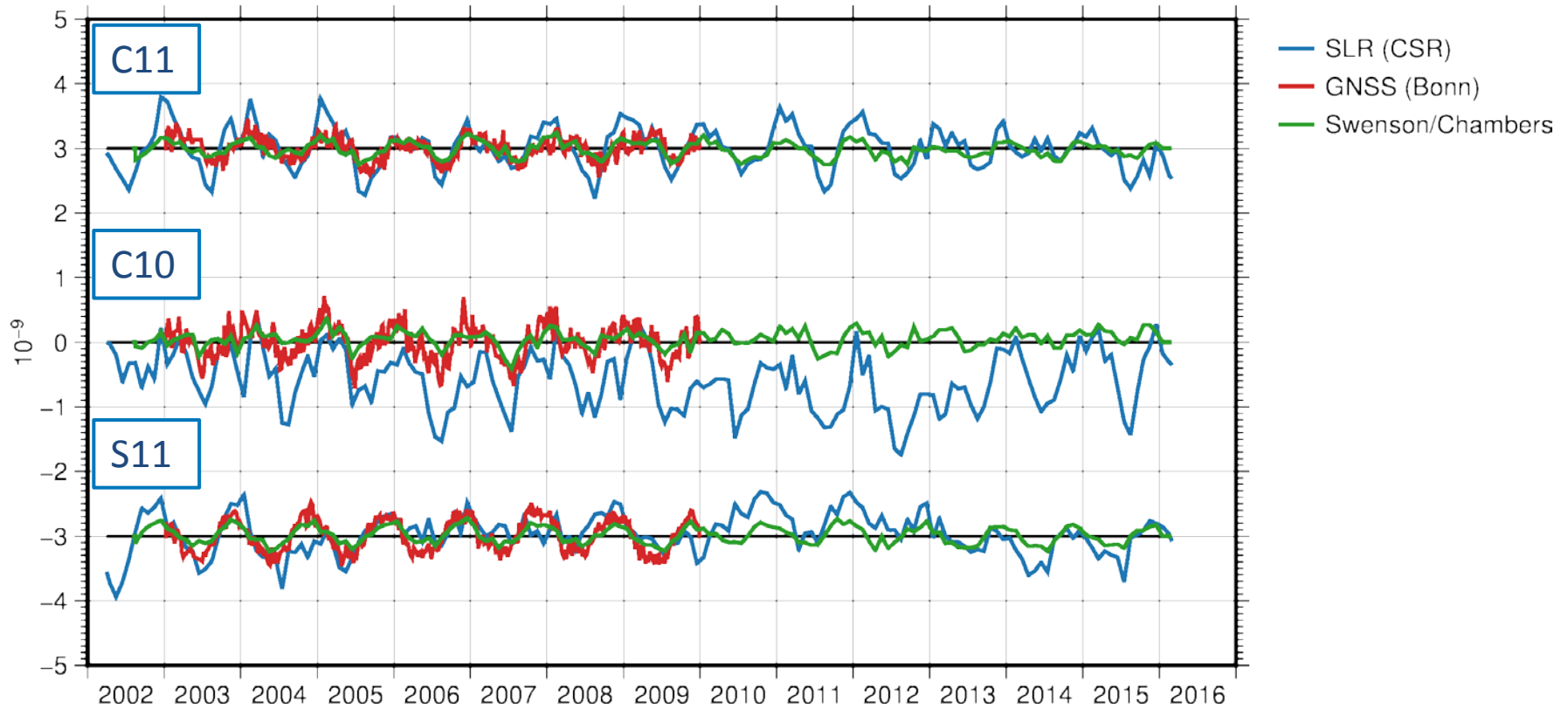


Status of NRT – Gridded Total Water Storage

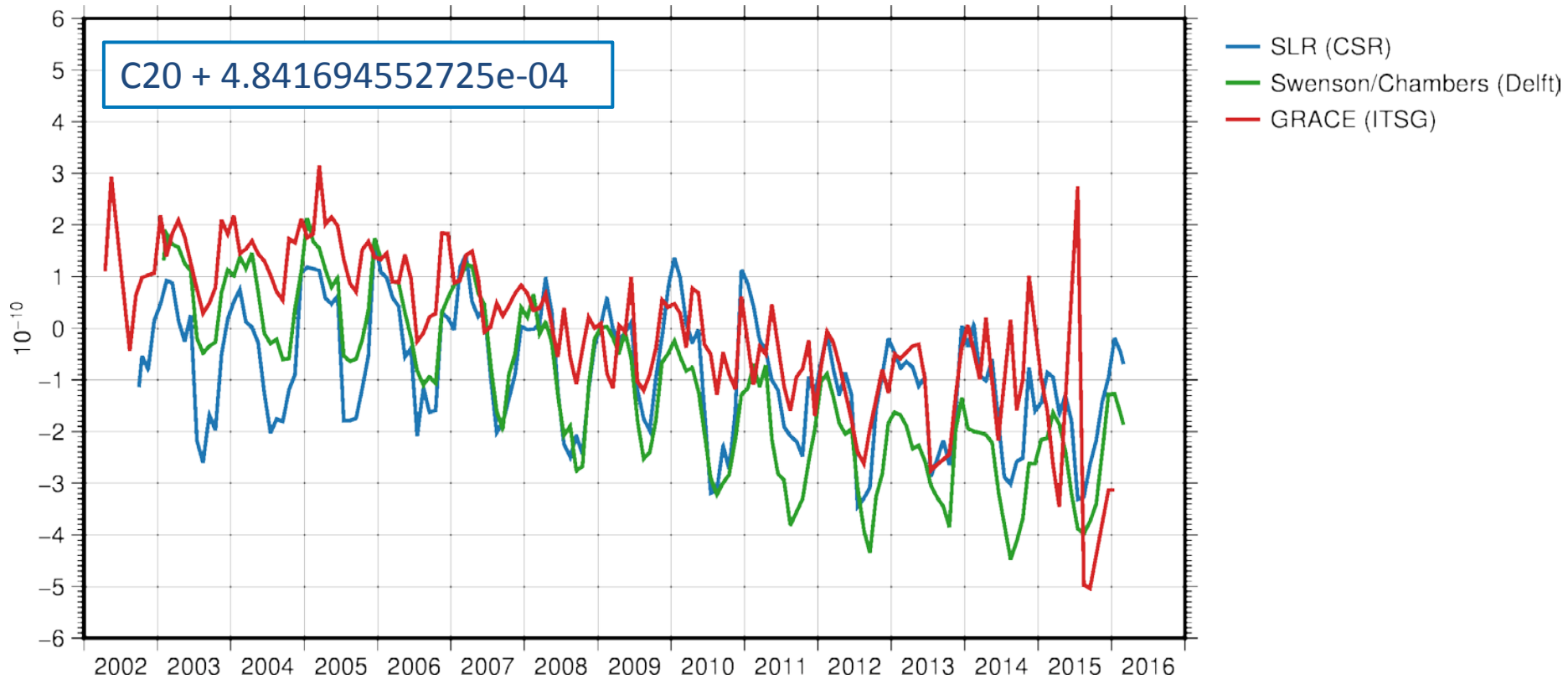
Approximation with SA/SSA/trend – 4 months extrapolated



Status of NRT – Gridded Total Water Storage



Status of NRT – Gridded Total Water Storage



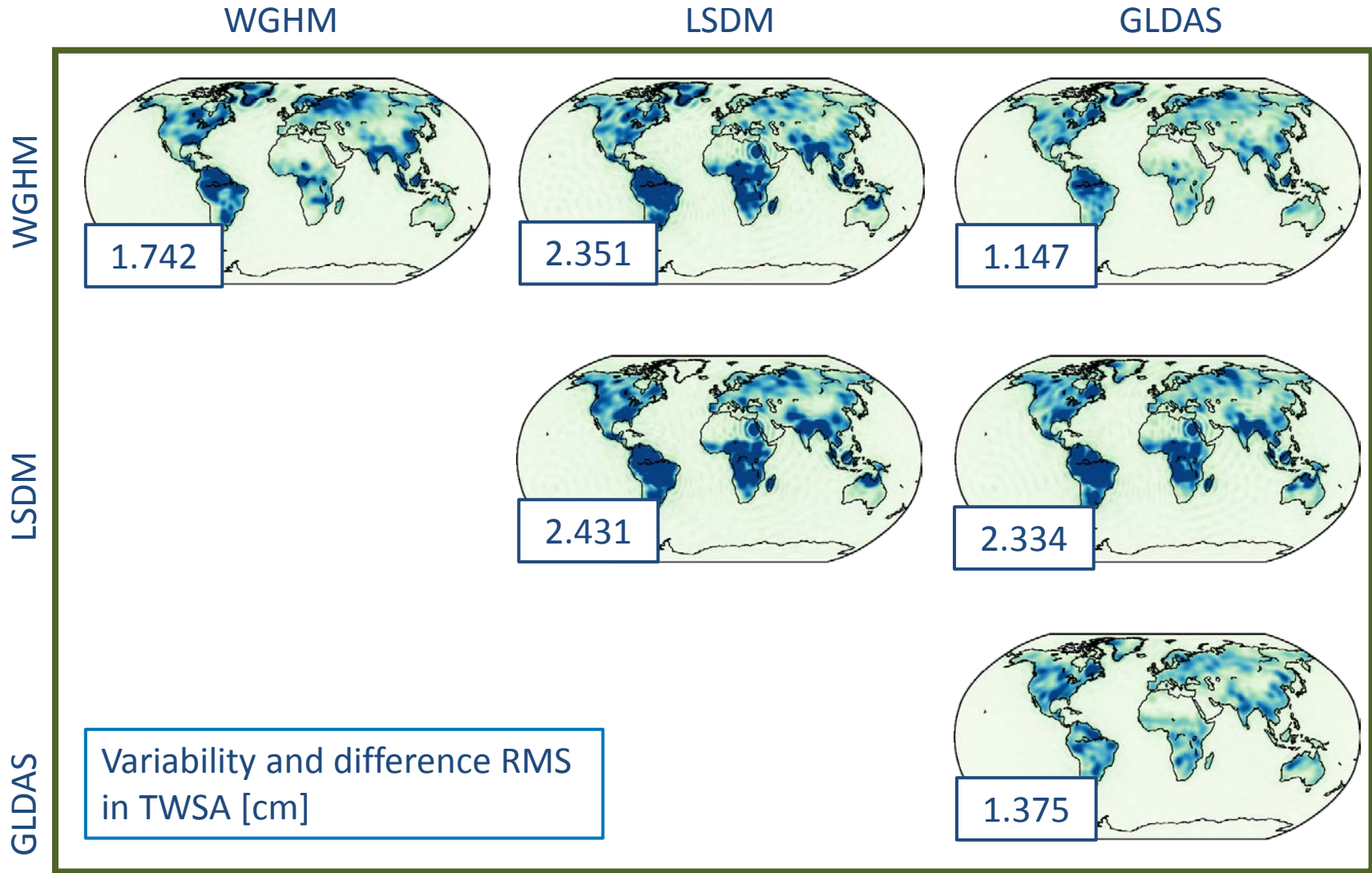
Which product to use?

Impact of Process Dynamic on Kalman Solutions

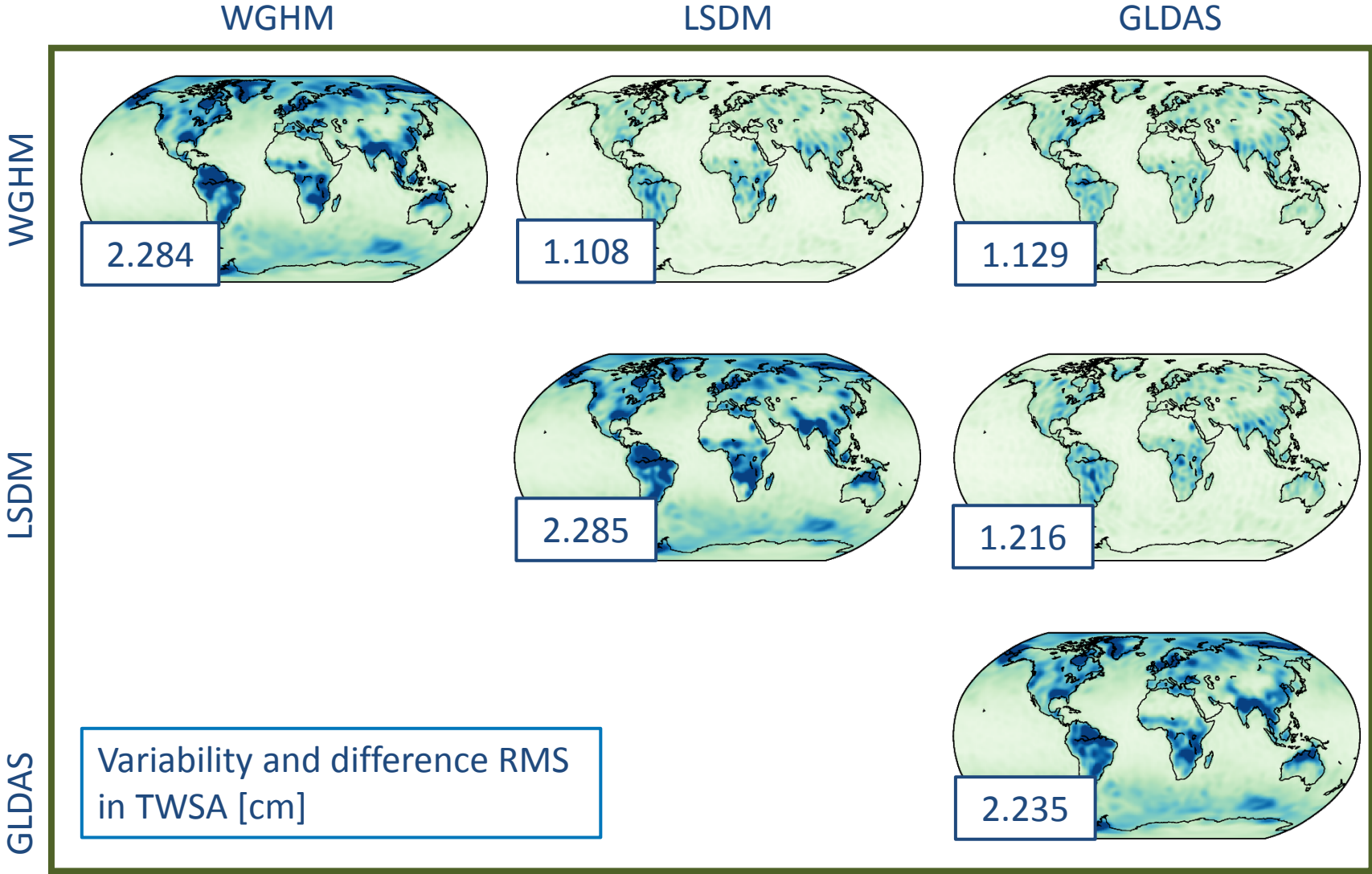
Daily Solutions – Impact of Background Models

- How much prior information is contained in the Kalman solutions?
- Study setup:
 - Process dynamic from three different hydrological models
 - one set of GRACE normal equations (ITSG-Grace2014)
 - three Kalman filter solutions
- Cross comparison of:
 - model \leftrightarrow model
 - GRACE \leftrightarrow GRACE
 - GRACE \leftrightarrow model

Daily Solutions – Impact of Background Models



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Daily Solutions – Impact of Background Models

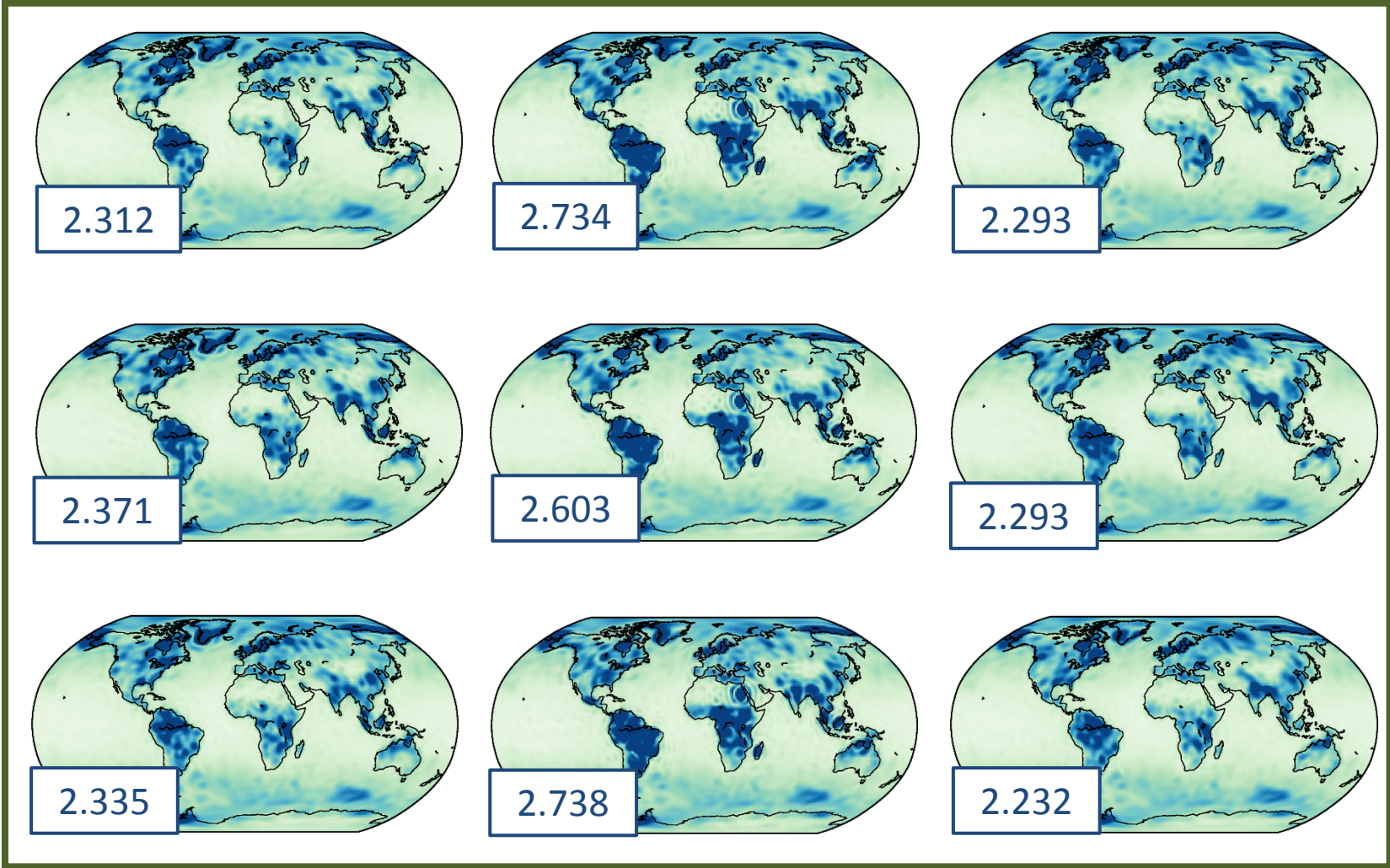
Models

WGHM

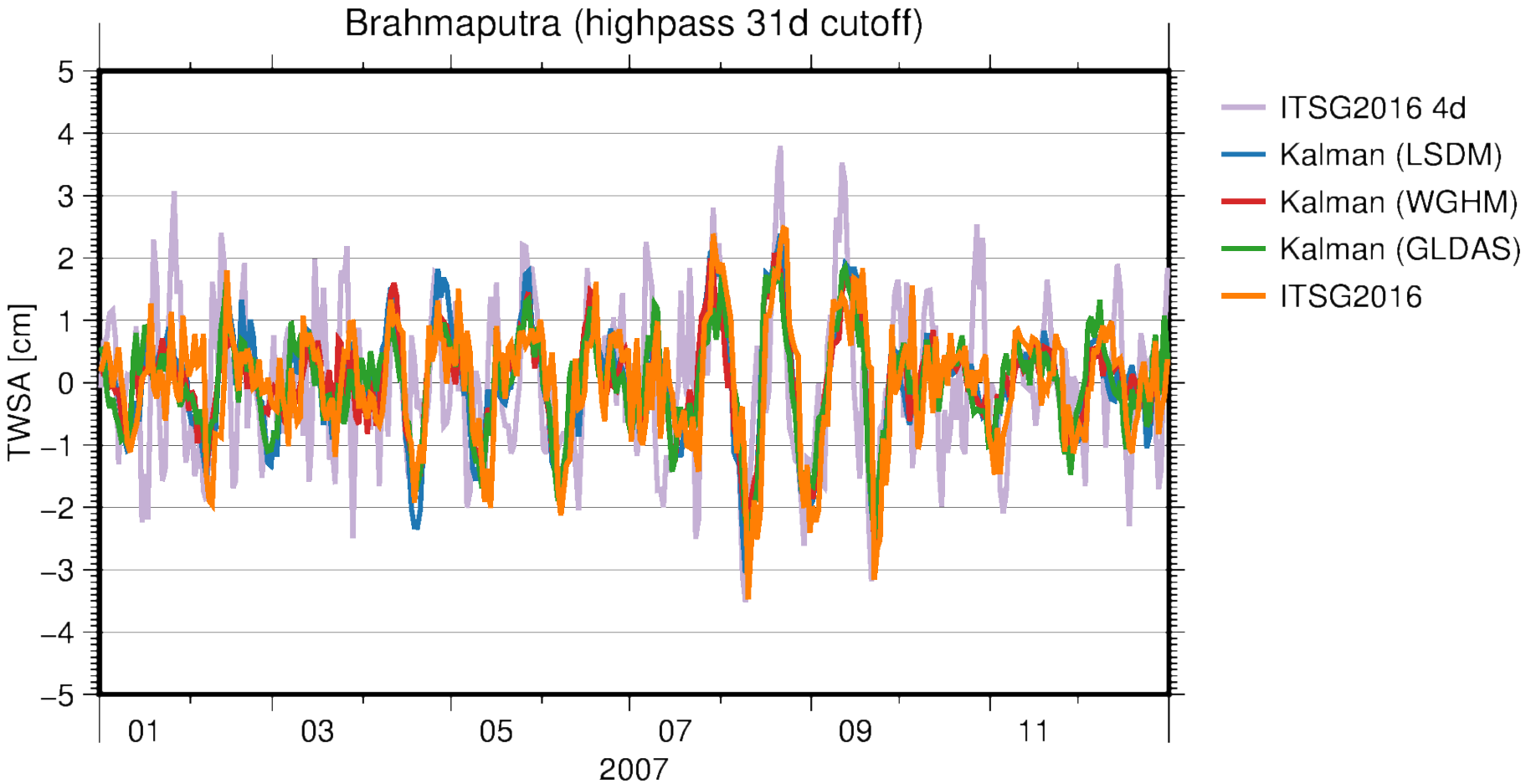
LSDM

GLDAS

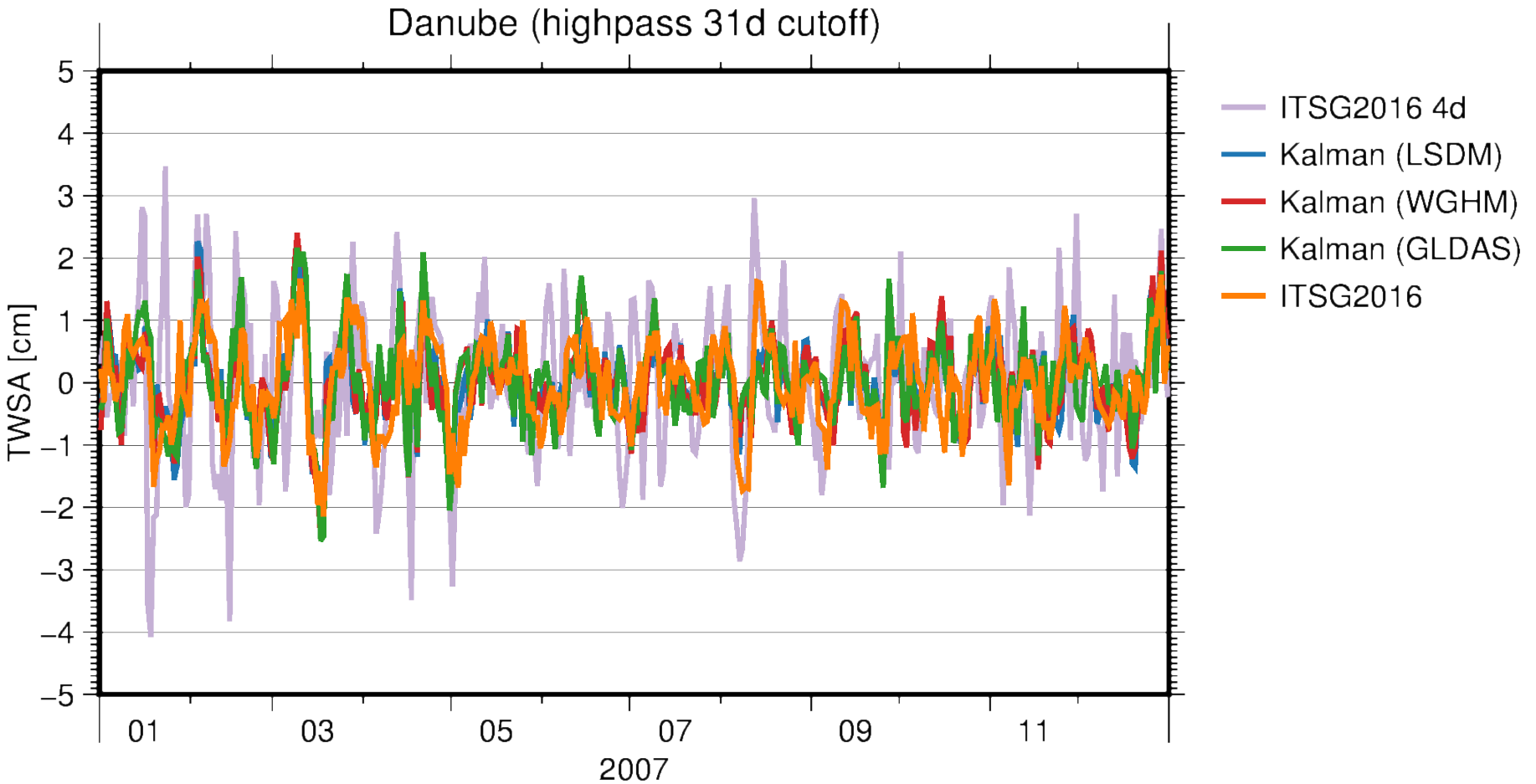
WGHM
LSDM
GLDAS
GRACE



Daily Solutions – Impact of Background Models

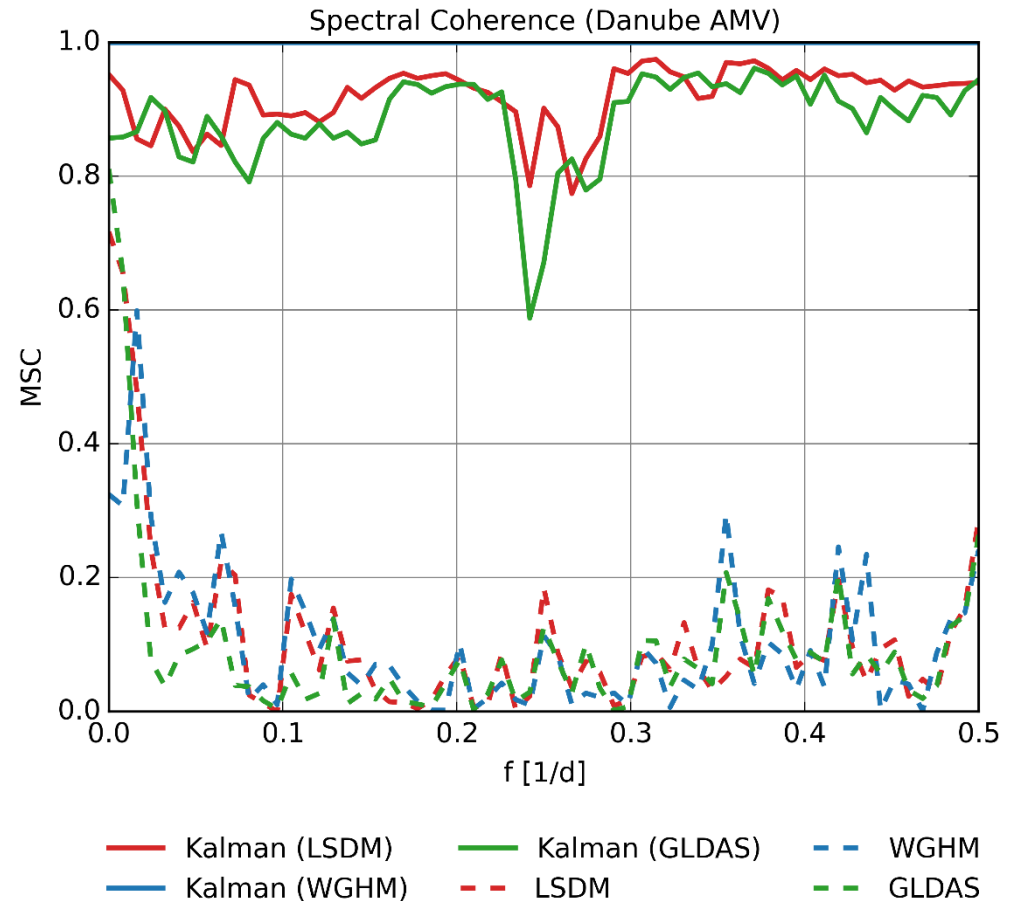


Daily Solutions – Impact of Background Models



Daily Solutions – Impact of Background Models

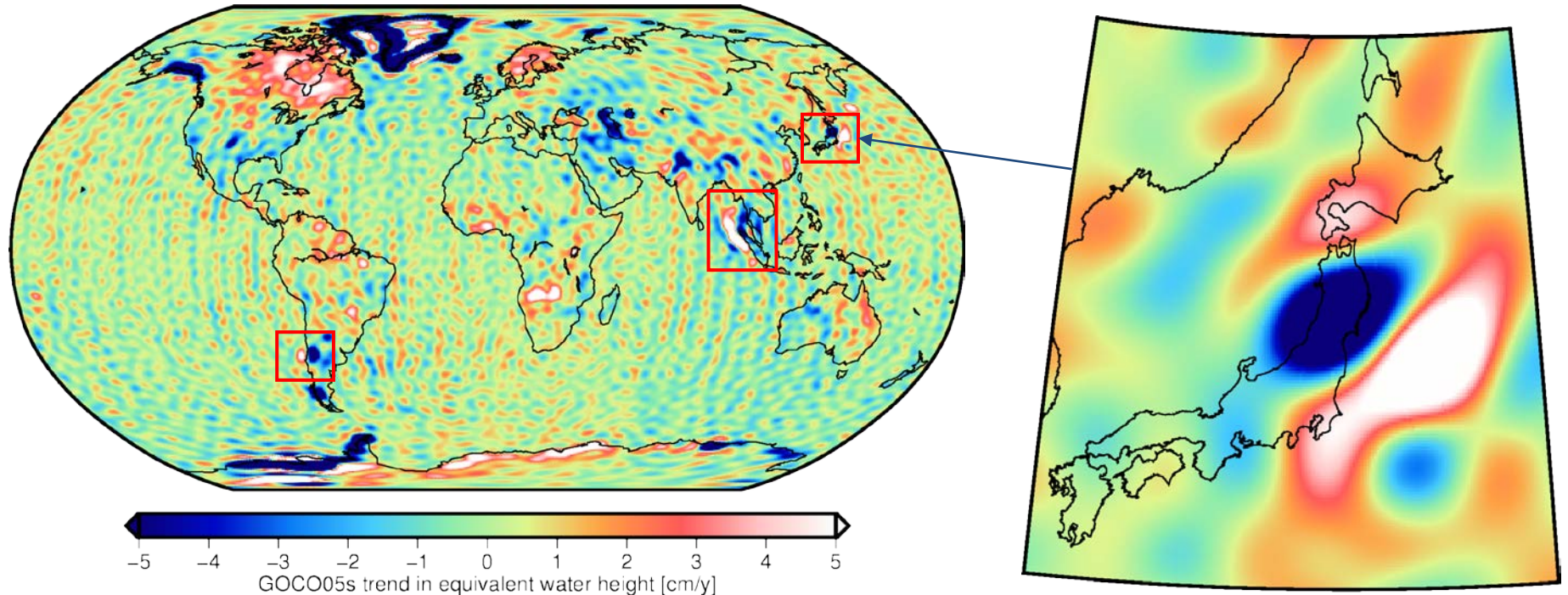
- GRACE solutions exhibit better consistency than models
- No clear bias towards the used process model visible



Plans Towards Operational Phase

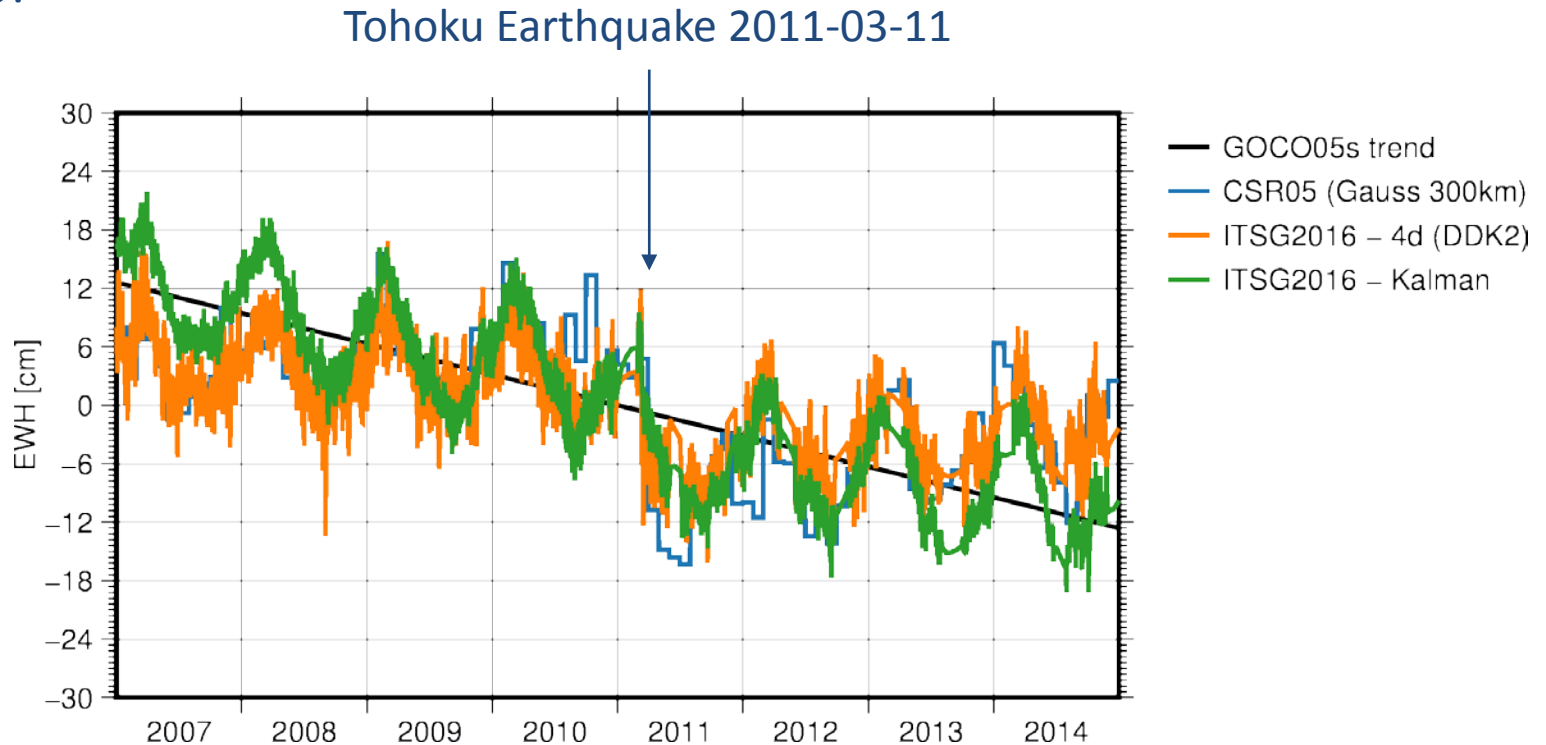
Plans Towards Operational Phase

- New static GRACE model (ITSG-Grace2016s, ITSG-Grace2016k)
 - Piecewise linear trend
 - Co-estimation of SA/SSA
 - Tides?



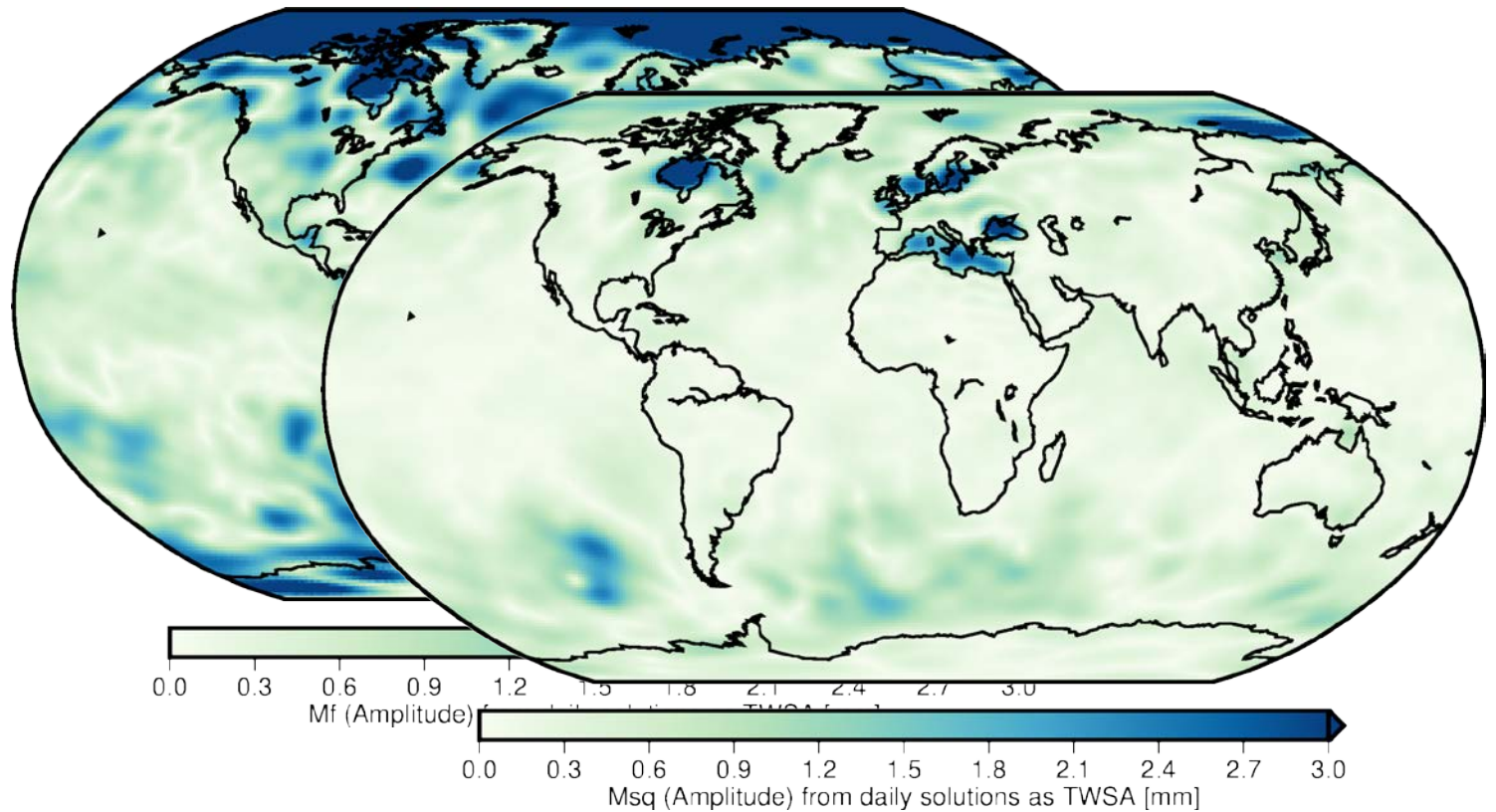
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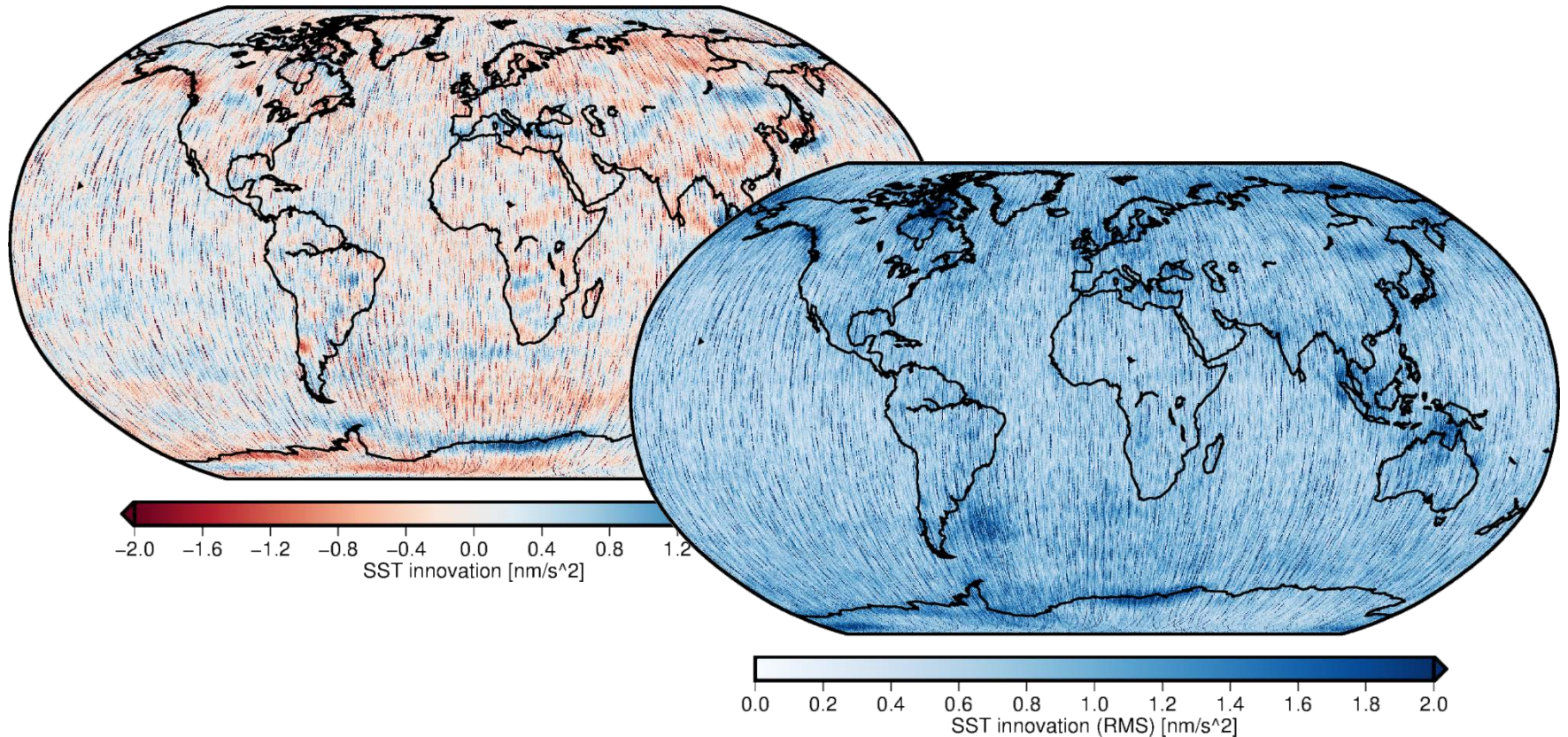
Plans Towards Operational Phase

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 - Co-estimation of SA/SSA
 - Tides?



Plans Towards Operational Phase

- Internal consistency checks using system innovation:
How well does the prediction fit the GRACE observations?



Plans Towards Operational Phase

- Evaluation of Swenson/Chambers method for NRT geocenter estimation
- Continuation of time lagged service run (currently seven years in the past)
 - Move towards a more recent time span → long data gaps

Summary

- Software packages for NRT operations are implemented → MS3
- Start of T5.3, T5.5 → Interfaces need to be defined
- Points for discussion:
 - NRT Level 3 product input data
 - Machine readable validation result
 - Interfaces to the outside world

EGSIEM

European Gravity Service for Improved Emergency Management

Title: **Status of NRT & Regional Service at TUG**

Presenter: AK

Affiliation: TUG

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