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European Gravity Service for Improved Emergency Management

Near real-time GRACE gravity field solutions for hydrological monitoring applications

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Horizon2020

Outline

- EGSIEM near real-time gravity field service
- Daily gravity field processing strategy
- Post-processing results
- Conclusions and outlook

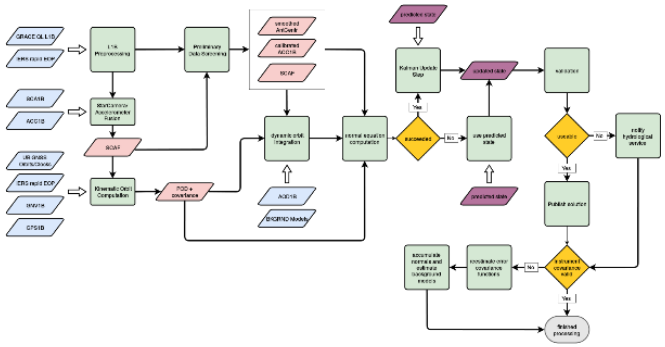
EGSIEM near real-time (NRT) service

- As part of the EGSIEM project a tech demonstrator for near real-time gravity products will be established

- Operations will be run at GFZ and Graz University of Technology
  - Evaluation with GNSS loading at University of Luxembourg

- Scope: daily GRACE gravity field solutions with five day delay

- Two independently computed solutions
  - Global: spherical harmonic representation
  - Regional: radial basis functions



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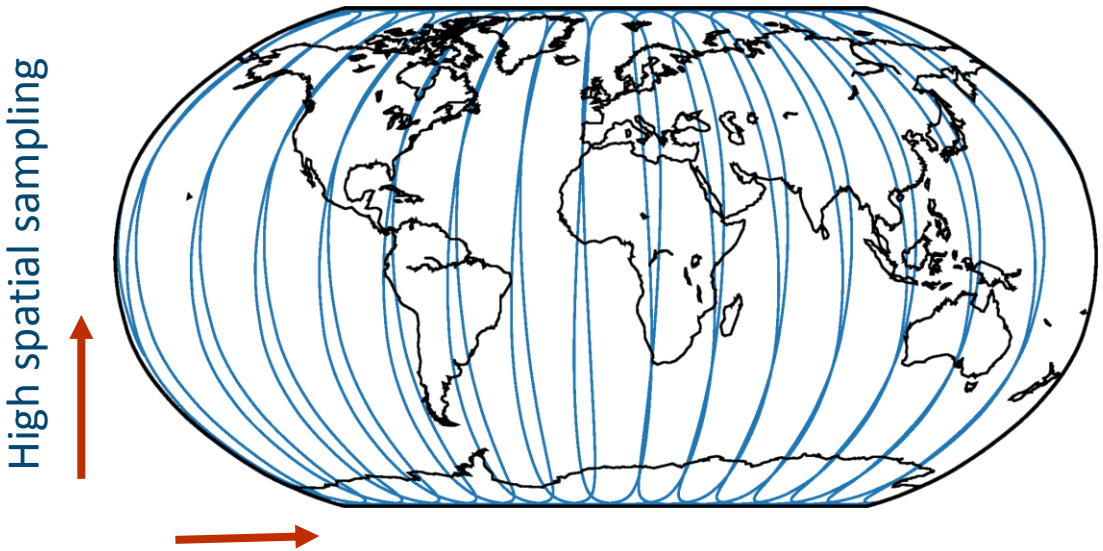
Processing strategy

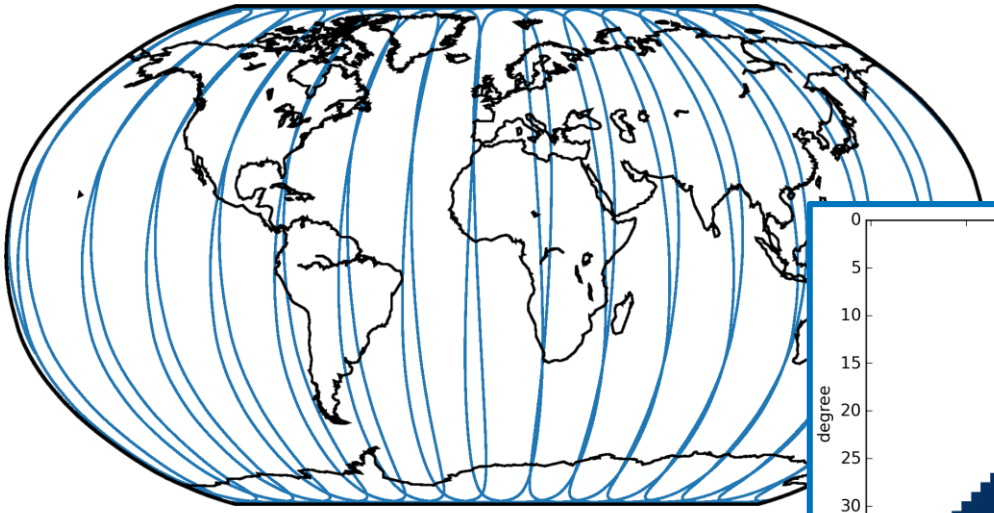


GRACE data coverage:

Daily

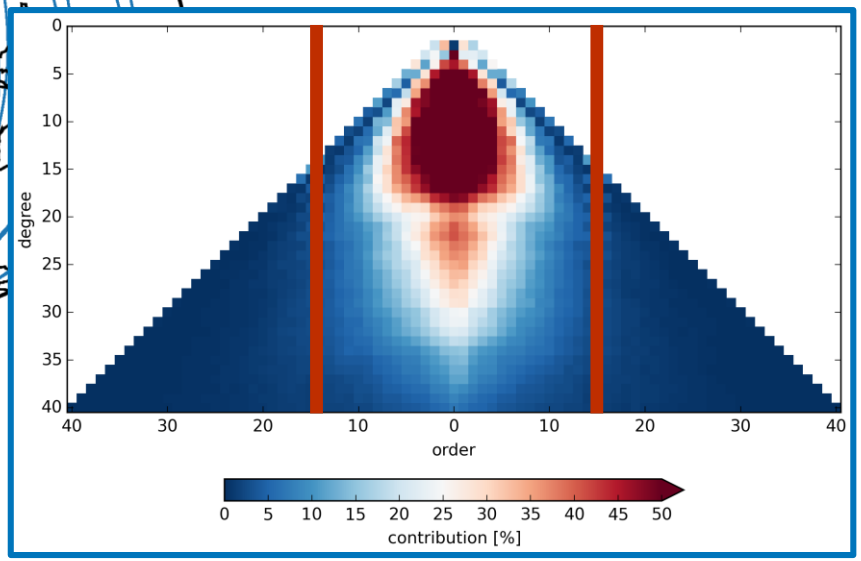
Processing strategy

High spatial sampling



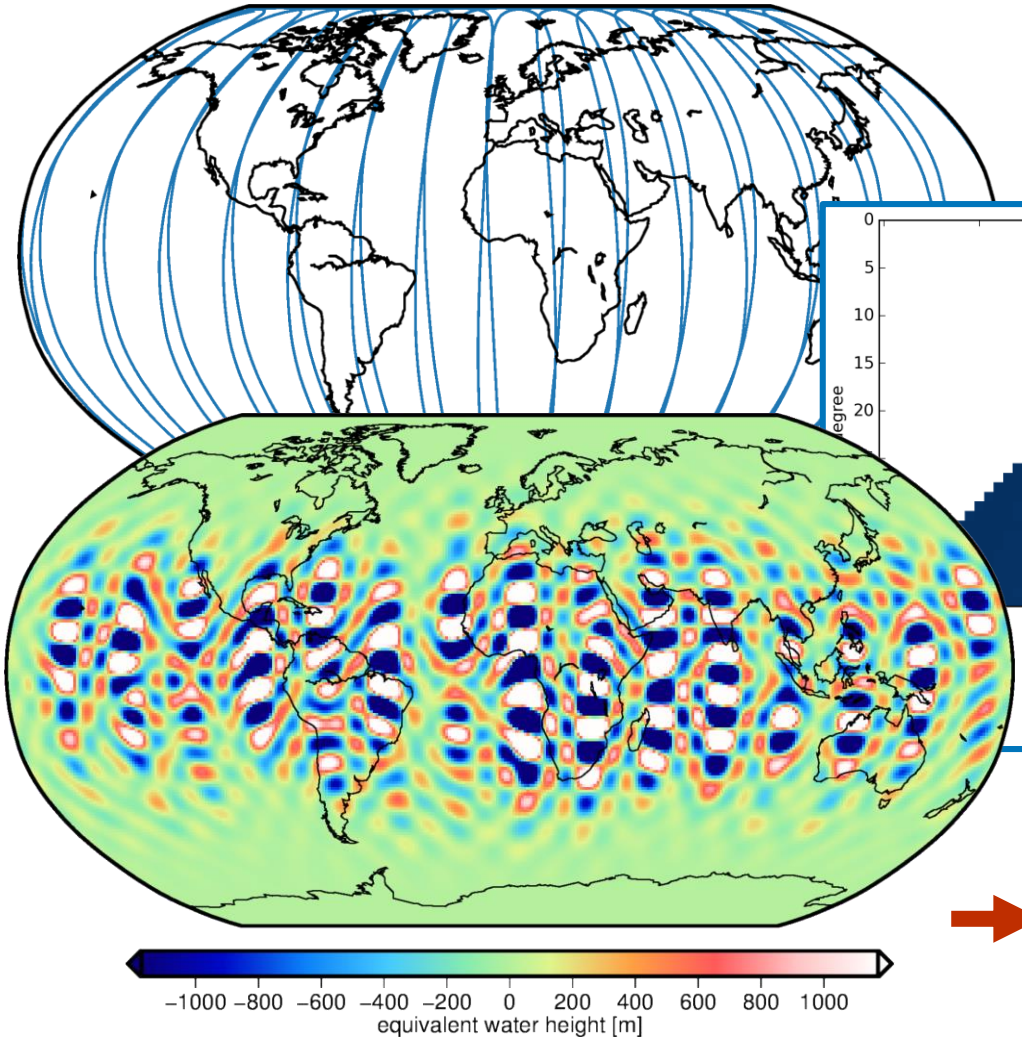
Limited spatial sampling

GRACE contribution
limited to order ~15



Processing strategy

High spatial sampling



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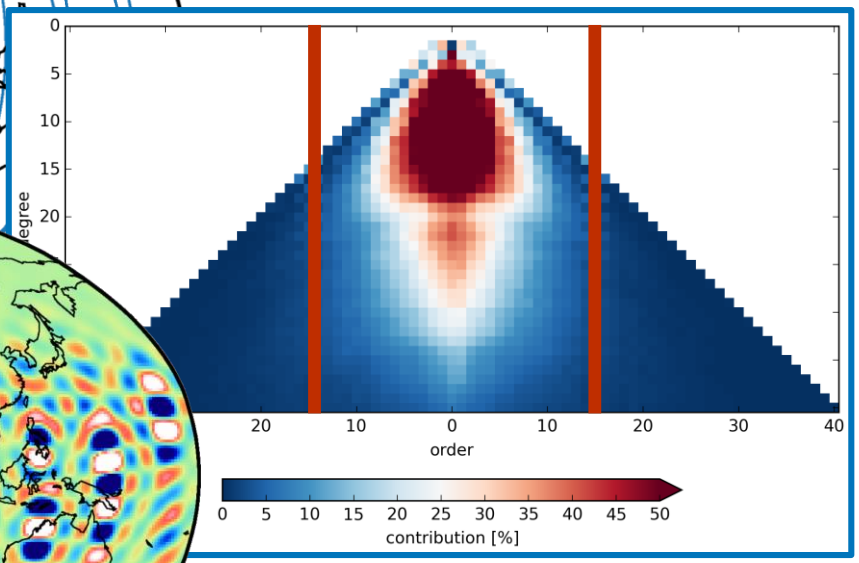
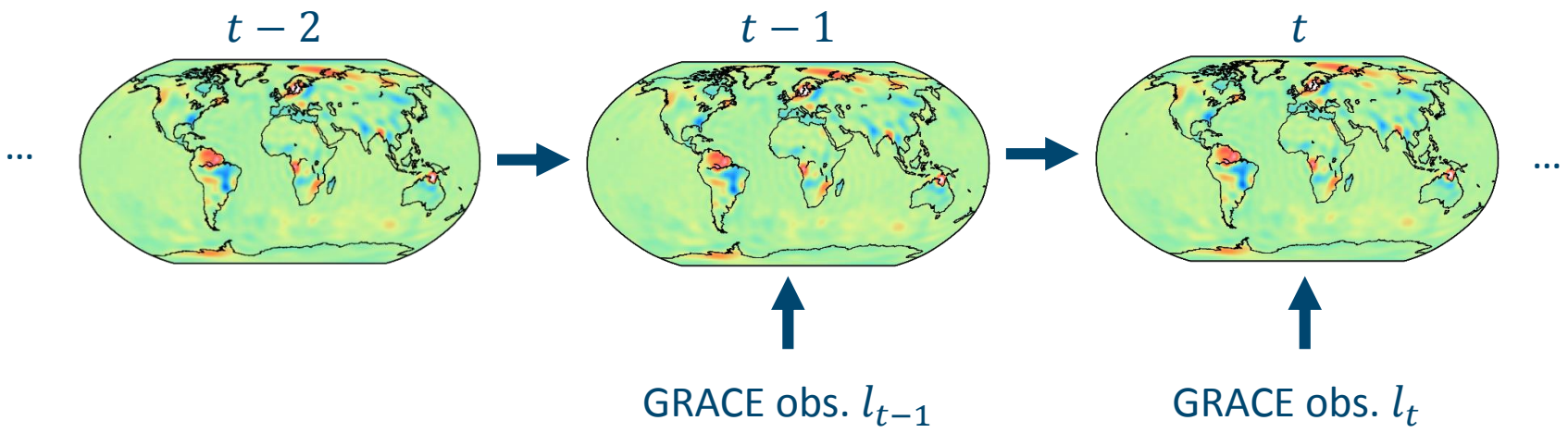


GRACE alone cannot observe the full gravity field signal

Processing strategy

- Additional information is introduced in form of a **process model**
  - Prediction based on spatio-temporal correlations from geophysical models
  - Solution is weighted mean between GRACE observations and prediction

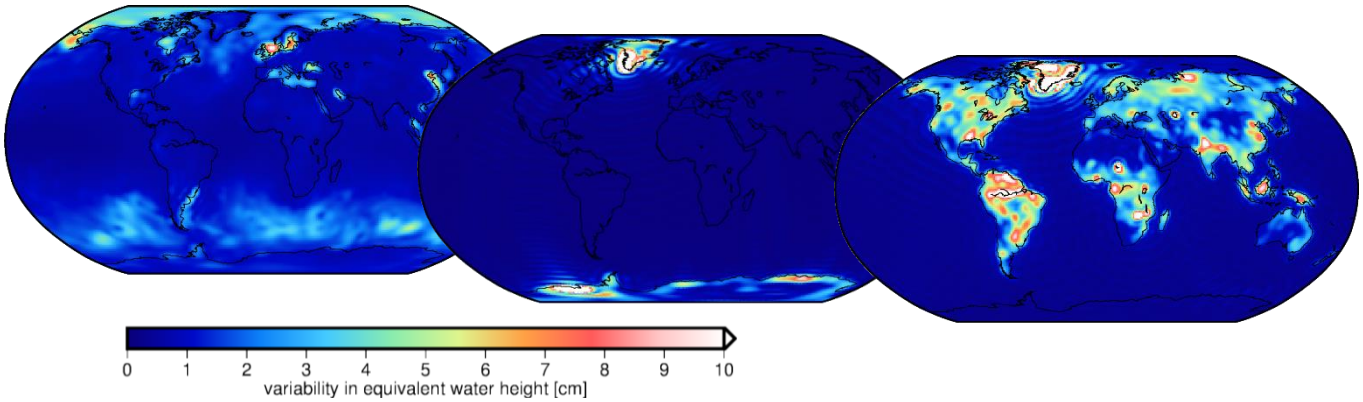


GRACE Kalman Filter
(Kurtenbach et al. 2012)

Post processing results – ITSG-Grace2016

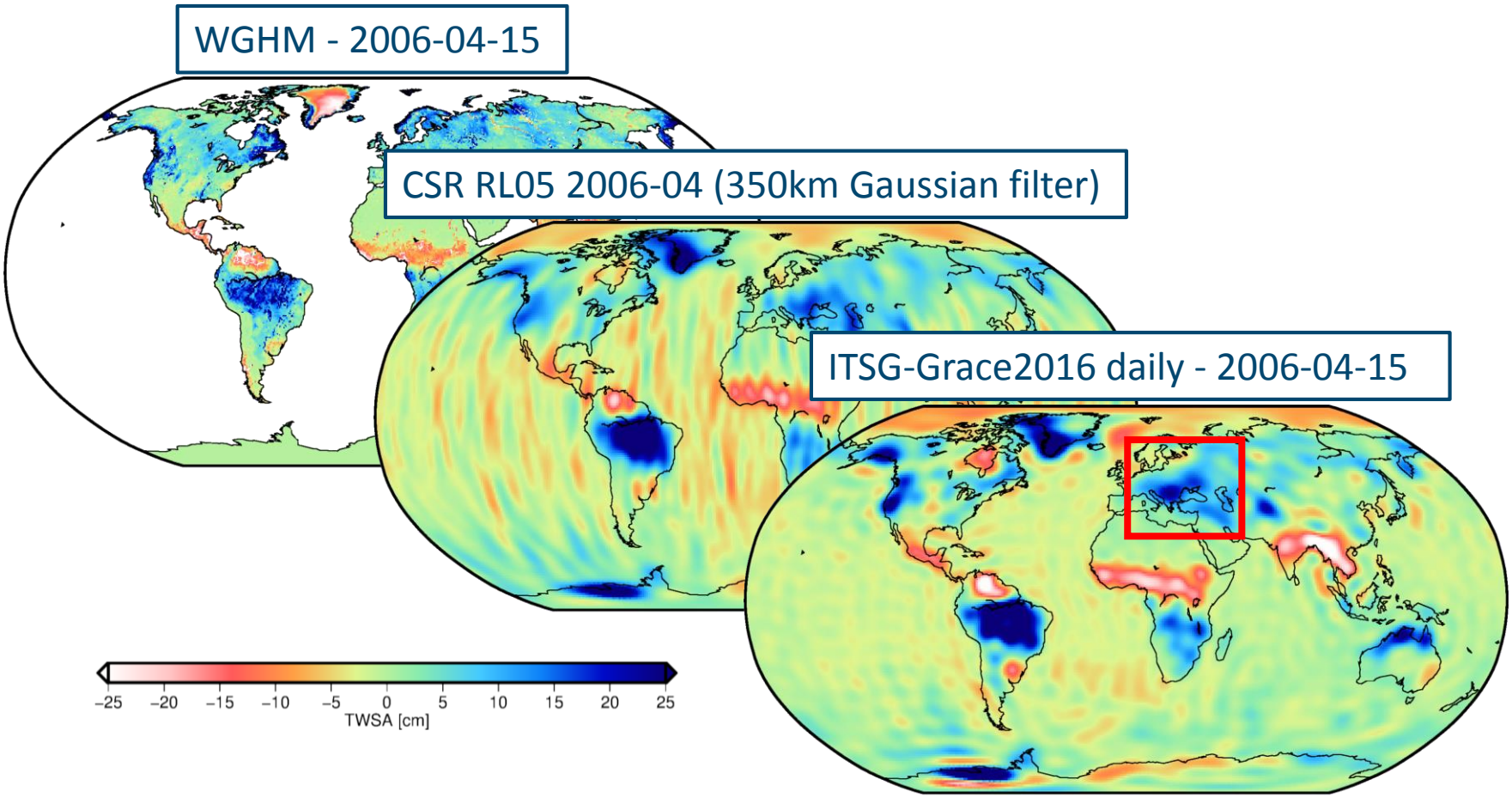
- GRACE time series (2002 to 2016) processed and continually updated
  - 5053 daily solutions (4258 days with GRACE contribution)

- 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



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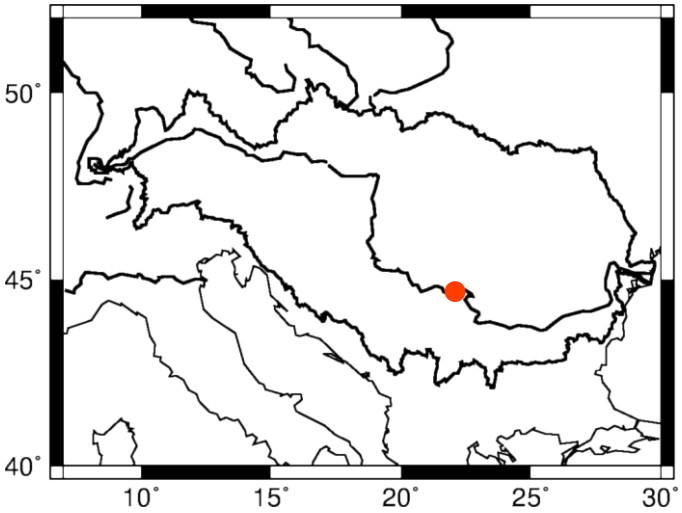

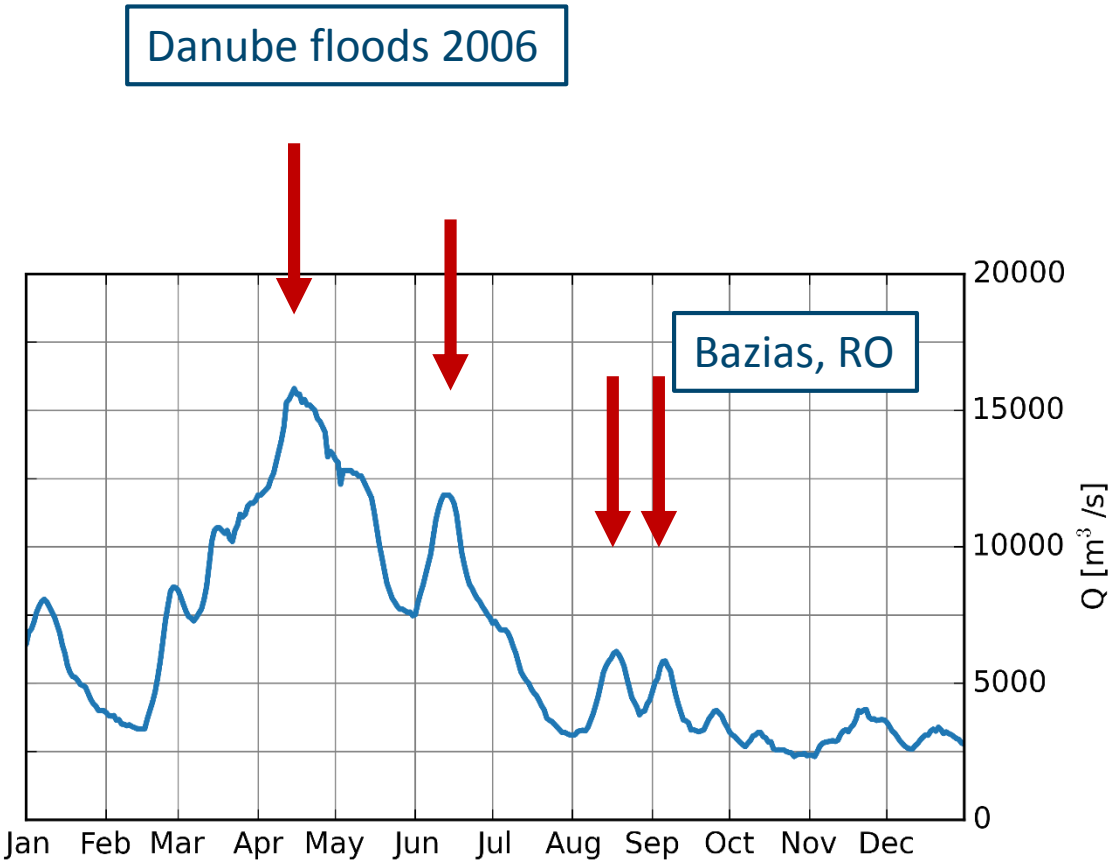

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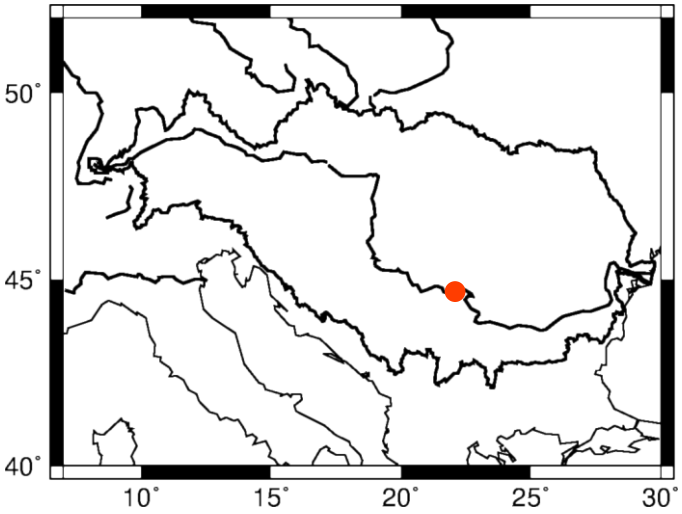

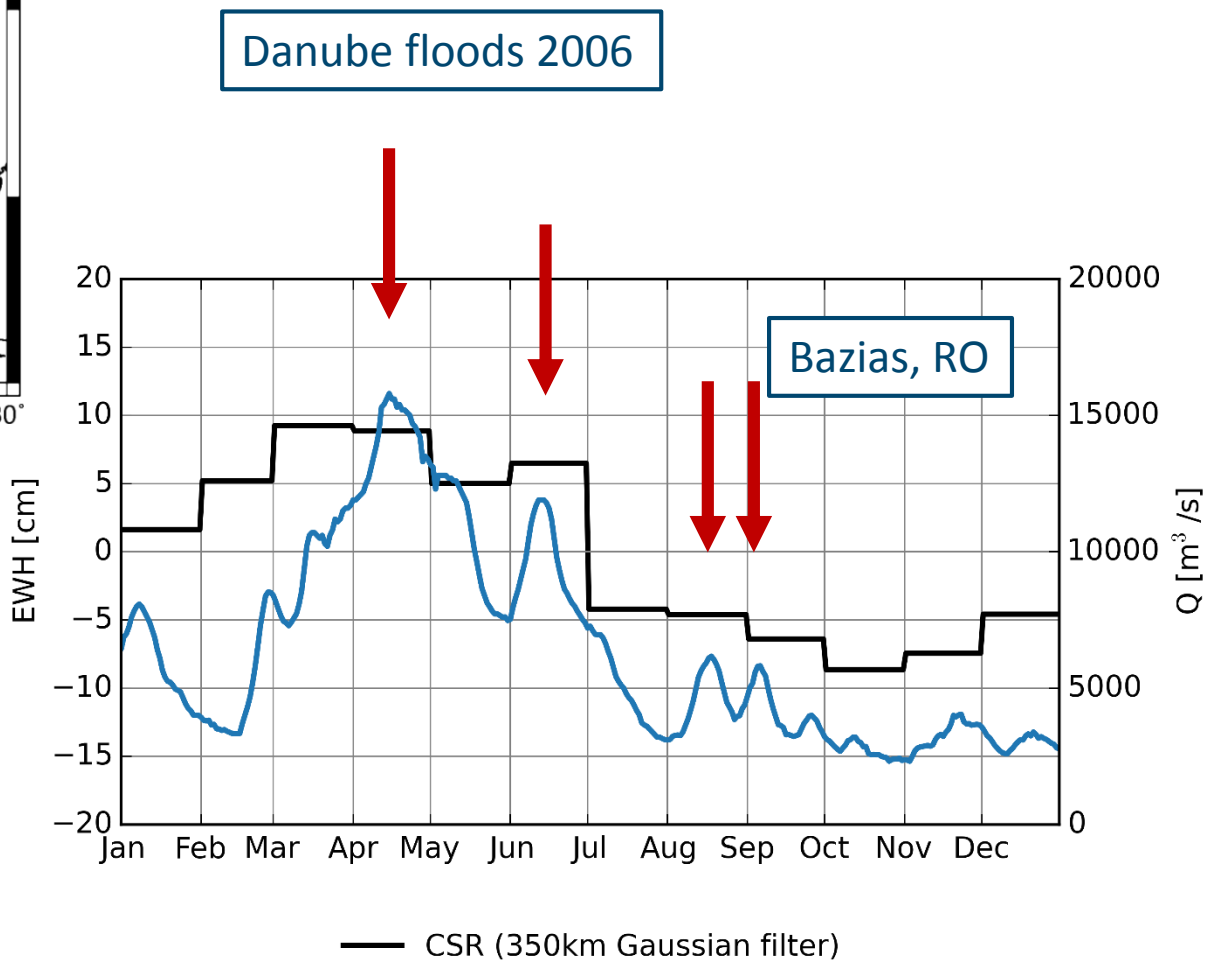

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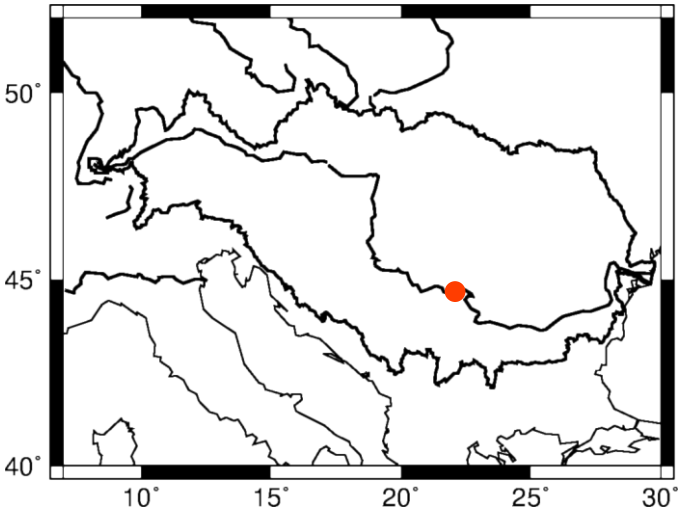

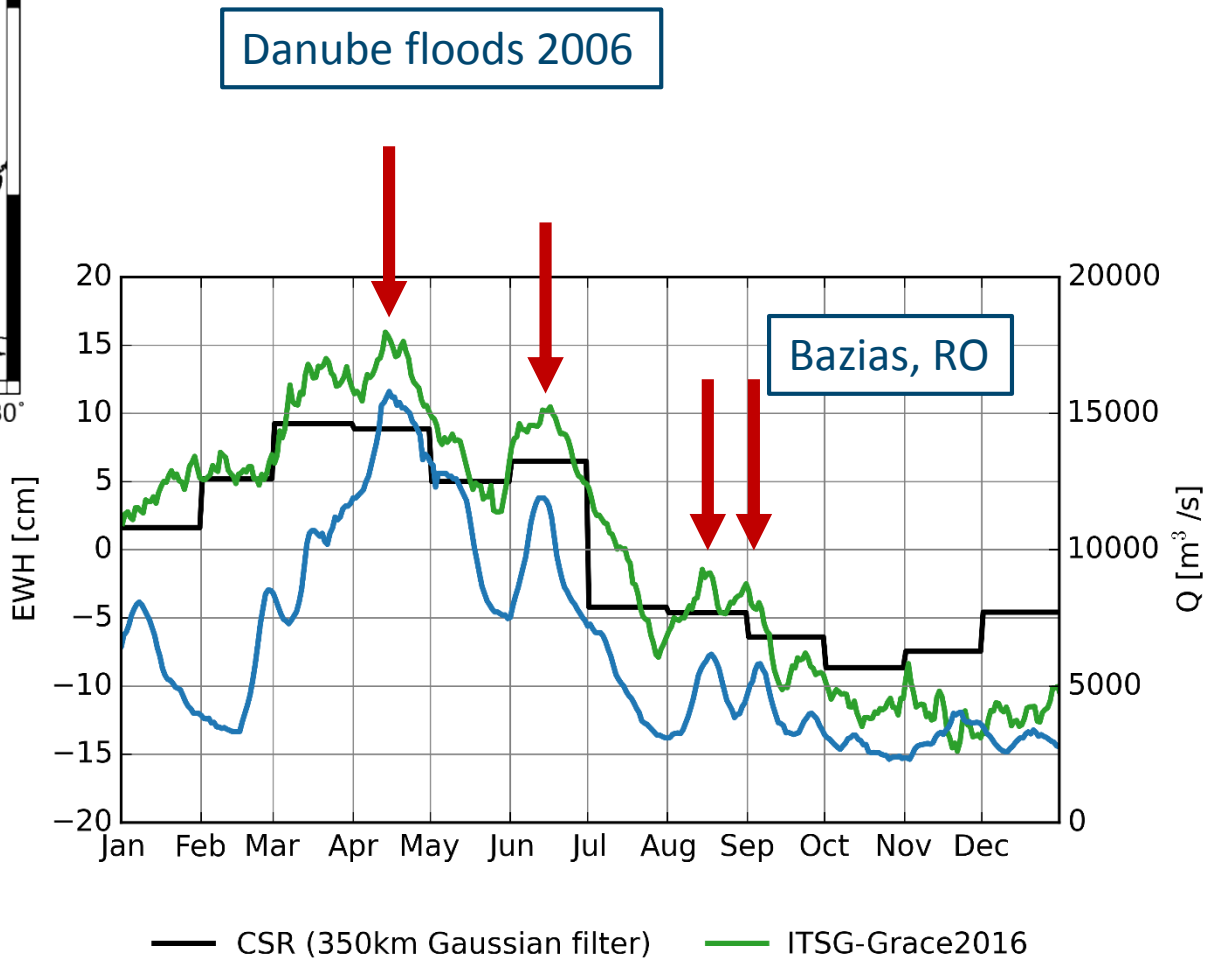

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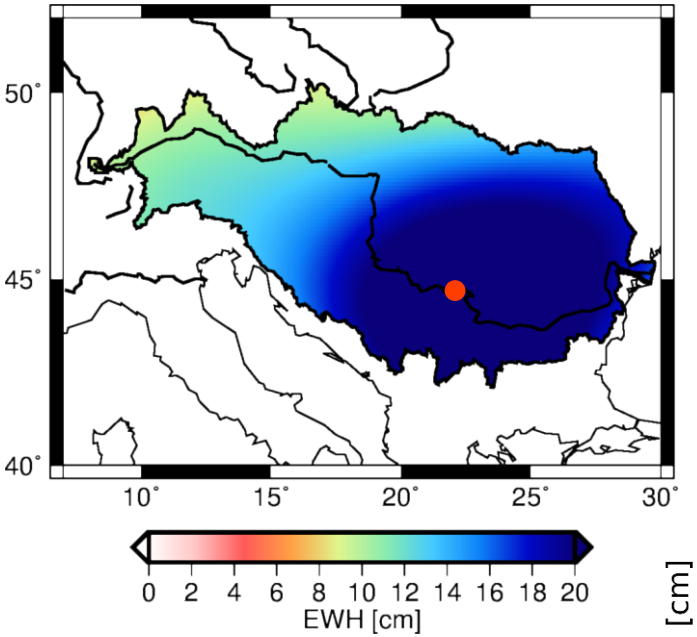
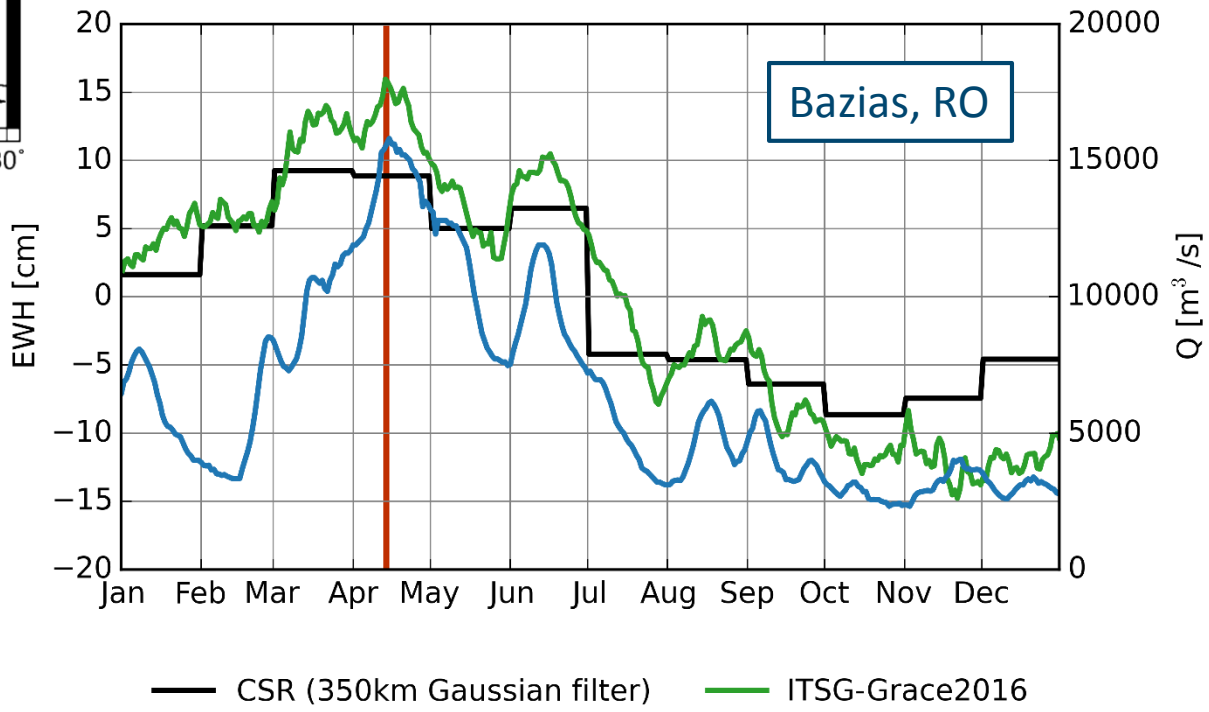


Danube floods 2006



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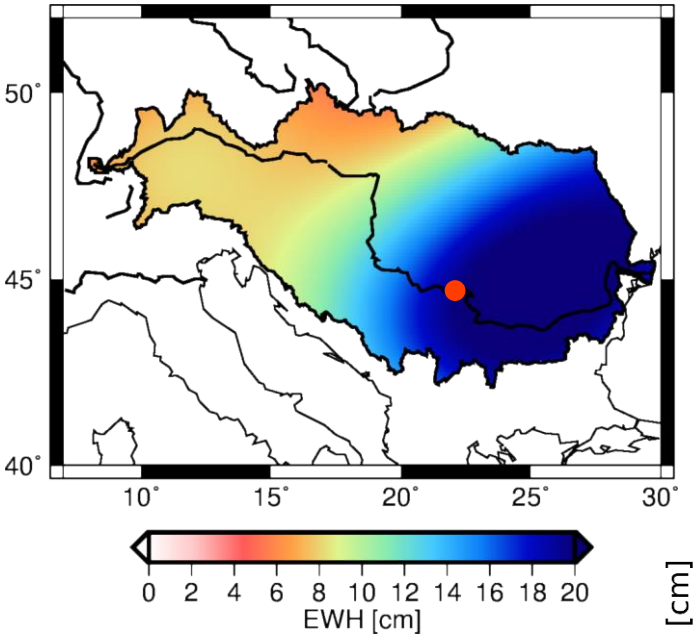

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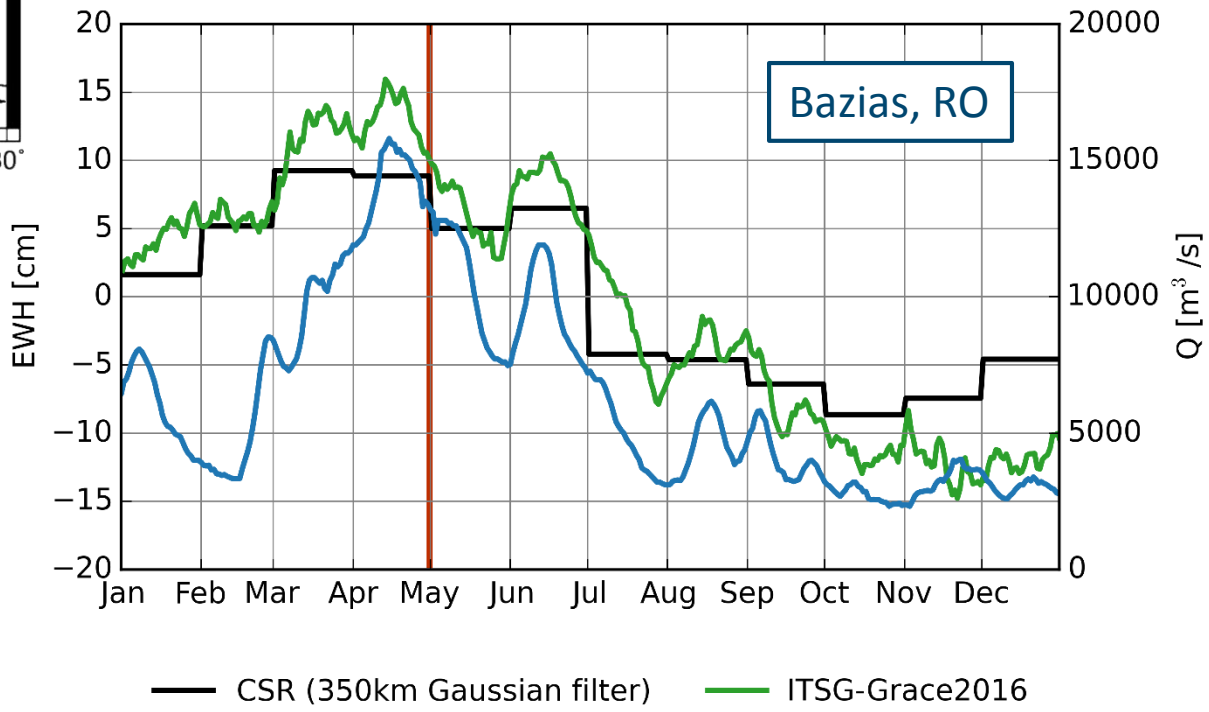

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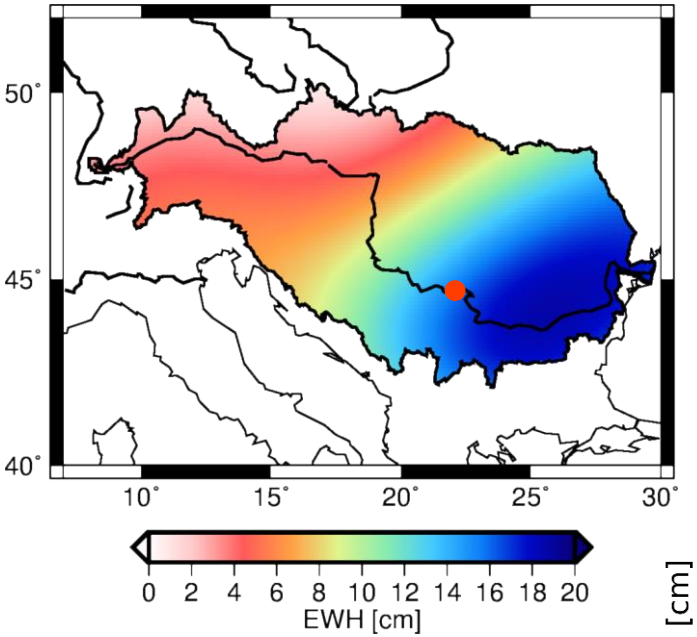

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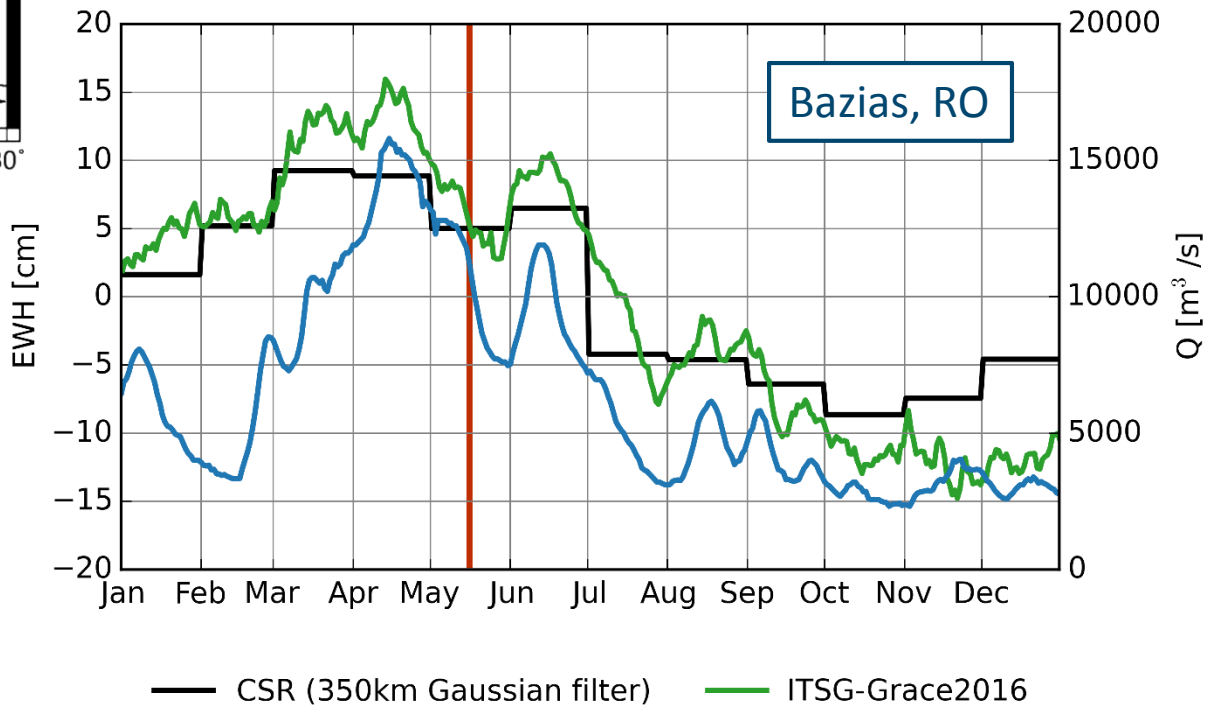

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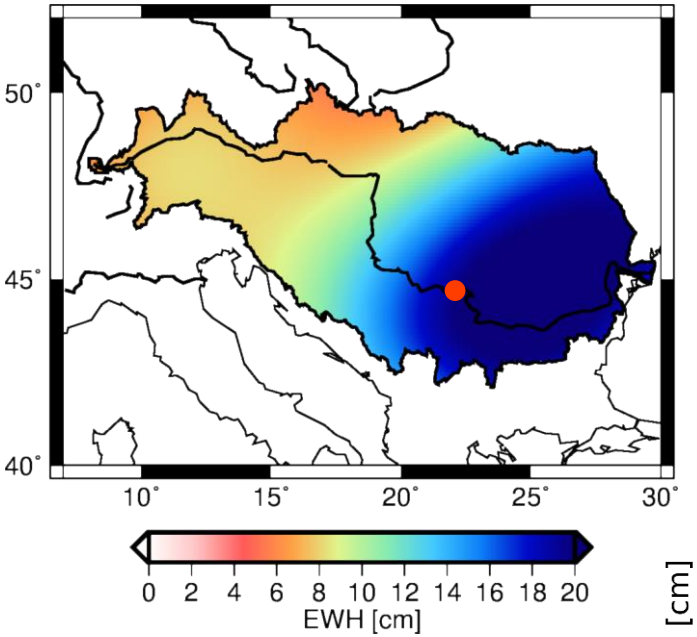

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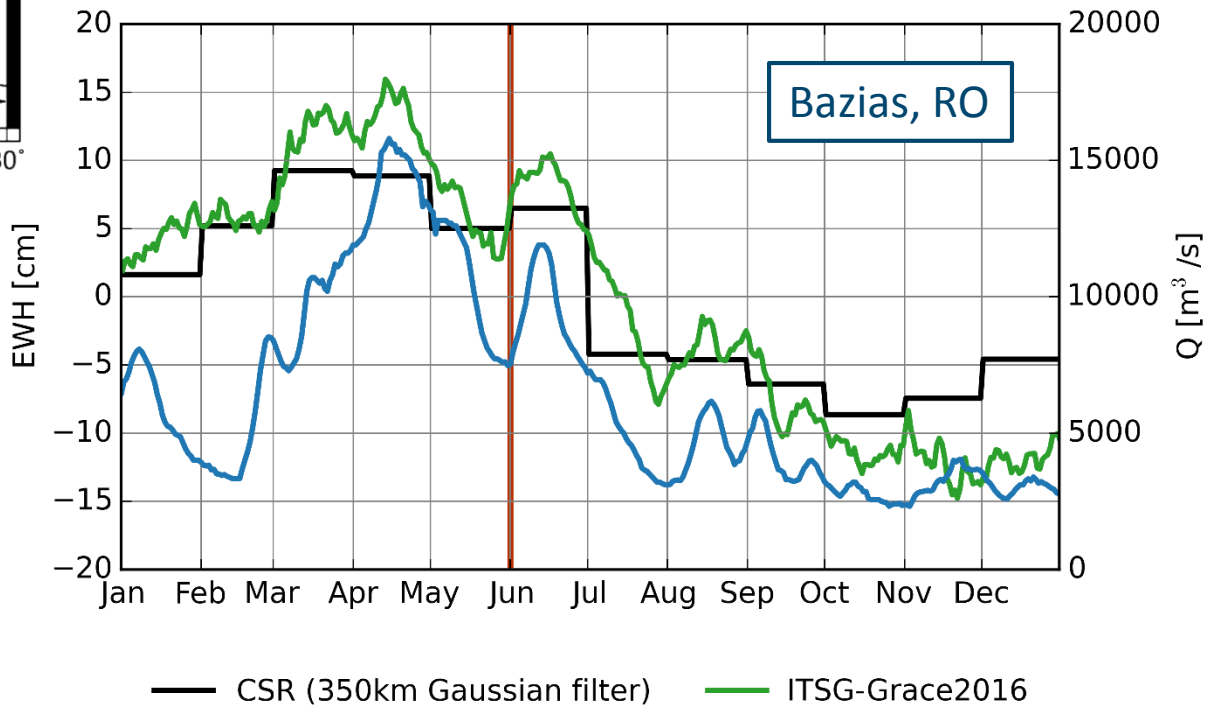

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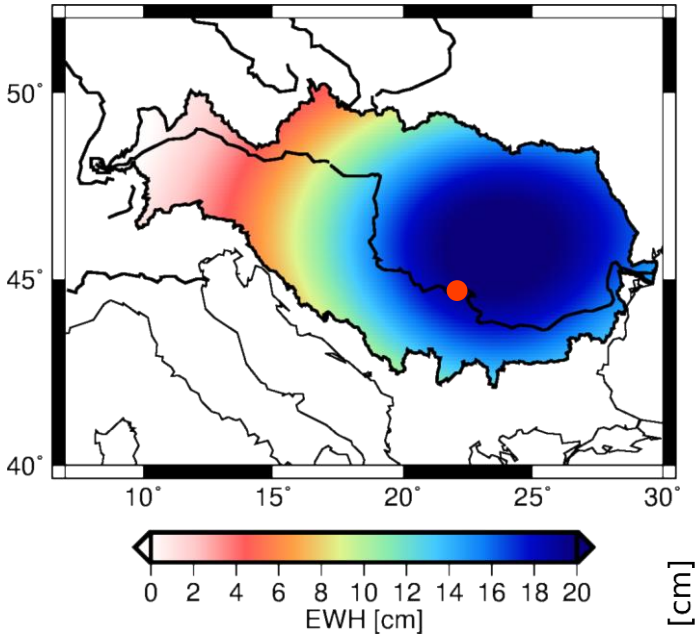

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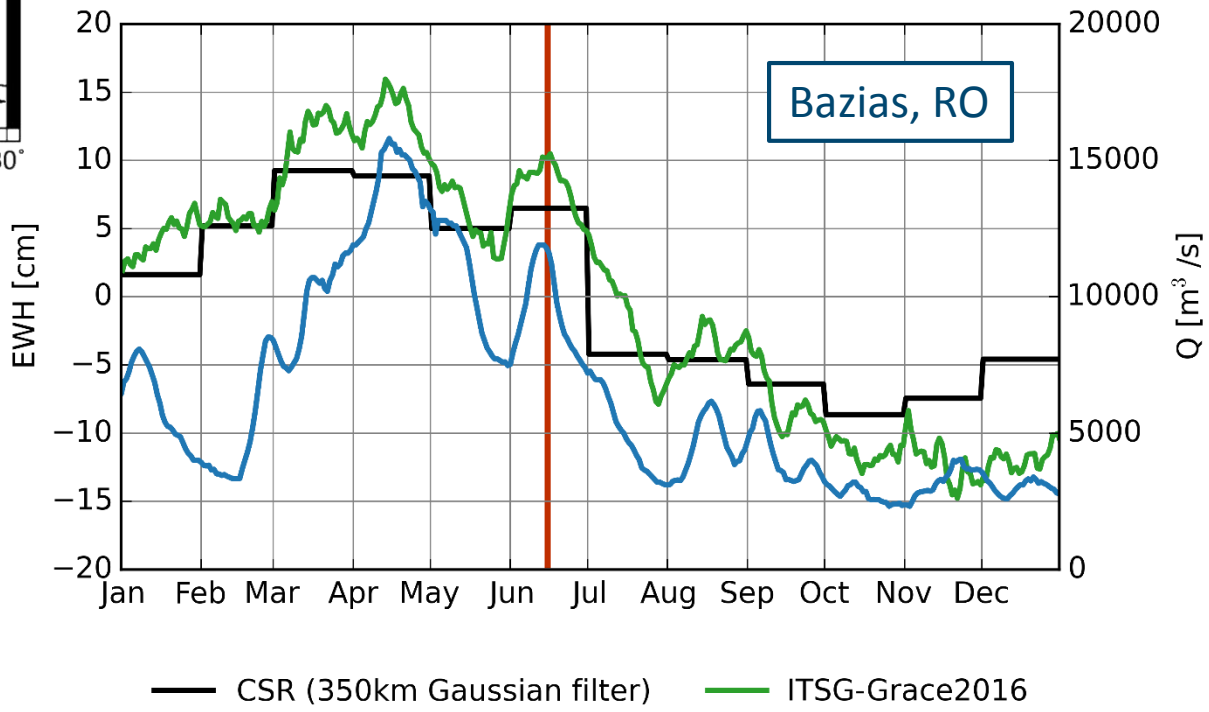

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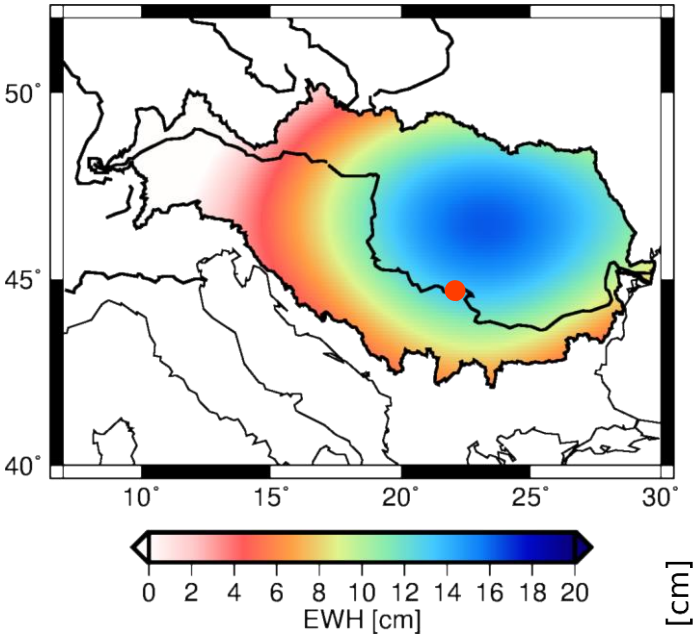

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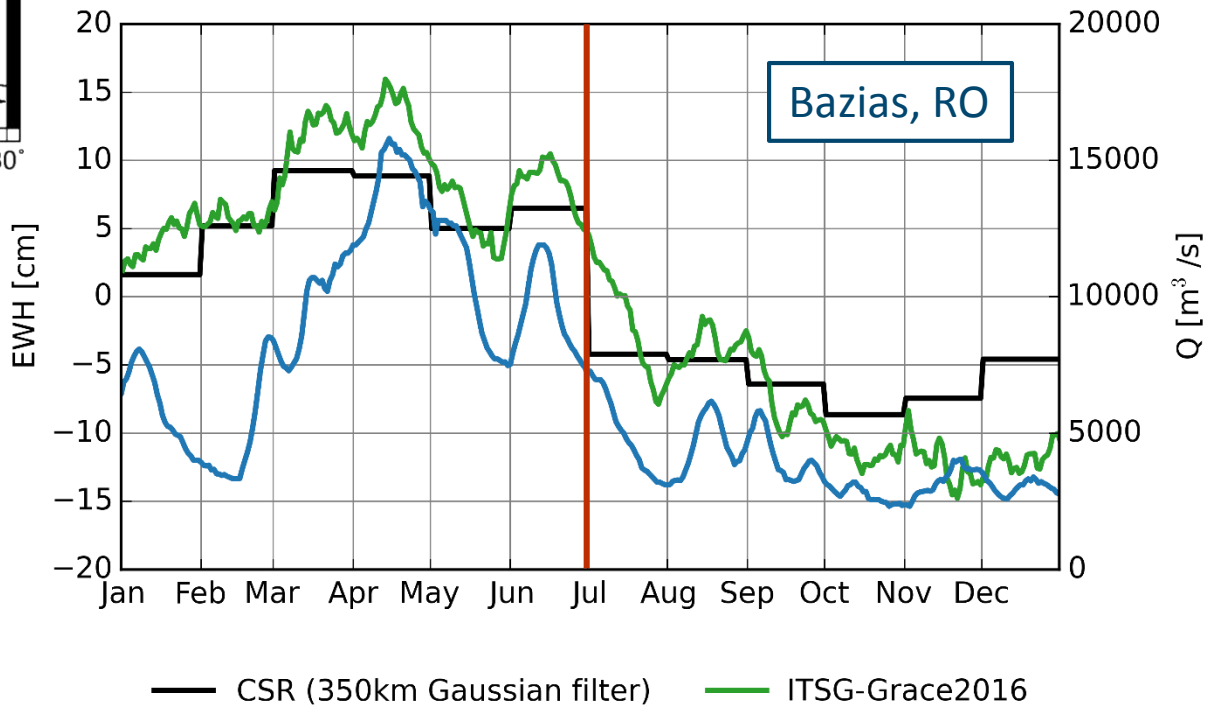

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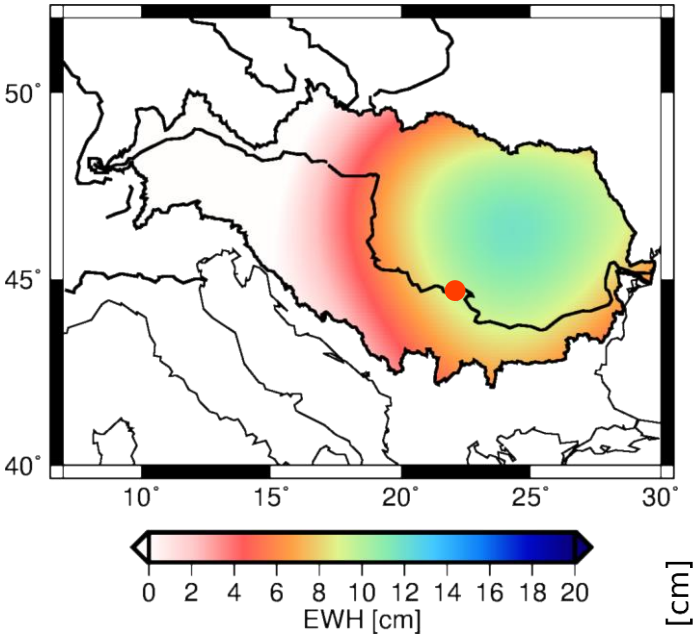

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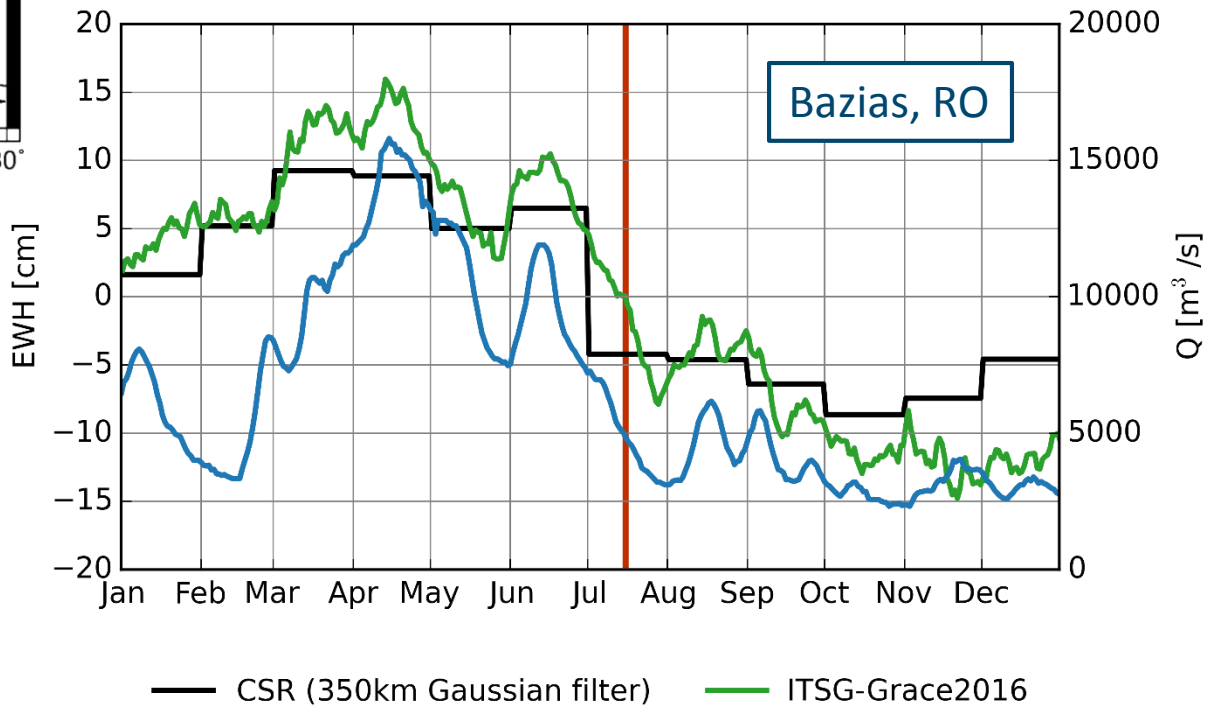

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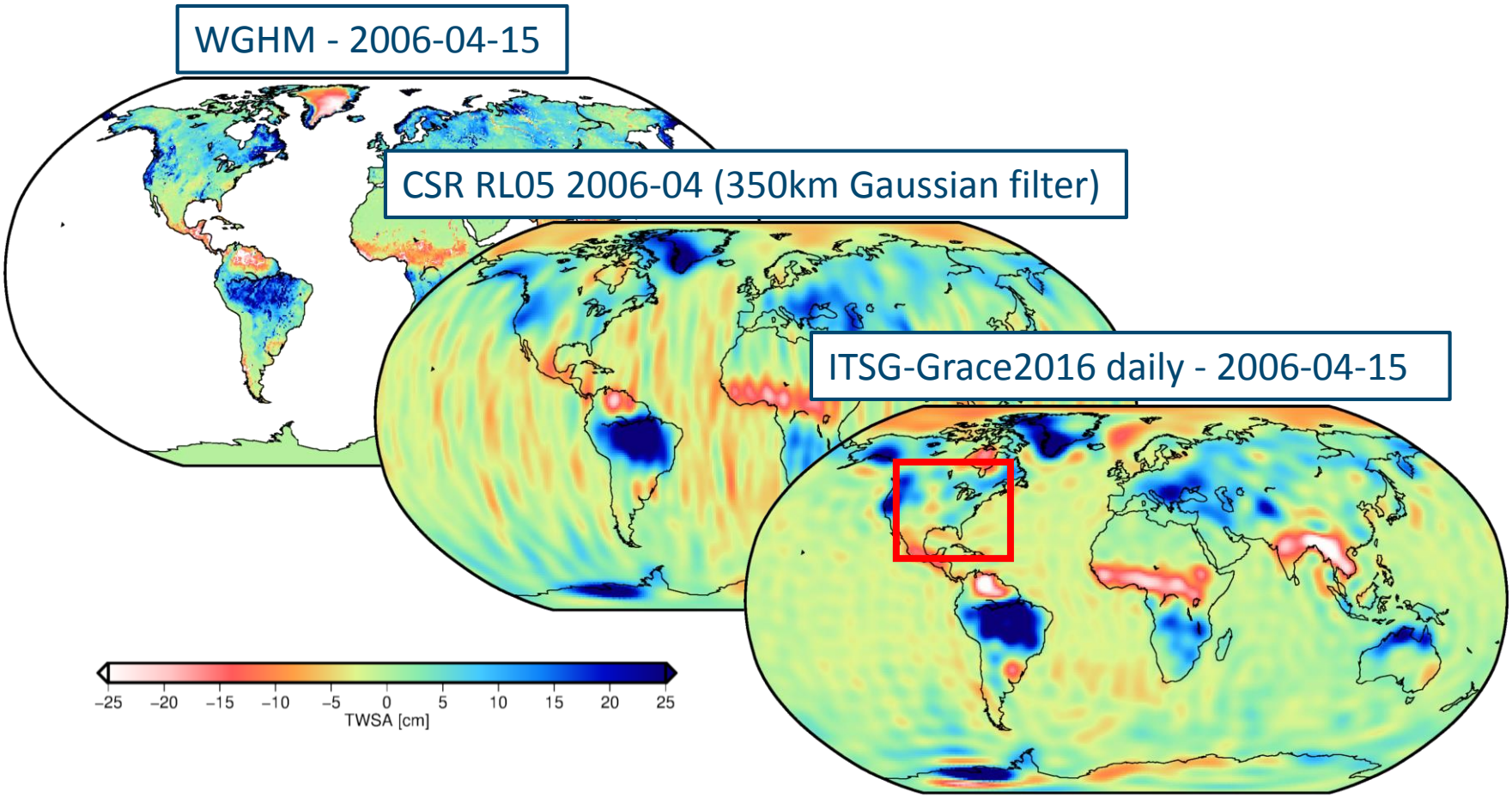

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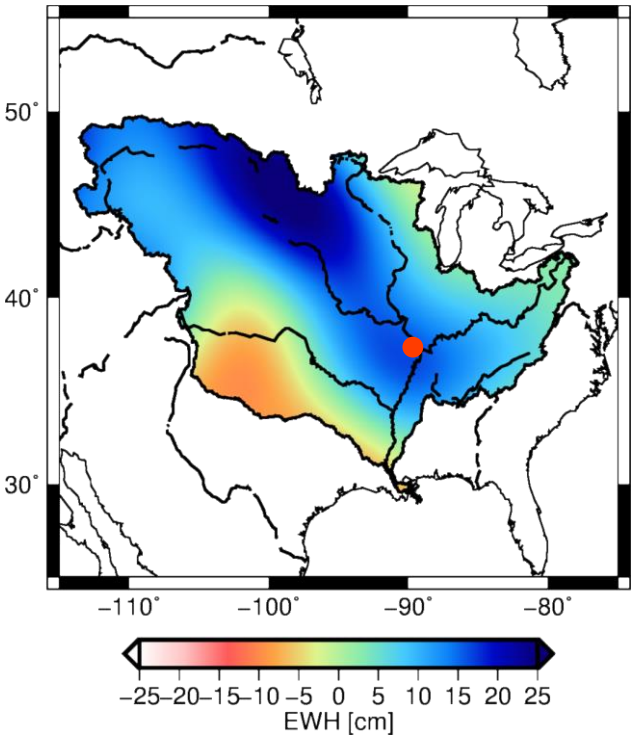
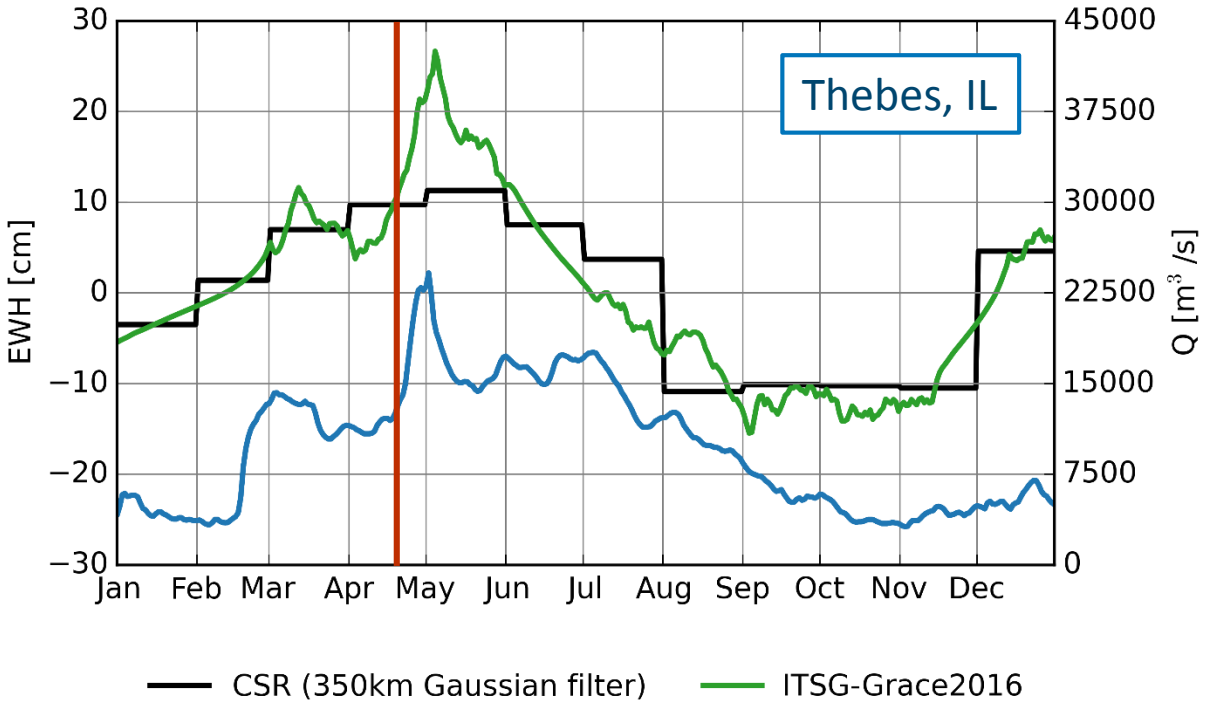


Great Mississippi Flood of 2011



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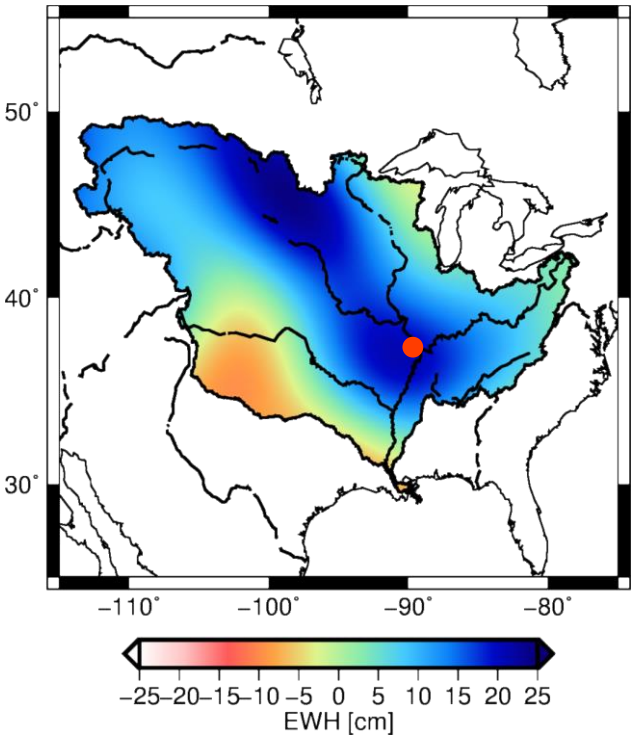

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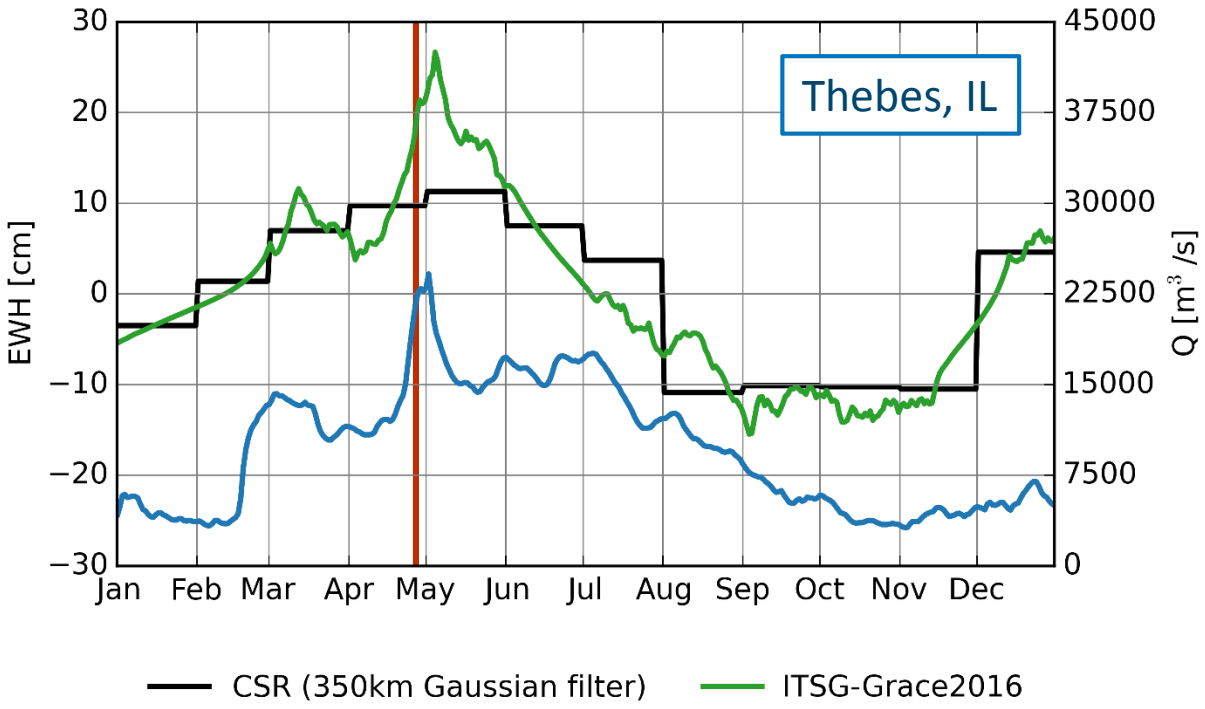

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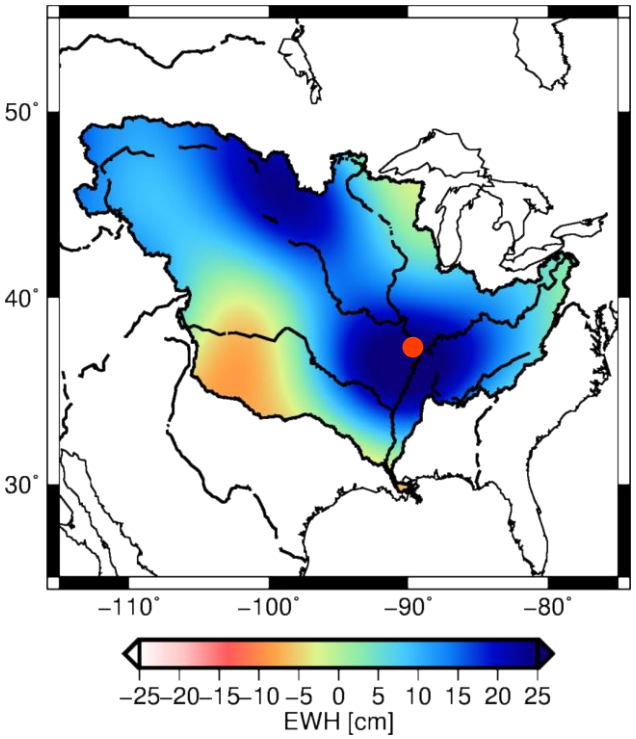

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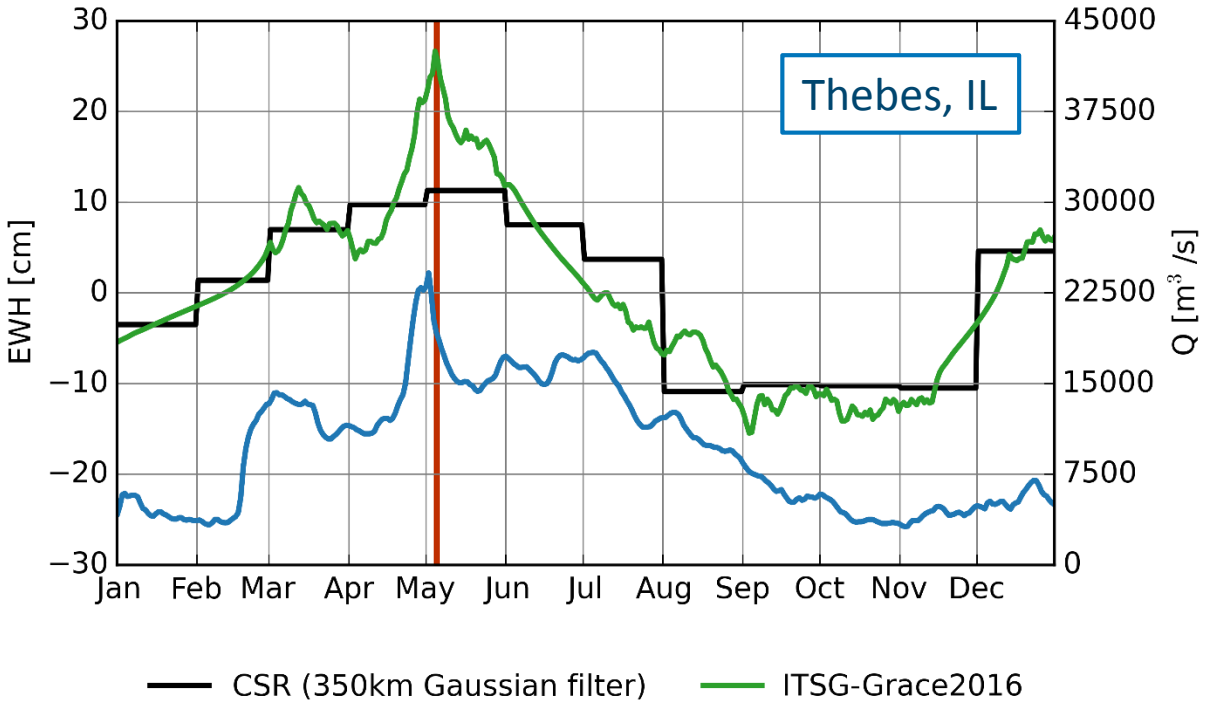

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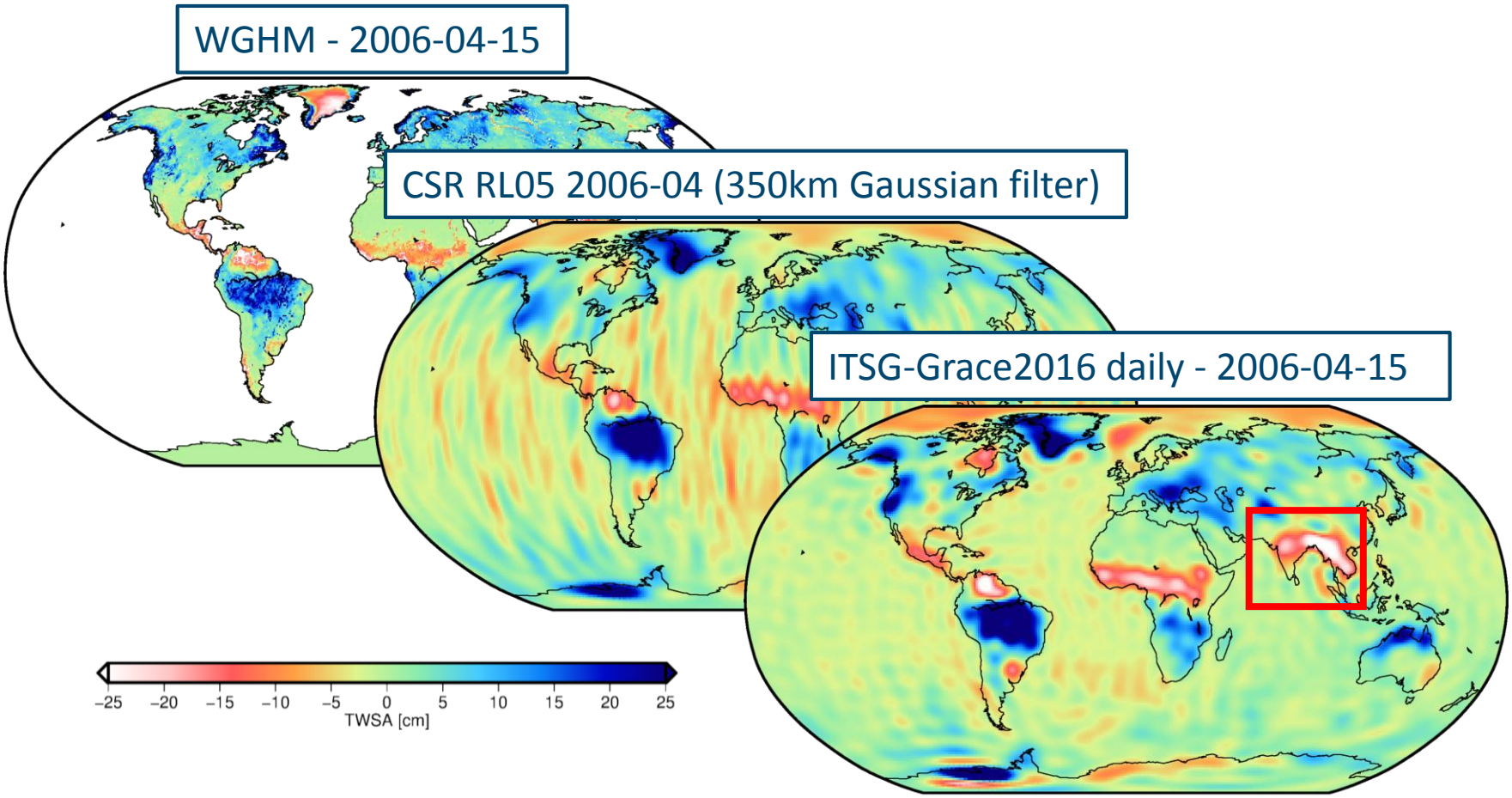

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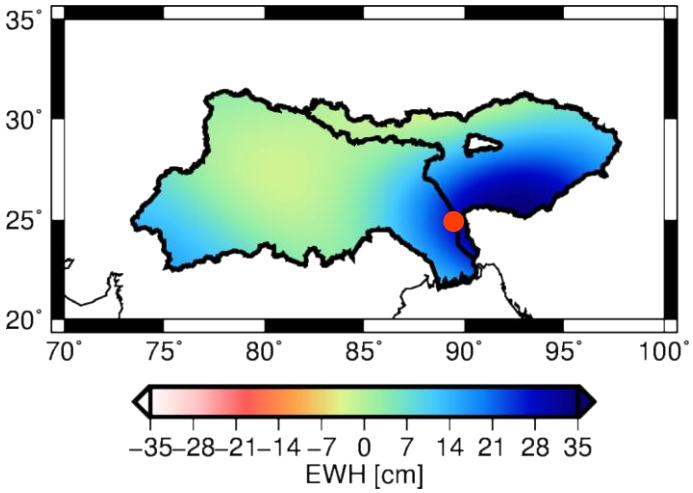
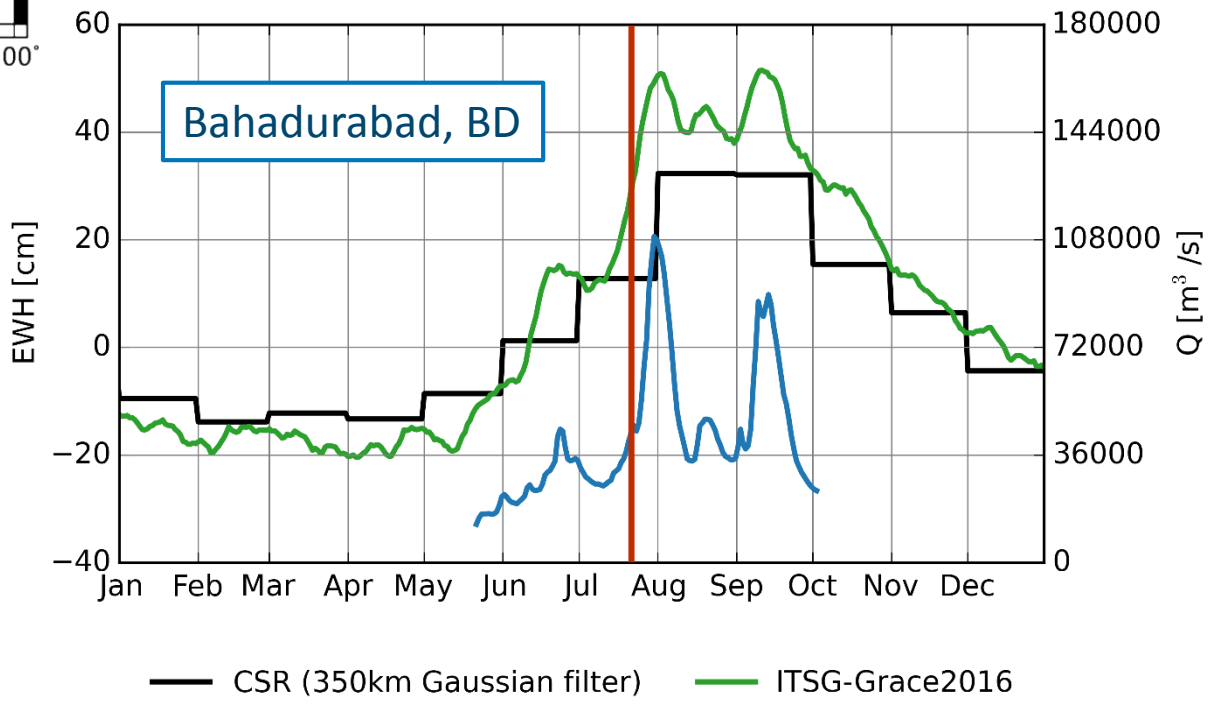


Ganges/Brahmaputra floods 2007



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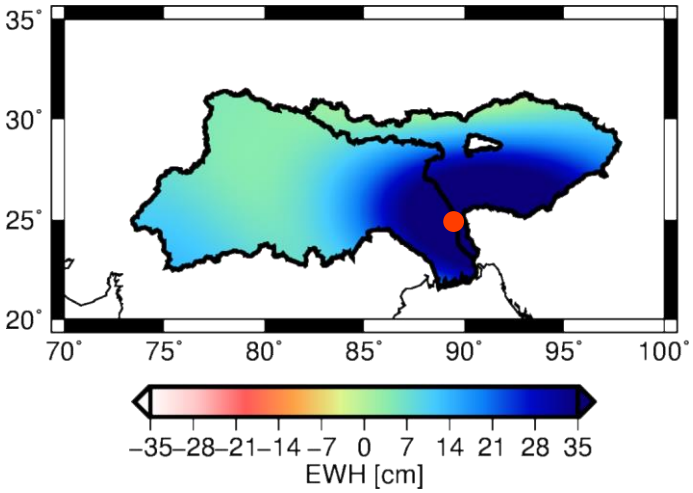

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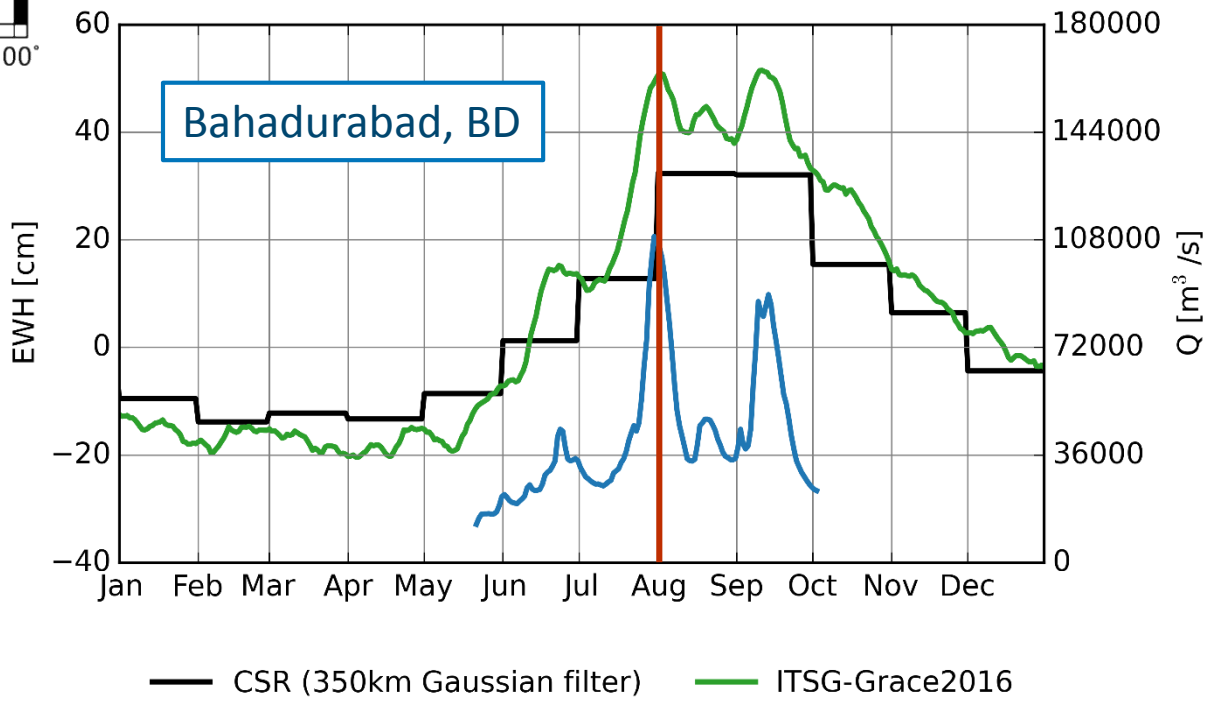

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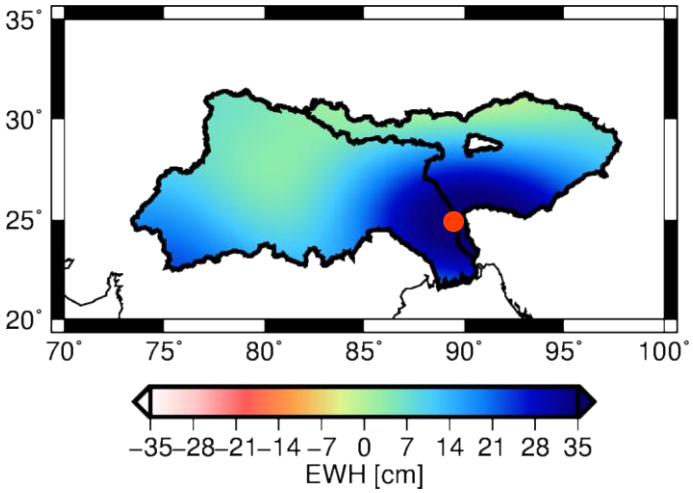

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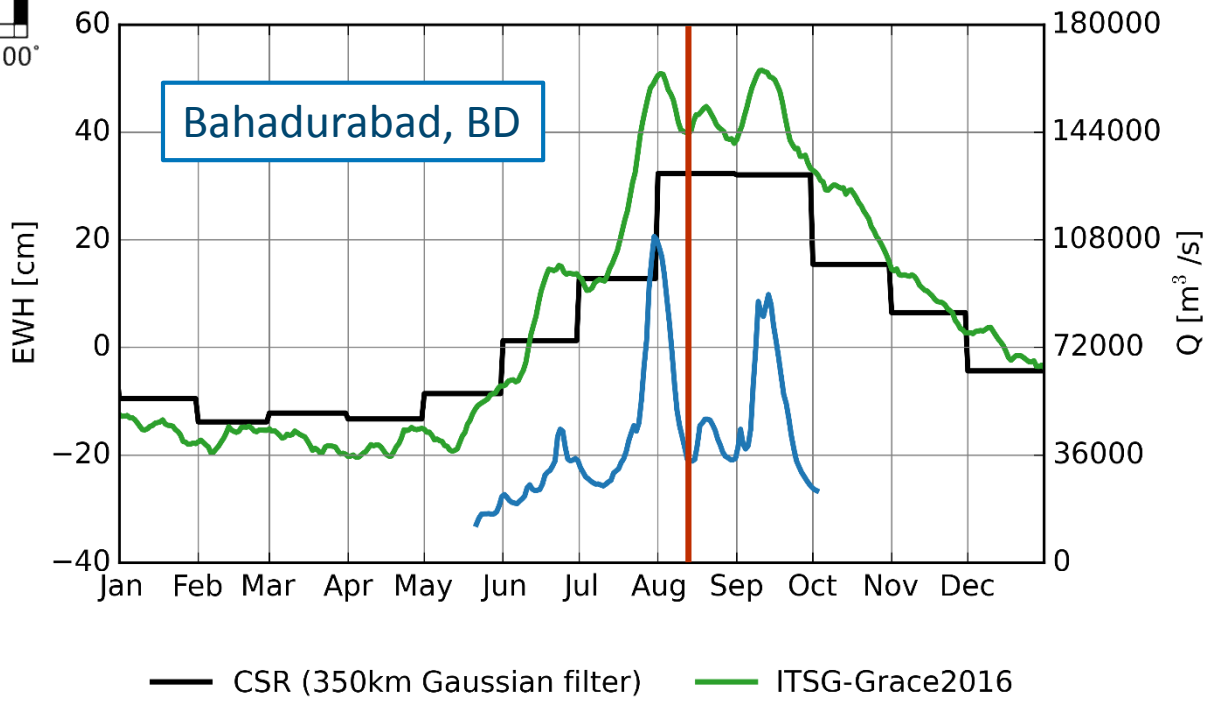

Conclusion and outlook

- GRACE can provide information for much shorter time spans than the standard monthly solutions
- Reduced latency will enable monitoring of floods and droughts as they occur
- EGSIEM near real-time operational test run starts in 2017
  - Global and regional daily GRACE gravity fields with 5 days latency
  - Check out **www.egsiem.eu** for updates
- ITSG-Grace2016 solutions are available under **ifg.tugraz.at/ITSG-Grace2016**

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Discharge data provided by the Global Runoff Data Centre, 56068 Koblenz, Germany

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