

## ITSG-Grace2016 – Daily Gravity Field Solutions from GRACE

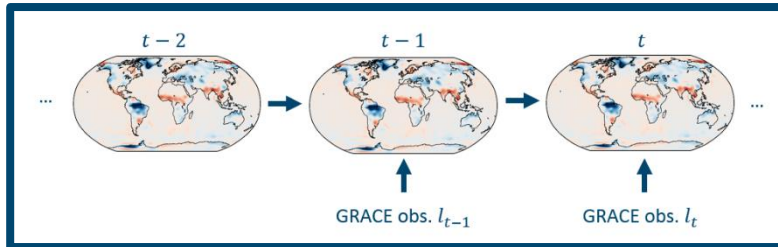
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Graz University of Technology

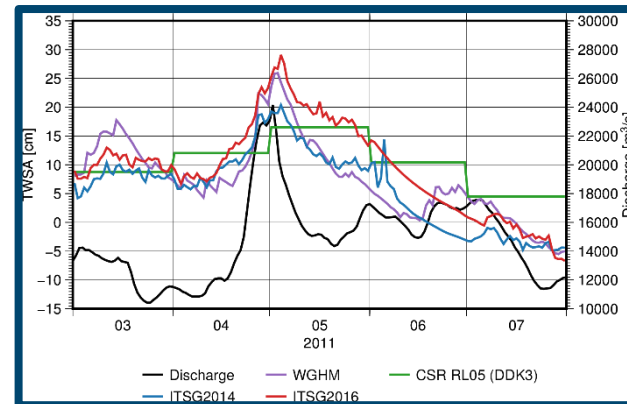
Grace Science Team Meeting  
Potsdam, 2016-10-05

# Outline

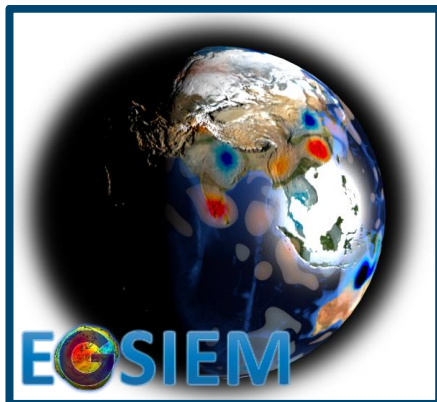
## ITSG-Grace2016 Processing Strategy



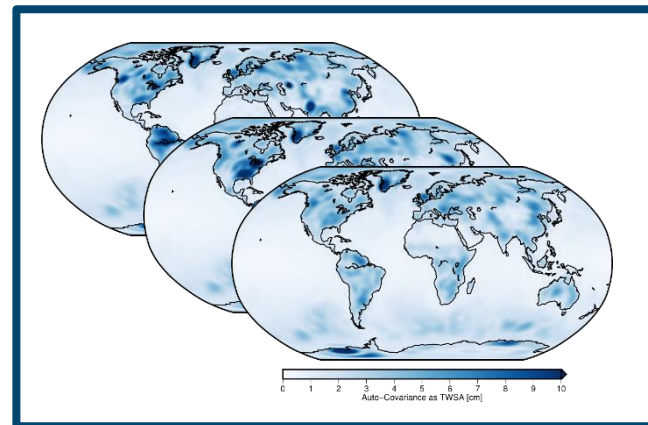
## Comparison with In-Situ Data



## Conclusions and Outlook

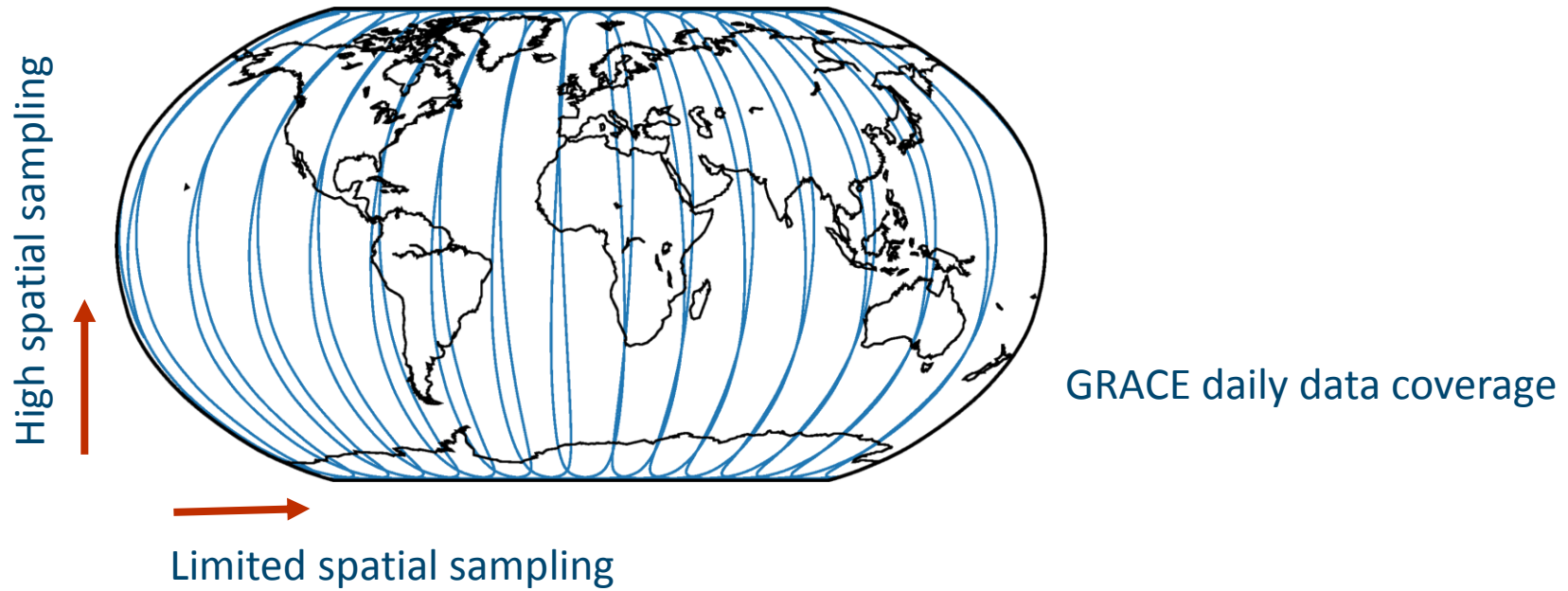


## Impact of Process Dynamic

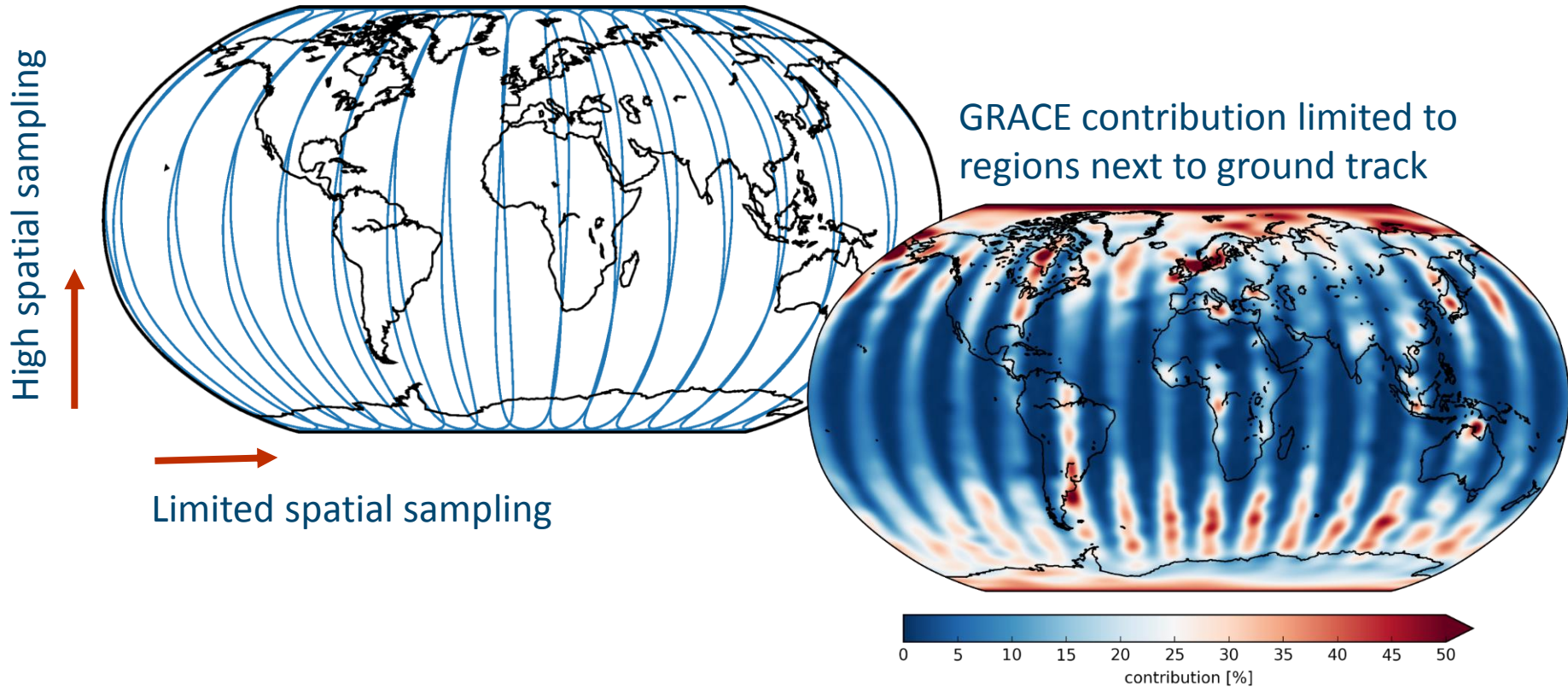


# Processing Strategy

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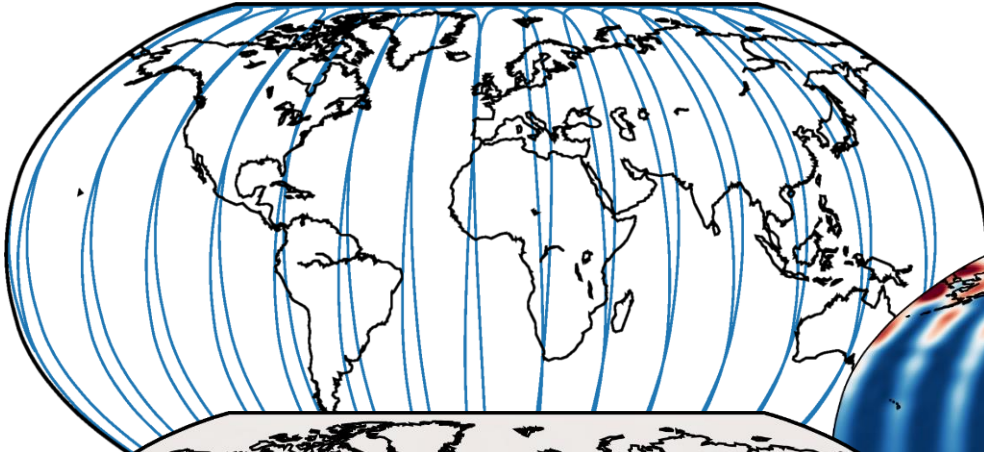
# Processing Strategy



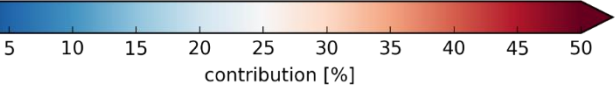
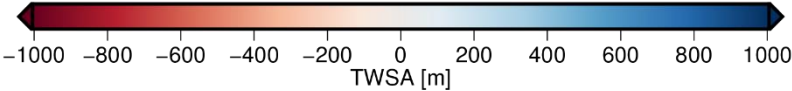
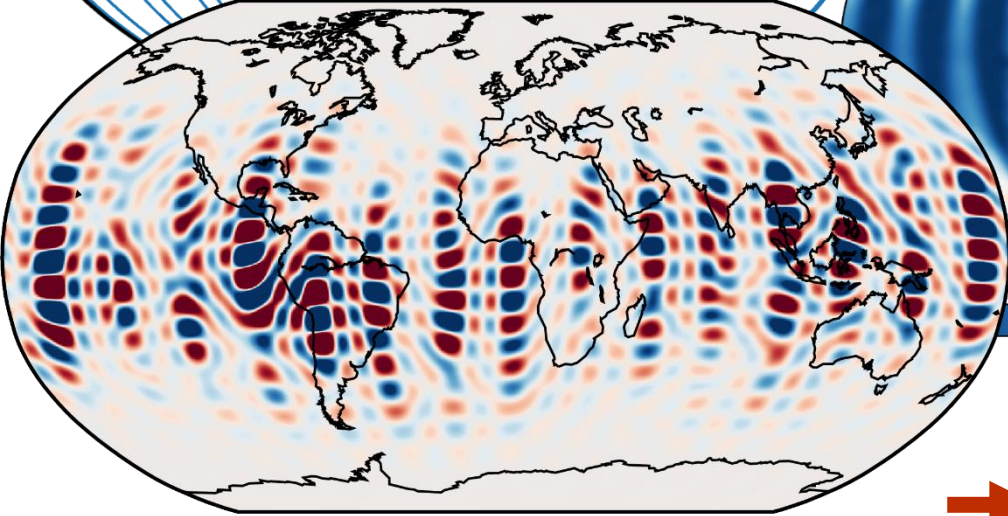
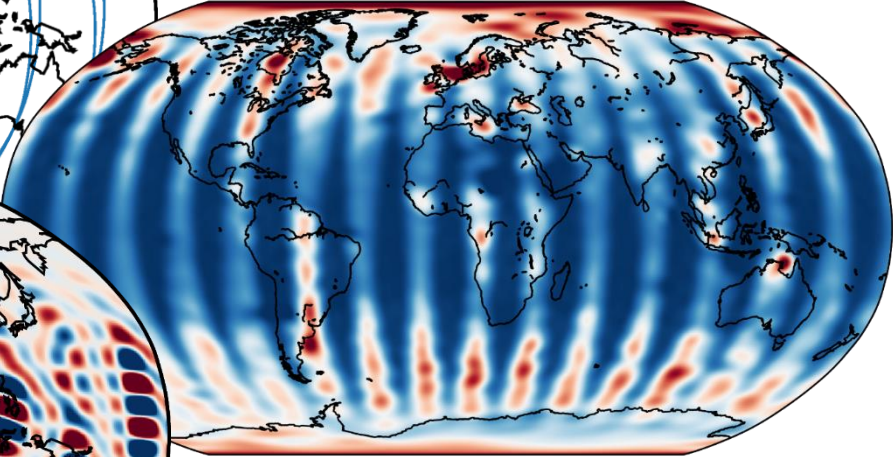


# Processing Strategy

High spatial sampling



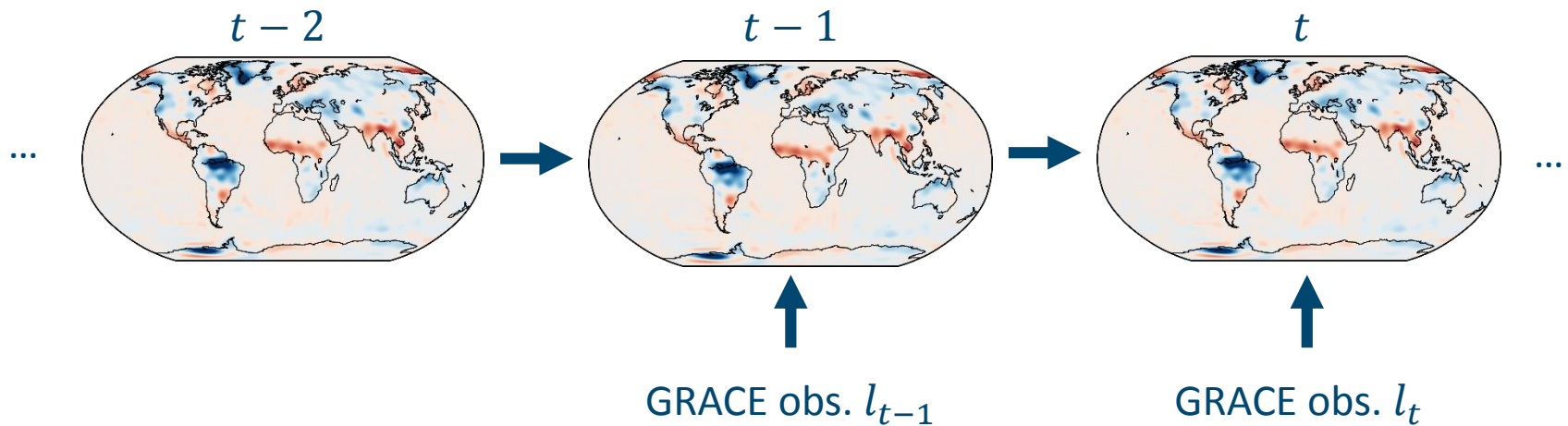
GRACE contribution limited to regions next to ground track



GRACE alone cannot observe the full gravity field signal

# Processing Strategy

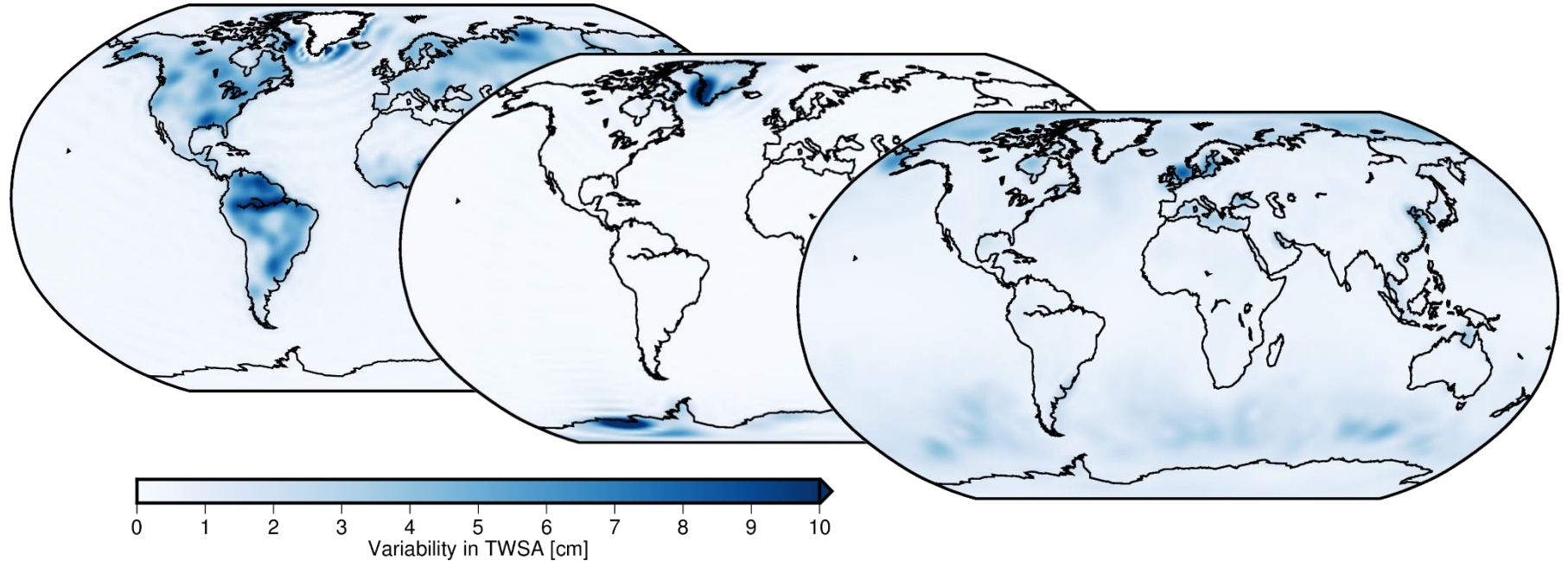
- Additional information is introduced in form of a **process model**
  - Prediction based on spatiotemporal correlations from geophysical models
  - Solution is weighted mean between GRACE observations and prediction



GRACE Kalman Filter  
(Kurtenbach et al. 2012)

# ITSG-Grace2016 Gravity Field Solutions

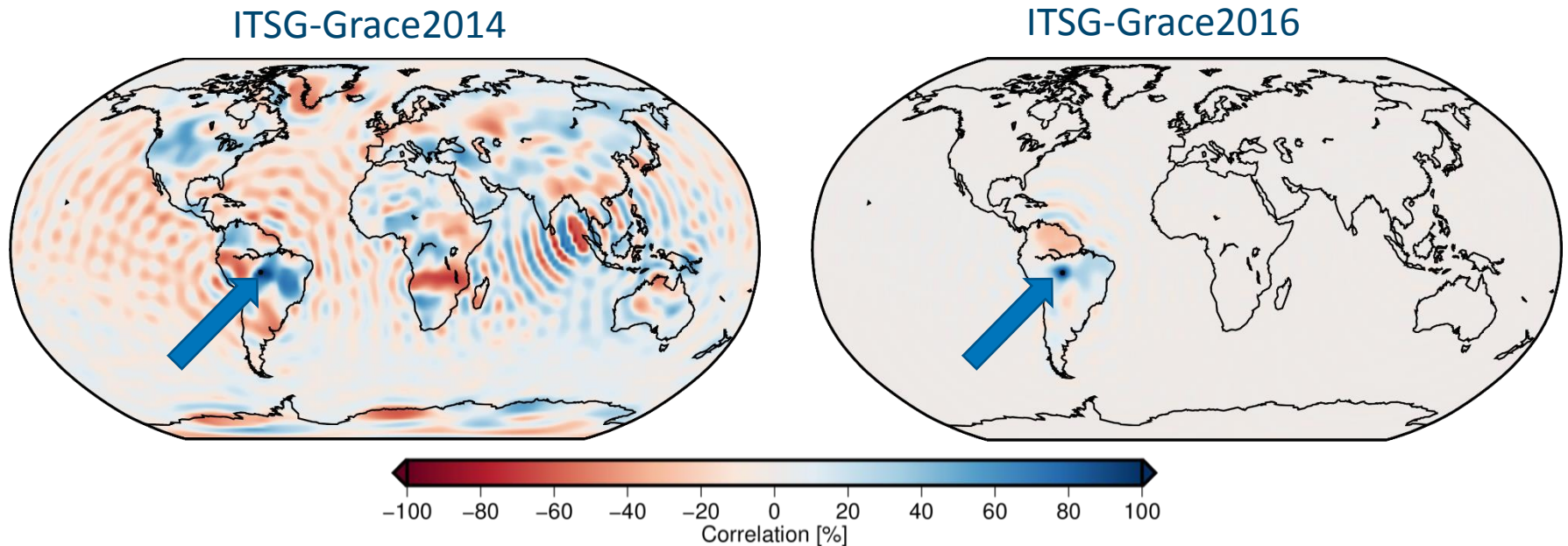
- GRACE time series (2002 to 2016) processed and continually updated
  - 5175 daily solutions (4363 days with GRACE contribution)
- Process model derived from WGHM (hydrosphere) and ESA ESM (cryosphere, residual atmosphere/ocean)





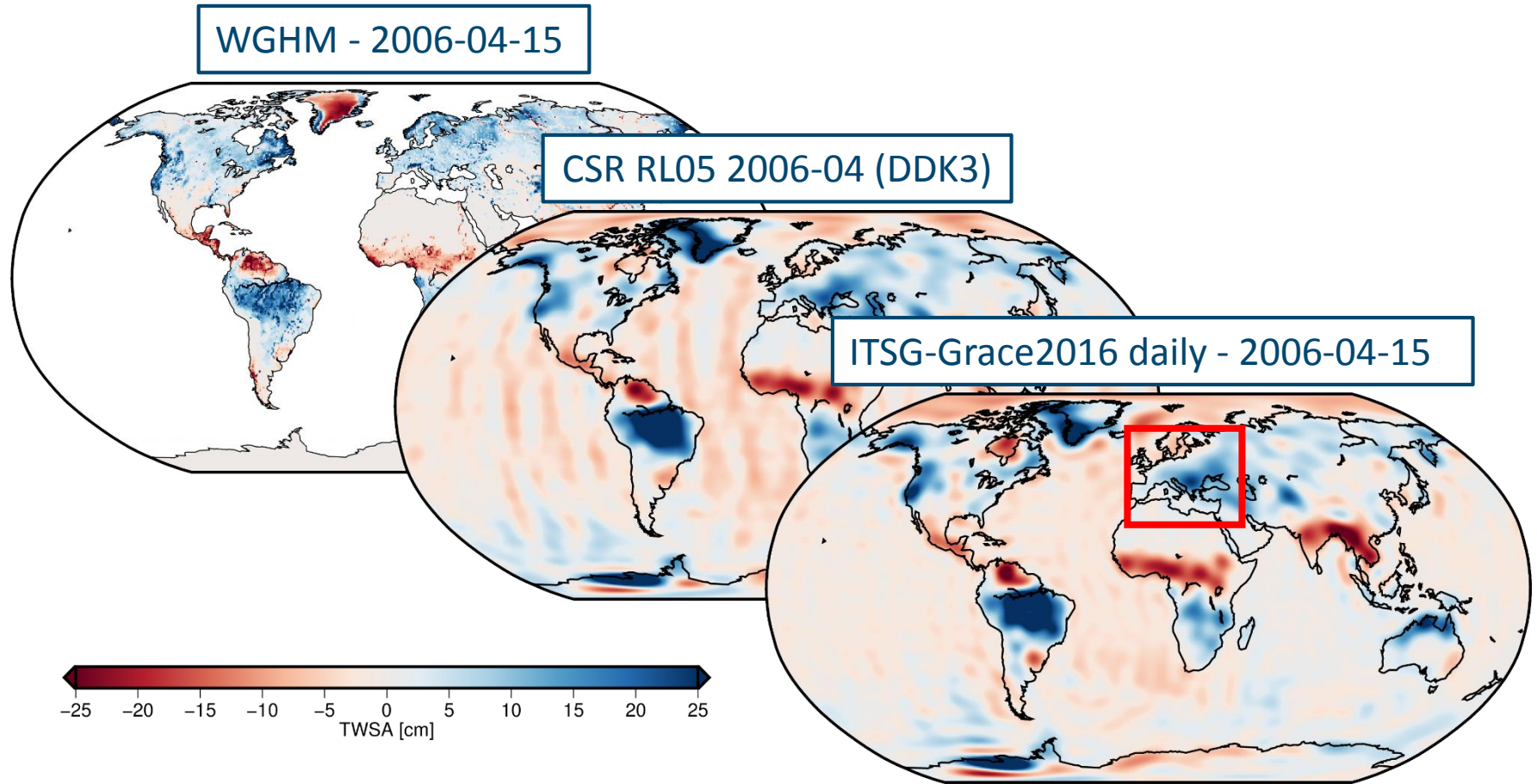
# ITSG-Grace2016 Gravity Field Solutions

- Updates to previous release:
  - Improved GRACE processing scheme (see Talk Mayer-Gürr et al.: Insights into the ITSG-Grace2016 processing)
  - Introduction of regions of independent temporal behavior to reduce spurious correlations



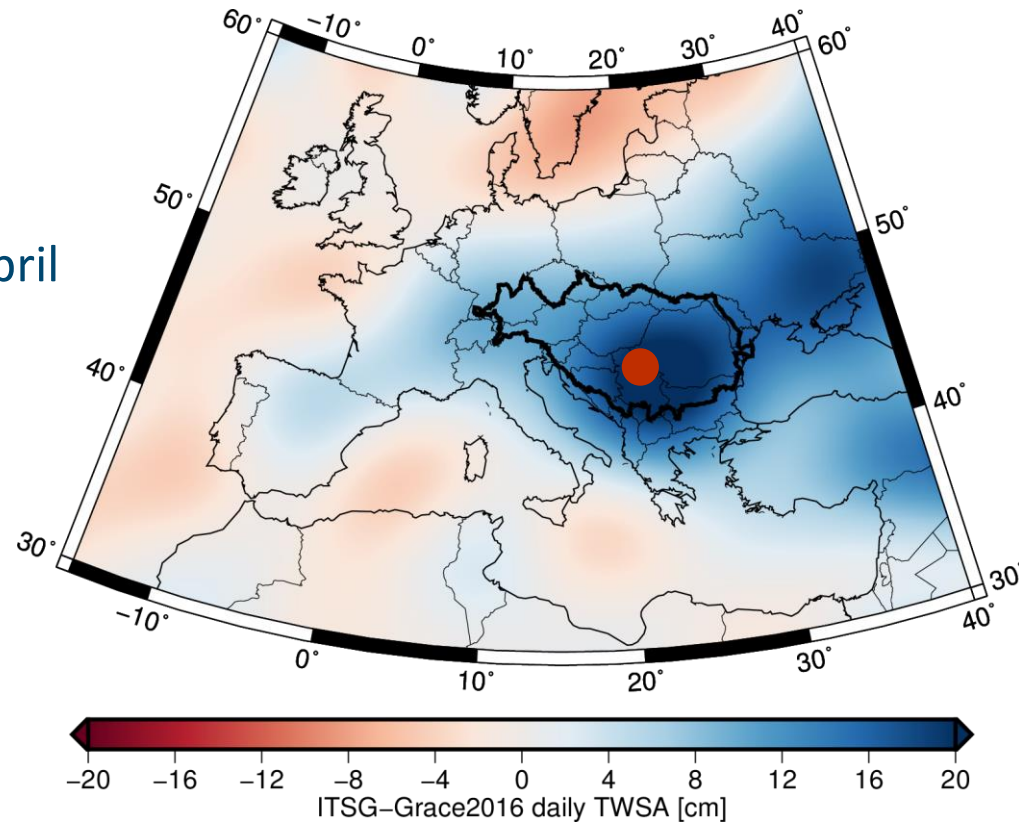
# Comparison with In-Situ Data

# Comparison with In-Situ Data



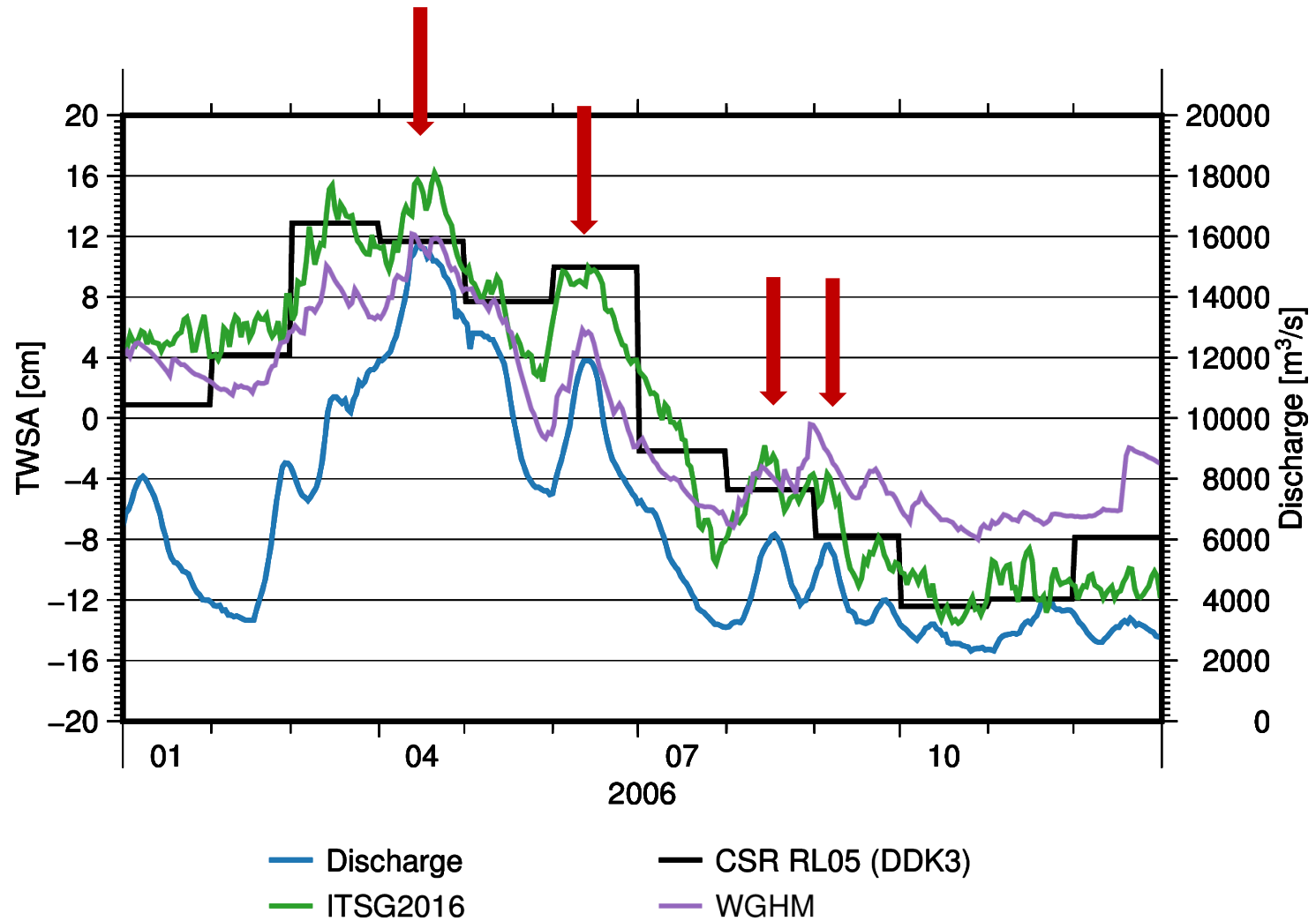
# Comparison with In-Situ Data

- Danube Floods of 2006
- Peak TWSA: approximately 17<sup>th</sup> of April



● Bazias Discharge Station

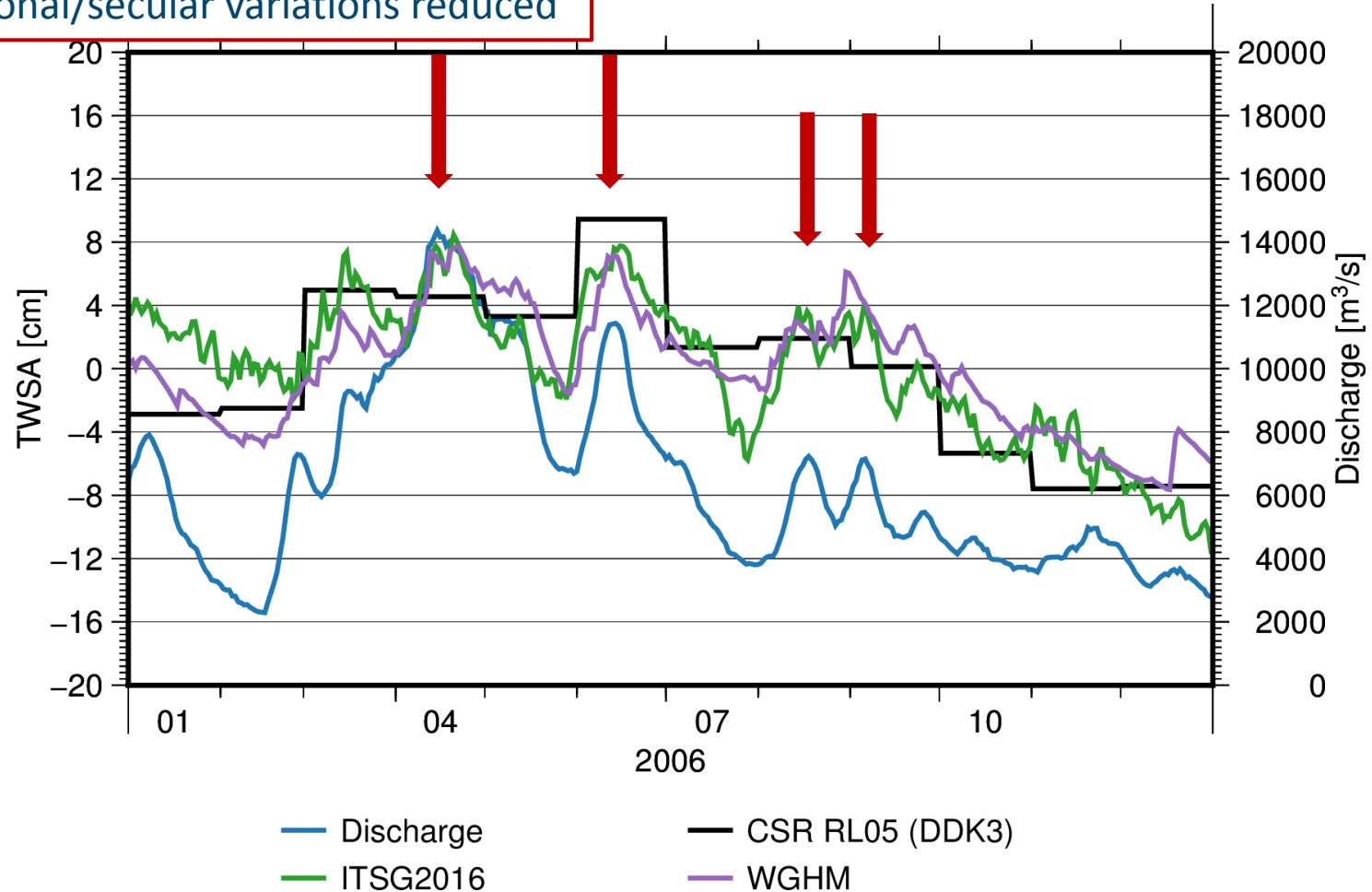
# Comparison with In-Situ Data





# Comparison with In-Situ Data

seasonal/secular variations reduced

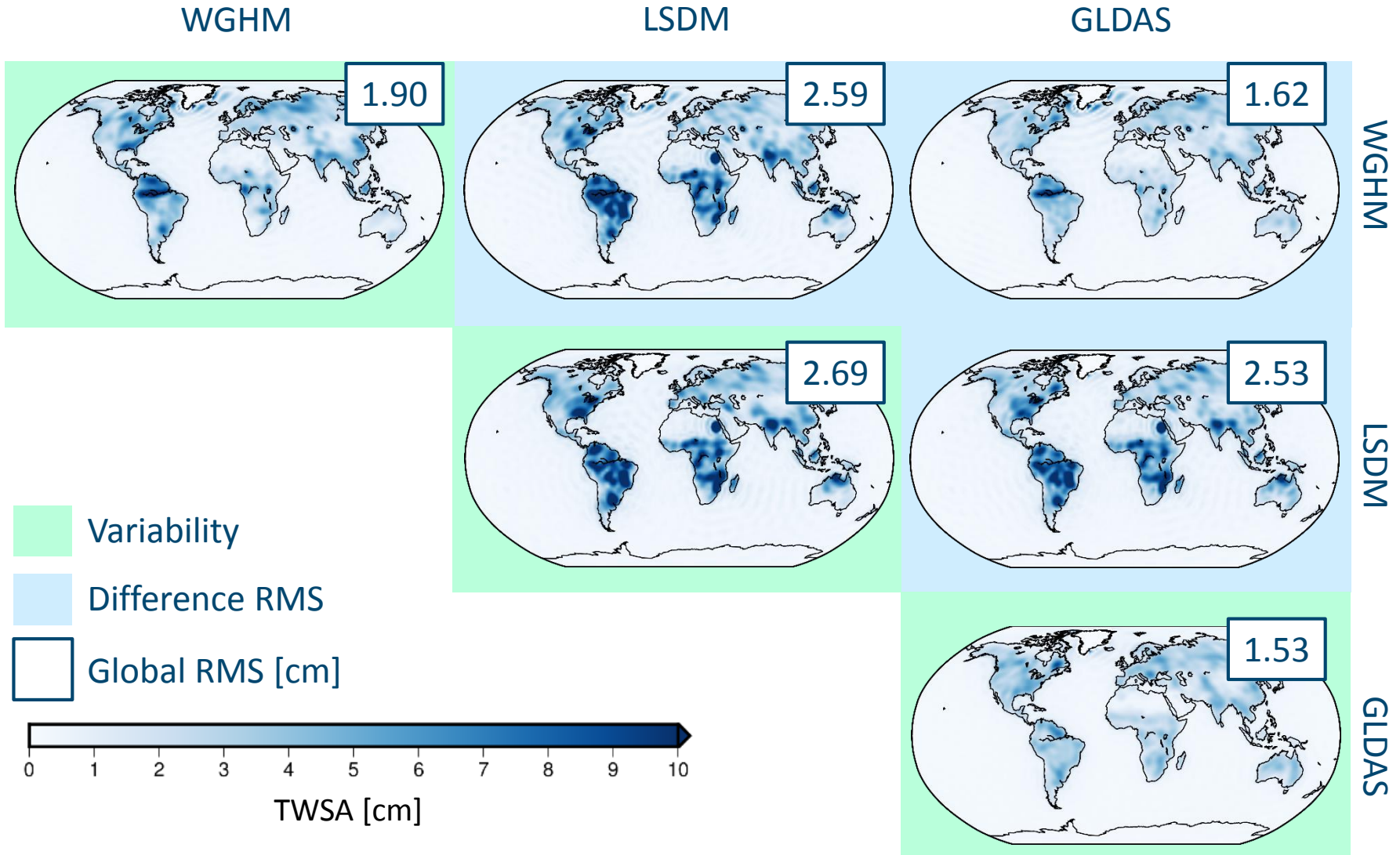


# Impact of the Process Dynamic

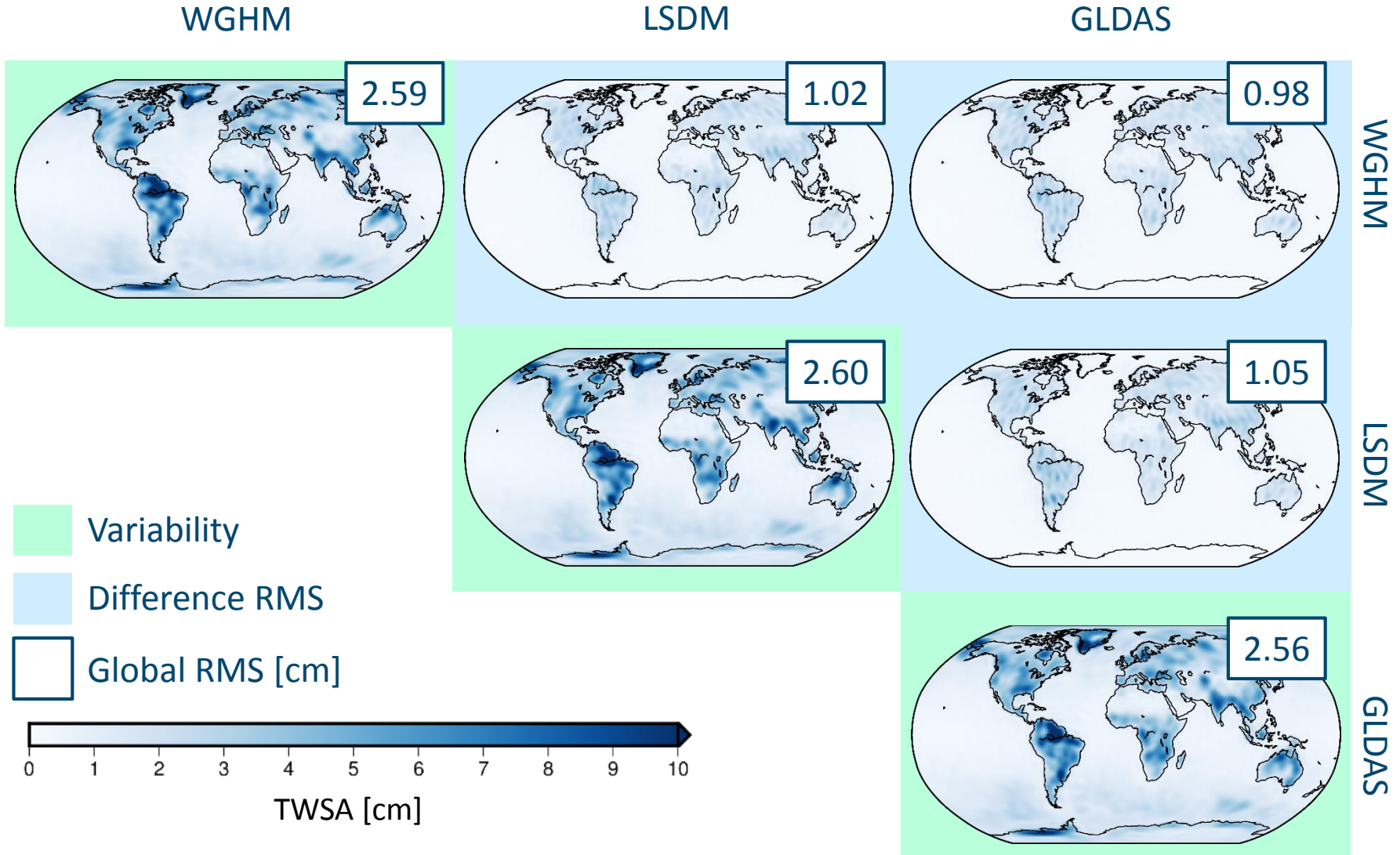
# Impact of Process Dynamic

- How much prior information is contained in the Kalman solutions?
- Process dynamic derived from three different hydrological/land surface models
  - WGHM
  - LSDM (ESA ESM H component)
  - GLDAS
- Identical GRACE input: ITSG-Grace2016 daily normal equations

# Cross-Comparison of Model Output



# Cross-Comparison of GRACE Solutions

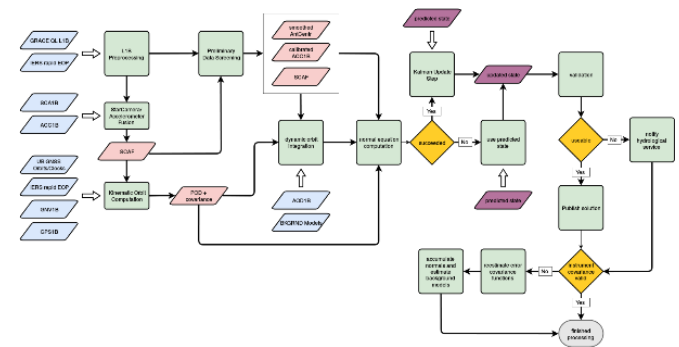




# Conclusions and Outlook

# 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



# Conclusion and Outlook

- GRACE can provide information for much shorter time spans than the standard monthly solutions
- ITSG-Grace2016 solutions are available under [ifg.tugraz.at/ITSG-Grace2016](http://ifg.tugraz.at/ITSG-Grace2016)
- 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](http://www.egsiem.eu) for updates

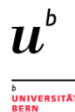
# EOSIEM

European Gravity Service for Improved Emergency Management



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



Leibniz  
Universität  
Hannover



Horizon2020