# WP 2: K-Band data screening and noise study

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**University of Bern**
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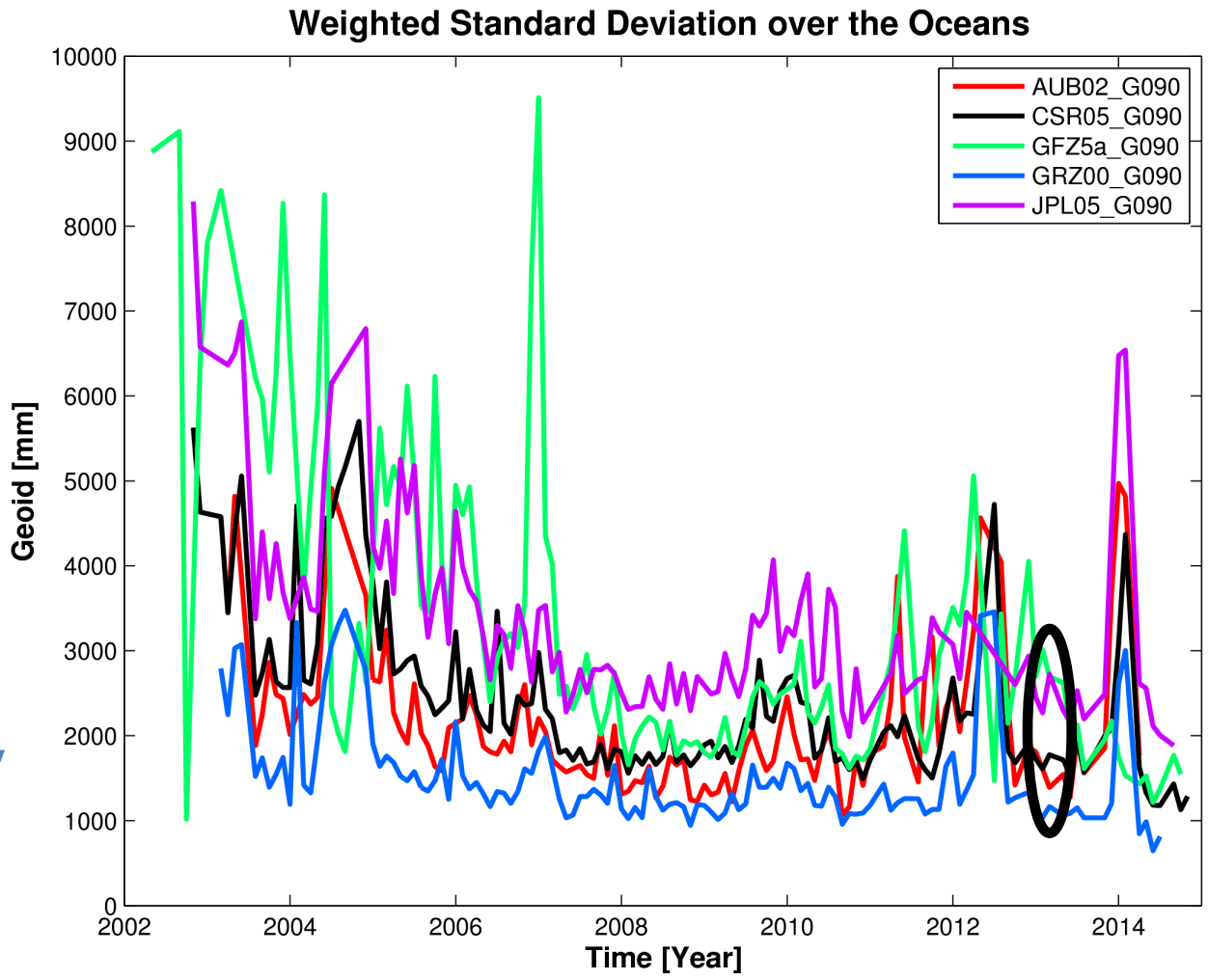
# Contents

- Impact of screening strategy on monthly gravity solutions

- Whole mission noise study for
  - GPS phase observations / kinematic orbits
  - KRR-observations
  - monthly gravity fields

# Screening strategy test month: December 2012




**Variability of monthly gravity fields over the oceans.**



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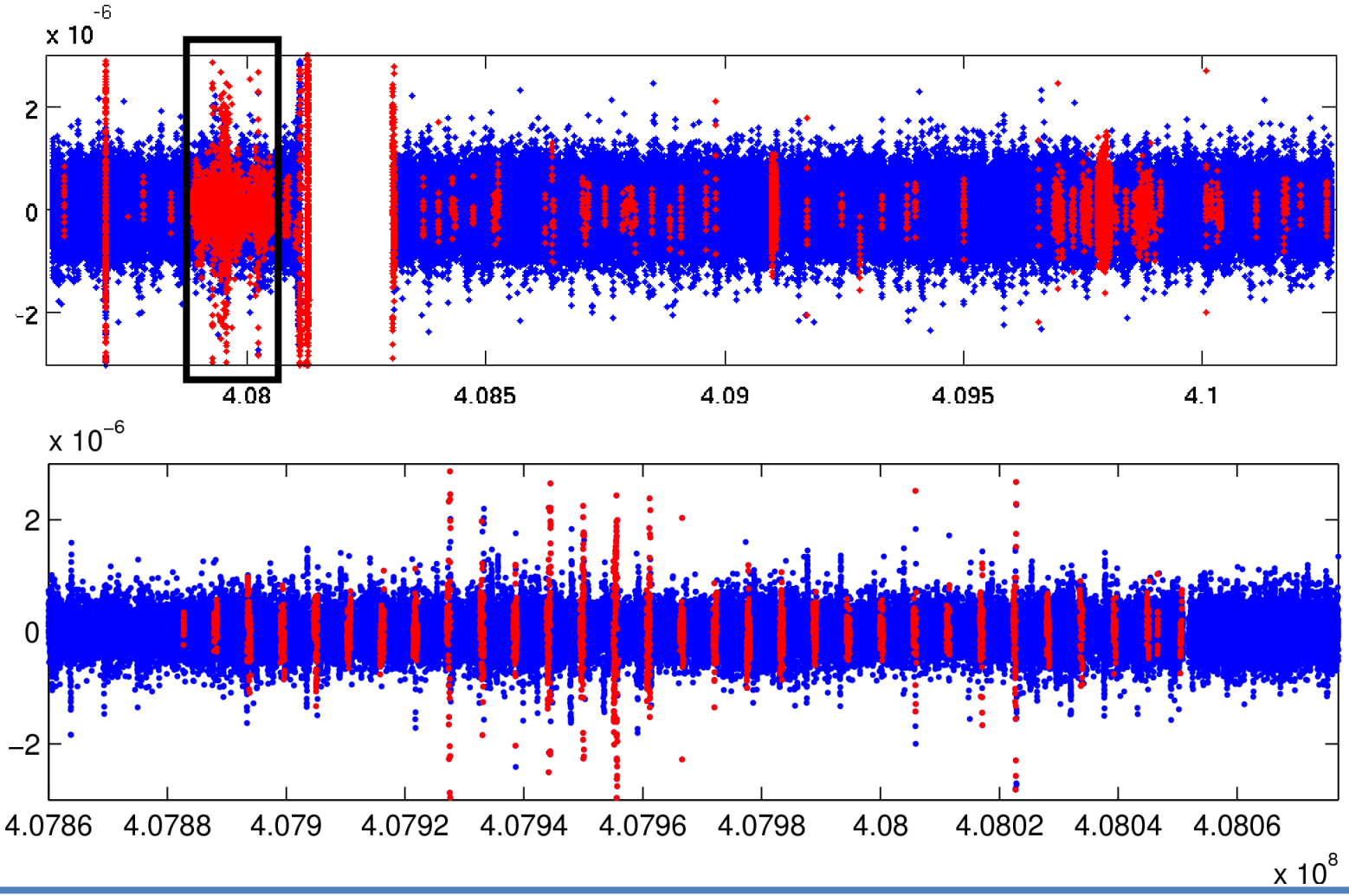
# KRR O – C: data screened out by CSR in red



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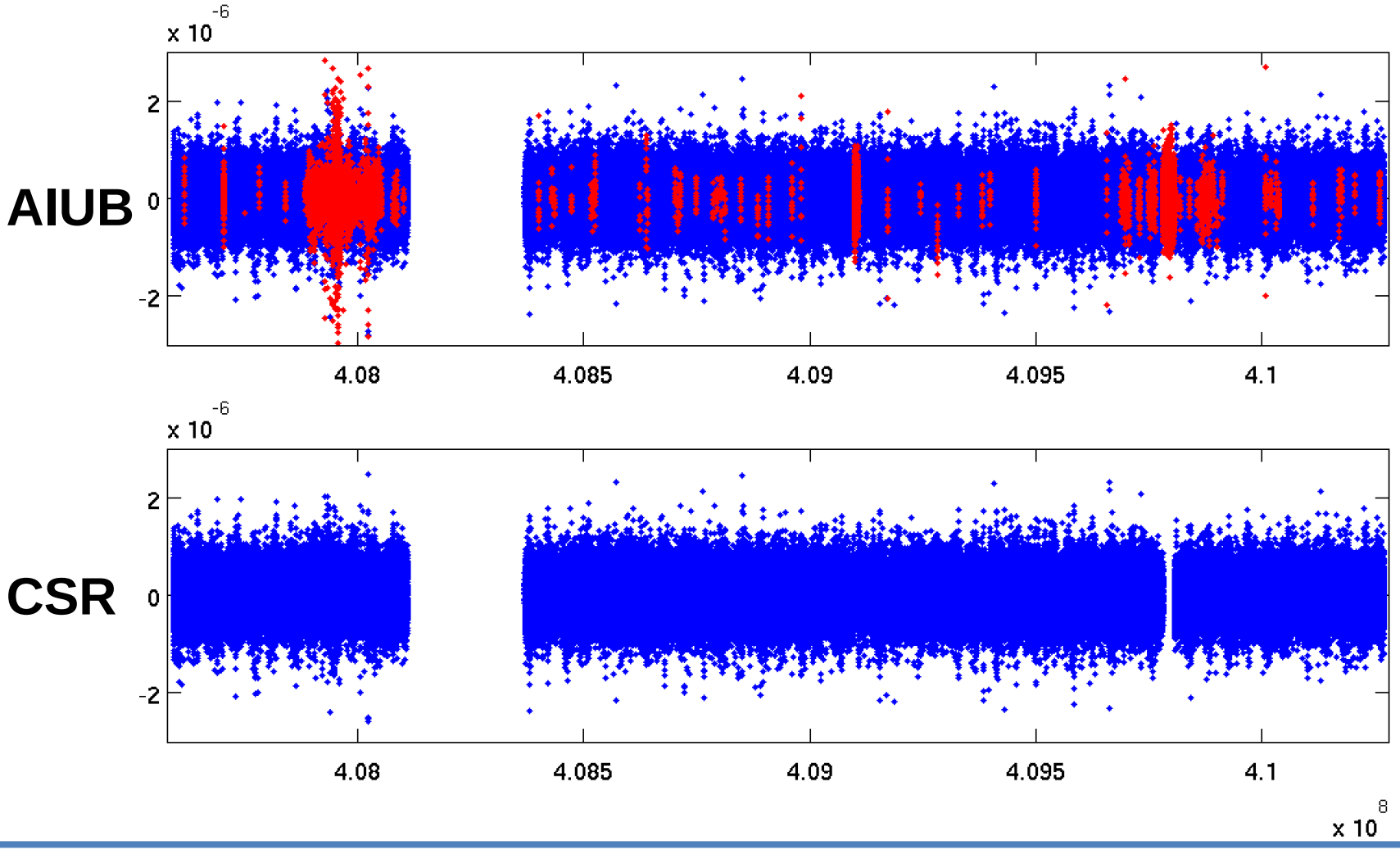
# KRR O – C: data screened out by CSR in red



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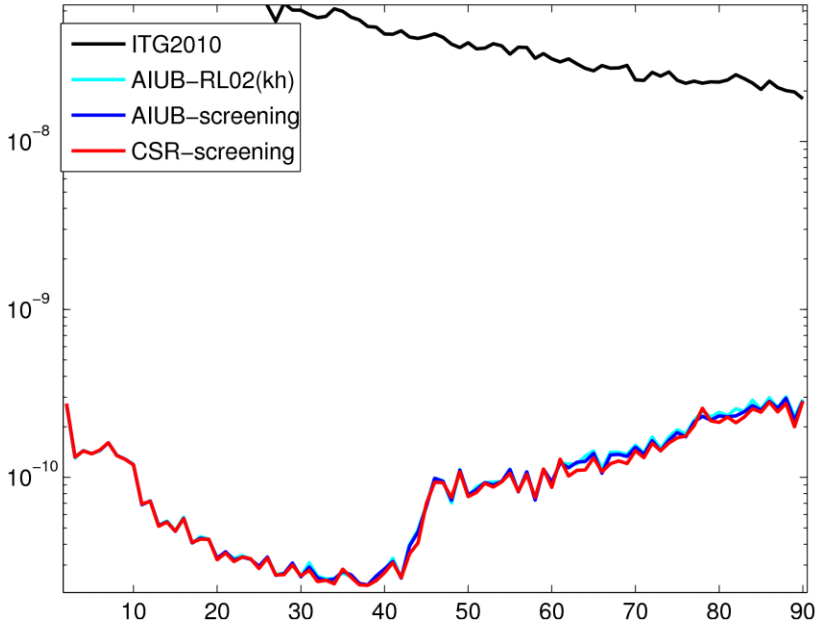
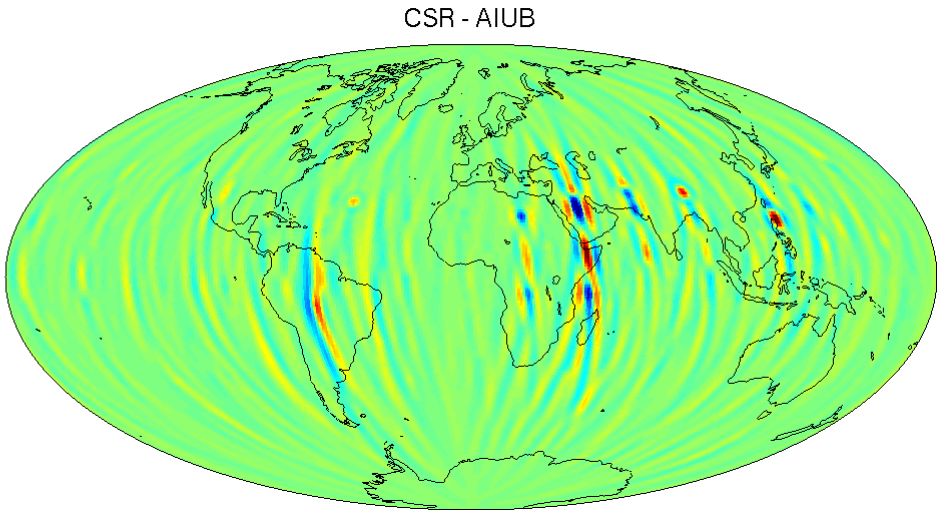
# AIUB-solutions with CSR-screening




**Differences in degree variances (with respect to ITG-GRACE2010) are small and limited to high orders (> 60).**




**Differences in equivalent water heights reach 20 cm but are very localized.**



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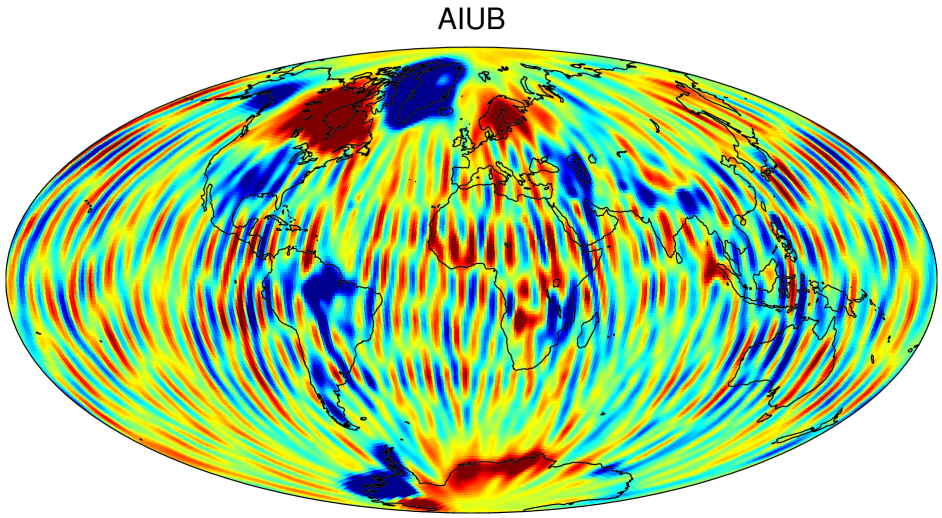
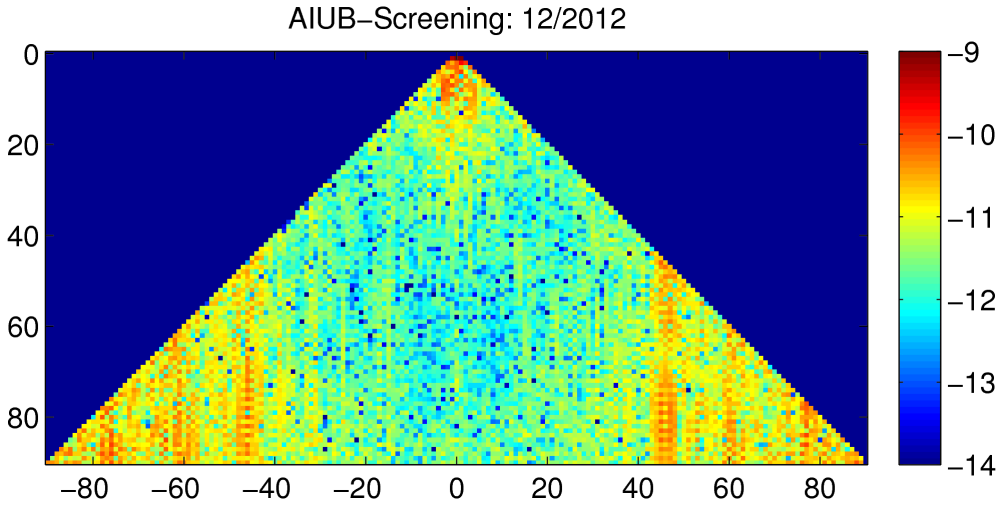
# AIUB: monthly solution 12/2012

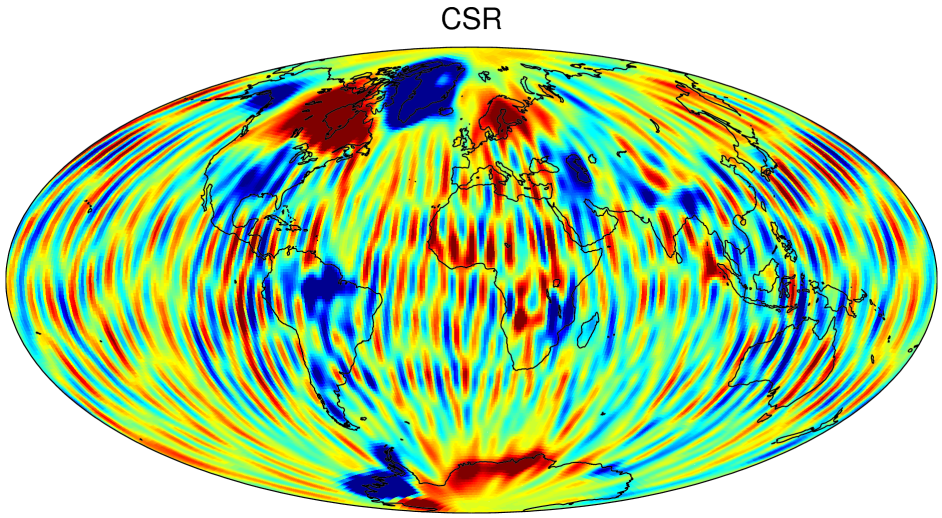



**Equivalent water heights (± 20 cm) with respect to ITG_GRACE2010.**

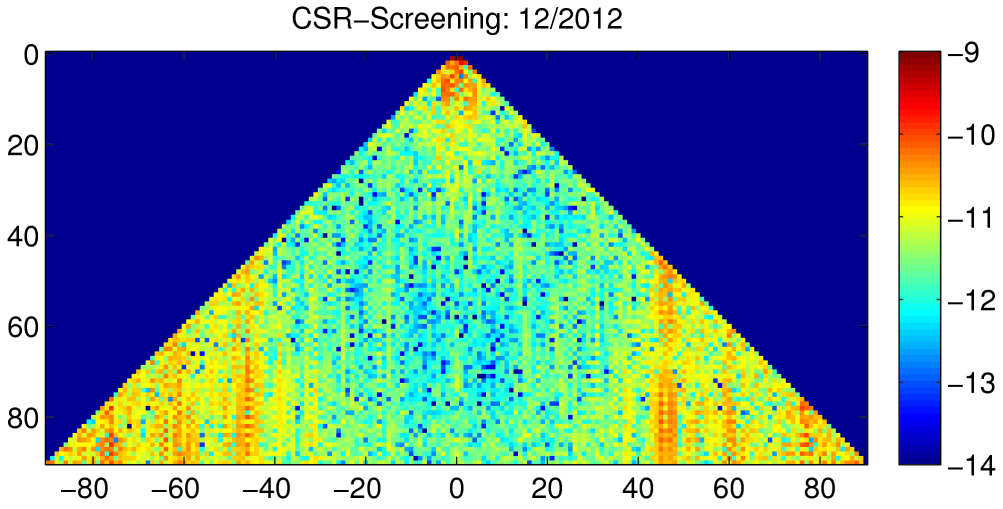
**Coefficients (S / C dimensionless) with respect to ITG_GRACE2010.**



# AIUB (CSR screening): monthly solution 12/2012

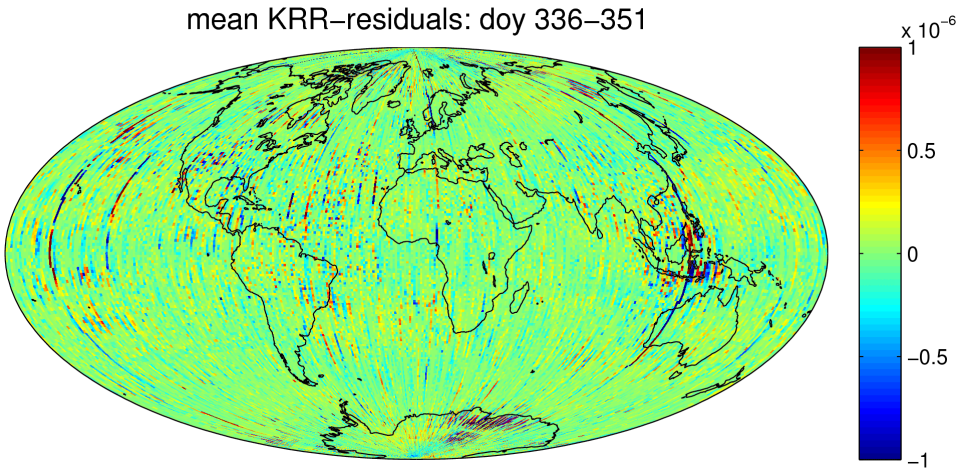



**Equivalent water heights (± 20 cm) with respect to ITG_GRACE2010.**

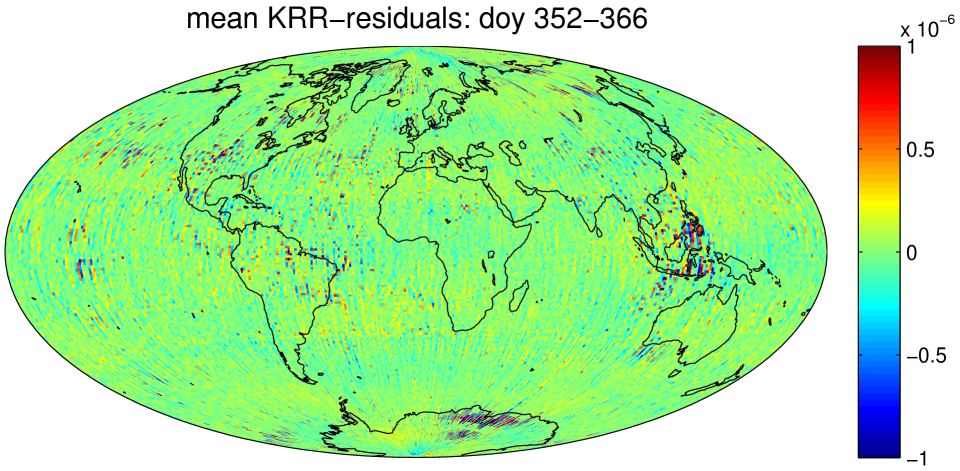



**Coefficients (S / C dimensionless) with respect to ITG_GRACE2010.**

# KRR-residuals, not screened




doy 336 - 351




doy 352 - 366



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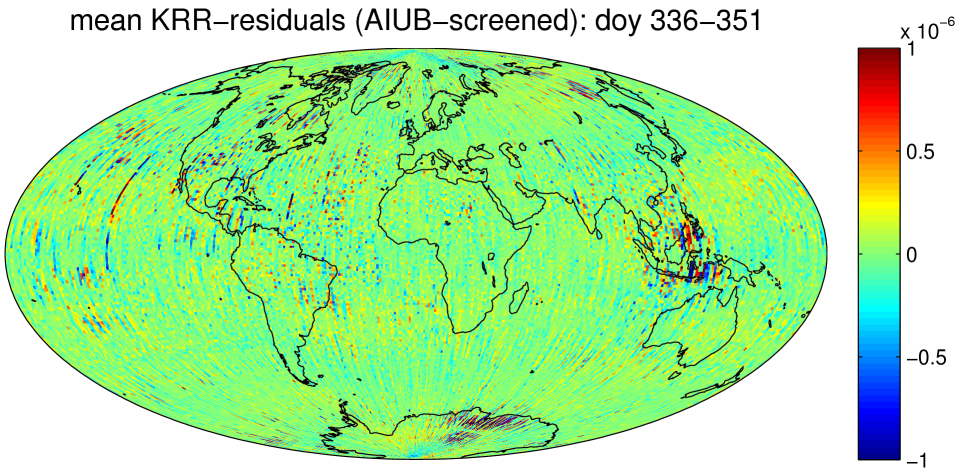
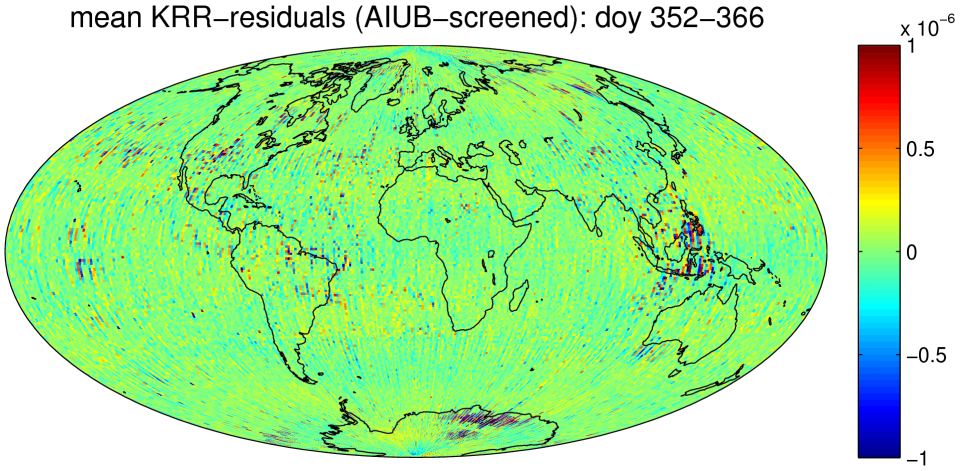
# KRR-residuals, AIUB-screened




doy 336 - 351

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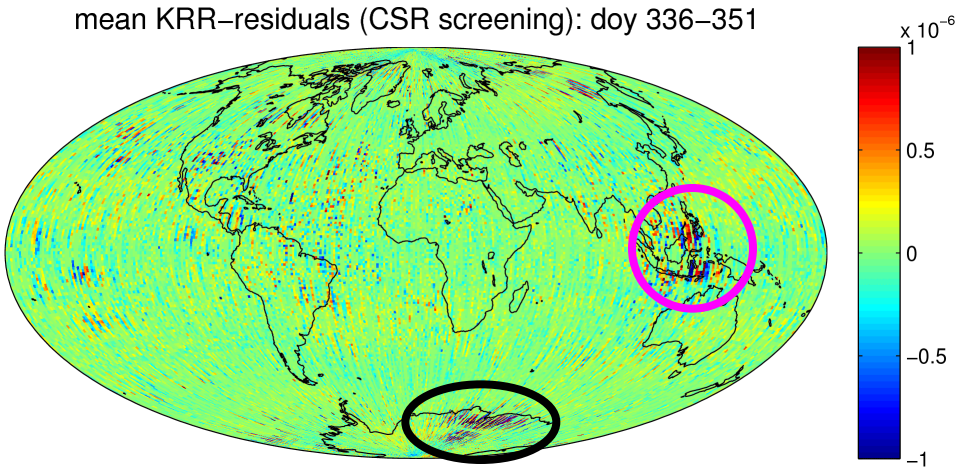
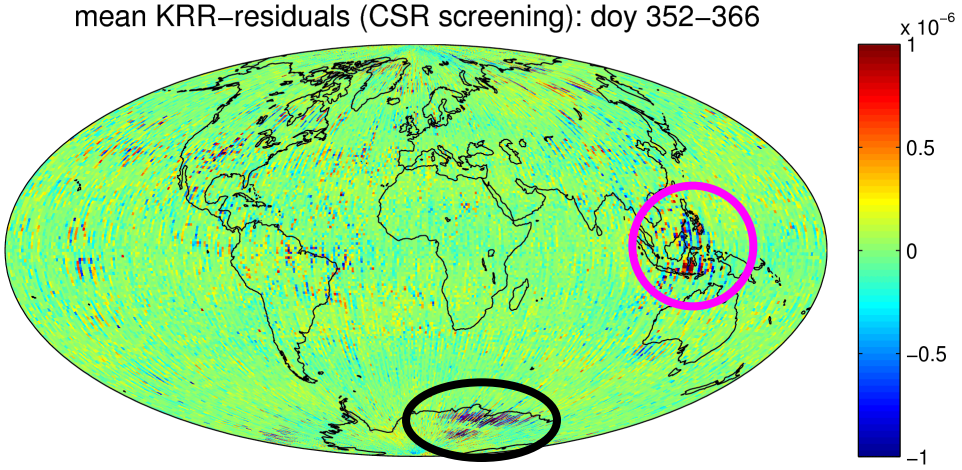
# KRR-residuals, CSR-screened




doy 336 - 351

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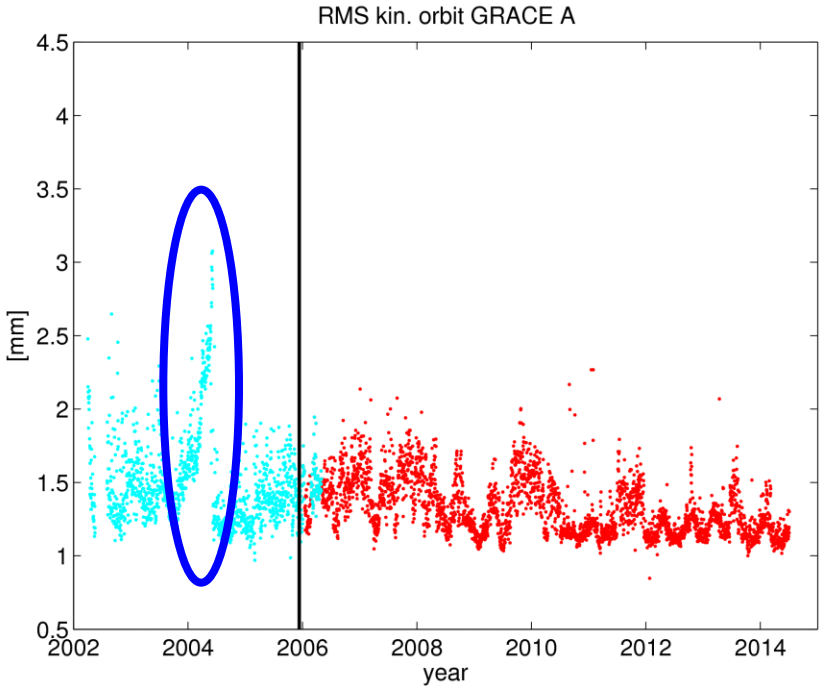
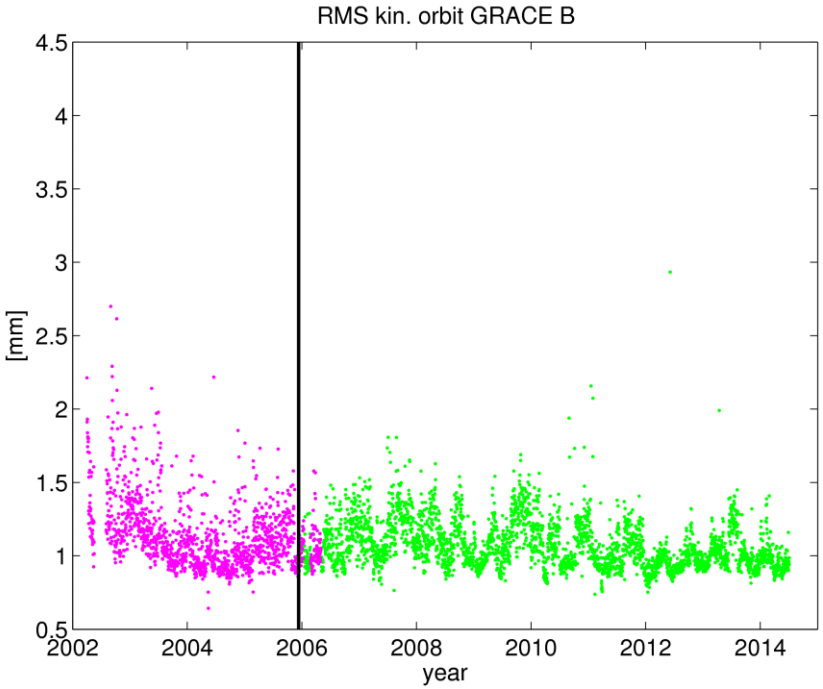
# Conclusions: screening strategy

- quite massive (6120 obs / 975810 obs = 0.6%) screening of KRR observations does not hurt the solution ...
- ... neither does it help a lot.
  - ➢ good CSR-performance probably not due to „magic screening“
- impact on gravity field solution not directly related to location of „bad“ observations
- big KRR-residuals at
  - illuminated magnetic pole
  - Micronesia (problem area of ocean tide models)

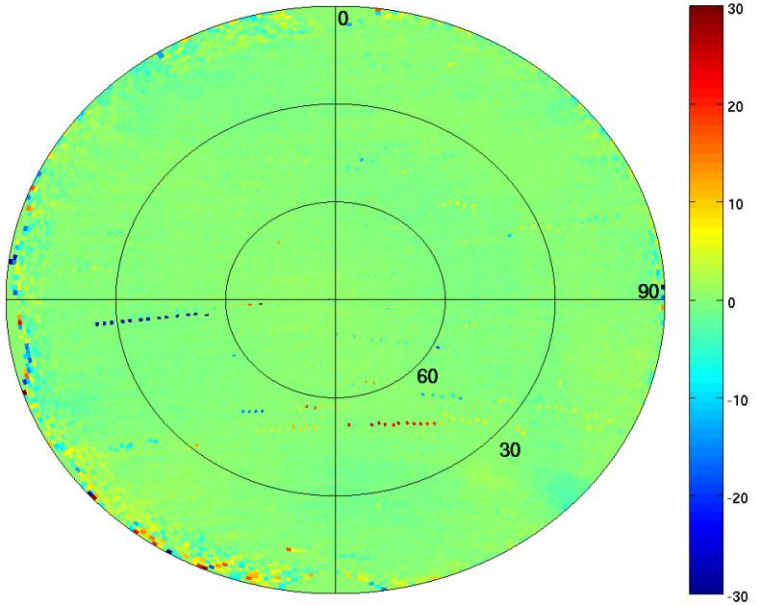
# Noise study: daily RMS of kin. orbits (geometry)



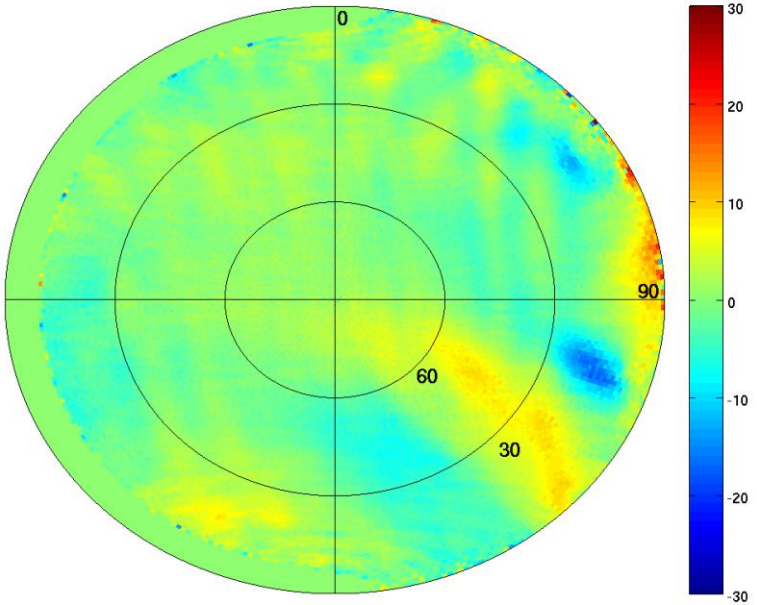



# Phase residuals mapped to antenna fixed system

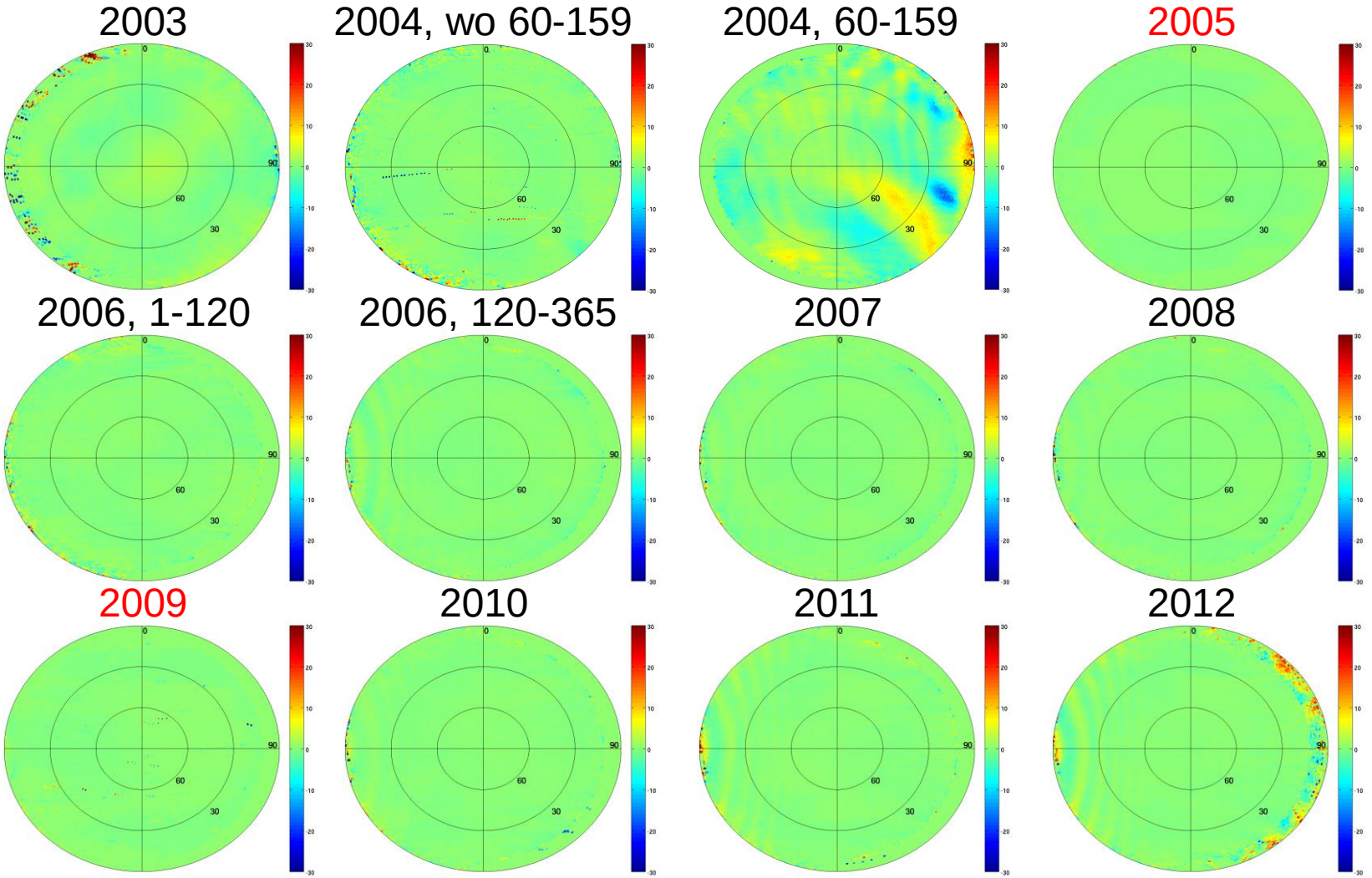
2004, doy 1-59, 160-366




2004, doy 60-159



# Phase residuals mapped to antenna fixed system



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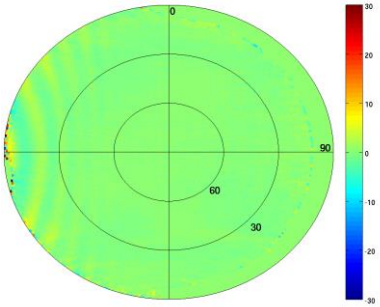
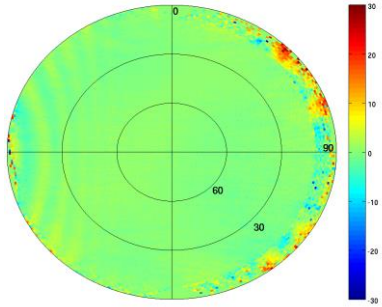
# Phase residuals mapped to antenna fixed system

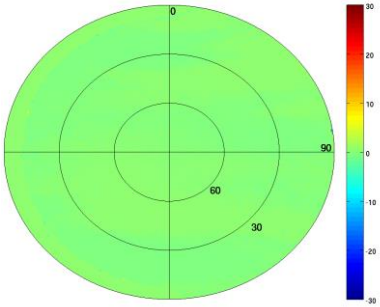
2013



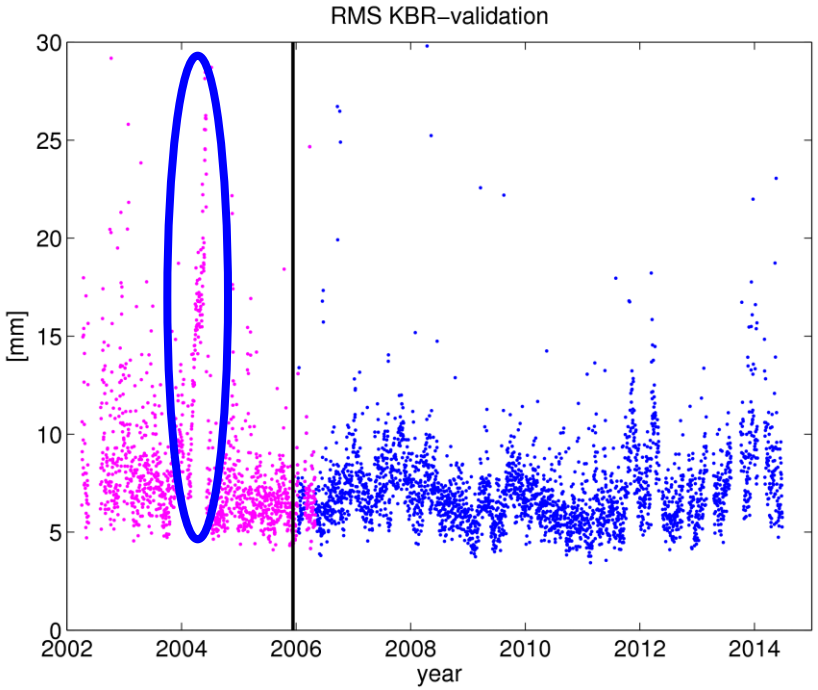

2014, 1-212

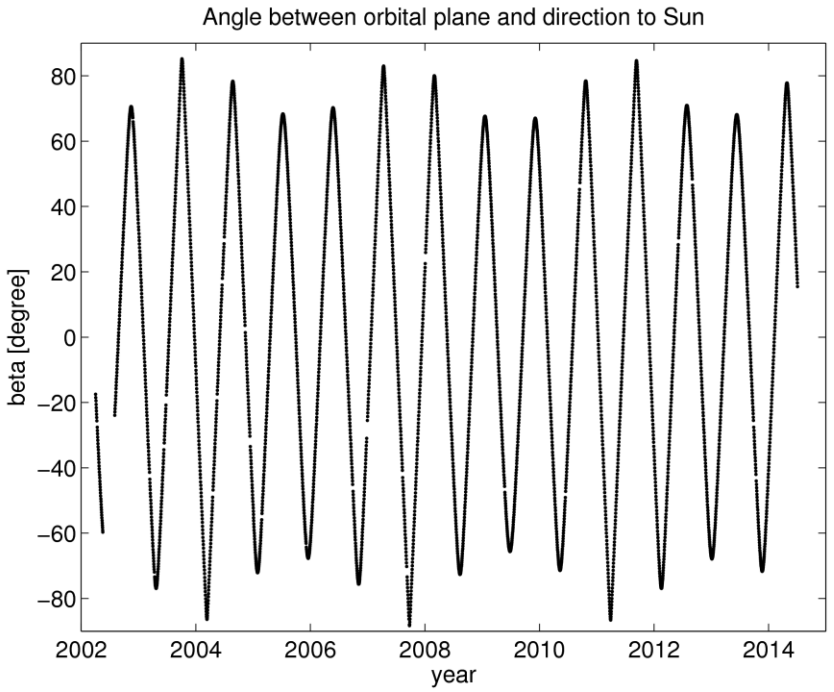



2014, 212-366



# K-Band validation of kin. orbits (geometry)



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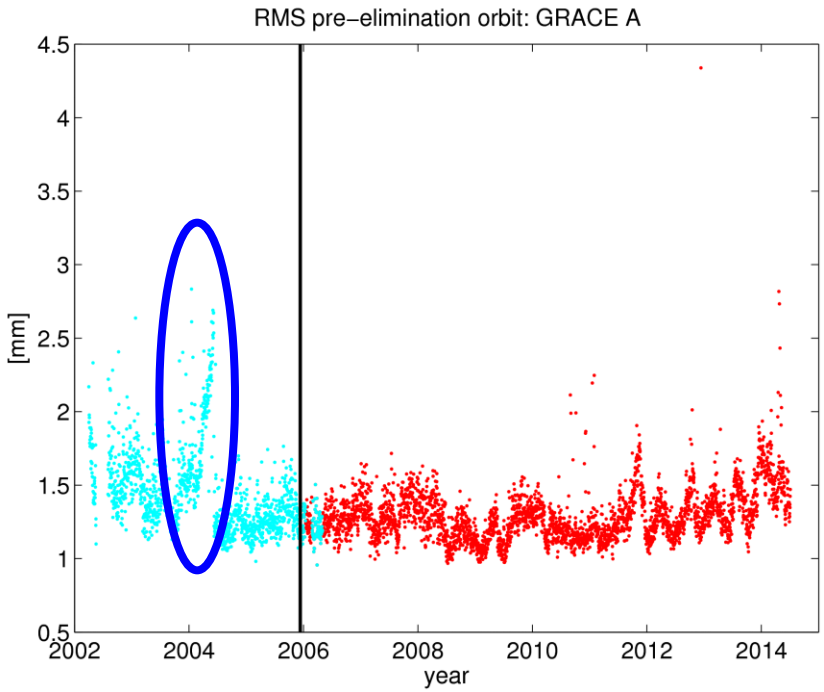
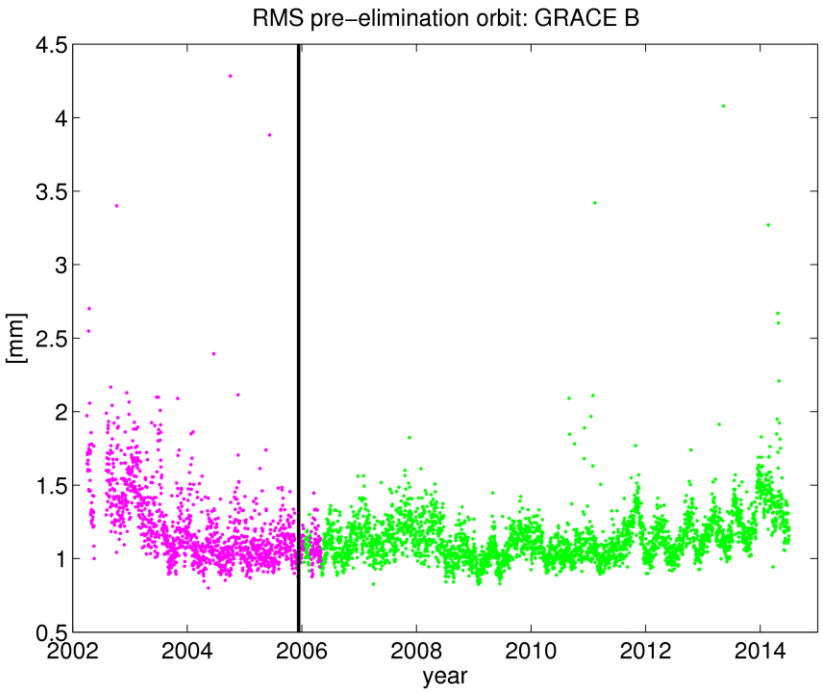
# Pre-elimination of orbit parameters from GPS-Neqs. (geometry + background model)



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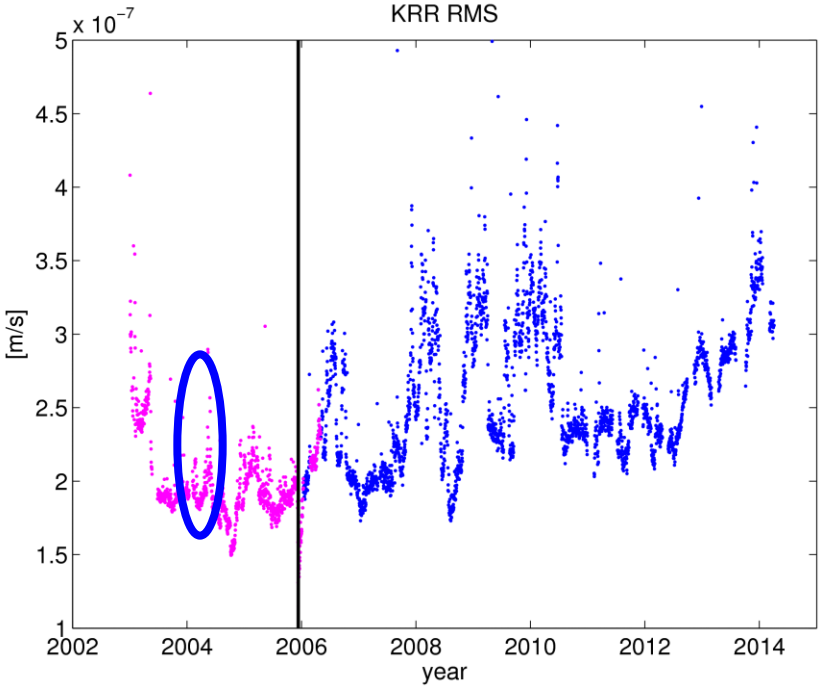
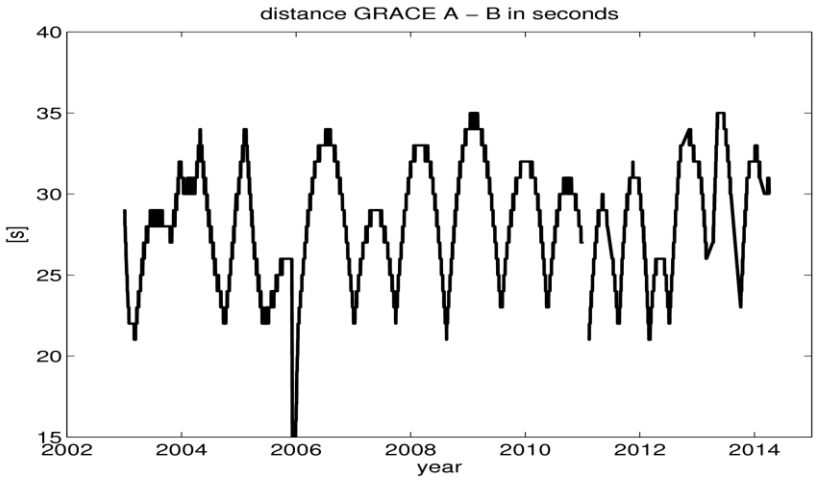
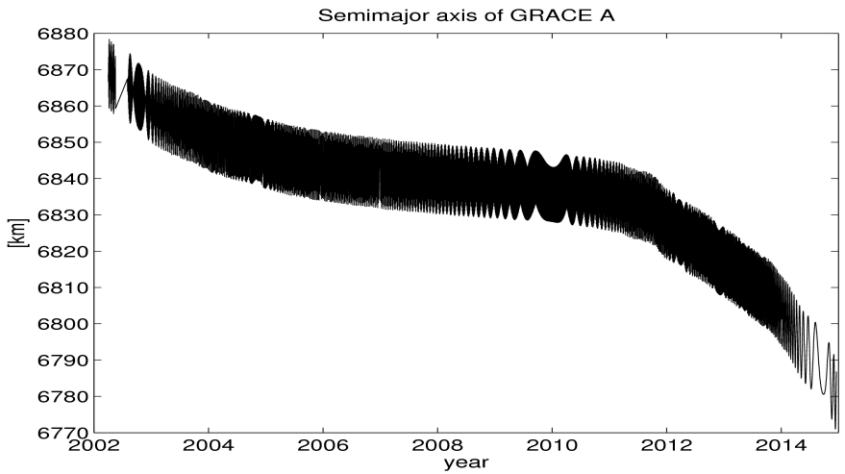
# Daily RMS of KRR-residuals (geometry + background model)

**Inter-satellite distance [dt]**




**Semimajor axis (GRACE A)**



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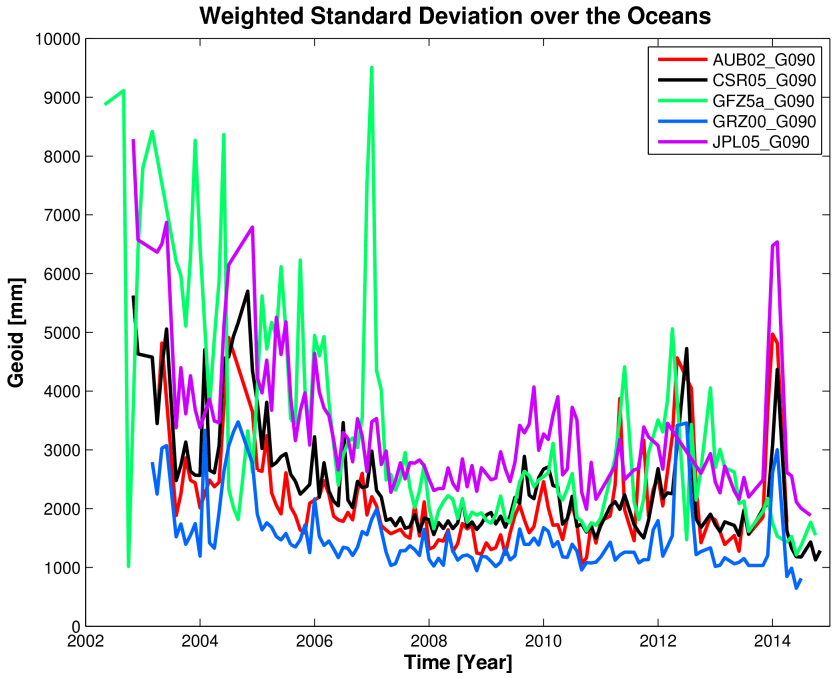
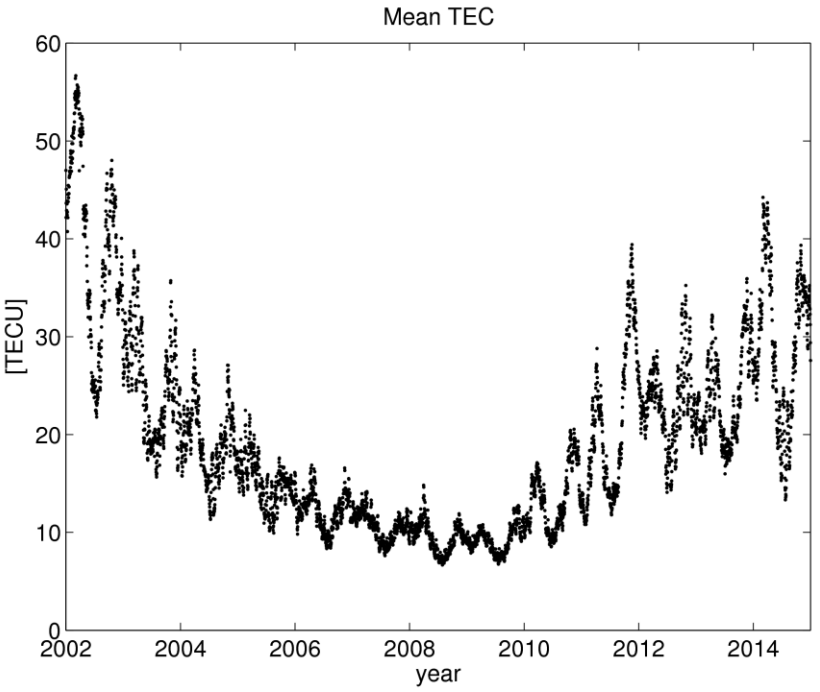
# Variability of monthly gravity field solutions




**Ionosphere activity (daily mean TEC)**



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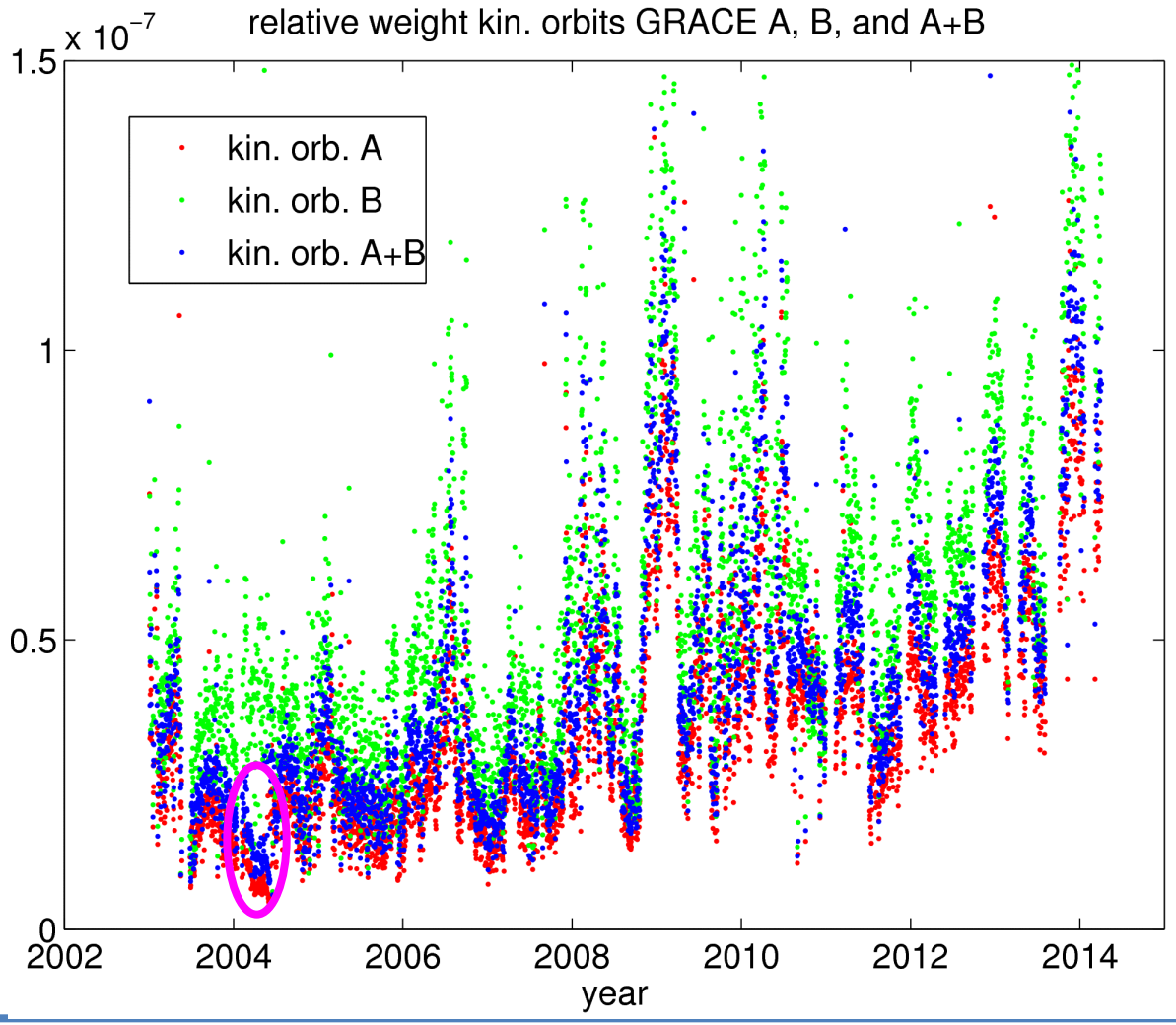
# Daily relative weights Kin. Orbits / KRR

$W = \sigma^2_{krr} / \sigma^2_{gps}$

$= (2e\text{-}7)^2 / (2e\text{-}3)^2$

$= 1e\text{-}8$

**Empirical: 1e-10**



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# Conclusions (noise study)

- RMS kin. orbit GRACE A: 1.5 – 1.2 mm,
  GRACE B: 1.3 – 1.0 mm
  - correlation with beta-angle (Sun)
- RMS of KRR residuals: 2e-7 – 3e-7 µm/s
  - correlation with inter-satellite distance
  - satellite elevation
  - solar / ionosphere activity???
- variability of monthly solutions (wSTD over oceans) correlated with solar / ionosphere activity

➢ constant relative weight not appropriate