

WP2: Status GFZ Monthly Solutions

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Level 2 Products at GFZ: General



- Current operational release: GFZ RL05a (156 monthly solutions from 04/2002-08/2016)
- Years 2006 & 2007 have been reprocessed for EGSIEM and delivered to WP4 as
 - Monthly Level-2 products (SH coefficients) up to d/o 90x90
 - Monthly NEQs in SINEX format
- RL06 shall be published Nov 2017 (SDS RR), EGSIEM L2 can be seen as “precursor”

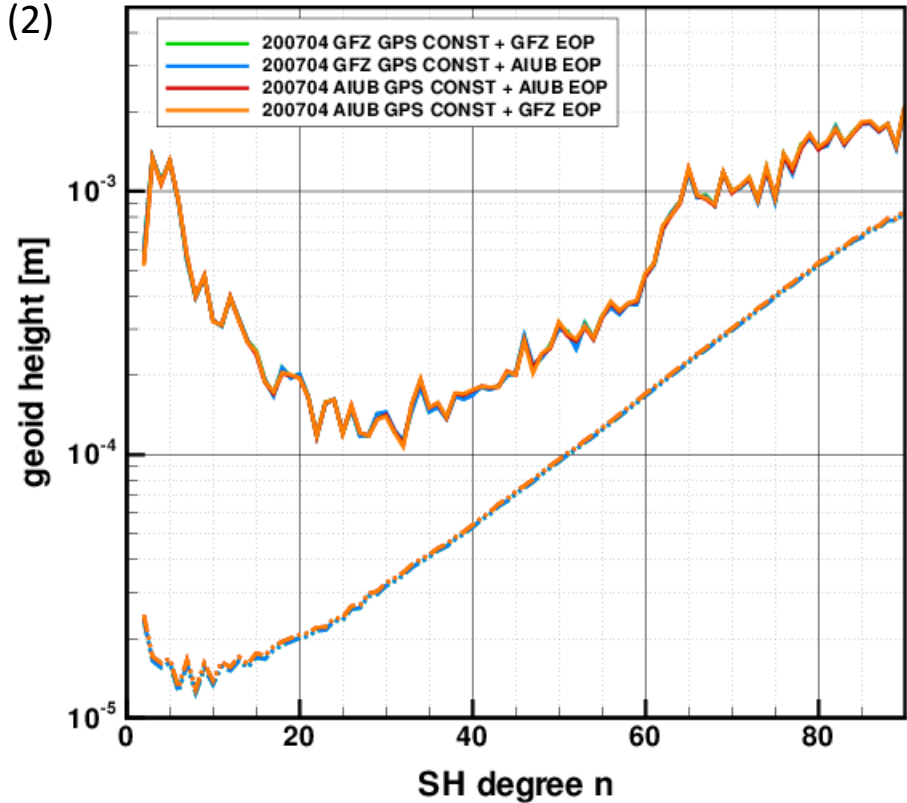
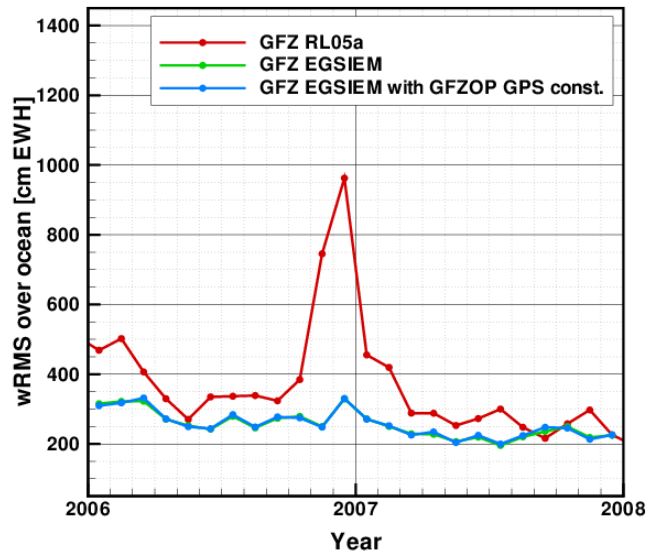
Level 2 Products at GFZ: General

- Improvements from RL05 to RL06 will comprise (EGSIEM applied in red) e.g.
 - Reprocessed RL03 L1B data
 - First set of data recently made available within SDS
 - New (improved) background models
 - ocean tide model: e.g. **FES2014**, GOT+GRACE, ... (tbd)
 - AOD1B RL06 (see next slides)
 - Modifications in processing strategy
 - stochastic modeling of KBR observations (first tests with promising results)
 - relative weighting KBR vs GPS
 - **GPS has been slightly down-weighted (a priori sigma 0.7 cm -> 1 cm)**
 - use of arc-wise KBR weights (ongoing research)
 - **use of AIUB GPS constellation (for EGSIEM only, see next slides)**
 - **handling/parameterization of accelerometer observations (see next slides)**
 - ACC biases as splines (currently under investigation)
 - parameterization of KBR observations (still to be investigated)

Level 2 Products at GFZ: GPS Constellation

Impact on monthly gravity field solution

- Using the GPS constellation by (1) AIUB and (2) GFZ yields the same results
- Even inconsistent EOPs have no impact
 - AIUB GPS orb/clocks + GFZ EOPs
 - GFZ GPS orb/clocks + AIUB EOPs



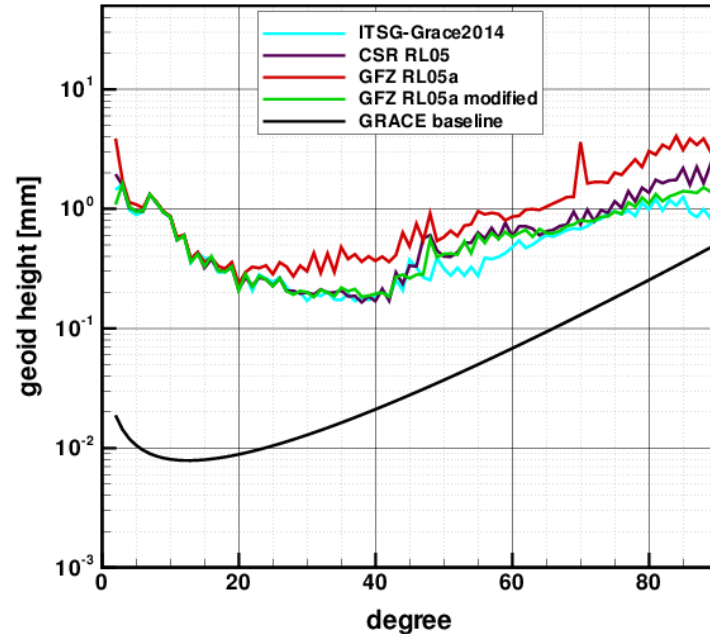
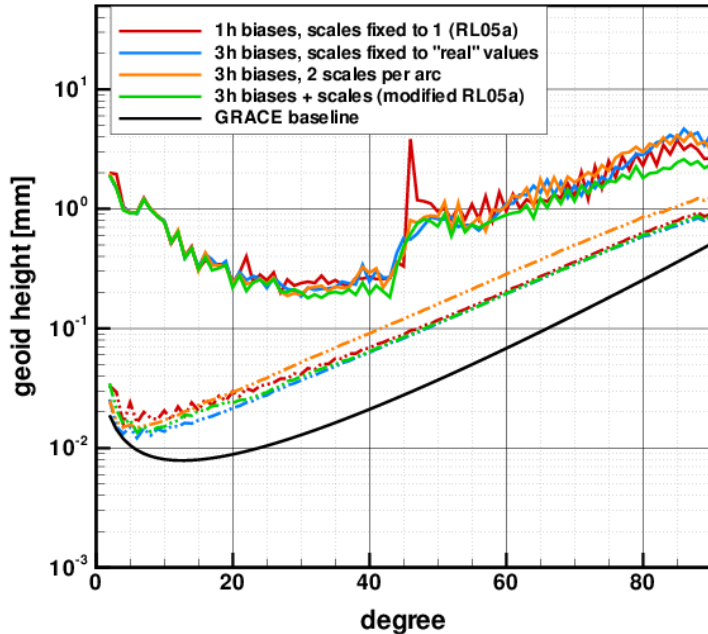
Level 2 Products at GFZ: ACC Parametrization



European Gravity Service for Improved Emergency Management

07/2012: comp. of different ACC parametrization

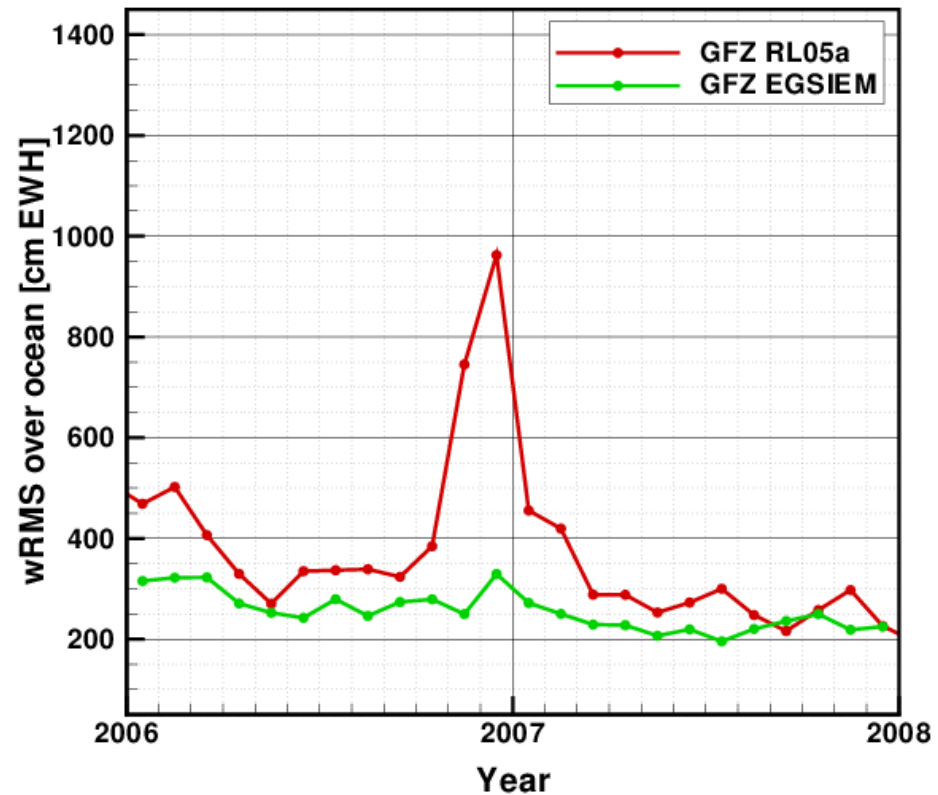
12/2012: comparison of different Analysis Centres



- 3h biases + scales least noisy (left Fig.), puts GFZ RL05a solution on a level comparable with CSR RL05 and ITSG2014 (right Fig.)
- Proper treatment of accelerometer observations crucial during early mission (higher solar activity) and during last years (reduced thermal control, again higher solar activity + lower orbit)
- => Tests are still ongoing (got suggestions from CSR, are interested in TUG results)

Level 2 Products at GFZ: EGSIEM 2006/2007

- Significant noise reduction and increased consistency w.r.t. GFZ RL05a:



Level 2 Products at GFZ: AOD1B RL06

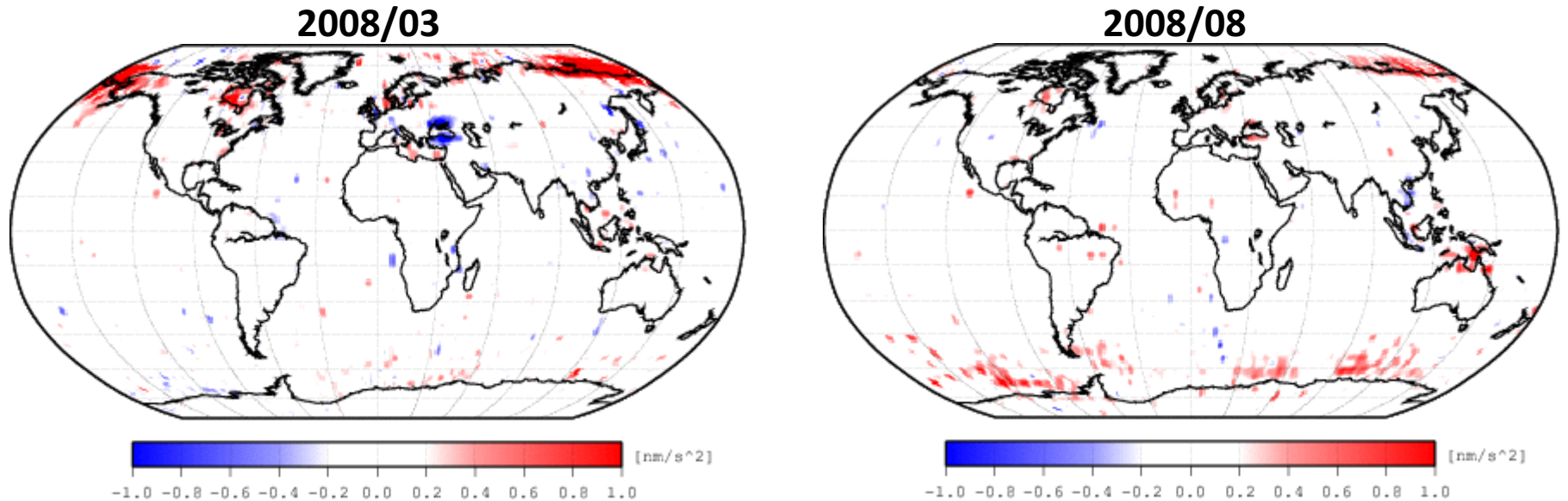
Differences between AOD1B RL05 and RL06:

- RL06 has higher spatial and temporal resolution (max d/o 180 instead 100, 3h instead 6h)
- (atmospheric & oceanic) tidal signals are removed from AOD1B products in RL06
- RL06 uses ERA-Interim data until 2006 (RL05: 2000) & op. ECMWF data since 2007 (RL05: 2001)
- Surface pressure is reduced to op. ECMWF orography from 2014 in RL06 (no reference orography in RL05)
- RL06 uses MPIOM ocean model (RL05: OMCT)
- No ocean signals beneath Antarctic ice shelves in RL06 (RL05: ocean dynamics from Padman et al. 2002)

Level 2 Products at GFZ: AOD1B RL06

Variance reduction of K-band range-acceleration residuals

Differences between GFZ GRACE solutions using (1) AOD1B RL05 and (2) AOD1B RL06 (red indicates AOD1B RL06 is better, blue AOD1B RL05 is better)

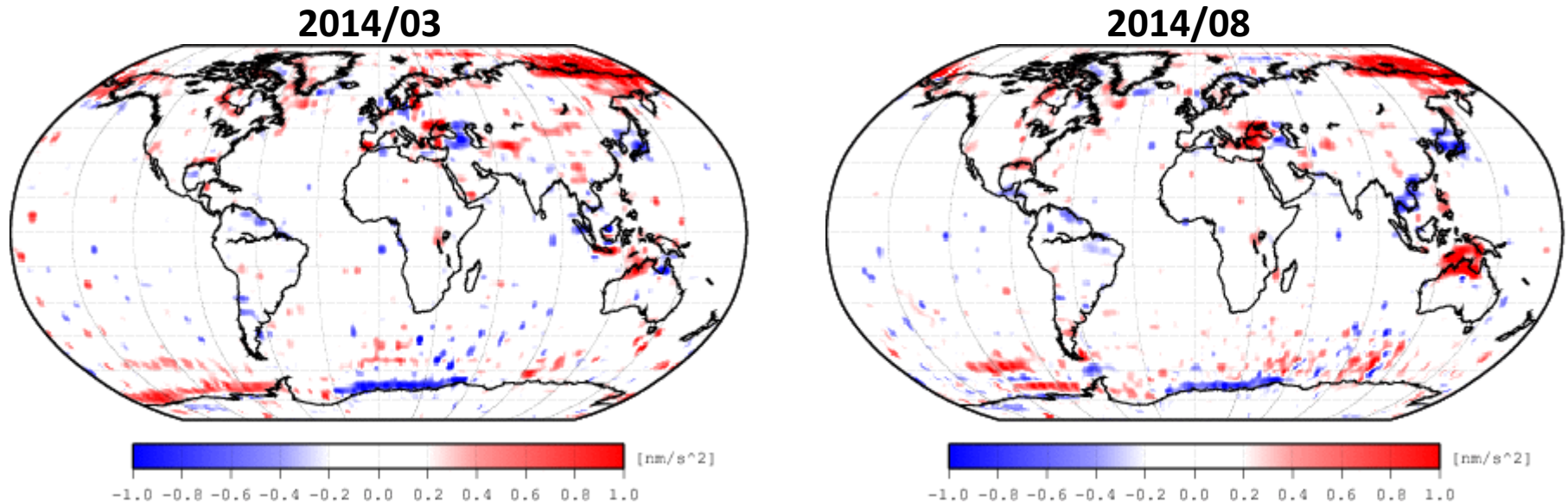


- Generally improvements by AOD1B RL06
- Years investigated so far: 2008 & 2014 (similar conclusions can be drawn from all months)

Level 2 Products at GFZ: AOD1B RL06

Variance reduction of K-band range-acceleration residuals

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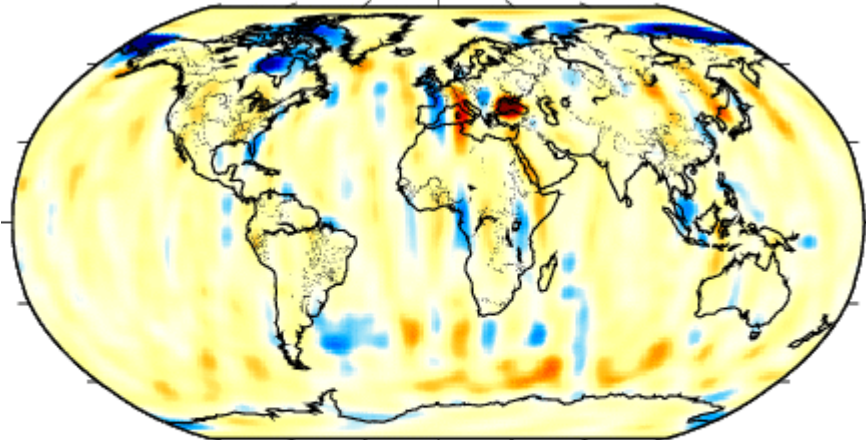
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Level 2 Products at GFZ: AOD1B RL06

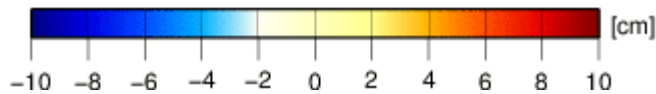
Impact on monthly gravity field solutions

EWH differences [cm] (DDK3 filtered) between GFZ GRACE solutions using (1) AOD1B RL05 and (2) AOD1B RL06 (red indicates AOD1B RL06 has smaller values, blue AOD1B RL05 has smaller values)

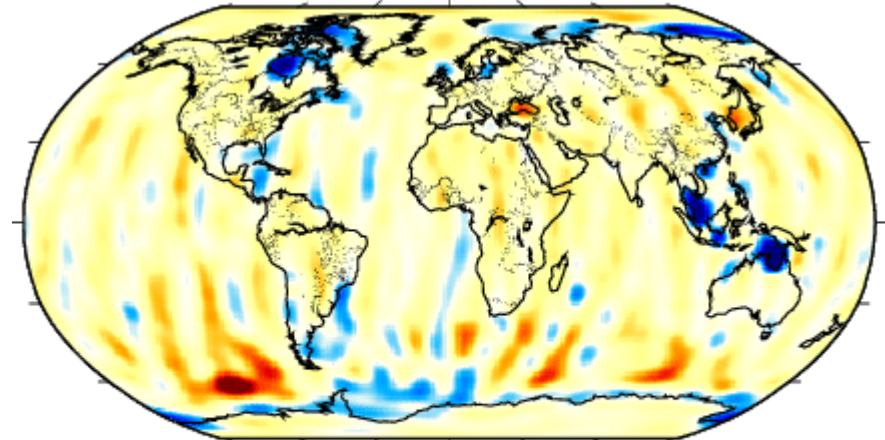
2008/03



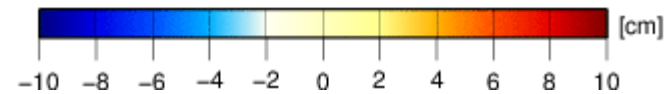
min/max/wrms [cm]: -19.2/15.3/1.8



2008/08



min/max/wrms [cm]: -18.5/15.4/2.0



- RMS differences of ~2cm, but also up to ~20 cm in certain regions!

Level 2 Products at GFZ: AOD1B RL06

Impact on monthly gravity field solutions: wRMS over ocean (EWH [cm], unfiltered):

	AOD1B RL05	AOD1B RL06
2008/01	186.7	177.5 (-5%)
2008/02	200.8	192.4 (-4%)
2008/03	198.2	191.7 (-3%)
2008/04	200.8	197.5 (-2%)
2008/05	189.5	186.7 (-1%)
2008/06	213.5	211.7 (-1%)
2008/07	208.1	199.7 (-4%)
2008/08	215.1	210.8 (-2%)
2008/09	213.2	214.2 (+0%)
2008/10	190.3	186.2 (-2%)
2008/11	195.0	188.9 (-3%)
2008/12	195.5	187.6 (-4%)

Level 2 Products at GFZ: Remark



- GFZ is planning to provide (at least) a (draft) RL06 2006/2007 solution for the EGSIEM Combination Service in September 2017.