

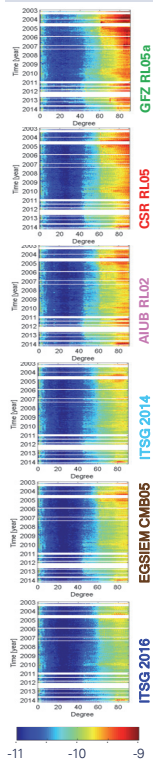
Evaluation of recent GRACE monthly solution series with an ice sheet perspective

Introduction

- GRACE monthly gravity field solutions have undergone a remarkable evolution.
- Efforts are under way to derive combined solutions within the EGSIM project (European Gravity Service for Improved Emergency Management).
- Which series should we use for applications such as ice sheet mass balance?
- We evaluate 6 series with $n_{max} \geq 90$ (most appropriate for polar applications).

- GFZ RL05a, $n_{max} = 90$
- CSR RL05, $n_{max} = 96$, truncated to $n_{max} = 90$
- AIUB RL02 RL2 (by Uni Bern), $n_{max} = 90$
- ITSG 2014 (by TU Graz), $n_{max} = 90$
- EGSIEM CMB05 test combination, $n_{max} = 90$ (month-wise weighted mean of the above 4 solutions & JPL RL05; see EGU2016-7586 – this poster session)
- ITSG 2016 (by TU Graz), $n_{max} = 90$ (see EGU2016-11547). This new solution is not included in the EGSIM test combination.

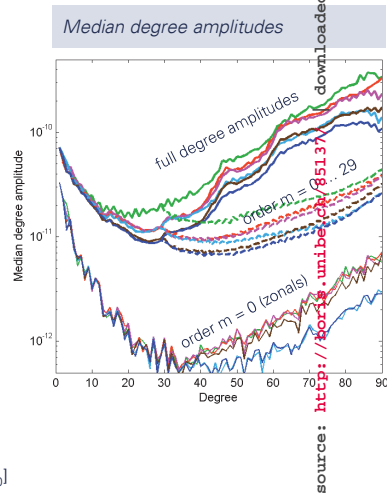
Monthly degree amplitudes



Spherical harmonic domain

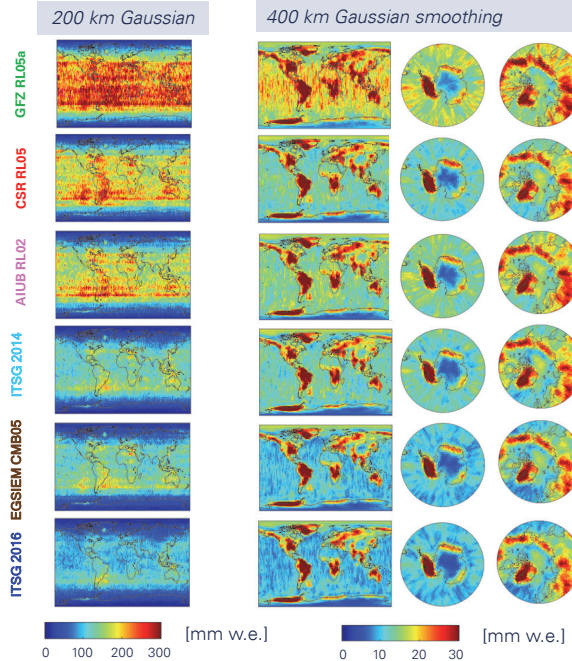
Approach:

- Fit and remove constant + linear + annual + semiannual signal parts.
- Analyze the residuals as upper bounds of noise.
- Use only those months that are included in all series



Spatial domain

Median absolute values of equivalent water height anomalies



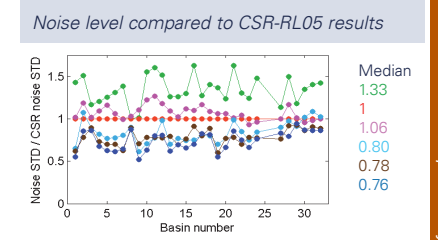
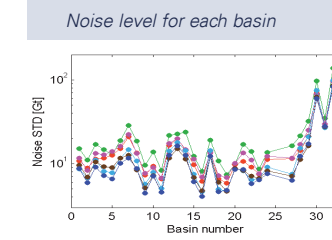
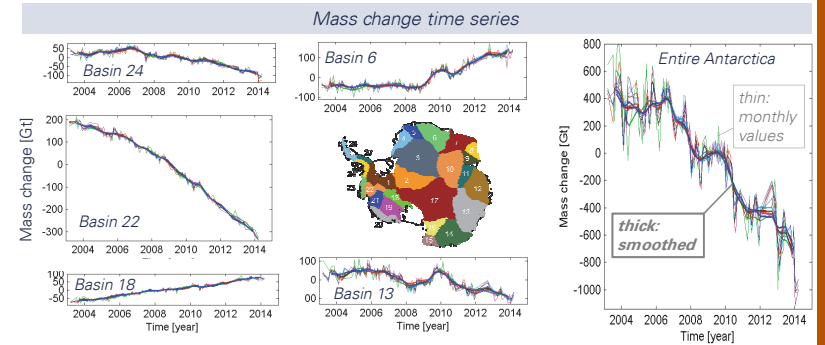
Martin Horwath¹, Andreas Groh¹ and the EGSIM Team

Adrian Jäggi² Ulrich Meyer² Yoomin Jean² Rolf Dach² Andreja Susnik² Matthias Weigelt³ Tonie van Dam³ Frank Flechtner⁴ Christian Gruber⁴ Andreas Güntner⁴ Ben Gouweleeuw⁴ Torsten Mayer-Gürr⁵ Andreas Kvas⁵ Jakob Flury⁶ Sean Bruinsma⁷ Jean-Michel Lemoine⁷ Hendrik Zwenzner⁸ Stephane Bourgogne⁹

Integrated mass changes

Approach:

- Estimate ice mass changes by the regional integration method with tailored sensitivity kernels (EGU2016-12065 talk on Monday).
- GIA correction using IJ05_R2 model.
- Quantification of noise based on high-pass filtered month-to-month variability.



Conclusions

- Noise levels of the different series differ by a factor of up to 2 in standard deviation.
- ITSG 2016 and EGSIM CMB05 show lowest noise levels.
- EGSIEM CMB05 remarkably out-performs its individual input solutions (which do not include ITSG2016).
- Differences in noise levels become less pronounced when noise is reduced through filtering.
- We find no visible difference in the signal content of the different releases. → No indication that different noise levels are associated with signal dampening.
- Mass balance time series noise STD is about 24% lower when using ITSG 2016 instead of CSR-RL05. Therefore ITSG 2016 has been selected for ESA's Climate Change Initiative Gravimetric Mass Balance products.