GRACE FOLLOW-ON SENSOR NOISE WITH REALISTIC BACKGROUND MODELS

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Introduction

We performed six gravity recovery simulations modeled on realistic ranging and accelerometer noise.

We used an artificially degraded background model in the recovery step, resulting in observation of a synthetic time variable gravity signal.

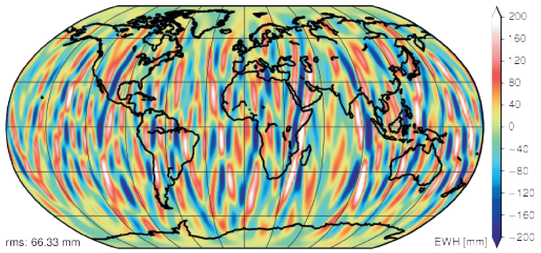
We employed successively more sophisticated processing approaches used in the generation of the new ITSG-Grace2014 model [1], and studied their impact on the solution. We also examined the impact of the improved range rate measurements of the proposed laser ranging instrument (LRI) aboard GRACE Follow-on on the best of these approaches.

Simulation 1

- No background model error
- Only realistic instrument noise

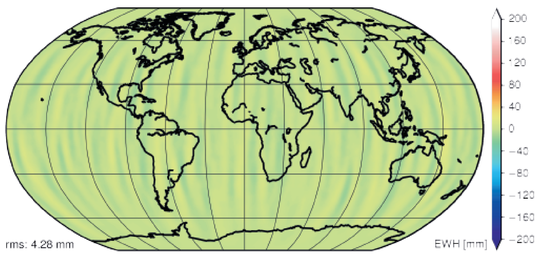
Recovery 1

- Without covariance function



Recovery 2

- With covariance function determined through variance component estimation

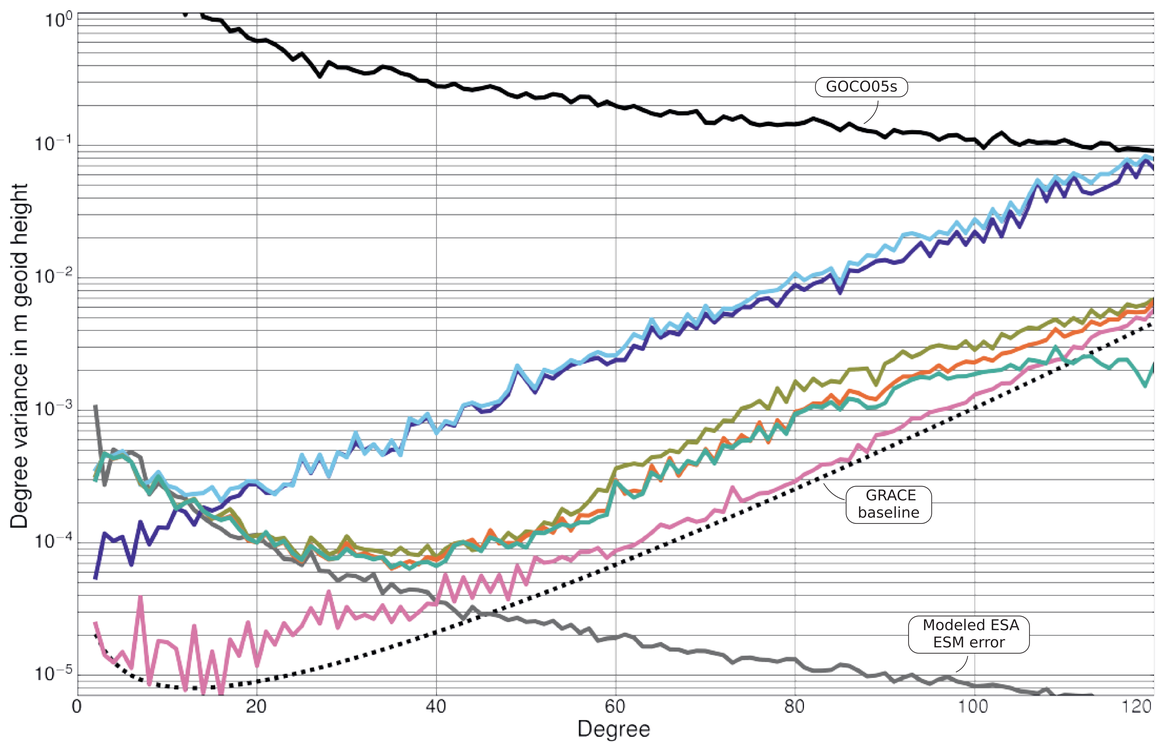


- σ_{KBR} = 4.5 µm
- $\sigma_{LRI} = \sigma_{KBR}/50$ [4]
- $\sigma_{ACC} \geq$ 0.17 nm/s2 [5]
- σ_{POD} = 2 cm

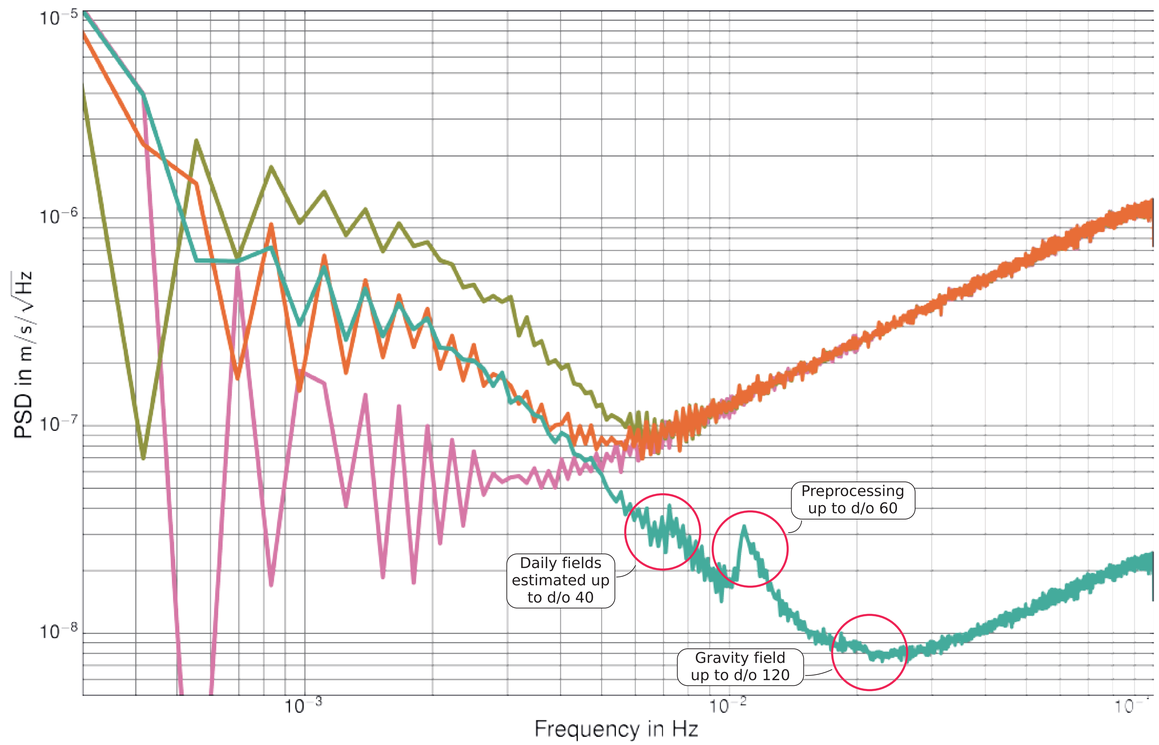
- All spatial plots given in eqivalent water height with a 400 km Gaussian filter.

[1] Mayer-Gürr et al. (2014): ITSG-Grace2014: a new GRACE gravity field release computed in Graz. GRACE Science Team Meeting 2014, Potsdam.
[2] Mayer-Gürr, T and the GOCO Team (2015): The combined satellite gravity field model GOCO05s. Presentation, EGU General Assembly 2015 Vienna.
[3] Dobslaw et al. (2014): Updating ESA's Earth System Model for Gravity Mission Simulation Studies: 1. Model Description and Validation. Scientific Technical Report 14/07, GFZ German Research Centre for Geosciences. doi: 10.2312/GFZ.b103-14079.
[4] Flechtner et al (2012): Status of the GRACE Follow-on Mission. Joint GSTM/SPP final Colloquium, presentation, Potsdam.
[5] Flury et al (2008), Precise Accelerometry Onboard the GRACE Gravity Field Satellite Mission, Advances in Space Research 42 (8): pp 1414–23.

Degree variances compared to GOCO05s [2]



PSD of range rate residuals through variance component estimation

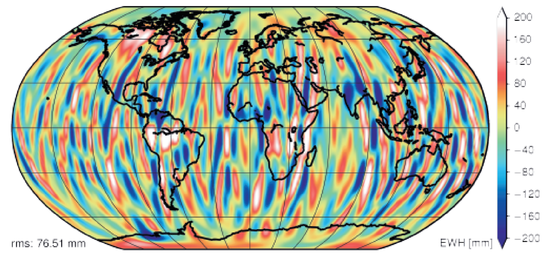


Simulation 2

- Realistic model error from ESA ESM [3]
- Realistic instrument noise

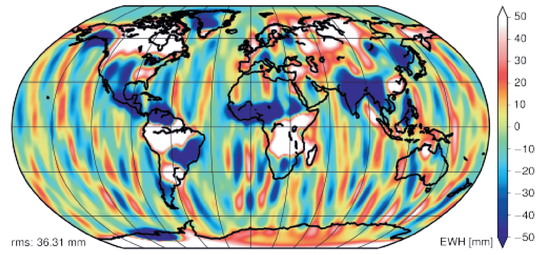
Recovery 3

- Without covariance function



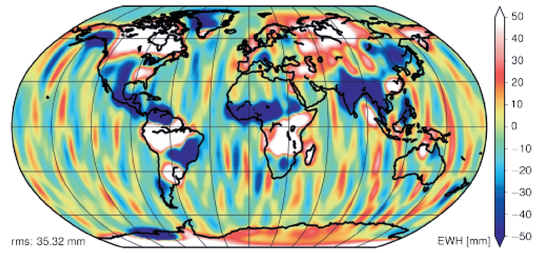
Recovery 4

- With covariance function



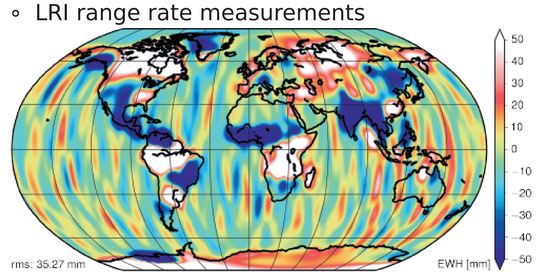
Recovery 5

- With covariance function
- Co-estimation of daily solutions



Recovery 6

- With covariance function
- Co-estimation of daily solutions
- LRI range rate measurements



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