

ASSESSMENT OF REDUCED-DYNAMIC GRACE/GRACE-FO ORBITS CO-ESTIMATED WITH MONTHLY GRAVITY FIELDS

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43rd COSPAR Scientific Assembly 2021

Jan. 28 – Feb. 4, 2021

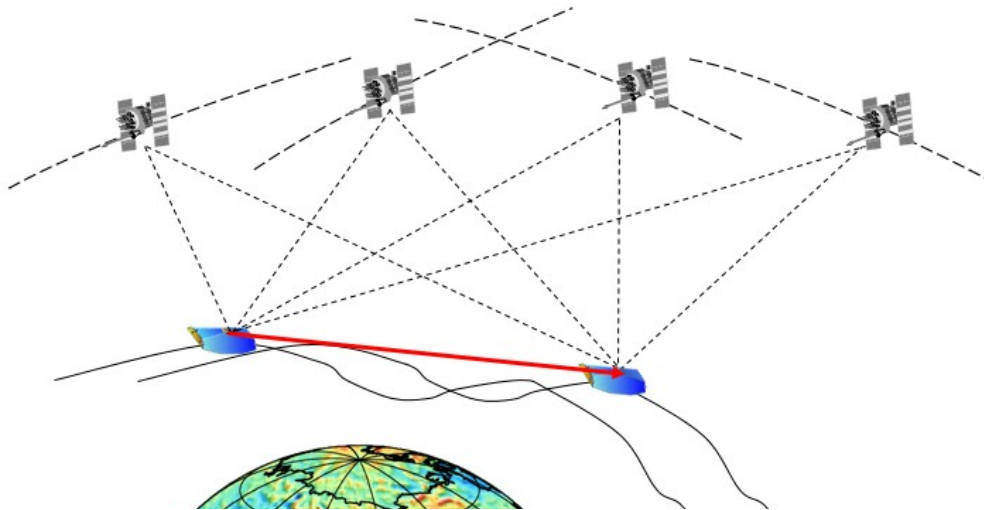
Sydney/Online



Background

Gravity field modelling: orbit is a sine qua non condition
→ co-estimation of reduced-dynamic orbits

GRACE/GRACE-FO: GPS & K-band



→ GPS needs to be downweighted to obtain best gravity field solution
→ not the «best possible» orbit

Modelling

Parametrisation

6 initial conditions (daily)

accelerometer bias and scaling (daily)

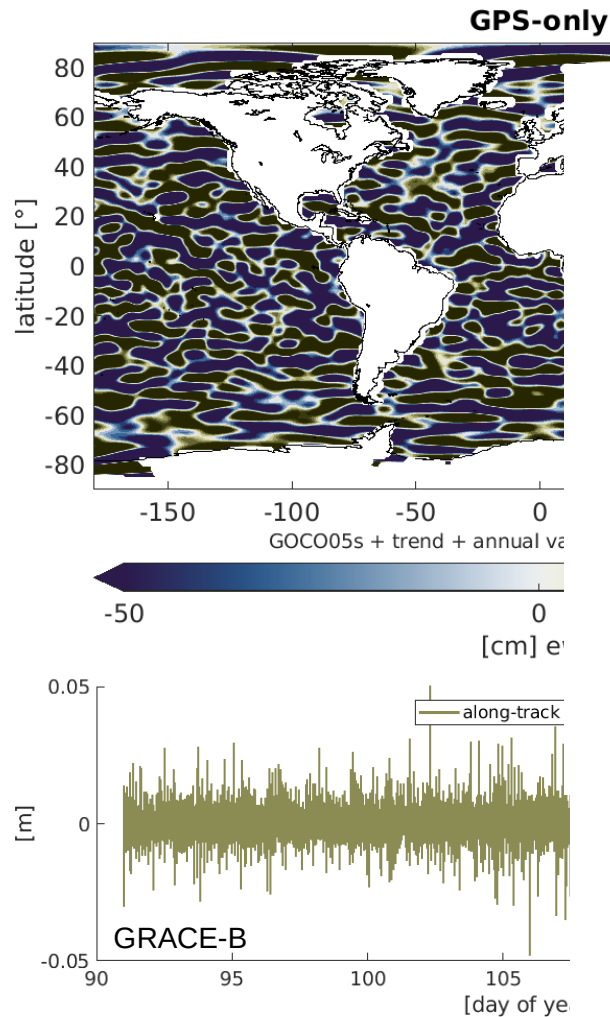
15 min piecewise constant accelerations (PCA) (daily)

gravity field coefficients (monthly)

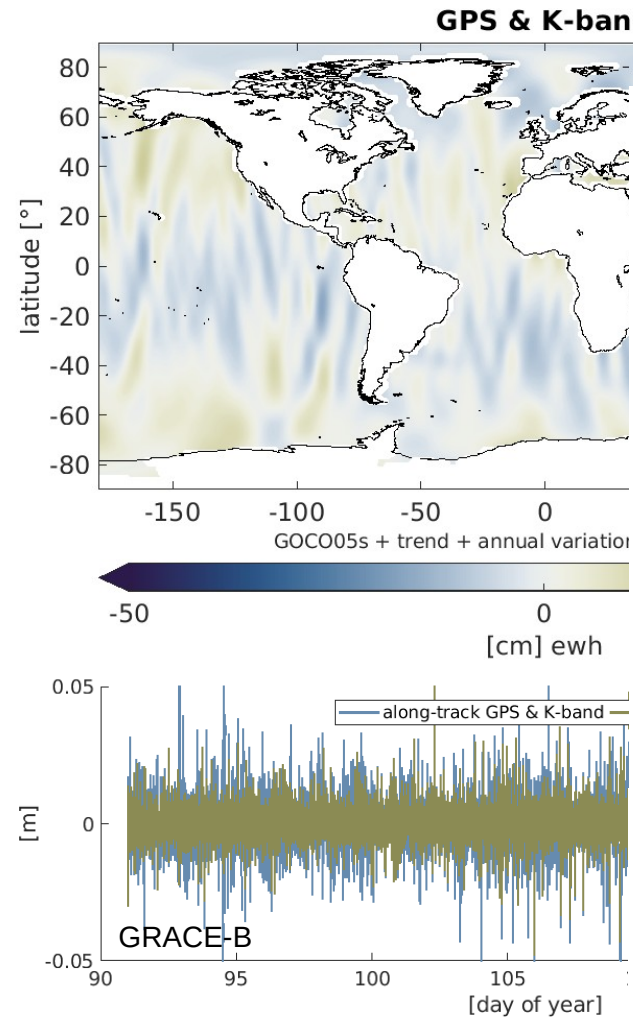
} forms the reduced dynamic orbit

$\sum_{d=1}^{31}$ accumulate normal equations to a monthly solution

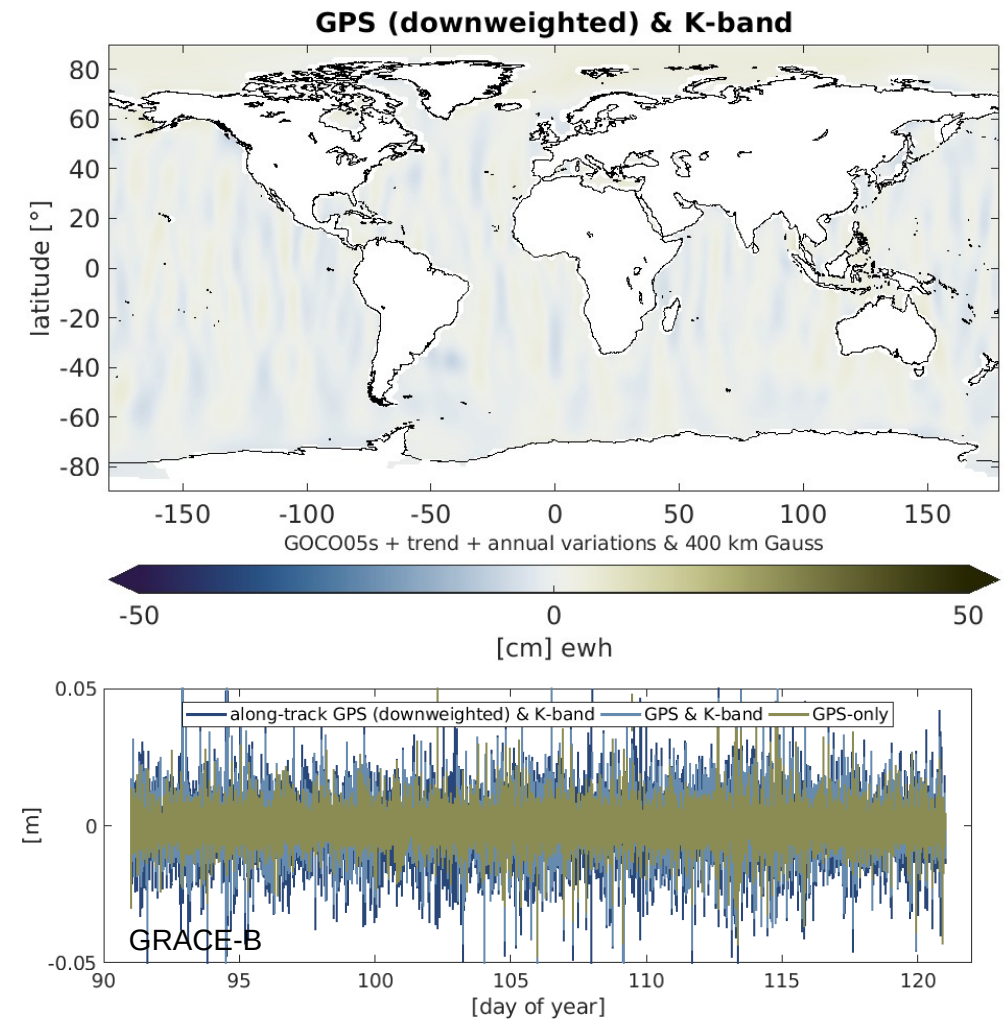
The problem illustrated



RMS = 4.17 cm



RMS = 1.57 cm



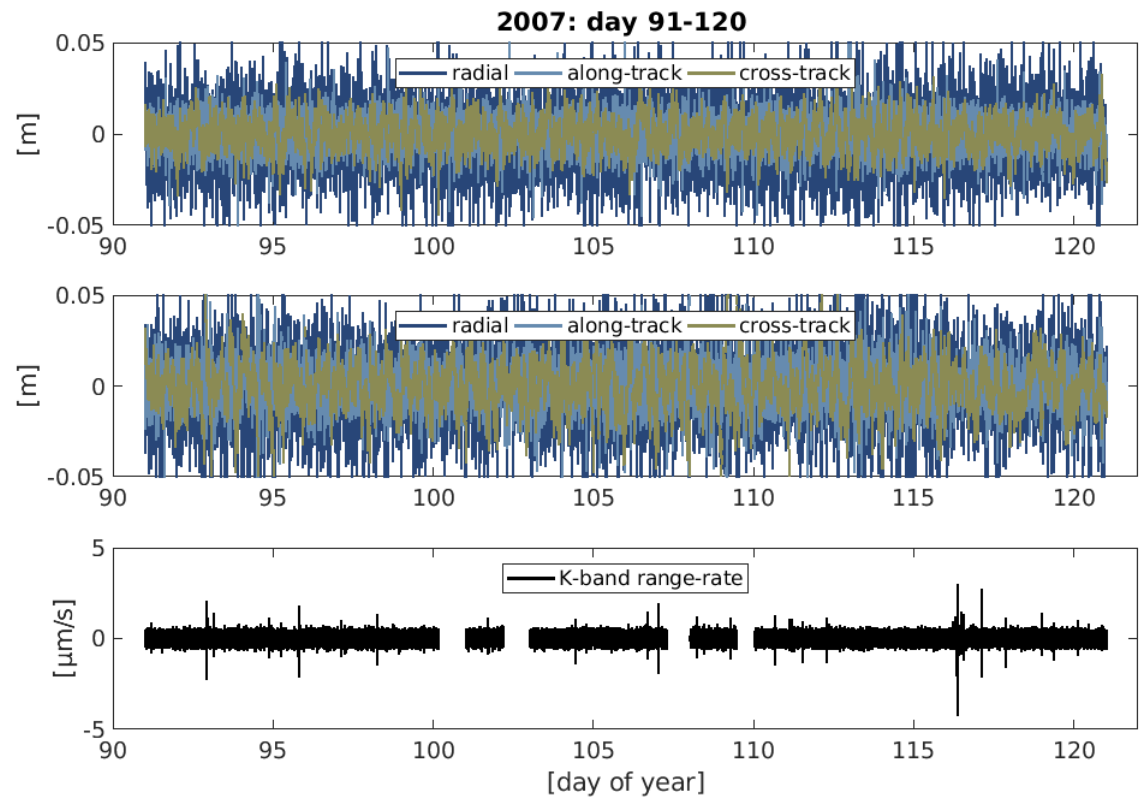
Post-fit residuals

1. Estimate orbit and gravity field

2. Evaluate estimated orbit in the new force field

3. Difference to original

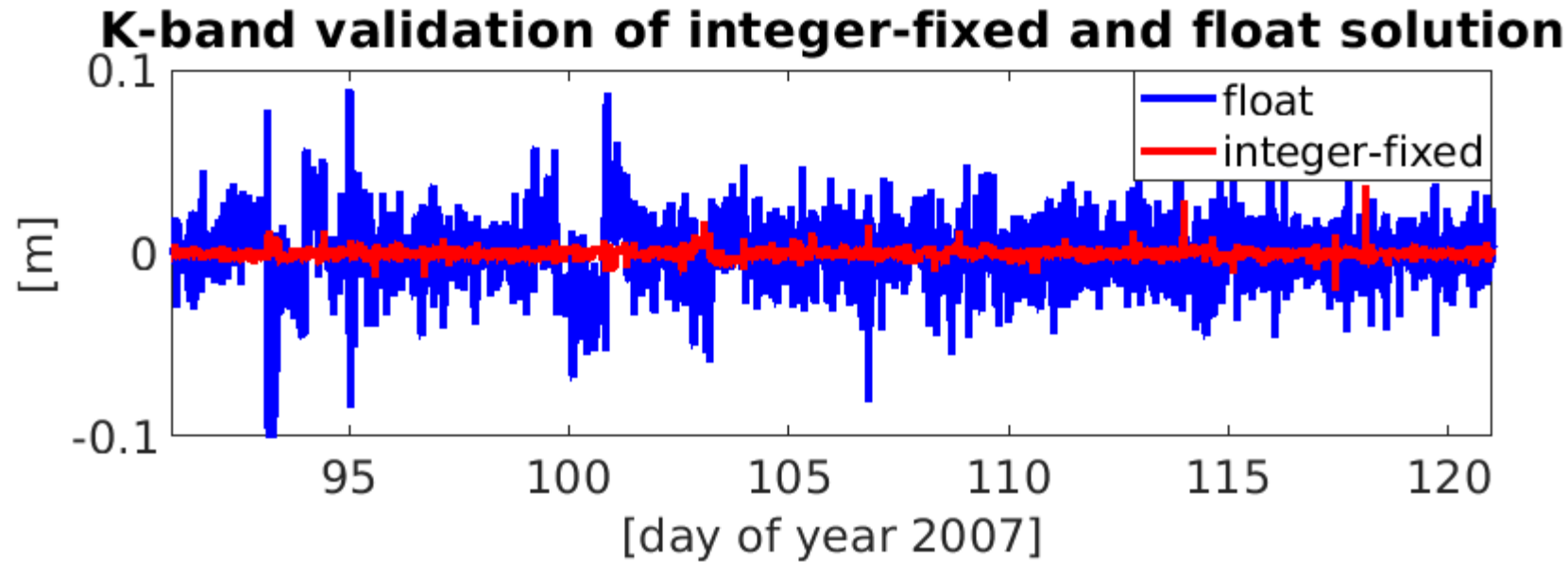
- kinematic positions
- K-band range-rate observations



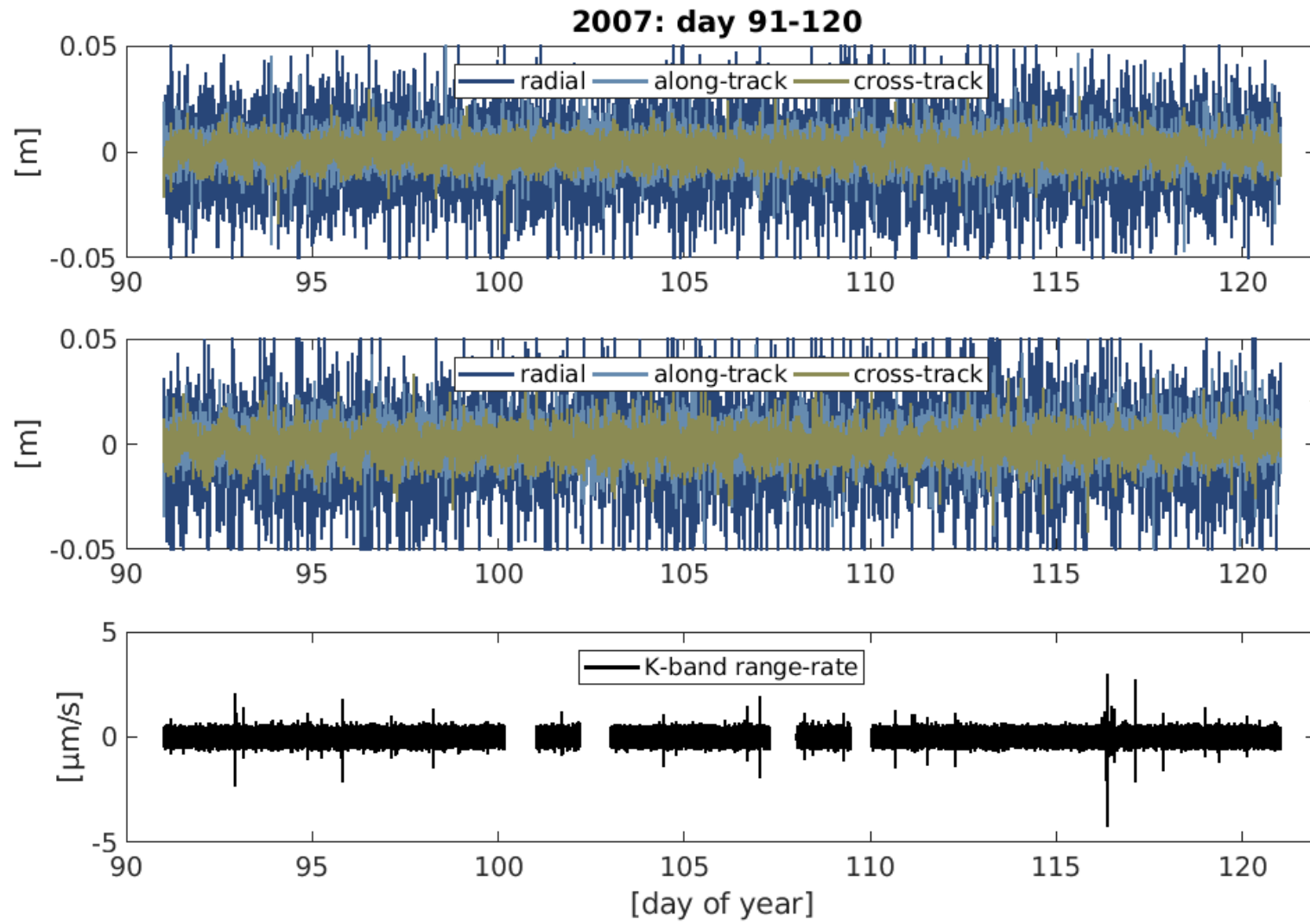
Towards a solution...

Fixing carrier phase ambiguities to integer values

→ higher consistency between two GRACE satellites (i.e. K-band)



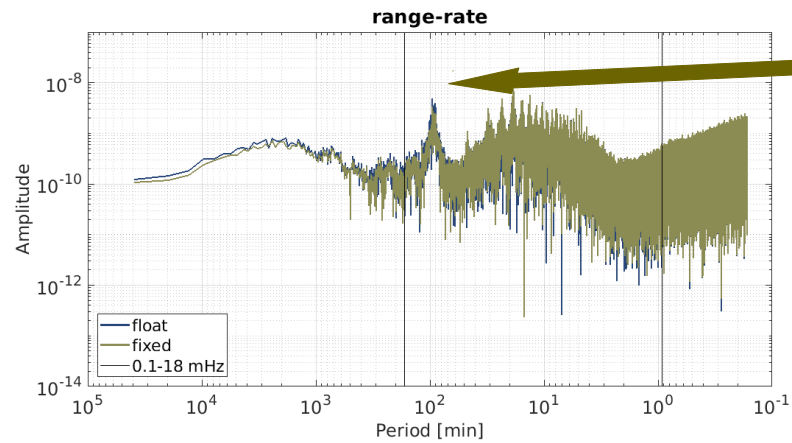
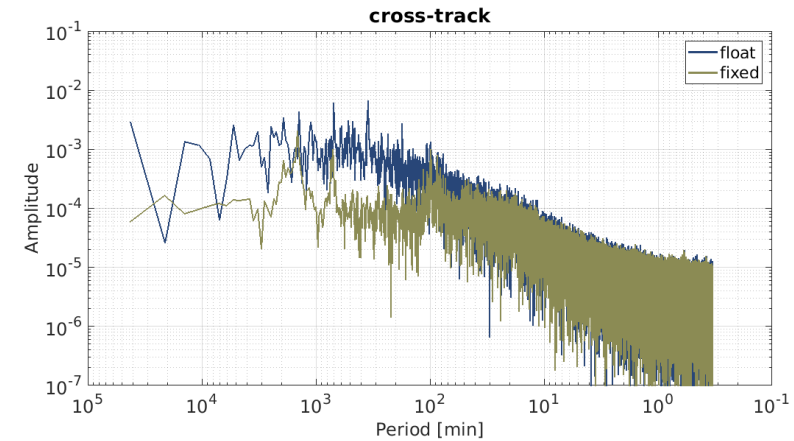
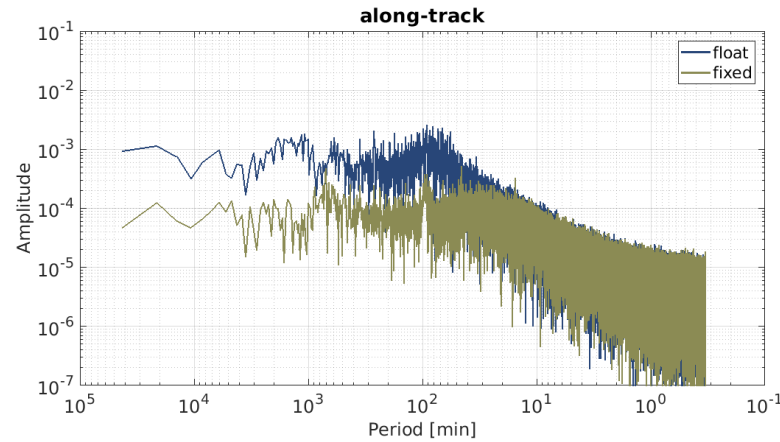
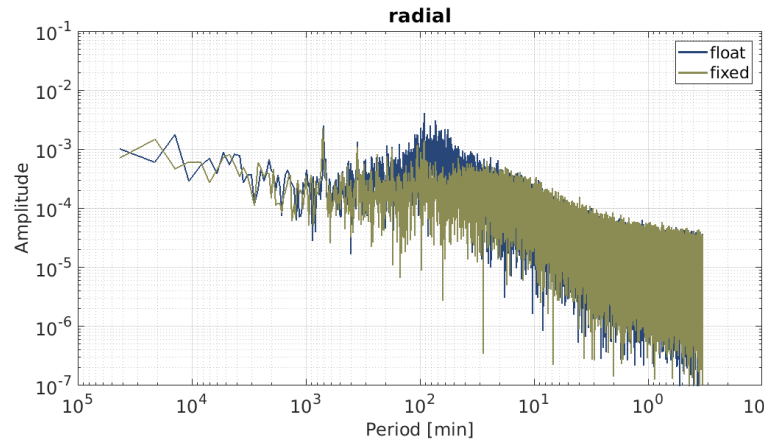
In terms of post-fit residuals



less noise in the
co-estimated orbit
residuals

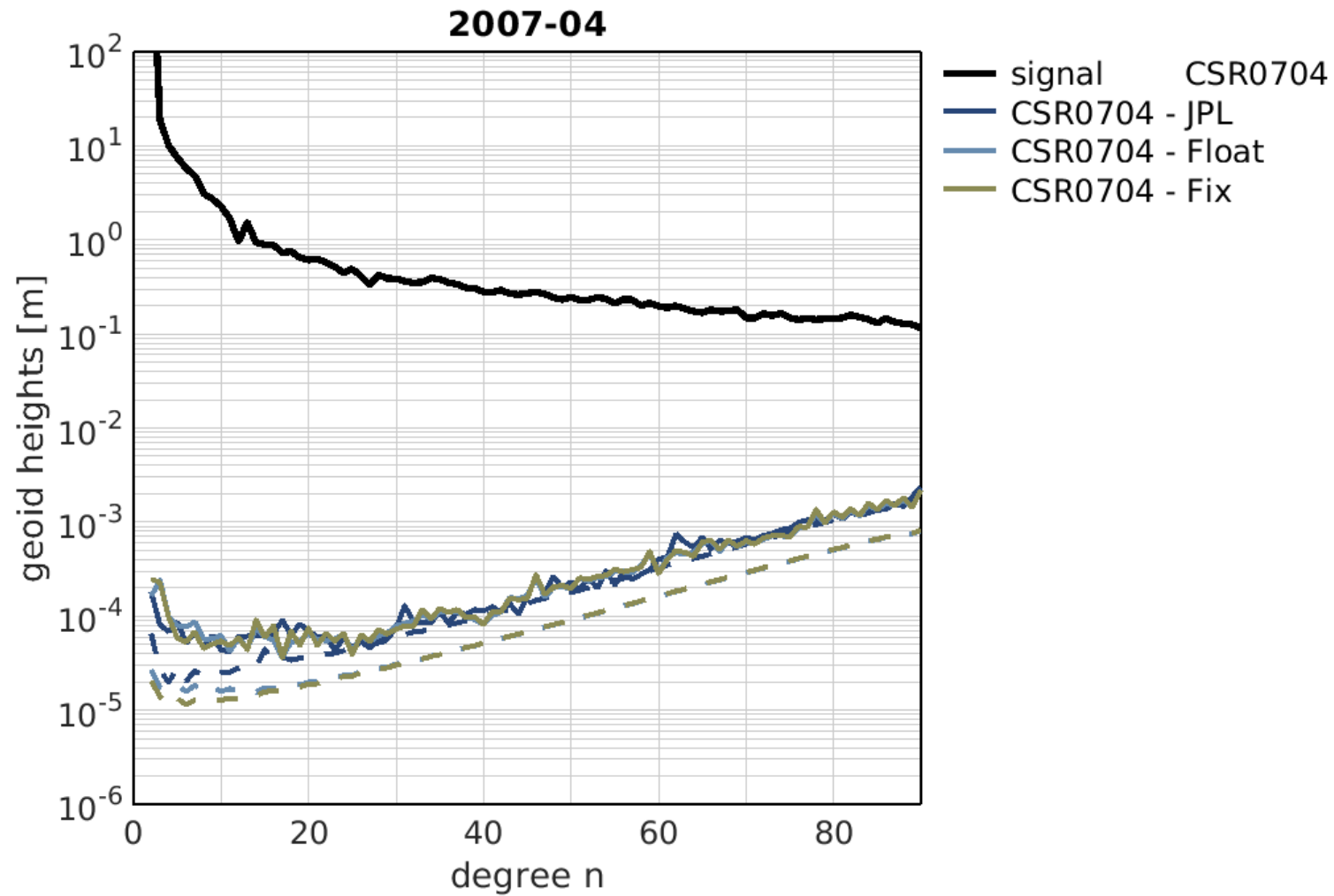
almost no
difference in
range-rate

Spectral analysis

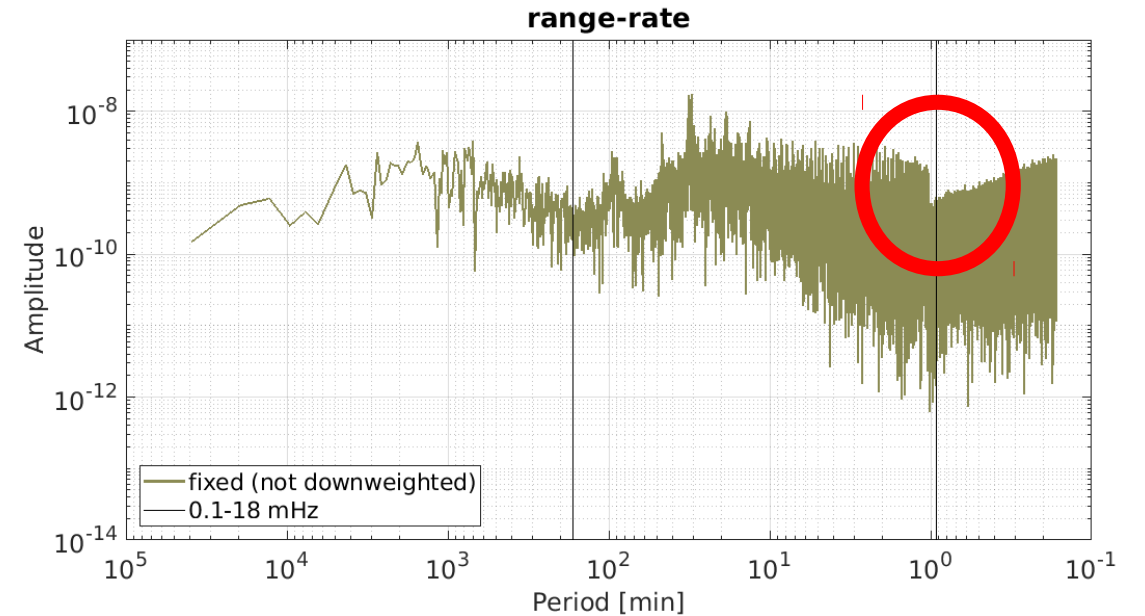
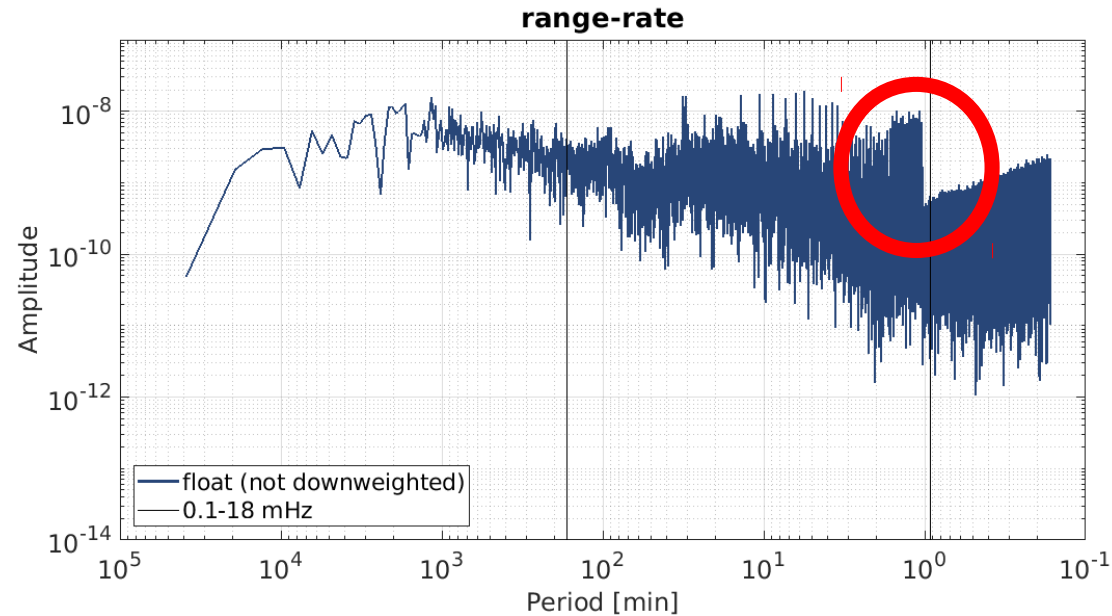
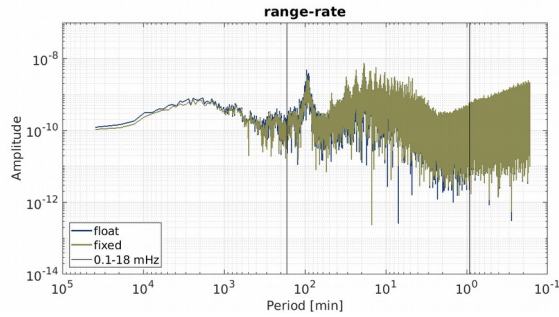


peaks at multiples per revolution

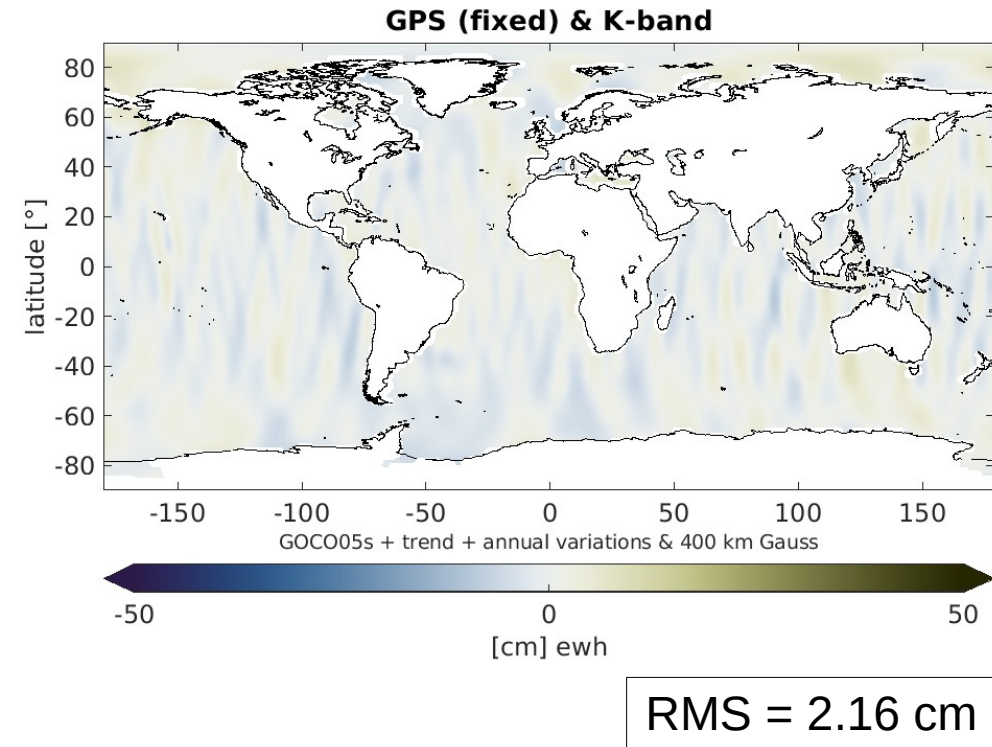
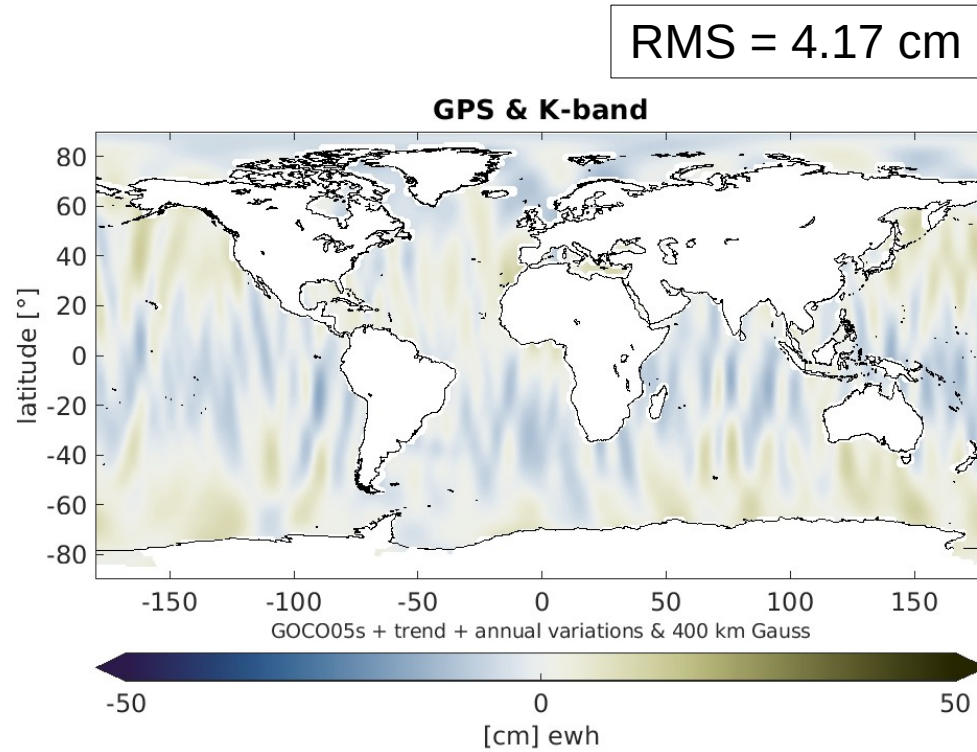
Gravity field solution



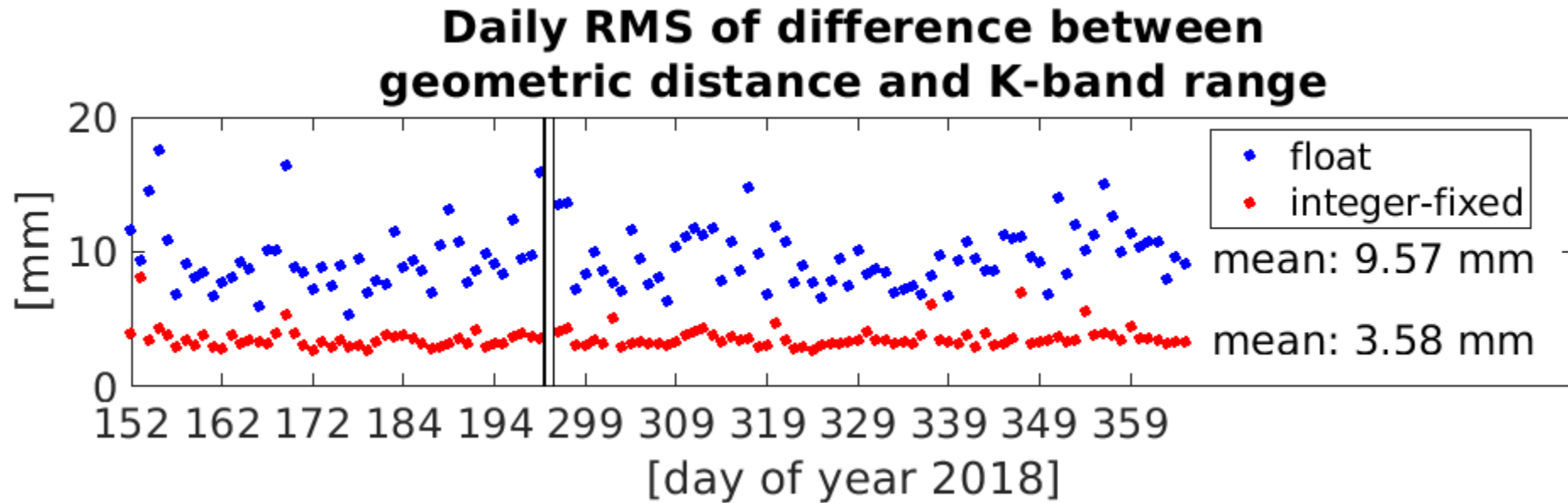
No downweighting of GPS



No downweighting of GPS – gravity field



Outlook to GRACE Follow-On



Less (long-periodic) noise in the kinematic positions

- orbits of the two satellites are more consistent
- K-band observations become more apparent and easier to handle
- downweighting of GPS could be reduced

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