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We study gravity field determination from GRACE Follow-On satellite-to-satellite tracking data using the inter-satellite link of the K-Band Ranging System and kinematic positions of the satellites as observations and pseudo-observations, respectively.

We compute our solutions in a Least-Squares Adjustment with the Celestial Mechanics Approach, where - next to orbit, accelerometer and gravity field parameters - a set of nuisance parameters (constrained piece-wise constant accelerations), are estimated to account for unknown deficiencies.

The kinematic positions are obtained from a precise point positioning where the carrier phase ambiguities are fixed to integer values. We use a simplified stochastic model based on epoch-wise covariance information, which may be efficiently derived in the kinematic point positioning process.

In addition, an empirical observation noise model is derived from post-fit residuals of the inter-satellite link observable and applied as observation data weighting.

In this contribution, we study enhancing the noise modelling by introducing another set of nuisance parameters, which are constrained according to uncertainty information about the atmospheric and oceanic de-aliasing (AOD), where we make use of the AOe07 variance-covariance information from Shihora et al. (2023)*.

We validate the new solutions by comparing them with models from the operational GRACE Follow-On processing at the Astronomical Institute of the University of Bern (AIUB), by examining the stochastic behaviour of respective post-fit residuals and by inspecting areas where a low noise is expected. Last but not least, we investigate the influence of AOD uncertainties in a combination of monthly gravity fields based on other approaches as it is done by the Combination Service for Time-variable Gravity fields (COST-G) and make use of noise and signal assessment applying the quality control tools routinely used in the frame of COST-G.

*Shihora, L., Balidakis, K., Dill, R. and Dobslaw, H.: AOe07 Variance-Covariance Matrix. V. 2.0. GFZ Data Services.
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Presentation file
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