



Estimation of GRACE K-Band antenna phase center coordinates using an error-in-variables approach.

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In the course of computing the ITSG-Grace2014 and ITSG-Grace2016 monthly potential time series from L1B data at the range rate level, the K-Band antenna phase center coordinates of both GRACE-A and GRACE-B were co-estimated.

In the resulting time series of antenna phase center coordinates, two effects could be observed:

1. The length of the phase center vector shows a large standard deviation of around 15cm to 20cm. This can be adequately explained by the unfavorable measurement configuration, where the opening angle between the respective phase center vectors and the baseline between the satellites' centers of mass is very small, on the order of a few milliradians.
2. The phase center vectors show a strong bias toward zero. Where, by knowledge of the construction of the satellites, it is known that the vector should have a length of approximately 1.5m, the mean of the estimates is approximately 1.2m. This suggests that there must be a systematic effect that is not sufficiently modeled.

Where the large standard deviation of the phase center estimate must be accepted, the bias must not. Investigations revealed that this bias is due to non-consideration of the stochastic characteristics of the star camera measurements providing the satellite orientation parameters in our adjustment. In a simulated scenario, proper consideration of both the range rate noise and star camera noise in an error-in-variables adjustment model eliminates this bias. In this contribution, we outline the adjustment approach we followed in our simulations, and give an outlook towards integrating the error-in-variables approach into our real data processing chain.