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De-Aliasing in Satellite Gravimetry – revisited

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Temporal Aliasing of high-frequent signals is a dominating error source in satellite gravimetry. The reduction of temporal aliasing errors is required in order to be sensitive to the global time variable gravity signal dominated by continental hydrology and ice. Within the gravity field processing of the Gravity Recovery And Climate Experiment (GRACE) and its follow-on mission temporal aliasing errors are often reduced by subtracting atmospheric and oceanic induced high-frequent signal contents on observation level. This is done by using independent tidal and non-tidal models. Hereafter this is called the classical de-aliasing approach.
In addition to the classical approach the co-estimation of high-frequent low resolution gravity field parameters proposed by Wiese et al. (2011) further reduces temporal aliasing errors. In order to be independent of external models the optimum de-aliasing procedure for temporal gravity retrieval would be without the classical. Then the philosophy also changes. The high-frequent signal contents are not reduced any more but they have to be observed.
To improve the observability of high-frequent signals on a global scale a second pair is required in addition to a single GRACE-like pair. On the one hand the observation geometry is improved by having a second pair in an inclined orbit besides the polar pair. On the other hand this automatically doubles the temporal resolution of the retrieved gravity fields.
In this study we discuss the different aspects of classical de-aliasing versus observation of high-frequent signals based on full-scale closed-loop simulations. We focus on the analysis and validation of high-frequent gravity field estimates from single and double pairs and the capability of this approach to replace the classical de-aliasing approach at least for the non-tidal part.

Wiese D, Visser P, Nerem R (2011) Estimating low resolution gravity fields at short time intervals to reduce temporal aliasing errors. Advances in Space Research, Vol. 48, Issue 6, p. 1094-1107, DOI: 10.1016/j.asr.2011.05.027