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Treatment of ocean tide aliasing in the context of a next generation gravity field mission

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One of the most promising configurations of a future gravity field mission beyond GRACE-FO will be a double-pair formation of two in-line pairs in a so-called Bender configuration. In spite of the fact that it has been shown in several previous studies that temporal aliasing can be significantly reduced by this constellation, also in this case ocean tide aliasing will still be one of the main limiting factors for the gravity field performance. In addition to the optimum orbit choice, which can further significantly reduce temporal aliasing or at least shift the effect to certain bands in the harmonic spectrum (Murböck et al. 2013, J Geod), improved processing strategies and extended parameter models should be able to further reduce the problem.

In this contribution, several methods dealing with the reduction of ocean tide aliasing are investigated both from a methodological and a numerical point of view. One of the promising strategies is the co-estimation of selected tidal constituents over long time periods, considering the basic orbit frequencies of the two pairs. These improved estimates for ocean tide signals can then be used in a second step as an enhanced de-aliasing product for the computation of short-period temporal gravity fields. From a number of theoretical considerations and numerical case-studies, recommendations for an optimum orbit selection with respect to reduction of ocean tide aliasing shall be derived.

An interesting approach to improve especially non-tidal temporal aliasing is the co-estimation of short-period low-degree gravity fields (“Wiese approach”). As a further aspect of this work, the cross-correlation of the Wiese approach with the co-estimation of tidal parameters is analysed in detail.