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# On the computation of a reliable signal covariance for the stochastic filtering of time-variable gravity field from GRACE

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Improving the mass estimates from GRACE time-variable monthly gravity field solutions by stochastic filtering requires the knowledge of signal and error covariances of the monthly solutions. Signal covariance is only poorly known for the time-variable field, and it is mainly computed from geophysical models. In this contribution, the signal covariance of time-variable field is computed from the GRACE monthly solutions, which is not straightforward due to the presence of noise in the higher harmonic degrees ($l > 21$–$28$). Hence, an isotropic signal covariance model, which can be considered as a first approximation of the actual signal covariance, is computed by fitting a Kaula-type power-law to the signal degree variances of the GRACE monthly solutions. In order to ascertain a reliable signal covariance model power-law fits to different subsets of the GRACE dataset were analyzed. The analysis indicates that all the subsets chosen indicate at only one signal covariance model within reasonable limits. This signal covariance model points to the less-noisy part of the monthly degree variances, which in turn indicate the resolution of the monthly time-variable gravity field solutions from GRACE. This analysis exemplifies the fact that a reliable (isotropic) signal covariance model can be constructed from the GRACE data itself. In the end, the computed signal covariance model and simulated error covariances were used for constructing stochastic filters for three different months. The results from the application of the stochastic filters indicate that the filtered monthly solutions are of different resolutions. Therefore, care must be taken in constructing and analyzing time-series from stochastically filtered GRACE datasets.