



Filtering of monthly GRACE gravity field solutions using time variable decorrelation by incorporating full covariance information

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Aiming for an as accurate as possible estimation of mass trends in Antarctica or other regions, based on global GRACE gravity field solutions, calls for best possible post processing strategies. Decorrelation filters employing static covariance information have already been developed in the past (e.g. DDK filter series by Jürgen Kusche 2007 & 2009), but covariance information for a decade long recent time series was (except for the ITG-GRACE2010 series) not publicly available since the publication of the ITSG temporal gravity field model in October 2014. With this work we aim to use this time series with its evolving correlation structures due to changing mission configuration (e.g. orbital height) and instrument characteristics over time.

Proper reduction of correlated errors is a crucial step towards trend estimation. For this purpose we analyzed the existing series of DDK filters based on static or simplified assumptions on the correlation structure of spherical harmonic coefficients and target signals. To analyze the potential gain using month to month full covariance information we have tested the impact of certain simplifications (e.g. the ones applied for the DDK filters) with respect to the full covariance information in a closed loop simulator.

Based on the outcome of the simulated results we computed new time variable decorrelation (VADER) filters using full error covariance information and investigated the impact on basin scale mass change estimates in the Antarctic region. The work presented includes a comprehensive assessment of the filter performance, accompanied by an intercomparison of the mass change estimates based on the VADER filter solutions against the ones obtained from DDK, Swenson & Wahr type and other filters as well as independently derived results from e.g. radar altimetry.