Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07079, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07079
EGU General Assembly 2008
© Author(s) 2008

Detection of dominant periodic components of water storage changes from GRACE and global hydrology models revisited

R. Schmidt, S. Petrovic, S. Werth, A. Güntner, J. Wünsch, F. Barthelmes, R. Hengst, J. Kusche

GeoForschungsZentrum Potsdam, Germany (rschmidt@gfz-potsdam.de)

As shown in previous contributions we have developed a new methodology of explicitly estimating the spectra of dominant periodic patterns found in monthly time series of GRACE gravity data which are not restricted to exact annual and semiannual periods. Our method combines conventional empirical orthogonal functions (EOF) analysis with a determination of sine waves of arbitrary frequencies from the principal components based on time series of spatial maps of surface mass anomalies from GRACE and external models, like e.g. global hydrology models. The significance of the GRACE-derived spectra in view of the correlated GRACE data errors can be assessed by means of a Monte-Carlo technique based on available GRACE error covariance information. Using only the resulting dominant, but significant terms we can construct filtered GRACE data series, which show an improved signal-noise separation and thus allow for an improved validation and calibration of global hydrology models. This has already been demonstrated in a previous study using 4 years of GRACE gravity fields and independent state-of-the-art hydrology models. In this contribution we revisit the topic again, using a further extended GRACE RL04 data series (now more than 5 years) and apply a more advanced decorrelation technique in the preprocessing of the GRACE data (in the previous study simple Gaussian filtering was used). Special attention is paid here to the study of the impact from the amplitude attenuation introduced by the decorrelation technique on the stability of the determination of the periodic terms. This enables more comprehensive conclusions regarding the magnitude of observed systematic advances of the phases of the dominating annual

waves of the hydrological models as compared to GRACE, but also allows for a more reliable detection of the spectra of special cases, like the detection of basins showing semiannual variations. Moreover, this study gives better insight into long-periodic terms in the range of 2 to 3 years, which were also found in the previous study and which may be possibly related to long-term variations of the continental water storage (e.g. from the El Nino - Southern Oscillation).