



Outlier detection and correction for GRACE data to improve the continental water balance

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GRACE gravity measurements provide a direct measure of mass changes over continents. As mass changes on land masses mainly correspond to water storage changes, these measurements allow to close the continental water balance on large scales within the respective error bounds. During the quantification of uncertainties, in the respective signals, positive and negative peaks are detected in GRACE signals which do not correspond to the related hydrological or atmospheric signals. These peaks mainly occur at specific times for many catchments simultaneously and thus can be interpreted as outliers. Outliers in the GRACE signal are expected to deteriorate signal correlation with hydrology and atmosphere and increase the noise level significantly.

In this study, an algorithm is developed to detect and identify outliers. The procedure of outlier detection is verified by a comparison of GRACE signals and both the hydrological and atmospheric signals. After identification, outliers in the GRACE signal are replaced by appropriate mean or interpolated values. The results of this outlier handling show a significant improvement in the correlation of GRACE signals versus hydrology and atmosphere. Also, a significant reduction of noise level can be achieved.