



A 1985-2015 data-driven global reconstruction of GRACE total water storage

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After thirteen years of measurements, the Gravity Recovery and Climate Experiment (GRACE) mission has enabled for an unprecedented view on total water storage (TWS) variability. However, the relatively short record length, irregular time steps and multiple data gaps since 2011 still represent important limitations to a wider use of this dataset within the hydrological and climatological community especially for applications such as model evaluation or assimilation of GRACE in land surface models. To address this issue, we make use of the available GRACE record (2002-2015) to infer local statistical relationships between detrended monthly TWS anomalies and the main controlling atmospheric drivers (e.g. daily precipitation and temperature) at 1 degree resolution (Humphrey et al., in revision). Long-term and homogeneous monthly time series of detrended anomalies in total water storage are then reconstructed for the period 1985-2015. The quality of this reconstruction is evaluated in two different ways. First we perform a cross-validation experiment to assess the performance and robustness of the statistical model. Second we compare with independent basin-scale estimates of TWS anomalies derived by means of combined atmospheric and terrestrial water-balance using atmospheric water vapor flux convergence and change in atmospheric water vapor content (Mueller et al. 2011).

The reconstructed time series are shown to provide robust data-driven estimates of global variations in water storage over large regions of the world. Example applications are provided for illustration, including an analysis of some selected major drought events which occurred before the GRACE era.

References

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