



Diagnostic Estimates of Terrestrial Water Storage Changes and Evaporation Using the ECMWF Reanalysis ERA-Interim and Hydrometeorological Measurements

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In a global perspective, little is known about terrestrial water storage and evaporation. However, these two variables of the hydrological cycle play a key role not only for agriculture and the estimation of current and future water availability, but also for improvements in seasonal forecasting and climate modeling. Using the atmospheric water balance, accurate estimates of terrestrial water storage variations and evaporation for large river basins can be obtained. Here, we present diagnostic estimates derived with this approach using the recent ECMWF reanalysis ERA-Interim, together with measured runoff for the estimated terrestrial water storage changes, and precipitation for the evapotranspiration estimates. Comparisons with ERA-40-based estimates from the Basin-Scale Water-Balance (BSWB) dataset (Seneviratne et al. 2004, Hirschi et al. 2006a,b; www.iacweb.ethz.ch/data/water_balance/) are performed for several basins. In this analysis, we focus on differences in the annual cycles as well as in the long-term drifts of the derived terrestrial water storage changes. Moreover, we compare the diagnosed ERA-Interim-based terrestrial water storage changes with in-situ soil moisture and snow measurements, as well as satellite retrievals from the Gravity Recovery and Climate Experiment (GRACE).

References:

- Hirschi, M., Seneviratne, S.I., Schär, C. (2006a). Seasonal variations in terrestrial water storage for major midlatitude river basins. *J. Hydrometeorol.*, 7(1):39-60.
- Hirschi, M., Viterbo, P. and Seneviratne, S.I. (2006b). Basin-scale water-balance estimates of terrestrial water storage variations from ECMWF operational forecast analysis. *Geophys. Res. Lett.*, 33, doi:10.1029/2006GL027659
- Seneviratne, S.I., Viterbo, P., Lüthi, D. and Schär, C. (2004). Inferring changes in terrestrial water storage using ERA-40 reanalysis data: The Mississippi river basin. *J. Clim.*, 17, 2039-2057.