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Terrestrial water storage estimates from water balance diagnostics and satellite retrievals

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Terrestrial water storage (TWS) plays an important role in the climate system. Observations of the main components of TWS are, however, spatially and temporally limited. The combined atmospheric and terrestrial water balance approach allows to accurately estimate variations in TWS. The here presented TWS dataset, hereafter referred to as EI-BSWB, is based on ERA-Interim reanalysis data for the atmospheric fields and observed streamflow for the terrestrial field. We present an uncertainty analysis for these TWS data, which is calculated with two different approaches: The imbalances between the employed atmospheric and terrestrial data, and the uncertainties of the single variables, from which the TWS estimates are computed. This uncertainty analysis reveals a relative uncertainty in the EI-BSWB estimates of about 4-6% in the largest river basins under study. The EI-BSWB dataset is further compared to retrievals from the Gravity Recovery And Climate Experiment (GRACE) and scatterometer data from the European Remote Sensing (ERS) satellites. Despite the different spatial resolution and the definition of water storage (the ERS data does not include ground and surface water), the correlations between these datasets are high in many of the river basins under study.