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Comparison of GRACE-derived terrestrial water storage against basin-scale water-balance diagnostics

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Although terrestrial water storage (TWS) plays an important role in the hydrological cycle, there are insufficient in-situ observations of its various components (soil moisture, snow and ice cover, surface and groundwater) available to assess the seasonal cycle of TWS over continental and sub-continental scales. In recent publications, a new basin-scale dataset of monthly variations in TWS was diagnosed for the ERA-40 time period (1958-2002) using an atmospheric-terrestrial water-balance approach (Seneviratne et al. 2004, Hirschi et al. 2006a). Using a similar approach, we test here the feasibility of using ECMWF operational forecast analyses–available for the recent time period in near real time–instead of reanalysis data for deriving these diagnostic estimates (see also Hirschi et al. 2006b). For ten domains with recent streamflow measurements, the derived basin-scale diagnoses are compared against TWS retrieved from the Gravity Recovery and Climate Experiment (GRACE). In general, the atmospheric-terrestrial water-balance estimates and the analyzed standard resolution GRACE products agree on the phase of the TWS variations, and the amplitudes are similar for several of the considered domains. The water-balance estimates show more geographical detail than the GRACE data when neighbouring domains are considered.

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