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# GRACE-based validation of terrestrial water storage variations as simulated by four different hydrological models

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Since its launch in 2002, the Gravity Recovery and Climate Experiment (GRACE) mission provides as a unique way to monitor the terrestrial water storage (TWS) variations at large spatial scale (>300km) by measuring month-to-month changes of the Earth's gravity field. We apply TWS variations estimated from GRACE to assess the accuracy of four hydrological model realizations that simulate the continental branch of the global water cycle. All four model experiments are consistently forced with atmospheric data from the WFDEI data-set derived from the ERA-Interim re-analysis.

Four different validation metrics are applied to focus both on seasonal signals and year-to-year variability of the TWS from the models. Actual evapotranspiration and runoff rates calculated with the different models are also analyzed. Considering the diversity of the performance of the models, we focus on time series of TWS variations in two regions which are characterized by different climate regimes, i.e. the snow-dominated catchments and the dry catchments, by looking into the TWS variation time series from models and GRACE. Besides, snow, surface water and subsurface water including root zone or/and deep layer storage from the models are also compared in order to analyze the contribution of different storage compartments to the total water storage. By investigating the relative performance of these different models, we attempt to trigger subsequent further development of global numerical models in the areas of large-scale hydrology and land-atmosphere interactions.