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Operational simulations of continental water masses and possible applications for GRACE processing

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To reduce the error budget of monthly mean GRACE gravity products, oceanic and atmospheric simulations are used for dealiasing purposes. Since short periodic variations are also caused by continental water mass redistributions, which are in turn responsible for leakage effects in coastal areas, there are recent intentions to consider hydrological effects within the GRACE gravity field estimation process, too. To simulate continental water storage a land surface scheme (SLS) is combined with a hydrological discharge model (HDM). SLS produces components of land water budget like soil moisture, snow accumulation and evaporation as well as input data for HDM, i.e., runoff and drainage. The simulated fields are variations of land water storage and lateral water flow. The quality of simulated mass redistributions depends on atmospheric forcing fields as well as on the accuracy of numerical parameterisations. Thus a validation has been performed by contrasting applied precipitation input data and simulated river discharges to corresponding observational data provided by GPCC and GRDC. Further, the variability patterns of simulated continental water storage were compared to monthly mean GRACE gravity fields. In general, the independent solutions agree fairly well especially with respect to large scale seasonal variations. Simulations with SLS+HDM have been performed to provide continental freshwater fluxes as additional boundary condition for simulations with the ocean model OMCT, which is currently in use for standard GRACE dealiasing processing. Forcing of both SLS+HDM and OMCT with operational analyses from ECMWF allows a consistent simulation of water mass transports in the hydrological cycle. Consequently, no artifical corrections have to be introduced to compensate the lack of freshwater supply into the ocean model. By interfacing the SLS+HDM to ECMWF's operational data and providing freshwater fluxes into the ocean model, SLS+HDM becomes a useful tool for applications on an operational basis, e.g., for GRACE gravity field processing.