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Biomass and soil moisture simulation and assimilation over Hungary using an offline land surface model with prognostic vegetation

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In the framework of ImagineS project a Land Data Assimilation System (LDAS) was applied at the Hungarian Meteorological Service (OMSZ) to monitor the above-ground biomass, surface fluxes (carbon and water) and the associated root-zone soil moisture at the regional scale (spatial resolution of 8km x 8km) in quasi real time. In this system the Surfex model is used, which applies the ISBA-A-gs photosynthesis scheme to describe the evolution of vegetation. Surfex is forced using the outputs of the ALADIN numerical weather prediction (NWP) model run operationally at OMSZ. An Extended Kalman Filter (EKF) method is used to assimilate Leaf Area Index (LAI, from SPOT/Vegetation and Proba-V) and Soil Wetness Index (SWI, from ASCAT/Metop) satellite measurements. Simulations are compared to observations (LAI and soil moisture satellite measurements) over the whole country and also at a selected site in West Hungary (Hegyhátsál). In Hegyhátsál the measurements (LAI, soil moisture and CO_2 fluxes) are made at 3 m and 82 m height on the tower. The results are evaluated with both kinds of samples. The fluxes measured at 3 m are representative for the grassland of the measurement garden and can be compared with the grassland patch of Surfex. The fluxes measured at 82 m are representative for a larger (mainly agricultural) domain and thus can be compared with the whole 8 km x 8 km Surfex grid box. It is shown that with data assimilation we got more realistic biomass and soil moisture analyses than in open-loop mode without assimilation. Two further developments of the system are also briefly described: i) development of a long-range surface forecasting system with prognostic vegetation and ii) the implementation of the analyzed LAI in the operational AROME NWP model.