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# Evaluating Hydrological Model Outputs with Satellite derived Land Surface Temperature

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A combined investigation of the water and energy balance in hydrologic models is needed for a better understanding of exchange, transport, and feedback processes in the soil-vegetation-atmosphere system. These models, however, are often only evaluated at gauging stations. While this evaluation does not provide any information about the spatial distribution of hydrological variables, such as evapotranspiration and soil moisture, additional methods have to be found.

The objective of this study is to indirectly evaluate such variables using satellite derived Land Surface Temperature (LST) fields. Therefore, we calculate the Land Surface Temperature with the hydrological model mHM from the sensible heat formulation. The sensible heat is determined as residual of the energy balance, assuming that the soil heat flux and the storage term is negligible at the daily time scale. Additionally, the evapotranspiration is determined due to solving the water balance with mHM. Furthermore, the remaining term of the energy balance, the net radiation, is obtained by solving the radiation budget using long and shortwave incoming radiation, albedo and emissivity data from the Land Surface Analysis - Satellite Application Facility (LSA-SAF, landsaf.meteo.pt). Finally, to determine the LST, the aerodynamic resistance is parameterized to solve the sensible heat formulation. The calculated fields of land surface temperature are evaluated against those provided by LSA-SAF for a period from 2005-2010.

The study is carried out in Germany, whereas sets of good performing global transfer parameters are estimated in seven German river basins: Danube, Ems, Main, Mulde, Neckar, Saale and Weser. The average Nash Sutcliffe Efficiencies exceeds 0.7 in the validation period from 2005 to 2010.

Preliminary results indicate that the estimated mHM LST agrees quite well with the satellite observations. This result indirectly indicates that the simulated evapotranspiration and corresponding soil moisture fields are reasonable estimates. This assertion will be corroborated by comparison with hourly evapotranspiration fluxes obtained at nine eddy covariance measurement stations (www.fluxdata.org).