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Local Reanalysis on the convective scale with a fully coupled model (TerrSysMP)

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Reanalyses provide temporally and spatially consistent fields of weather and climate parameters by combining model physics and assimilation of measurements. The generated fields can be used to quantify water and energy budgets and intercompartmental fluxes within the earth system.
Reanalyses usually are performed for longer time periods and globally, therefore using a coarsely meshed spatial grid is necessary to delimitate the computational effort. Due to the coarse spatial resolution, local and small scale processes, e.g. within meso scale river catchments, are not well represented, as well as the resulting water and energy budgets.
The latter is one of the main research topics of the Transregional Collaborative Research Centre 32 (TR32). Hence, a regional high resolution reanalysis will be performed with a strong limitation of the model area using lateral boundary conditions resulting of an reanalysis with a coarser spatial grid.
A new Terrestrial Systems Modeling Platform (TerrSysMP) will be used in the regional reanalysis, which is able to reproduce processes within the atmosphere, surface and groundwater.
TerrSysMP is a scale consistent fully coupled modeling system, which is composed of the atmospheric model COSMO, the surface model CLM3.5 (Community Land Model) and the 3-dimensional hydrological model ParFlow. The different models are connected by an external coupler (OASIS3) for the exchange of relevant state vectors.
The reanalysis setup uses a spatial resolution of 1 km in the atmosphere and a finer resolution in the ground ($\sim$500 m), within an area of approx. 150x150km in central Europe (Rur-catchment and surrounding). This area was chosen, because it includes the study area of TR32 and therefore a lot of different measurements from atmosphere to ground are available for comparison with the modeled parameters. Hence, results of the regional reanalysis will be validated with comprehensive measurements of the terrestrial system, expecting an improved estimation of the water and energy budgets of the Rur-catchment. Earlier studies already prove that TerrSysMP provides a rectified hydrological balance in the coupled system and well reproduces the energy and water fluxes between the atmosphere and ground on small scales.
We report about the first step to perform such an reanalysis with the implementation of TerrSysMP in the Kilometer-Scale Ensemble Data assimilation Tool (KENDA) of Deutscher Wetterdienst (DWD) and about first test runs with assimilation of radar data and conventional observations.