



Catchment-scale circulations in TerrSysMP with ICON

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The Terrestrial System Modeling Platform (TerrSysMP) was developed to model the interaction between ground and surface flow processes with that of the lower atmosphere up to several kilometers in height. TerrSysMP is composed of an atmospheric model (Consortium for Small-Scale Modeling - COSMO), a land surface model (the NCAR Community Land Model - CLM3.5), and a subsurface flow model (ParFlow). These three models are coupled together using the OASIS3-MCT coupler which exchanges information between models during runtime, managing different temporal-spatial scales of the atmosphere, land and subsurface models. Being part of the HD(CP)2 project our current focus is on catchment-scale circulation (CCs) for which an atmospheric model with a turbulence package adapted for finer resolutions is most suitable. To this end, we have incorporated ICON, the next-generation atmospheric numerical model, into TerrSysMP, courtesy of the German Weather Service (DWD) and Max-Planck Institute for Meteorology. In our recent work we provided a test setup for studying influence of soil moisture heterogeneity on the development of boundary layer using ICON. Thus far, the analysis has been carried out assuming a simplified “free drainage” surface model (TERRA). With ICON coupled into TerrSysMP, we are able to provide more insight in the boundary layer development originating from the genuine 3D water treatment in the (sub)surface model which now includes lateral flow and groundwater. In this study, we will outline the development strategy along with technical and performance aspects arising from the coupling process.