



Modeling the atmospheric and terrestrial water and energy cycles in the ScaleX experiment through a fully-coupled atmosphere-hydrology model

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The TERENO preAlpine Observatory, comprising a series of observatory sites along an altitudinal gradient within the Ammer catchment (southern Bavaria, Germany), has been designed as an international research platform, open for participation and integration, and has been provided with comprehensive technical infrastructure to allow joint analyses of water-, energy- and nutrient fluxes. In June and July 2015 the operational monitoring has been complemented by the ScaleX intensive measurement campaign, where additional precipitation and soil moisture measurements, remote sensing measurements of atmospheric wind, humidity and temperature profiles have been performed, complemented by micro-light aircraft- and UAV-based remote sensing for three-dimensional pattern information.

The comprehensive observations serve as validation and evaluation basis for compartment-crossing modeling systems. Specifically, the fully two-way dynamically coupled atmosphere-hydrology modeling system WRF-Hydro has been used to investigate the interplay of energy and water cycles at the regional scale and across the compartments atmosphere, stream, vadose zone and groundwater during the ScaleX campaign and to assess the closure of the budgets involved. Here, several high-resolution modeled hydro-meteorological variables, such as precipitation, soil moisture, river discharge and air moisture and temperature along vertical profiles are compared with observations from multiple sources, such as rain gauges and soil moisture networks, rain radars, stream gauges, UAV and a micro-light aircraft. Results achieved contribute to the objective of addressing questions on energy- and water-cycling within the TERENO-Ammer region at a very high scale and degree of integration, and provides hints on how well can observations constrain uncertainties associated with the modeling of atmospheric and terrestrial water and energy balances.