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# Assessing the model performance of snow water resources simulated by a coupled mesoscale atmospheric and hydrologic model

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Predicting snow water resources is a key functionality of atmospheric and hydrologic models. The verification of the performance can be done by comparing the model's output with snow ruler or snow water equivalent (SWE) observations. In the last years, snow covered area observations from optical satellite sensors have become a considerable extension to evaluate the snow extent. SWE observations derived from passive microwave satellite sensors are restricted to larger spatial scales. Despite these areal comparison techniques the evaluation of hydrologic models is traditionally carried out by assessing the performance of the simulated stream flow. The stream flow integrates all hydrological processes on catchment scale, which also includes snow accumulation and melt. A comparison of simulated and observed stream flow in order to verify the model is in general only subject to hydrologic models. In contrast, atmospheric models commonly represent the physics of snow dynamics in a more comprehensive way than hydrologic models do.

This poster addresses the applicability of regional climate models (RCM) to predict the snow water storage within a catchment by comparing simulated and observed stream flow. The simulated stream flow is derived by using a hydrologic model which is driven by the atmospheric model. Meteorological fields simulated by WRF (Weather Research and Forecast model) including precipitation and SWE were converted to maps on an hourly time step. These maps were prepared as input boundary conditions for the hydrologic model Panta Rhei. In contrast to classic hydrologic simulations, the snow melt module was replaced by a distributed SWE boundary condition module, which allows hydrologic simulations with an external input of spatial and temporal SWE distributions. Since accumulation and melt is directly calculated by the RCM and other land surface hydrologic processes are simulated by the hydrologic model, the comparison of simulated and observed stream flow also enables the evaluation of the RCM's performance to predict the snow storage on catchment scale. The case of the winter 2005/06 accumulation and ablation season in the low mountain range catchment Sieber (44 $km^2$) in northern Germany was studied.

The study shows that WRF simulates the seasonal course of the SWE with good agreement compared to observations on the point scale. The simulated stream flow with a distinctive rain on snow event is reproduced reasonably well by the coupled modeling system. Hence, the study emphasizes the applicability of hydrologic models for verification studies of RCM in general. Furthermore, hydrologic models are useful tools to assess the performance of snow water resources predicted by RCM in particular. Since the coupled simulations only depend on global input data, the presented approach could be of some interest for the prediction of snow accumulation and melt in remote areas.