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Validating the soil-hydrology approach implemented in the environmental model PROMET-V

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For hydrological and environmental modeling soil hydrology is one of the most prominent but also complex aspects that must be adressed. Therefore, a huge variety of either empirical or physically-based model approaches exists. For a rigid testing of spatially distributed models, data representing the high spatial and temporal variability of soil hydrology are required.

The aim of this study is to test the soil hydrology module of the environmental model PROMET-V according to a 2-years soil moisture monitoring representing the high temporal variability of modeled processes.

PROMET-V is a process-oriented spatially distributed environmental model focused especially on evapotranspiration and plant growth processes. The model simulates plant growth dynamic, water movement, nitrogen dynamic and the influence of agricultural management. Runoff, infiltration and capillar rise are calculated according to a simplified Philips approach developed by Eagleson. Water movement within the unsaturated zone of the soil is calculated using a cascade approach.

The simulated soil moisture is tested against continously measured frequency domaine reflectrometry (FDR) probes in different soil depths (10 cm, 30 cm, 90 cm) in the Sieg catchment east of Bonn (Germany). At the test site Luvisols with a soil texture of silt loam are predominant. To test the soil moisture without being affected by evapotranspiration processes, the analysis is focused on precipitation events ($>$ 10 mm) and the corresponding response time of the soil moisture rise.

Best results were obtained for the upper soil layer where during 15 simulated events (Juli 2003 to December 2003) a root mean square error of 2.0 Vol.-% soil moisture

was achieved. For the 30 cm and 90 cm soil layers results were less accurate and the model needs some more testing.

In general the results show the potential of the model to simulate the high temporal variability of soil moisture processes. Hence, further studies to validate PROMET-V according to spatially distributed soil moisture data derived from ERS radar measurements are planned.