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Comparing soil moisture from Advanced Microwave Scanning Radiometer (AMSR-E) observations with two distributed hydrological models in an operational flood forecasting system

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An inter-comparison between remotely sensed soil moisture data retrieved from AMSR-E brightness temperature observations and soil moisture simulated by a process-based and a conceptual hydrological model has been carried out. The 30.000 km^2 Mosel basin, a sub-system of the Rhine basin, served as study area. Both models were implemented within the operational flood forecasting system for the river Rhine. The models were calibrated on flow data observed over the 1996-1999 period.

The dynamics in time and space of the topsoil moisture simulated by the Representative Elementary Watershed (REW) model and the HBV model were compared against the surface soil moisture retrieved from the AMSR-E brightness temperature images.

The most conspicuous similarities were found for the central part of the watershed, with correlation coefficient (r) as high as 0.7 for the REW and 0.77 for HBV hydrological model. The most noticeable differences were found for the mountainous and densely forested areas of the basin, with (r) as low as 0.3 for REW and 0.55 for HBV.

Surprisingly, a better correspondence between the modeled and observed remotely sensed soil moisture was observed for the conceptual soil moisture storage of the HBV model, rather than for the top-soil moisture signal modeled by the Richards equation solver in the REW model and representing the upper 10 cm of the topsoil. The obvious question arises if the AMSR-E retrieved soil moisture actually represents

top-soil moisture or a root-zone average soil moisture.