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Testing of a conceptualisation of catchment scale surface soil moisture in a hydrologic model

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In this study the simulated surface soil moisture of a dual layer conceptual hydrologic model is tested against ERS scatterometer top soil moisture observations. The study catchment at the Kamp river with a size of 1550 km^2 is located in north-eastern Austria. The hydrologic simulations in this study are based on a well calibrated hydrologic model. The model consists of a spatially distributed soil moisture accounting scheme and a flood routing component. The spatial and temporal resolutions of the model are 1 x 1 km^2 and 15 minutes. The soil moisture accounting scheme simulates the mean moisture state over the entire vertical soil column. To get additional information about moisture states in a thin surface soil layer from the continuous rainfall-runoff model, the soil moisture accounting scheme is extended by a thin skin soil storage sitting at the top of the main soil reservoir. The skin soil storage is filled by rain and snow melt. The skin soil reservoir and the main soil reservoir are connected by a bidirectional moisture flux which is assumed to be a linear function of the vertical soil moisture gradient. The calibration of the additional dual layer component is based on hydrologic reasoning and the incorporation of measured soil water contents close to the study catchment.
The comparison of the simulated surface soil moisture with the ERS scatterometer top soil moisture observations is performed in the period 1993-2005. On average, about 3 scatterometer images per month with a mean spatial coverage of about 82% are available at the Kamp catchment. The correlation between the catchment mean values of the two top soil moisture estimates changes with the season. The differences tend to be smaller due the summer month from July to October. The results indicate a good agreement between the modelled and remote sensed spatial moisture patterns in the study area.