Application of WaSiM-ETH model to Northern German lowland catchments: model performance in relation to catchment characteristics and sensitivity to land use change

The hydrological catchment model WaSiM-ETH (Water Balance Simulation Model) is a spatially distributed, process- and grid-based hydrological catchment model which was primarily developed to simulate the water balance of mountainous catchments. In this study, the ability of WaSiM-ETH was tested to describe the hydrological processes of lowland catchments. In addition, the resulting model performance was related to subcatchment characteristics and the model's sensitivity to possible future land use change. The prediction of the hydrological effects of land use change is a major challenge in contemporary hydrological model applications. The study revealed that WaSiM-ETH is a suitable tool for the simulation of the hydrological behaviour of lowland catchments. However, for a few subcatchments model validation failed. Analysing the correlation between model performance and physiographic catchment characteristics revealed that WaSiM-ETH performs better in sloped catchments compared to plane ones. Modelling results were also better in heterogeneous catchments with respect to soils and vegetation compared to homogenous ones. However, the hydrological reaction to land use change scenarios was similar in all investigated catchments.

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