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Importance of uncertainty analysis on the identification of optimum spatial discretization of a distributed rainfall runoff model

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Currently, there is a growing awareness of input uncertainty in distributed hydrological modelling. Studies on aggregation effects of spatial input data including predictive uncertainty are rare. In this study the hydrological model WaSiM-ETH, which includes the Topmodel approach, was applied on a daily time step in a 100 km^2 catchment of the lower mountain range. The model was calibrated with PEST for input grid resolution of 25, 50, 100, 200, 300 and 500m. An extensive uncertainty analyses was conducted using the Monte Carlo Markov Chain method for all grid resolutions. Comparing the model outputs on the basis of Nash-Sutcliffe criteria, no differences of model performances could be found. This shows that calibrating the model has compromised the information losses due to disaggregation in the input grids. However the MCMC analysis revealed clear differences in predictive uncertainty between different input grid sizes. An improvement in the reliability of the model prediction could be observed with increasing grid resolution. Furthermore a threshold in the grid resolution of 200 m was found. Using spatial resolutions finer than this threshold value didn't decrease the uncertainty of model predictions. For resolutions coarser than the threshold value a strong decrease in the reliability of model predictions was detected.