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A modelling Concept combining rural and urban Hydrology

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A concept for integrated modelling of urban and rural hydrology is introduced. The concept allows for simulations on the basin scale as well as on the local scale. It is based on a two-layer-approach which facilitates the parallel coupling of a catchment hydrology model with an urban hydrology model, considering the interactions between the two systems.

The concept has been implemented in a computer model combining a grid based distributed hydrological catchment model and a hydrological urban stormwater model based on elementary units. The combined model provides a flexible solution for time and spatial scale integration and offers to calculate separate water balances for urban and rural hydrology. Furthermore, it is GIS-based which allows for easy and accurate geo-referencing of urban overflow structures, which are considered as points of interactions between the two hydrologic systems. Due to the two-layer-approach, programs of measures can be incorporated in each system separately.

The capabilities of the combined model have been tested on a hypothetical test case and a real world application. It could be shown that the model is capable of accurately quantifying the effects of urbanization in a catchment. The affects of urbanization can be analyzed at the catchment outlet, but can also be traced back to its origins, due to the geo-referencing of urban overflow structures. This is a mayor advantage over conventional hydrological catchment models for the analysis of land use changes.

The concept adds to model complexity and increases the number of model parameters considerably. However, it clearly reduces the uncertainties in model predictions with regard to changes in urbanization.