MODELLING THE INFLUENCE OF LAND-USE CHANGES ON STORM-RUNOFF GENERATION AT THE MESOSCALE

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Based on various land-use scenarios, the influence of altered catchment characteristics on flood runoff is simulated utilizing a modified version of the physically based hydrological model WaSiM-ETH. In order to improve the representation of land-surface conditions within the model, it has been extended to cover relevant phenomena like macropore flow or a connection of sealed surfaces to a sewer system, which depend directly on land-use management. Modelling is performed spatially distributed on the same grid-cell basis as used for the land-use scenarios. The procedure is applied to three mesoscale catchments within the Rhine basin. These exemplary catchments (between 100 and 450 km² in size) were chosen with respect to their prevailing land-use, one of them being dominated by settlement areas, one by agricultural and one by forestal use.
The simulation results indicate that storm-runoff generation depends very much on rainfall intensity and duration as well as initial soil moisture conditions. Other governing factors are the geomorphological and geological catchment properties. The sum of these partly event-related and partly static boundary conditions determines the degree, up to which catchment response can be influenced by land-use changes. Therefore, a clear definiton of these boundary conditions is a prerequisite for any statements made in this context. With increasing scale, there is also a shift in the relative importance of different types of rainfall as well as different geophysical catchment characteristics.