Flash Flood Warning System – One Model, Two Methods

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This paper presents recent flash flood warning developments in small catchments in Southern Austria. The work is carried out in close cooperation between end-users and developers. Two different methods following the specific needs of the end-users are tested. The first method is a simple and robust flood catalogue approach where the catalogue is a compilation of historical flood peaks and flood peaks derived from simulated scenarios. Food peaks are predicted offline depending on the precipitation amount and duration as well as the antecedent soil moisture conditions. Soil moisture is stratified into four classes ("very wet", "wet", "dry", "very dry"), and precipitation amount is calculated for one, three and six hours. The second method is based on the development of an operational hydrological flood forecasting system. For both methods the same hydrological model is used - the spatially distributed continuous model KAMPUS (Blöschl et al., 2008) - with the same structure and parameters. For generating the flood scenarios in the catalogue the model is used as an event based model. The methods are tested in the well-equipped catchment of the Sulm River ($1100 km^2$) in western Styria with sub catchment sizes in the range of 30 to $300 km^2$. The model is calibrated to a runoff data set from 1999 to 2009 comprising a wide range of hydro-meteorological conditions. For flood warning, in the first method the user manually characterizes the actual soil moisture conditions in the catchments and retrieves forecasted precipitation amounts for the three precipitation durations defined above. This information allows the user to estimate a range of possible flood peaks in the catalogue. Using the second method one flood peak is simulated for each forecast point in a deterministic manner. In both cases the resulting flood peaks are compared to a critical discharge according to different warning levels. For method one only one critical discharge (bankfull) is defined, whereas method two includes three warning levels corresponding to different discharge values with different return periods.

Blöschl, G., Ch. Reszler & J. Komma (2008): A spatially distributed flash flood forecasting model. Environmental Modelling & Software, 23, 4; 464-478; doi:10.1016/j.envsoft.2007.06.010