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Continuous Rainfall Runoff Modelling using different synthetic Precipitation Data for Derived Flood Frequency Analysis

I. Buchwald, A.-D. Ebner von Eschenbach, U. Haberlandt and A. Belli

Institute of Water Resources Management, Hydrology and Agricultural Hydraulic Engineering, Leibniz Universität Hannover, Germany (Buchwald@iww.uni-hannover.de)

For the design of hydraulic structures floods with different recurrence intervals are required. Usually, long time series of observed discharge maxima are statistically analysed to obtain those values. In the case of insufficient long-term discharge observations a “derived flood frequency analysis” can be carried out using continuous rainfall runoff modelling. However this requires long precipitation time series with a high temporal resolution to model the dynamics of the discharge of the catchment. Observed precipitation data with sufficient spatial and temporal coverage are scarcely available. An alternative provide disaggregated and stochastic precipitation data.

The idea of this paper is the comparison of different synthetic precipitation input data with hourly resolution for the deterministic estimation of design floods. On the one hand disaggregated daily precipitation data based on a multiplicative random cascade model are used; on the other hand synthetic precipitation data from a multivariate Alternating-Renewal-Model are applied.

Two mesoscale subcatchments of the Bode river basin in Eastern Germany are used as study region. For rainfall runoff modelling the conceptual model HEC-HMS is used. First, hourly and daily data of observed rainfall and discharge were utilised to calibrate and validate the model over short periods of four and three years, respectively. Then, the different synthetic precipitation data were used as input for the rainfall runoff model to simulate continuous discharge (30 and 50 years, respectively). The performance of each of the two precipitation inputs is assessed by comparison of extreme

value statistics from observed and simulated flows.