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Calibration framework for derived flood frequency analysis driving a rainfall-runoff model with stochastically generated rainfall data

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For derived flood frequency analyses, stochastic rainfall models can be linked with rainfall-runoff models to improve the accuracy of design flood estimations when the length of observed rainfall and runoff data is not sufficient. Previous studies have shown here that for an optimal calibration of rainfall-runoff models, flood statistics should be considered and the same input data should be used for the calibration as for the application of the model. In general, however, the observed runoff data as annual maximum values are too short to follow the classical split-sampling approach and divide the sample into a calibration and validation period. To ensure an independent validation of the calibrated rainfall-runoff models with an increased sample size to enable split-sampling, this work will investigate a calibration framework using monthly maximum values of the observed runoff. The objective function takes into account flood statistics of monthly maximum flows, e.g. l-moments of the independent peaks and the ratios between peak and volume. The conceptual rainfall-runoff model HBV-IWW is driven by stochastically generated rainfall data on an hourly time step for 140 meso- and macroscale (30km² - 1500km²) catchments in Germany. The results of this calibration framework could be used as benchmarks for future studies.