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Capabilities of stochastic rainfall models as data providers for urban hydrology: Part 1 – Generation and statistical analysis of precipitation time series

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Abstract

In urban hydrology, models are necessary for the dimensioning of sewer systems as well as for waste water treatment. These models need long, continuous precipitation time series in a high temporal resolution. The use of synthetic precipitation is a common alternative to observed data since available time series are often too short, restricted to some locations or of an insufficient data quality. The aim of this project (SYNOPSE II) is to provide synthetic precipitation time series in Germany for sewer applications.

The contribution of part 1 compares two precipitation models: a parametric stochastic model based on an alternating renewal approach (Callau Poduje and Haberlandt, 2017) and a non-parametric probabilistic approach (Bárdossy, 1998). Both models generate point time series in a high temporal resolution (5 min) for whole Germany on a 5 km x 5 km grid. They are set up with data of 950 pluviometers in 5 min resolution provided by the German weather service (Deutscher Wetterdienst - DWD) covering the years 1993 – 2016.

This study uses 45 of the 950 stations as reference stations for a cross-validation. The 45 reference stations consist of minimum of 20 years of observed data and are chosen to statistically represent the climate of whole Germany (i.e. the mean yearly precipitation sum, the geographical height, the probability of daily values > 1.5 mm and the Párde-coefficient describing the fluctuation of monthly precipitation within one year).

The performance of both precipitation models is compared against the reference stations using different kind of statistics, for example yearly precipitation sums, event based characteristics and intensity-duration-frequency-curves. Part 2 *Application and validation of synthetic precipitation time series for urban drainage modelling* compares the results of the runoff simulations in order to quantify the difference between the generated and observed time series.

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