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Capabilities of a stochastic rainfall model for urban hydrology – Generation and statistical analysis of precipitation time series

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In urban hydrology, models are necessary for the dimensioning of sewer systems as well as for waste water treatment. These models are using long, continuous precipitation time series in a high temporal resolution as input data. Since available time series are often too short, restricted to some locations or of an insufficient data quality, the use of synthetic precipitation is a common alternative. The aim of this project SYNOPSE II - funded by the German Federal Ministry of Education and Research (BMBF) - is to provide synthetic precipitation time series in Germany for sewer applications.

The contribution gives an insight of a non-parametric probabilistic approach (Bárdossy, 1998). The model generates point time series in a high temporal resolution (5 min) for whole Germany on an 1 km x 1 km grid and is 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.

45 of the 950 stations are used 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).

Different kind of statistics, for example yearly precipitation sums, event based characteristics and intensity-duration-frequency-curves are used to compare the performance of the precipitation model against the reference stations.

References

Bárdossy, A., 1998. Generating precipitation time series using simulated annealing. Water Resources Research 34(7): 1737-1744.