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Merging of rain gauge and radar data for urban hydrological modelling

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Urban hydrological processes are generally characterised by short response times and therefore rainfall data with a high resolution in space and time are required for their modelling. In many smaller towns, no recordings of rainfall data exist within the urban catchment. Precipitation radar helps to provide extensive rainfall data with a temporal resolution of five minutes, but the rainfall amounts can be highly biased and hence the data should not be used directly as a model input. However, scientists proposed several methods for adjusting radar data to station measurements. This work tries to evaluate rainfall inputs for a hydrological model regarding the following two different applications: Dimensioning of urban drainage systems and analysis of single event flow. The input data used for this analysis can be divided into two groups: Methods, which rely on station data only (Nearest Neighbour Interpolation, Ordinary Kriging), and methods, which incorporate station as well as radar information (Conditional Merging, Bias correction of radar data based on quantile mapping with rain gauge recordings). Additionally, rainfall intensities that were directly obtained from radar reflectivities are used. A model of the urban catchment of the city of Brunswick (Lower Saxony, Germany) is utilised for the evaluation. First results show that radar data cannot help with the dimensioning task of sewer systems since rainfall amounts of convective events are often overestimated. Gauges in catchment proximity can provide more reliable rainfall extremes. Whether radar data can be helpful to simulate single event flow depends strongly on the data quality and thus on the selected event. Ordinary Kriging is often not suitable for the interpolation of rainfall data in urban hydrology. This technique induces a strong smoothing of rainfall fields and therefore a severe underestimation of rainfall intensities for convective events.