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Effect of spatially distributed radar-gauge rainfall products on simulated urban flows

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Weather radars have become a valuable tool for urban hydrological studies because they capture the rainfall intensities at a high spatial and temporal resolution. However, radar products are affected by objects or phenomena not of meteorological interest, making it necessary to apply various algorithms to correct and improve their rainfall estimation. In addition, multiple methods for merging rain-gauge and radar data are presented in the literature, which combines the advantages of high spatial resolution of radar products with the measurement accuracy of rain gauge stations. While merging methods are commonly validated on rain-gauge measurements, little has been discussed in the literature about the influence of such techniques on urban hydrological models. Therefore, this study investigates the use and selection of gauge-radar merging methods as input for urban hydrological modeling.

This work studies the influence of different precipitation products (rain-gauge stations, radar, and radar-gauge merged products) on flow rates simulated with a hydrodynamic model in two cities: Hildesheim and Osnabrück, Germany. Sewer pipe measurements at least every 2 minutes for several discharge events within 2020-2021 are available and used to evaluate different rainfall products. The techniques to be assessed are temporal and spatial smoothing and radar merging methods such as external drift kriging, quantile mapping, and conditional merging. This study will allow identifying if, in general, there is a single product that presents the best results for urban flow simulations or if, on the contrary, it depends on the type of rainfall event. Additionally, since the study areas are located at different distances from the Hannover radar station, it will be possible to analyze the influence of the attenuation correction on the improvement of the radar product.