

# Optimal temporal resolution of merged radar – gauge rainfall for urban applications

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## ABSTRACT

The optimal temporal resolution for rainfall applications in urban hydrological models depends on different factors. The use of different rainfall measuring instruments implies different temporal resolutions, typically 5 minutes for weather radars and 1 minute to 1 day for rain gauges. Accumulations to a coarser temporal resolution are often used to reduce the impact of random errors in rainfall measurements and helps reducing the uncertainty. At the same time, urban hydrology often has short characteristic time, depending on the size of the study area and on the modelled phenomena, and rainfall estimates should have a sufficiently fine resolution to capture the temporal variability of the processes. Merging radar and rain gauge rainfall data is recognized to improve the accuracy of the estimates without losing information on the areal rainfall characteristics, typical of radar measurements. This work explores the possibility to perform radar-rain gauge merging at a coarser temporal resolution, and to downscale the results, in order to obtain fine temporal resolution rainfall estimates suitable for urban hydrological applications with the lowest possible uncertainty. A case study in Twenterand, in the Netherlands, is used to compare rainfall estimates merged at different resolutions and then downscaled. On the 15th June 2016 the town of Vroomshoop, in the municipality of Twenterand, was affected by flooding due to the impossibility of the urban drainage system to cope with the high-intensity rainfall event. The rainfall data from 3 municipality rain gauges, 14 sub-daily amateur weather stations from the network Het Weer Actueel, 2 automatic hourly rain gauges from the Royal Meteorological Institute of the Netherlands (KNMI), and 19 daily amateur rain gauges from the KNMI are merged with radar rainfall composites from the KNMI between the 13th June 2016 and the 17th June 2016, and used in an Infoworks model reproducing the urban drainage system of Twenterand. In order to assess the impact of temporal accumulation and downscaling, 15 different combinations of accumulation and downscaling resolutions are produced. The merged products are used in the same Infoworks model and the results are compared with measurements in the catchment, in order to identify the best combination of accumulation resolution and downscaling resolution.

## KEYWORDS

Kriging with External Drift, rainfall downscaling, rainfall temporal resolution