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Spatial and temporal resolution effects on urban catchments with different imperviousness degrees

Elena Cristiano, Marie-Claire ten Veldhuis, and Nick C. van de Giesen

Water management Department, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Stevinweg 1, 2628CN, Delft, NL

One of the main problems in urban hydrological analysis is to measure the rainfall at urban scale with high resolution and use these measurements to model urban runoff processes to predict flows and reduce flood risk. With the aim of building a semi-distribute hydrological sewer model for an urban catchment, high resolution rainfall data are required as input. In this study, the sensitivity of hydrological response to high resolution precipitation data for hydrodynamic models at urban scale is evaluated with different combinations of spatial and temporal resolutions. The aim is to study sensitivity in relation to catchment characteristics, especially drainage area size, imperviousness degree and hydraulic properties such as special structures (weirs, pumping stations). Rainfall data of nine storms are considered with 4 different spatial resolutions ($3000\mathrm{m}$, $1000\mathrm{m}$, $500\mathrm{m}$ and $100\mathrm{m}$) combined with 4 different temporal resolutions ($10\mathrm{min}$, $5\mathrm{min}$, $3\mathrm{min}$ and $1\mathrm{min}$). The dual polarimetric X-band weather radar, located in the Cabauw Experimental Site for Atmospheric Research (CESAR) provided the high resolution rainfall data of these rainfall events, used to improve the sewer model. The effects of spatial-temporal rainfall input resolution on response is studied in three Districts of Rotterdam (NL): Kralingen, Spaanse Polder and Centrum district. These catchments have different average drainage area size (from $2\mathrm{km}^2$ to $7\mathrm{km}^2$), and different general characteristics. Centrum district and Kralingen are, indeed, more various and include residential and commercial areas, big green areas and a small industrial area, while Spaanse Polder is a industrial area, densely urbanized, and presents a high percentage of imperviousness.