Geophysical Research Abstracts
Vol. 14, EGU2012-3317, 2012
EGU General Assembly 2012
© Author(s) 2012

Rainfall resolution from weather radars and their application in urban drainage modelling

G. Bruni (1), J.A.E. ten Veldhuis (1), T. Otto (2), and H. Leijnse (3)

(1) Watermanagement Department, Delft University of Technology, Netherlands (guendalina_bruni@yahoo.it, J.A.E.tenVeldhuis@tudelft.nl), (2) International Research Centre for Telecommunications and Radar, Delft University of Technology, Netherlands (T.Otto@tudelft.nl), (3) Royal Netherlands Meteorological Institute, De Bilt (Hidde.Leijnse@knmi.nl)

Urban hydrological modelling requires high resolution rainfall data to be able to simulate fast runoff processes and related short response times. Over the last three decades, rainfall input into urban hydrological and hydrodynamic models has often been restricted to a single rain gauge in or near the catchment, rendering rainfall input one of the main sources of uncertainty in model calculations. In recent years, rainfall data from weather radars that provide space-time estimates of rainfall are becoming increasingly available. C-band and S-band radars have been used for operational precipitation measurements and offer spatial resolutions of 1km^2 to several km^2. This resolution is still insufficient to meet the relevant scales of urban hydrology (e.g. Berne et al. 2004; Emmanuel et al., 2011, Schellart et al., in press). Higher spatial resolution rainfall measurements can be provided by X-band radars, especially at short range where attenuation is not yet a major factor.

At the Cabauw Experimental Site for Atmospheric Research (CESAR), an X-band Doppler polarimetric radar has been installed as well as a dense network of rain gauges (Leijnse et al., 2010). Data from the C-band Doppler radar at 25 km distance are also available for this site. A network of 11 rain gauges is to be installed in the city area as well as a network of water level sensors in the stormwater sewers.

A selection of rain events is analysed based on the available rainfall measurement instruments for this site. The events are used as input into a hydrodynamic model of the sewer system of the city of Utrecht, located between CESAR and the C-band radar site. The effect of different spatial rainfall data resolutions and of rainfall data uncertainty on hydrological response will be analysed for various sizes of catchments within the Utrecht sewer system.

References

Berne, A., Delrieu, G, Creutin, J., and Obed, C. (2004). Temporal and spatial resolution of rainfall measurements required for urban hydrology. Journal of Hydrology, 299, 166-179.

Emmanuel, I., Leblois, E., Andrieu, H, and Flahaut, B. (2011). Variabilité spatio-temporelle des précipitations aux échelles de l'hydrologie urbaine. La Houille Blanche, 4, 31-36.

Leijnse, H., Uijlenhoet, R., van de Beek, C.Z., Overeem, A., Otto, T. , Unal, C.M.H., Dufournet, Y., Russchenberg, H.W.J., Figueras i Ventura, J., Klein Baltink, H., and Holleman, I. (2010). Precipitation measurement at CESAR, the Netherlands. Journal of Hydrometeorology, 11, 6, 1322-1329.

Schellart, A.N.A., Shepherd, W.J., and Saul, A.J. (in press). Influence of rainfall estimation error and spatial variability on sewer flow prediction at a small urban scale. Adv Water Resour (2011), doi:10.1016/j.advwatres.2011.10.012.