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Discussions

Interactive comment on "On the sensitivity of urban hydrodynamic modelling to rainfall spatial and temporal resolution" *by* G. Bruni et al.

Anonymous Referee #4

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General comments

The paper provides a useful study into the sensitivity of urban hydrodynamic models to spatial and temporal distribution of rainfall. In the light of increased interested in urban drainage and urban flood modelling, this is an important area of research. Amongst both urban drainage practitioners as well as researchers it is well known that using high spatial and temporal resolution rainfall data is essential, however, clear guidance on the rainfall resolution necessary, given the desired level of detail and uncertainty in the output of hydrodynamic urban drainage models is lacking. There are only a very limited number of studies on the effect of spatial and temporal distribution of rainfall on high resolution urban hydrodynamic models currently available (most studies on this subject have been carried out on non-urban areas), hence a paper on this subject is a

valuable contribution.

Specific comments

P 5994 – L 15, It would be very helpful to provide a little bit more information on the X-band radar utilised in the text, rather than referring to two references about the radar: including the distance between the radar and the catchment, as well as a brief summary of the quality control algorithms that have been employed on the radar signal would be helpful.

Figure 1a – the y-axis is in mm/hr, yet the caption says 'date and duration, rainfall volume range. . .'? Should Y –axes be in mm, or were there originally 2 figures here (one for rainfall volume, one for rainfall intensity). In any case, the text currently doesn't include what the overall rainfall volume is, it would be useful to add this to the explanation of the rainfall events. Also, it would be helpful to get some idea of the estimated return periods of the events, i.e., are they fairly 'normal', events, or 'extreme' events, as the assumption on P 5996 L 18-19 that green areas do not run off doesn't hold for more extreme events when green areas tend to get saturated and start contributing to runoff.

Figure 2 – right panel, runoff length 'RRL' appears to be 100m, i.e., looking at the figure it appears the runoff is calculated from 100x100 m gridcells? If so, why in table 2 is the 'mean runoff length' 28 (23) metre (and not 100?). This could do with a little bit more explanation in the text (i.e., p 5999, Line 22/23, just says, '. . .catchment is divided into sufficiently small elements. . .' is it a 100x100 m grid, except for at the subcatchment boundaries?)

P5996 L15 and also Table 1– it would be helpful to add a few more columns in Table 1, to include the runoff factor and surface storage for each type of area (as per Table 6.12, page 674 of the SOBEK user manual). Also, these are empirical coefficients, have any checks been done as to how sensitive the model outputs are to uncertainty in these coeffients? I know it was not the original focus of the paper to do a full sensitivity analysis of all other coefficients/inputs in SOBEK, but in general urban runoff

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models are also known to still have considerable uncertainty attached. It would be very interesting to include a few 'quick checks', i.e, for example by changing h with 1 mm in SOBEK if possible, or if that's not possible, doing a run with 'open paved stretched flat' instead of 'open paved flat' selected as area type instead (i.e., c 0.1 h 1, instead of c0.2 and h 0.5 0 a difference in surface characteristics that would in reality be quite hard to distinguish), and see if that would be likely to significantly alter the conclusions of the paper or not.

P 6004 – L 17-18, what is the common pipe shape (circular?) and what is the filling percentage of the pipes during the events. i.e, if the pipes are almost full/nearly surcharges a small difference in flow will have a large difference in water level, whereas if most pipes are about half-full, a small difference in flow will cause very limited difference in water level. So without knowing how full the system is, i.e., how large the rainfall events are compared to what the sewer system was designed for, it is difficult to draw any conclusions based on water levels in the pipes. It would be helpful to include some information on whether during the events the system reached full pipe flow/near full pipe flow, or not. Also, in light of the comment above, in P 6002 – Eqn 5, the water level is normalised against maximum water level in the pipes, it would make more sense to normalise it against pipe full flow capacity instead.

I agree with the other reviewers, it would be better if a few more events were included in the study

Technical corrections, typing errors, etc.

Page 6001 – Line 17 – should it be 'lower' rather than 'higher' here? I found the text in lines 5 – 22 hard to follow (lot of lower/higher, 'this parameter' 'this ratio' etc), it may be easier to summarise these parameters and their descriptions in a small table.

P6011 – L 7: Analyses instead of analysed.

(and a few more, as already pointed out by the other reviewers)

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