Interactive comment on "Urban sewershed overflow analysis using super-resolution weather radar rainfall" *by* J. Y. Hyun et al.

Anonymous Referee #1

Received and published: 30 September 2016

This paper addresses two interesting and linked questions – first, can we optimise the Z-R relationship for rainfall measured on a short time-scale? Second, what rainfall events cause CSOs? The research is then divided into two parts. In the first part, a Support Vector Classification approach is used to improve the correlation of radar-rainfall measurements by identifying a new Z-R relationship. The authors use a variety of techniques to study these questions and the methods generally are sound. First of all, the paper is generally well written, with only a few typos or sentences that could be improved. However, perhaps the fault rests with me and my reading of the manuscript but there are places where it is not clear what is meant and what precisely was done. This is particularly the case in relation to optimization. I ask questions below merely to ascertain whether my reading of the manuscript is correct. Line 66 – Mailhot 2015, not Mailhot 2016 (unless there is a missing reference) Line 98 "The focus of this study is the

application ... " Line 104 "... with (or by) weather radar ..." Line 125 "phenomena" (if plural is what is intended) Line 141 – Please specify more clearly what the correlation is here – do you mean the spatial correlation? Line 144 – What is the intergauge distance? Line 174 – Could you justify this step a little further. If the central cell (of the 9) is smoothed to the average, is this not likely to remove what might be heavier rainfall? Alternatively this step could increase low rainfall values. Could you say how often this smoothing took place and how it may have affected the results. Could this be related to the underestimation you see, especially for tropical rainfall? Line 178 – could you explain how the rainfall type is identified? Was this provided to you as part of the original dataset and the classification made by the providers of the data? Or is this what you mean by optimization. (As I have read further, I see on line 436 that this is discussed. Could you explain this earlier in the paper please?) Line 189 – why is this equation in the appendix? Line 205 – Could you clarify what is meant by optimization here? Is it the selection of one of four Z-R relationships, or the modification of the parameters of the Z-R relationship? Line 316 – You talk quite early on in the paper about continuity, but it is not until line 432 where you define it. Could it be defined earlier? Line 319 – here you say super-resolution data is important to the estimation of CSO, but with your smoothing operation (already discussed), you may be losing the high resolution data that is important. If I understand correctly, the pixel resolution is 5 ha. If you use the smoothed result from 9 pixels, you are using the rainfall from an area of 45 ha. Is this correct? Line 370 – I'm not sure I follow the analysis of acceptable and unacceptable overflow events. Where there is an overflow and the overflow ratio is less than 0.6, is anything known about the volume of overflow that reaches the receiving body? What is an acceptable overflow? If I proceed to line 400, we read that for values greater than 0.40, there is a likelihood of significant pollution. Why then is 0.60 chosen as the threshold for acceptable overflow volumes? It is clear from Figure 11 that the unacceptable events are those events with greater volumes, but I would appreciate a better understanding of how you derive at this from the index. Line 389 – could you say something about the relationship between raingauge and radar raingauge for

the CSO causing events. Are they in anyway different from the other rainfall events? Conclusions - Could you discuss any differences you may have seen between the two types of tropical storms – can the information in your research be used to identify in real-time which Z-R relationship to use, and whether it can be used to improve the prediction of CSOs? The conclusions section could be improved. You say early on that "Categorization of the severe rainfall events inducing CSO occurrence can provide insights for hydrologic and hydraulic design guidelines to reduce sewer overflows from combined sewer systems in an urban area". Can you say a little more about how this might be done? Could you also say more about the number of false negatives in Table 2? Out of 52 events listed, you predict 11 out of 52 incorrectly? What is different about these events. If you look at Table 1 – the major differences seem to be rainfall intensity and total depth (the other differences aren't great. This is what you would expect. When do you make a false prediction?

C3