

Interactive comment on “Critical scales to explain urban hydrological response” by Elena Cristiano et al.

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Dear reviewer,

Thank you for comments and suggestions. Below you can find the reply [AR] to your comments [RC].

[RC]General comments: The authors analyse rainfall variability in space and time in relation to catchment characteristics and model complexity. They use various indices to characterise these variability. Beside known indices they introduced some new indices and a new classification of rainfall variability based on percentage of coverage above a selected threshold. For the analyses data from nine rainfall events observed with a X-Band radar located in the Netherlands are utilised. For modelling three hydrologic/

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hydraulic models with different complexity and a sewage network in London are applied. The results show that the new classification allows a good representation of the storm cores and gives information about the required scales for hydrological modelling. The paper is quite well written and clear in structure. An interesting innovation is seen in the new classification of rainfall events. The conclusions are supported by the analyses. However, one problem is the readability of the article due to the large number of specific indices which are usually not very common. Many times a had to leaf back to the methodology section and re-read the definitions of the indices to understand the discussion and conclusions. I don't have a real good idea how to improve the readability regarding this issue; one possibility would be to append an extended table of symbols with short definitions including ranges of the indices; another possibility would be to reduce the number of indices. Otherwise there are only a few minor comments for improvement (see below). Altogether the paper is very interesting and well worth of publication after the authors have the opportunity do some revisions.

[AR] Regarding the readability of the paper, we will add a table to help the reader with the new parameters, adding symbols, names, descriptions and units.

[RC] Detailed comments: 1. Page 3: The location for rainfall data observation (Netherlands) and analysed sewage networks (London) don't correspond. Please, explicitly state this mismatch and include a brief discussion why you have chosen this setting.

[AR] Thank you for pointing this out. We agree that the reason why we chose to apply data measured in the Netherlands over the London area was not well explained in the manuscript. We will add a paragraph motivating the choice of using rainfall datasets from one and hydrological model from another, albeit same climatological, region in the Data section and some comments about the possible consequences of this assumption

[RC]2. Page 4, line 12: What are the left and right boundaries of the area under the variogram? 3. Page 4, line 13: Why "correlogram"? You probably mean here also the variogram. 4. Page 10, lines 28: Is it really the case that the spatial variability index is

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increasing for storms with a large range? It looks like the opposite in Table 3 (e.g. E2, E4, E6,E8).

[AR] We will clarify the questions about the variogram clarified and rephrase sentences they may have caused confusion.

[RC] 5. Page 36, Table 2: E2 has the same starting and ending times as E1?

[AR] Yes, it has. E1 and E2 are part of the same event, yet they represent different rainfall cells, hence different pixel regions of the radar measurement.

[RC]6. Page 36, Table 2: I do not understand what min and max means in the column with total depth (over time total depth cannot have min and max; is this regarding different spatial extents)?

[AR] The total depth is for each pixel, so mean and max refer to different pixel. A better description of this parameter will be added in the manuscript and in the table.

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