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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Precipitation variability within an urban monitoring network in terms of microcanonical cascade generators" *by* P. Licznar et al.

Anonymous Referee #1

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The paper addresses the question of rainfall variability in urban areas which is a topic relevant to hydro-meteorology and urban water management. Some methodological developments are also introduced. Papers on this issue are welcomed. However I believe that some aspects should be significantly improved before publication and that the modifications needed require a major revision.

General comments

The following general points need to be addressed by the authors in the revised version:

- Clarify more precisely the added value with regards Licznar et al 2011 a and b

- With regards to cluster analysis, it not straightforward what "non-obvious" information it brings. Authors should clarify the purpose of this study and why this methodology was tested on the various rain gauges of this rather small area.

- Results should be discussed much more in-depth with some physical interpretation rather than simply stating output of statistical analysis.

- Why some spatial (some elements are in Rupp et al, 2012) or even spatio-temporal dowscaling has not been tested with this data set.

- Some methodological aspects should be justified, especially the overlapping methods, statistical significance of the differences in cluster analysis...

Detailed comments

Abstract:

Last sentence : "The cluster .... time scales"; I believe this is overstated with regards to the content of the paper.

1) Introduction

There is a lack of references and "context" statements in the introduction:

- 1st paragraph : some references about urban hydrology and required time step should be added (ex among many Berne et al 2004, Gires et al. 2013)

- 2nd paragraph: are you considering real time?

- 3rd paragraph: micro-canonical cascades are mentioned, but I think that other types (such as macro-canonical ones) should be mentioned, and you should justify the use of one type rather than the other ones.

- 4th paragraph : in the context of cascades process for rainfall the "beta model" often refers to a dead or alive cascade process to model the rainfall occurrence (Over and

Gupta, 1996). May be it should be briefly clarified that you are not dealing with this here.

2) Data

2.1)

- p.5 l.16-22: the setting of the gauges seems quite impressive for an urban area !

- p.6 l.6 -8: the notion of “step error” should be clarified, and the results displayed Fig. 2 commented in the text.

- p.6 l.8 -10 : it is not clear why the data was aggregated to 5 min, especially for heavy rainfall events which are the trickiest to handle. By the way the discrete cascades that are implemented also exhibit some “step-like” features.

- p.6 l.16-18 : if the network is compared with other cities, an approx. estimate of the area covered area by these networks should be added.

2.2)

- For readers not necessarily familiar with the cascade framework, I think a scheme would be quite helpful.

- p.7 l.1-6: From my understanding the final number of time steps is 128 (n=7), but 1280/128 is different from 5 min which is mentioned in the text. Please check the consistency.

- p.7 l.14-17 : I believe the discussion with regards to long lasting debate micro/macro – canonical cascades should be extended. Indeed micro-canonical cascades can limit the appearance of extremes. A discussion on this topic in a framework of urban hydrology applications can be found in Gires et al. 2012, details are also in Schertzer and Lovejoy 1989.

- p.9 l.1-6 : The procedure seems very artificial... could you justify more precisely it

(tests with some simulations, or extend the discussion to previous work using it).

- p.9 l.7-20: the problem is that the suggested method still use the same data... it would be more convincing if justified more carefully (may be with some tests on simulations, see also comments in section 3).

2.3)

- The probability distributions of the BDC for each rain gauge could also by compared between themselves using statistical tests to see whether they are statistically significantly different.

- Could you clarify the quantification of the distance between two clusters, and especially criteria for statistical significance of the differences between two clusters (in the following all the rain gauge of Warsaw seem very close...)

3) Results and discussion

- I would suggest to divide this section into several sub-sections to clarify the presentation of the results

- Fig. 5 and 6 : improve readability

- p.12 l.8-12 : the explanation is too short. A solution to actually illustrate the relevance of the technique could be to use a long series to estimate the histograms and then select only a portion of your series and re-estimate the histograms with your new method.

- p 12 l13-16 /p13 l1-9: there are neither justifications for the choice of the distribution nor quantification of the quality of the fitting. Fitting 5 parameters with this histogram seems a lot. It should be added.

- p 12 l 17-19 : please clarify this sentence

- p13 l 11: I think “up” should be changed to “down”

- p10 l10-22 : there is only a description of the parameter evolution with scale; a physical interpretation should be added.

- p13 last paragraph: you should give more details on the disaggregation processes

- fig 9 : I did not found it very easy to read. If this is point shared by other referee, may be you should change it.

- comments on Fig 10 (p14 l5-18): “behaviour . . . is very similar”, this is not obvious from the curve, especially since it is plotted in log-log, the differences (overestimation on the whole range) in physical unit must be quite significant, the statement should be much more justified; for the extremes the discrepancies are even greater and should be discussed more in details (potential issues with the model but also the measurements for extreme events ...); why is the validation performed at a single scale whereas you are working in a cascade framework; may be other comparison tool should be implemented.

- Fig 11 : again why validation is done at a single scale?

- p14 l25 – p15 l14 : it should be clarified what knowledge does the rather “heavy” methodology brings, given that the conclusions as mentioned in the text are rather obvious. What is the statistical significance of the observed differences?

- p15 l14- p16 l16 : some explanations and physical interpretations should be added.

References mentioned:

Berne, A., Delrieu, G., Creutin, J.D. and Obled, C., 2004. Temporal and spatial resolution of rainfall measurements required for urban hydrology. Journal of Hydrology 299 (3-4), 166-179.

Gires, A., et al., 2012. Quantifying the impact of small scale unmeasured rainfall variability on urban hydrology through multifractal downscaling: a case study. Journal of Hydrology, 442–443, 117–128.

Gires, A., Tchiguirinskaia, I., Schertzer, D. and Lovejoy, S., 2013. Multifractal analysis of an urban hydrological model on a Seine-Saint-Denis study case. Urban Water Journal.

Over, T.M. and Gupta, V.K., 1996. A space-time theory of mesoscale rainfall using random cascades. Journal of Geophysical Research-Atmospheres, 101(D21): 26319-26331

Schertzer, D., Lovejoy, S., 1989. Nonlinear variability in geophysics multifractal analysis and simulations, in: Pietronero, L. (Ed), Fractals Physical Origin and properties. Plenum Press: New-York., pp. 41-82.

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