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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.

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Reply to Reviewer#3 comments

We would like to thank you for the comments, and provide an ad-hoc reply to the two major concerns with the willingness to incorporate these in revised version of the manuscript.

Concerning major concern no. 1: "It appears that the methodology is not new in comparison with the previous publications by the authors (Licznar et al., 2011a, b; Rupp et al., 2012). In Licznar et al. (2011a, b), similar methodology was applied but to other

rain gauges in Poland and Germany; and Rupp et al. (2012) made use of the same rain gauge data of Warsaw?? Can the authors clarify the scientific innovations of the current paper more clearly? These should better demonstrate that this paper is more than a new case study (applying existing methodology), hence deserves publication in a journal as HESS."

We would like to underline the fact that our methodology is only partially similar to the one presented by Licznar et al. (2011a, b), while there are not overlaps with Rupp et al. (2012).

While Rupp et al. (2012) focused the attention on the development of 2-D cascade of canonical type whereas here we focus the attention on apparently much more prosaic topic of 1-D cascades of microcanonical type. The only common point between our work and Rupp et al. (2012) is the same dataset used.

Regarding the connection between our manuscript and Licznar et al. (2011 a, b), it is clear and even stressed in our manuscript. Licznar et al. (2011 a, b) have questioned the common practice of BDCs distributions fitting with symmetrical beta theoretical distribution for all hierarchy of sub-daily timescales. Licznar et al. (2011a) was based on a single Wroclaw gauge (digitized paper charts) while Licznar et al. (2011 b) based on 4 gauges from Germany. From this perspective, one aim of this study was to confirm the methodology of Licznar et al. (2011 a, b) for a dataset of 25 modern gauges.

However this aim is not the main motivation of our study and the source of novelty. In our manuscript, we considered two important issues: the first is the cascade models promptness, the second is the locality of derived cascade generators.

The first issue can be formulated through the following question: How long should be the high-resolution time series to derive the microcanonical cascade model parameters? If these have to be 20–40 years long, like in studies by Molnar and Burlando (2005, 2008) and Licznar et al. (2011 a, b), microcanonical cascades could be of limited value for engineers. According to technical codes (Schmitt 2000), precipita-

tion time series of length of about 20-30 years are suitable for hydrodynamic urban drainage modeling. When the access to long time series is possible, engineers are not interested in use of synthetic time series any longer.

Here we propose an overlapping moving window algorithm to solve the common problem of scarce representation of BDCs at large timescales, and we show the possibility of microcanonical cascade generator fitting based on short time series of about 2 years length only. In our opinion, this is novelty of our study, which we do not find in previous studies. We fully agree that statistical implications of overlapping moving window algorithm are worth to be studied in more detail in the future. We are not able to do it now in a comprehensive manner for all 25 gauges for Warsaw due to limited observational series. However, in revised version of manuscript we would like to at least partly confirm the correctness of proposed by us novel overlapping moving window algorithm based a 25 year long record from single gauge in Warsaw. We are ready to present results of BDCs calculations performed for short periods following overlapping moving window algorithm and compare them with results for all period of 25 years and non-overlapping moving window algorithm.

The second issue considers the locality of derived cascade generators.

The question that we address in our manuscript is if cascade generators vary from a site to the other within a city? From previous studies we only know that cascade generators vary, from city to city, but we do not know if cascade generators display variability within a single city? We try to answer to this question, which we believe is novel. To do this, we use cluster analysis techniques to compare obtained BDCs histograms.

Concerning major concern no. 2: The authors propose to use of overlapping moving windows for the calculation of the empirical histograms and calibration of the small-scale rainfall generators (microcanonical cascade generators in this study) for use in urban hydrological applications. This indeed leads to more smooth histograms and

parameter calibration results, as shown in the paper. But, it does not meet the shortcoming of local precipitation data shortage (see motivation of the authors on page 5253 line 13) !! The histograms and calibrations are still based on the same short rainfall record. Given that rainfall statistics may strongly be influenced by climate oscillations (e.g. at decadal time scales; see Willems, 2013), precipitation statistics derived from short records may be biased. They may systematically differ from the long-term statistics, which is the main problem of the local precipitation data shortage. This is not solved by the proposed use of overlapping moving windows. I suggest that the authors make this clear in the paper.

Yes, we fully agree with this comment, and we will make it clear in the revised manuscript. We hope it would be possible at least partly by enhancing our manuscript and incorporating additional results, obtained for already mentioned a 25 year long time series originating from pluviograph gauge located at current place of gauge R7.

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