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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Downscaling future precipitation extremes to urban hydrology scales using a spatio-temporal Neyman–Scott weather generator" *by* H. J. D. Sørup et al.

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Thank you very much for the thorough review.

Page C1750, paragraph two: We will add further discussion and references on the appropriate temporal scale of urban rainfall in a climate change context, but even though finer temporal scale data would be very beneficial in urban hydrology the link to climate change and the RCM data available would be worsened markedly.

Page C1750, paragraph three: Inclusion of IDF curves were considered in the manuscript writing process but the final choice was to include the relative measures

reported in Figure 11. This is essentially the same data, bur normalized against the IDF curve for present data. Due to the double-logarithmic axes used in IDF curves it was very difficult to discuss differences and the present Figure 11 was thought to better support this.

Page C1750, paragraph four: The focus has been solely on extremes as this aspect has been assessed to be of most importance for the direct dimensioning of urban water collection systems. With respect to CSO's the definition used in this study includes events that should be frequent enough to include a fairly large part of the CSO causing events, at least in many Danish contexts. Also in waste water treatment plant operations the extremes are very important in the operations as the hydraulic capacity will also be determined in a design phase based on events that are included in the definition of extremes of this study.

Page C1750, paragraph five: For the novelty of using the weather generator with abundant data on very small scale we lack instruments for thorough validation. As the observational data set is very unevenly distributed and lacks data in many points for extensive periods we do not expect the weather generator data and the observational data to fit each other perfectly. What we expect is merely an average fit (but for the parameters, not only the average rainfall). Thus, we do not expect that a Kolmogorov-Smirnov test (or the like) would give any positive result if applied on any of the points in the model as we do not expect the extremes to happen at the exact same spatial locations as in the original data set.

Page C1750, paragraph six and eight: On the question whether the weather generator could have been calibrated differently or better the short answer is: Yes – probably. And this of course relates to the subjectivity of the weighing factors. The weighing factors are, as stated in the manuscript, based on knowledge about rainfall and a subjective assessment of which elements are considered important in that context. Others would have chosen other weight factors resulting in different calibrations; some of them potentially better. We have not invested time in pursuing the best possible fit; we merely

see this study as a proof-of-concept that it is possible to use this model framework at much different scales than what is usually seen. Thus, satisfactory in this context is that we from our knowledge of rainfall can set up a weighing scheme that results in a calibration that again result in data that actually behaves similarly to the input.

Page C1750, fourth last paragraph: We will specify in Figure 3 that the isohyets are 3 mm.

Page C1750, last paragraph: For Figure 4 we will add a discussion on the yearly variation where appropriate.

Page C1751, first and second paragraphs: We acknowledge that Figure 5 does not provide enough information to discuss the fit of the model and will replace it with a figure showing the density plots of the normalized errors for the different parameters, to highlight that the density is higher near the 1:1 line of the present Figure 5 and to guide the discussion on how accurate (unbiased) the model is and on how large the variance is.

Page C1751, third paragraph: As stated in the methodology section the evaluations are based on a PDS approach and a Generalized Pareto Distribution model fitted to data (both observation and weather generator data) and, no, we do not have 100 years of data and it is therefore an extrapolation, but the 100 year return period is interesting in urban water management as cloudburst management is becoming increasingly relevant. The typo in the text with the 50 year event will be corrected.

Page C1751, fourth paragraph A confidence interval for the estimation of the SVK IDF curve will be added to Figure 7 to show the relative closeness of the WG fits.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 2561, 2015.