Hydrology and
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Discussions

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Interactive comment on "Temporal rainfall disaggregation using a micro-canonical cascade model: Possibilities to improve the autocorrelation" *by* Hannes Müller-Thomy

Anonymous Referee #1

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The objective of the paper is to compare different versions of a rainfall disaggregation model that aims to produce high resolution times series (10min) from daily time series of precipitation. The versions is applied on a set of 24 recording stations. The main challenge for the author is to reproduce well the autocorrelation that was observed in the measurements.

This issue is obviously of high interest for the specific configuration of hydrological design in rapid response catchments, especially in urban areas. The manuscript however suffers from a number of limitations. The model is very rough and some basic assumptions of it do likely not hold. This make the model likely poorly relevant. On the other

hand, other disaggregation models have been proposed in past years and the present work should at least include some in their comparison (it just compares variants of the present model but those are not really convincing). The description of the model / results is often rough and requires improvement. I could not understand what is done with some model variants and with the "resampling" process.

I would thus suggest rejection with the recommendation for a resubmission after clarification / improvements. For the Editor, it is not comfortable to have a numbering of lines which is reset to zero at every page. A unique numbering would make the review more convenient.

In the introduction, the authors mention that cascade models underestimate autocorrelation. This is not always true. See the comparative study of Hingray and Ben Haha (2005). They present results obtained for different disaggregation models including the so-called pattern-based microcanonical model. The reproduction of the autocorrelation with this model is almost perfect. This model should likely be included in the present work for comparison. Other models mentioned in the introduction perform also relatively well for AC reproduction. The best ones should be at least included in the present comparative work. The author state in their introduction (p.1 – ln 21/22) that "Since time series with 1280 minutes do not exist as observations, these studies [the studies related to the other models] are rather theoretical than practical from an engineering point of view." It seems to be the reason why the author disregarded the related models. This statement does obviously not hold. All the suggested models can be of high practical interest even from an engineering point of view. You just have to push the disaggregation process at the right temporal level (as the author does it actually in the present disaggregation process > disaggregation to 2.5min + reagregation to 5min).

Relevance of the present model: Variant A : in the first disaggregation step, the daily amount is distributed uniformly on the wet times steps (the wet 8hrs time step can be 1, 2 or 3). This is obviously not realistic at all. The model should relax this strong assumption which obviously cannot be validated from observations (or if it can, this has

to be shown) The amount generated at the 7.5min time step are distributed uniformily on 2.5min time steps and then aggregated back to 5min. The uniform assumption is again really strong. Why don't you do the disaggregation to a finer resolution (3.75 min) and then aggregate back (using the same disaggregation model than the one you used for the previous time step) ?

Variant C : Clarify. I can not understand how it works. The scheme of Figure 2 is very unclear. I do not understand at all.

Avoiding time steps with too small rainfall intensities. Two approaches are considered to tackle this issue. This makes the paper rather complex. The results obtained with both approaches differ not a lot. I would suggest to keep only one of both (The one that mimic the measurement device would be likely relevant).

Resampling. What do you do with the resampling step? Please clarify. What is the archive of observed structure you use ? Please clarify. Give perhaps a graphical scheme for illustration. P10 ln 12. Which structure ? what are the volume classes ? P10 ln 16. "Restriction b) is fulfilled by swapping only relative diurnal cycles as time series elements, which does not affect the daily rainfall amount." I do not understand. Clarify. Why should you swap structure from one day to another ? what about the configuration where the rainfall event lasts more than one day ? do you swap 2-days structures ? if no, why not ?

Definition of an event : P4. Ln 23. Why should you define "events". The separation of events is always rather subjective and all results would depend on the separation rules. Here, you consider that "An event is hereby defined as a wet period enclosed by at least one time step without rainfall before and after the wet period." What is the time step there ? This definition seems to be not really relevant if it is 10mn or 1hour... A number of events present intensities interruption. We cannot consider that a break of one or 2 hours makes different events.

Minor comments : P8 : clarify : is model B non preceding model ? model C : preceding

model ?

P9 ln 2 : what is the "so-called non preceding" ??

p7 ln 20 Clarify : how works the bounded cascade

Equation 2 and equation 4 : what is the sum of probabilities ?

How many parameters have to be estimated for each model ? A table is required.

Can you precise what is an event based and a continuous based evaluation ?

P 11. Ln 13-15. This statement has to be justified

P11. Ln 18-19. "The return period Tn=1.5 years is assumed to be representative for typical return periods for dimensioning purposes in urban hydrology (Tn={1, 2, 5, 10 years},". This can not be possible T15 can not be representative of other T.

p11. Ln 23 : the amount of diurnal cycle ? what is this ?

p12. Ln 23 : for the sake of completeness. I do not see why this is completeness there

p13 : what is partial duration series ??? is it a standard terminology ?

p13 : ln 22 : what is "the single out of all n realisations "?

Table 1 : what are AC values (to be given in the table)

Table 2 : can not understand what is presented there

Table 3 and 4 and 5 : which model ? what should be the sum of probabilities ?

Table 4 and 5 : they have the same caption !!!

Table 6 / 7 : what is the variability between stations ?

Reference : Hingray, B., Ben Haha, M. (2005). Statistical performances of various deterministic and stochastic models for rainfall series disaggregation. Atm. Res. 77:152-175.