Dears

Manuscript title: **Precipitation extremes on multiple time scales – Bartlett-Lewis Rectangular Pulse Model and Intensity-Duration-Frequency curves**

The comments are included at the bottom of this report.

This paper demonstrates the use of original Bartlett-Lewis models for simulating rainfall series having precipitation extremes on multiple time scales. I believe it is an interesting paper that confirms some of the problems already indicated for the model used. More is needed in terms of discussion and a clearer extreme-value analysis, possibly involving the examination of other cell intensity distributions and proposed a new version of the model, which they called the Modified Bartlett Lewis (MBL) model.

The original Bartlett Lewis model is proved efficient to explain the rainfall characteristics at all time intervals considered (1hr to 24hr) as explained by several authors such as Rodriguez-Iturbe et al. (1988) and Onof (1992), a major deficiency is its inability to reproduce the proportion of dry periods correctly. To overcome this problem, Rodriguez-Iturbe et al. (1988) proposed a new version of the model, which they called the Modified Bartlett Lewis (MBL) model. Although several studies have pointed out limitation of the original model and suggested some improvements. Onof and Wheater (1994a), for example, introduced a two- parameter gamma distribution as opposed to the original Bartlett Lewis model which considers a single parameter exponential distribution to describe the depth of a cell in order to better capture extreme events. However, the problem of underestimation of the extreme values still persists, particularly for lower aggregation levels, as described by Verhoest et al.(1997). Vandenberghe et al. (2010) found that the models demonstrated a too severe clustering of rain events.

Comments:

I would recommend the paper to be published after addressing some of the following remarks.

I believe that this work could be improved by better demonstrating the advantages of the original and modified models compared to other rainfall generators (for instance, rectangular pulses models better maintain statistics at different aggregation levels), but also give an overview of drawbacks of the model. For instance, Onof and Wheater (1994) introduced a gamma distribution for the depth of a cell in order to better capture extreme events. Verhoest et al. (2010) discusses that problems still remain as infeasible cells (extremely long) sometimes occur. Vandenberghe et al. (2011) found that the models demonstrated a too severe clustering of rain events. Cameron et al. (2000) and Verhoest et al. (1997) found that these models generally underestimate the extreme values, especially for lower aggregation levels. Onof and Wheater (1993) reported problems for return periods greater than the length of the dataset. According to Cowpertwait (1998) this problem could be overcome if higher order properties would be included in the fitting procedure.

Besides of being in mentioned above, the authors could validate whether the same problems occur for their simulations.

2. Section 2

1. line109: "…the weights, $(w_i; i = 1, 2, ..., k)$ which allow more important weight to be given to fitting some sample moments relative to others. Try to give weights given by $w_i = 1/Var(T_i(y))$ where $Var(T_i(y))$ represents the i^{th} diagonal elements of the covariance matrix of the summary statistics.
2. Give more info on the boundary constraints identified for the parameters of original model that contribute to the stability in the parameter estimates. For the original model, the values of λ that are only considered ranges from 0.01 to 0.05.

3. Section 5 Results
1. From results listed in Table 1, it is interesting to observe the higher number of storms with high cell intensity and this is contrary to our prior knowledge about less storm arrivals in dry periods like June. The occurrence of heavy rain in a short duration often induces flush floods in the city area. Form data, it is found the values of cell arrival β based on the original model is smaller with high rainfall intensities, particularly for June. This implies that there is a substantial enough cell overlap which could bring extreme rainfall events. Thus, the occurrence of these realistic rainfall cells, whereas, at the hourly time scale, the annual maxima do not generally result from this model.

2. Please check how the extreme events of the original model look like and compare this to the extremes of the historical series. From this you may conclude what is the problem rather than guessing that it has to do with the nature of the rainfall (maybe it is a shortcoming of the model instead! E.g. Verhoest et al. (2010))