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Geoscientific Model Development Discussions

Interactive comment on "STORM: A simple, flexible, and parsimonious stochastic rainfall generator for simulating climate and climate change" *by* Michael Bliss Singer et al.

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In their paper, Singer et al. present the STORM model, a rainfall generator that simulates convective storms for present and future climates. The model is relatively new (earlier version was presented by Singer and Michaelides in 2017), and here the Authors provide additional information regarding the model setting and operation, alongside with several other improvements (e.g. simulating PET). I believe that many hydrologists and geomorphologists will benefit from having a relatively lite (in terms of computational demands and parameterization requirements) rainfall generator model as the one presented here. The paper is well structured and written. Some further in-

formation on the model is required, to explain the need in a new rainfall generator and to better understand its engine. I have made several minor suggestions and comments that are listed below.

[page line] or [topic/section]

[Schematic flowchart] A figure illustrating the schematic flowchart of STORM might be useful to understand the model architecture.

[Inputs and parameters] Consider summarizing the required inputs and parameters of STORM in a table.

[Introduction] There are some other space-time rainfall generator models that were recently introduced to the scientific community. For example: STREAP (Paschalis et al., 2013), HiReS-WG (Peleg and Morin, 2014), STEPS (e.g. Niemi et al., 2016), AWE-GEN-2d (Peleg et al., 2017) and a recent stochastic rainfall generator that was presented by Benoit et al. (2018). I suggest adding a paragraph briefly mentioning these models (and others that are similar to STORM, if exists) and explaining why STORM is needed and what functions it can fill, what advantages it has in comparison to the other models, etc.

[2 12-15] I must say I disagree with this statement - using reanlysis data, for example, one can get today a good representation of wind and storm trajectories at fine spatial and temporal resolution, e.g. using MERRA product at 50-km and hourly.

[3 17-18] Why there is a limitation for two seasons? Can the model be used with monthly statistics? What about advection? Is it consider or is the storm stationary in space? Some further information about the cross-correlation between model inputs are required. For example, is the storm area correlated with storm duration? The dependencies between variables need to be discussed.

[3 19] Can a storm have multiple "centers" at a given time step?

[3 25] Does it mean that PET has a different set of statistics also for wet and dry

periods? If the answer is no, then I guess that PET is simulated as a standalone module, i.e. with no correlation to the storm. Is that right?

[page 4] I suggest moving this part to the Supplementary Information or as an Appendix. [4 33] I guess the user can modify the temporal and spatial resolution and the ones given here are the resolution used for the case study. Am I right? If so, I suggest it will be explicitly written. Moreover, here you mention the spatial resolution to be 1-km, but in Figure 1 the example is for 500-m.

[5 8] I cannot access the link. Consider adding a table summarizing the distributions that are fitted for each of the variables (can be as supplementary material). Some of this information I see in Figure 1, but it will be clearer as a separate table.

[5 19] v.2017b

[Figure 1] From the "note" onward: I suggest moving this text from the figure caption to the main text.

[8 6+] Some of the text here explains how the model works and is more suitable to be placed in the methodology section that comes before.

[Model evaluation] What about rainfall extremes? For example, does the model reproduce extreme rainfall intensities satisfactory when comparing model simulation to gauges? Moreover - the model simulates rainfall at the minute scale - some analysis should be presented to prove that at the minute scale rainfall statistics are adequately reproduced. Please provide more information on the analysis: how many observed years are there? 43? How many years are simulated for a given realization and how many realizations are composing the simulated ensemble?

[16 5] Varying from ensemble to ensemble. To overcome this - I suggest simulating an ensemble of 50 realizations of 43 years each.

[16 10-12] Belongs to the methodology section above. [Figure 9] Consider plotting the results spatially, i.e. over a map of the catchment. Then one can see if, for example,

the biases are increasing moving toward the catchment boundaries, are depended on elevation, etc.

[19 15] What is 'n' here? The number of rainfall events?

[20 5] Peleg and Morin, 2014 - I think Peleg and Morin (2012) is a more suitable reference here.

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