Dear Florian Ehmele and Michael Kunz,

I have now finished reading your manuscript entitled "Flood-Related Extreme Precipitation in Southwestern Germany: Development of a Two-Dimensional Stochastic Precipitation Model". I found the manuscript interesting and I think the hydrological community will benefit from the advancements in Smith and Barstad's stochastic rainfall model you are suggesting. The manuscript fall within the topics cover in HESS, and I believe that after revising the text the paper can be accepted for publication. Saying that, I have struggled to read the paper till the end. In its present form the text is hard to read and to follow. My main comments are therefore related to the structure and length of the text:

- The text is too long. I suggest moving some of the Tables and Figures to the supplementary material (SI) – see some suggestions in the specific comments below. The same goes to the text itself – some of the descriptions can be summarized in a Table (list of model parameters, for example) and some can be moved to the SI. In addition, the text can be shorten in many places. For example, Section 3 (data sets) could be summarized in a single page (2.5 pages currently). The first sub-section describing the rainfall product can be summarized in two sentences, refereeing to REGNIE and indicating the product limitations.
- There are many replicas in the text that need to be eliminated. For example, Section 2.6 "Stochastic modeling of precipitation events with SPM2D requires the adjustment of appropriate probability density functions (pdfs) to all input parameters…" and in the beginning of Section 5.1 "Stochastic model simulations are based on pdfs that are adjusted to the required parameter…". The text should be concise as possible, especially when the text is of technical nature like in this manuscript.
- Some restructuring is needed. In many cases I thought that information is missing and that the text is incomplete just to realize that the information I looked for is written later in the text. For example, in page 5 line 15 you mention that "R may become negative" and only later (page 6 line 25) you explain that even if it is negative you consider it to be zero. Another example, the model is briefly described at the introduction and then again in Section 2.1. I suggest to follow a simple structure: general introduction, description of the model component, model calibration (general calibration procedure, not tailored to the case study, so readers can understand what input is required and how to calibrate the model), short description of the study area, short description of the data sets, calibration and results of the case study, and conclusions.

Below please find my specific comments to the text. I hope that you will find my comments useful and take my criticism positively. I value your study and I hope they will assist in improving the manuscript.

Best regards,

Nadav

Specific comments

[page line]

[2 1] Actually, IDF curves can be estimated over large areas using gridded information from remote sensing. In recent years there were several advances in this direction. Search, for example, for recent publications by Francesco Marra.

[2 4-6] For more recent studies were rainfall generators were used to compute spatially distributed IDF curves I can suggest the Authors to also consider two recent papers that we (Peleg et al., 2017 and 2018) have published that address this topic explicitly.

Peleg et al. (2017). Partitioning the impacts of spatial and climatological rainfall variability in urban drainage modeling. Hydrology and Earth System Sciences, 21(3), pp.1559-1572.

Peleg, N. et al. (2018). Spatial variability of extreme rainfall at radar subpixel scale. Journal of Hydrology, 556, pp.922-933.

[2 14-25] This paragraph belongs to the method section, where the model is described.

[4 3] Why only stratiform clouds? I see in eq. (1) that the convection component is also consider. I suspect that Eq 1 is not referring to the original model but to the developments you added later. Maybe first describe simply the original model as it, and then added a section explaining the changes you are suggesting.

[4 7] "large scale lifting". What do you mean by that? upward lifting (i.e. omega component)? Isn't that part of vertical convection?

[4 9] "rSPM". If I understand right, you are modifying the original SPM2D model to be a reduced complexity model for some components while adding additional components that were not part of the original model. The fact that you have two names for the same model (SPM2D and rSPM) is confusing. Mention the changes made to the model (can also be given in a form of a table - original model components and the new model components) so it will be clear what is what.

[4 9] "we included two additional precipitation components". Which are not part of the original Smith and Barstad model? If this is the case, then equation 1 should be with only the components originally used in SPM2D and a new equation 2 is to be given with the components of rSPM. That will also resolve my above comment related to the stratiform cloud.

[4 11-13] The sentence is not that clear, please rephrase.

[general comment] Please add a table that summarize the parameters of the model.

[4 15] "is simulated". Simulated how? For each year the total numbers of events and the length for each events are sampled from a given distribution? If so, which distribution is used? Please give more details here.

[4 18-19] I am missing some information here. What is the spatial and temporal resolution of the model? Is the model daily or sub-daily?

[4 30] "sounding data". Can also be estimated from other sources, such as reanalysis data? A matter for a latter discussion.

[Figure 2] What are all the larger/smaller values from zero refer to? For example, for Roro, which arrow is for values larger than zero and which arrow to follow when values are smaller than zero? Rtot will always be larger than zero as only wet events are consider, no?

[5 9] I can understand why the time sacles are constant in time, but why they are constant in space?

[5 15] And is consider negative when embedded in equation 1 or is set to zero?

[6 24-26] OK, that answer my previous question. This should have been mentioned earlier.

[7 4] I do not see it in equation 6. Did you meant eq. 7?

[7 11] Eq. 7. Equation 6 is still on the k,l plane.

[7 15] "whereas Coro is constant over the whole domain". From Fig. 3 it seems that Coro is changing along the x-y plane and is not constant over the whole domain. Is it constant in time? I guesses you meant here to say that Coro is affecting all grid cells in all times.

[8 2-4] This explanation should be moved up, after equation 1 is introduced.

[8 30] The value of Cfront is determined from a distribution? Or is it constant for each season? Depend on the wind direction? Please add information on how the values of Cfront are defined.

[9 10] "Note, however, that the model is not foreseen to simulate purely convection". But, often the most extreme rainfall is (almost) purely convective in nature - isn't that contradict the purpose of this study, to explicitly account for the extreme (200-y return period) rainfall events?

[10 9] "convective cells". It makes sense to follow the cell structure only if the temporal resolution of the model is hourly or sub-hourly (is it? reading so far I couldn't find the information about the temporal resolution of the model), with coarser resolution you cannot detect cells' structure anymore.

[10 12] I get from this that the grid cell size is 1 km? That information should be written somewhere.

[11 3] "the spatial distribution of Cconv randomly varies between the given limits". Why? Anyhow you do not try to capture the spatial structure of the cells, so why adding another level of complexity?

[12 2] March-April-May, MAM from hereon. Same for the other seasons.

[Table 1] Instead of list of distributions that were examined, I suggest having a table summarizing the distribution used for each of the variables.

- Further reading, I see that this information is given in Table 3. I thus do not see the need in having Table 1 (maybe as supplementary material) and suggest to remove it.

[16 6] r refer here to the spatial correlation of a given rain field?

[Figure 7] Can be moved to the supplementary material.

[Figure 9] can be moved to the SI as well.

[21 7-11] There is more than the mean areal rainfall that needs to be consider when comparing maps of extreme rainfall. For example, how well the structure (dimension and location) of the heavy rainfall (e.g. above 50 mm per day) are reproduced?

[26 7] Simulated how? I guess that for a given event the parameters were sampled from the relevant distributions independently. Are the model variables (e.g. the lapse rates) corss-correlated and, if so, is the cross-correlation accounted for in the model (for example, by sampling the parameters from the pdfs using copulas). Please provide more information here.

[new table] I suggest adding a new table summarizing the different models and experiments (rSPM10k, CCLM, rSPM…). It becomes difficult to follow all the names.

[Figure 16] SI