

Interactive comment on “Stochastic daily precipitation model with a heavy-tailed component” by N. M. Neykov et al.

Anonymous Referee #2

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GENERAL COMMENTS

The authors of the manuscript present a stochastic model for generating daily precipitation amounts. The novelty of their work lies in the fact that mixed (hybrid) distribution functions are applied to model the very rare, unique values, i.e. the heavy upper tail of the distribution of daily precipitation amounts. The manuscript does not present a pioneering work since – as it is several times also stressed by the authors – it is based on the former study of Furrer and Katz (2008). Herein, two heavy-tailed distributions are incorporated and their performance is compared with a traditional stochastic model for a given location in Bulgaria. The paper reads well, its formal structure does not need serious comments, the adopted methods are correct and the main conclusion (the novel method performs better than the traditional one) is clear. The results are

C334

supported by a number of tables and figures, quality of which is adequate; they only need minor technical improvements (listed below in section ‘Technical comments’). Therefore, I would recommend the manuscript, after minor revisions, for a publication in NHESS.

My main concerns are in line with the opinion of Reviewer #1. First, the study is presented and the stochastic model is evaluated in the case of a single station, and it is not clear whether it is possible to implement the model in other regions of the country or eventually, at sites with considerably different precipitation regime. Second, the authors should at least discuss the possibility of extending the model towards aggregation times below the daily scale (e.g., hourly precipitation intensities).

SPECIFIC COMMENTS

Lines 48–49 – I would like to see a short comment on how unique the referred rainfall event was in the light of the climate of the country.

Line 112 – Can you please explain why exactly the threshold of 87% was selected?

Line 162 – Can you please explain why the previous day precipitation occurrence was included and not some other covariate? Is it a result of a former analysis?

TECHNICAL COMMENTS

Line 127 – ‘... but there are no strong grounds for applying a varying threshold.’ Nevertheless, you applied the varying threshold though, did not you? This part of the sentence seems a bit confusing for me...

Line 132 – Mistyping: write Table 2 instead of Table 6.

Line 166 – Function $g(x)$ is not explained explicitly (Obviously, it is GP, based on the information on Lines 165 as well as 95, but I suppose all variables should appear in the explanation that follows the equation).

Lines 171 and 172 – The abbreviation GPD is used twice; however, without clarification.

C335

I suggest dropping it and using 'GP distribution' instead.

Line 187 – There are no yearly data in Fig. 5, thus, delete the part '...and for the entire year (lower line plots)'.

Line 190 – Change the word order 'hybrid and'.

Line 207 – Separate 'bottomrow'.

[From now onward, no line specification in the Tables and Figures section]:

In a number of Table captions and Figures, the unit of [mm] is missing: Table 1, Figs. 1, 2, 4, 5, 8 and 9.

All figures: Please remove the titles placed at the top of individual panels of figures. In some cases they contain redundant information (e.g., location Ihtiman), in other cases there are irrelevant (perhaps internal) codes and abbreviations of your simulation procedures. Please clarify these details rather in the figure captions.

Fig. 1 (top panel) seems a bit messy, it does not look like a box-and-whisker plot.

Fig. 1 (caption) – '... shown by month' is only valid for the bottom panel.

Table 4 (caption) – Separate 'gamma(left)'.

Fig. 6 – Vertical (threshold) lines cannot be recognized.

Fig. 6 (legend) – Change 'gpd' to 'GP', in order to have consistent abbreviations throughout the manuscript.

Fig. 7 The dashed lines in the plots are hardly recognizable. Moreover, using grey colour for the individual values of rainfall is not too wise in the upper part of the plots: the highest extremes cannot be really seen, and this evokes the impression that the range of y-axes is not ideally set.

Fig. 8 Can you please specify what is the difference between the individual columns of the figure? Please do the same also in the text of the manuscript, lines 209-211.

C336