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Geoscientific Model Development Discussions

Interactive comment on "Simulation of Extreme Heatwaves with Empirical Importance Sampling" *by* Pascal Yiou and Aglaé Jézéquel

Anonymous Referee #2

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GENERAL COMMENTS

The authors introduce a new method to simulate extreme heatwaves by using a stochastic weather generator, which is adapted to simulate high temperature values with low probability based on importance sampling. Ragone at al. (2017) had shown that importance sampling can be used to simulate heatwaves with numerical models at low computational costs. The present work is based on the same idea, but the importance sampling is implemented in case of a stochastic weather generator. The authors underline the computational effectiveness and flexibility of their method, which can be implemented to simulate also other types of persistent extreme events.

Although I think that the method is a promising complimentary tool to simulate persistent events, I am afraid that the simulated time series become physically less and less

realistic with increasing alpha values. There are obviously limitations of this method which should be handled more carefully.

Overall, the structure of the manuscript is clear, the abstract is clear and concise. I appreciate that the authors mention several caveats of the method and of the used data sets. Nonetheless, the description of the method is not totally and unequivocally clear. Furthermore, the majority of the figures is hard to read, and some figure captions are lacking important information.

SPECIFIC COMMENTS

P2 L9-12: The statement about EVT is too general and one-sided. EVT has been used successfully to estimate extreme temperature and precipitation events also in case of relatively short time series of about 30 years (see for example Zahid et al. 2017), and has the advantage to provide estimates for unobserved events. It is true, however, that EVT is more useful to model instantaneous extremes instead of long lasting events. Thus, the main problem of using EVT to simulate heat waves lies in the temporal persistence of these events.

P5 L28-29: A more detailed formulation would help understanding.

Sec. 3: In Sec. 3.2 K best analogues are mentioned (with K=20), and in Sec. 3.3 as well. Furthermore t(k) (k as superscipt) is used to denote the dates of the K best analogues. However, in Fig. 2 N analogues are mentioned (N=?) and we find t(1), t(i) and t(90). It seems like the notation is not totally consistent.

P16 L6-8: Other climate variables, like precipitation and wind speed, are very different from temperature in terms of their probability distribution and the auto-correlation. Are the authors totally convinced about the applicability of the presented method also in these cases?

TECHNICAL CORRECTIONS

FIG3: error bars and circle markers are not explained in the caption. In the upper left

panel the black line representing the observations is almost invisible.

FIG4: the meaning of the colours red and blue, the error bars and circle markers are not explained in the caption.

FIG5: What is BDOTM? Orange dashed line is almost invisible.

P2-L14: poor English P2-L26: linked to P3-L1: Sec. 3 recalls P14-L2: The optimal Z500 patterns. . . are similar to...

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