Reply to Referee #2

GENERAL COMMENTS

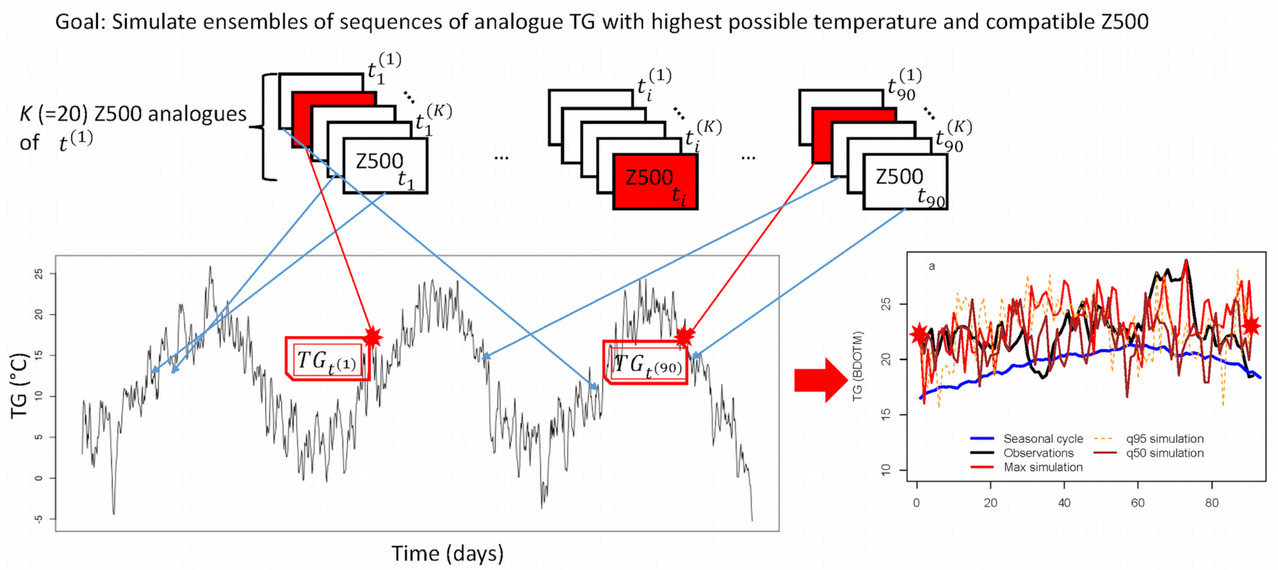
The authors introduce a new method to simulate extreme heatwaves by using a stochastic weather generator, which is adapted to simulate high temperature valueswith low probability based on importance sampling. Ragone at al. (2017) had shown that importance sampling can be used to simulate heatwaves with 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.
Thank you for the general comments. Most of those comments were also made by the first referee (physical realism of the simulations, figure captions, clarity of the method presentation). A better set of parameters was used to make more realistic simulations (i.e. with a seasonality). This is explained in the text and reflects in revised figures. The figure captions now fully describe the features of the figures. Many points on the methodological presentation were expanded and clarified.

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.
Fair enough. The statement will be reformulated.

P5 L28-29: A more detailed formulation would help understanding.
OK. We clarified the formulation.

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 superscript) 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.
The notation will be streamlined: K instead of N in Fig. 2, and care taken to superscripts. See revised figure below.



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?

Prolonged episodes of precipitation are being tested. We leave this to another paper. Short lived events (e.g. storms or Mediterranean events) are out of the scope of this methodology, as pointed out in the manuscript.

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.

Sorry. Red is for "dynamic" weather generator and blue is for "static" weather generator. The boxplots indicate the median, 25th and 75th quartiles. The upper "whisker" classically indicate min(1.5 (q75-q25)+ q50, max(T)). The lower whisker is the symmetrical formulation. This is explicit in the revised manuscript.

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

Sorry. Red is for "dynamic" weather generator and blue is for "static" weather generator. The boxplots indicate the median, 25th and 75th quartiles. The upper "whisker" classically indicate min(1.5 (q75-q25)+ q50, max(T)). The lower whisker is the symmetrical formulation.

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

Berlin-De Bilt-Orly-Toulouse-Madrid. This is now explicit in the figure caption. The orange line will be thicker.

P2-L14: poor English

OK. The sentence is rephrased more linearly.

P2-L26: linked to P3-L1: Sec. 3 recalls
OK.

P14-L2: The optimal Z500 patterns...are similar to…
OK.