Response to Short comments on 'Comparison of occurrence-bias-adjusting methods for hydrological impact modelling' by J. Van de Velde et al.

J. Olsson

We would like to thank Jonas Olsson for his supportive statements on and his interest in the manuscript. He suggested an additional reference. We added several references at the original l. 48.

As various other occurrence-bias-adjusting methods are also available and seem to perform well (e.g. Schmidli et al. (2006), Olsson et al. (2012), Ntegeka et al. (2014)), the goal of this paper is to compare a selection of the available methods and study how they interact with the subsequent intensity-bias-adjusting methods. Most of the common bias-adjusting methods, and therefore also the methods used in this comparison, stem from the quantile-mapping-method family (Panofsky et al.,1958).

F. Tootoonchi

We would like to thank Faranak Tootoonchi for her interest in our manuscript and taking the time to read it and give some comments. We will respond comment-per-comment.

Comment: l 62-63: Maybe better to change to: such as CDF-t which was originally proposed by Michelangeli et al. (2009) and later used in e.g. Vrac (2018)

Response: Thank you for the suggestion, this does increase the readability of the sentence. We have updated the text.

Older quantile mapping methods are also still in use, such as CDF-t, which was originally proposed by Michelangeli et al. (2009) and later used in e.g. Vrac et a. (2018), and standard empirical quantile mapping, used in e.g. Räty et al. (2018) and Zscheischler et al. (2019).

Comment: L 154-155: I do not fully understand what do you mean by moment? Do you mean mathematical moments or time? And if it is the latter, how does it insure a sound comparison during the intensity phase?

Response: What we mean is that both time series are adjusted in the same calculation step (i.e. the moment in time). The sentence has been updated to clarify this.

Third, both historical and future simulations are adjusted during the same calculation step, to ensure a sound comparison during the intensity phase of the adjustment.

Comment: L 159 Why simulated time series must have more wet days than observations?

Response: This is the assumption mentioned in the first paragraph of the previous section (Section 3.1). To clarify this link, the sentence has been expanded:

To overcome the assumption needed by methods such as thresholding that the simulated time series has to have more wet days than the observations, Vrac et al. (2016) proposed the Stochastic Singularity Removal (SSR) method.

Comment: l 286: This sentence is a bit unclear to me.

Response: This sentence was altered in response to the Referee comment by Stefan Lange.

The version of QDM applied in the step prior to the Schaake Shuffle is the same as in Section 3.4. As such, the shuffling procedure is the only difference with the univariate bias-adjustment, implying that differences in performance can be related to it.

Comment: l 332-333: This sentence is a bit unclear to me.

Response: This sentence has been rewritten.

All methods used here, except for SSR and TDA, are deterministic, thus only the combinations of SSR and TDA with ~~respectively~~ QDM and MBCn were simulated 20 times.

Comment: l 368-369: It is a bit unclear to me what is "this" referring to.

Response: The previous sentence has been altered in response to the referee comment by Stefan Lange. Hopefully this change clarifies the link between the sentences

However, in contrast to what is advised for many other quantile mapping methods (e.g. Li et al. (2010)), quantile delta mapping does not explicitly apply extrapolation on the observed time series if the highest simulated percentiles are larger than the largest observed value. ~~This extrapolation is often advised for these percentiles, as their simulated values might be larger than the largest values of the observations.~~

Comment: l. 484: This sentence is a bit unclear to me

Response: The sentence has rewritten.

In general, the discharge simulated by the adjusted climate simulations performs better than that simulated by the raw climate simulations.