Manuscript: The effect of bias adjustment on impact modeling

Major remarks

The authors present an interesting study on how univariate bias corrections of climate model output affect impact indicators that depend on more than one climate variable. They chose two hazard indicators related to heat stress and fire risk to demonstrate to demonstrate the effect of separate univariate bias corrections in comparison with a multivariate method. The latter corrects the dependence structure between the variables in addition to the respective variable distributions. The paper is written well so that I have only a few minor comments.

-   The title seems to be too general. The focus of the paper is on impact indicators that depend on more than one climate variable, and not on impact modelling in general. I suggest revising the title.

-   I suggest citing (in the introduction and discussion of results) Räty et al. (2018) who actually found that in many cases a multivariate bias correction is not necessary (from the hydrological perspective). They stated that "the additional benefit of using bi-variate bias correction methods is not obvious, as univariate methods have a comparable performance. "
    Räty, O.; Räisänen, J.; Bosshard, T.; Donnelly, C. Intercomparison of Univariate and Joint Bias Correction Methods in Changing Climate From a Hydrological Perspective. Climate 2018, 6, 33.

-   The analysis of results (Sect. 3) takes into account relative changes in the bias (reduction by at least 50%, increase). This means that also grid points are included where the bias is small/negligible for impact purposes. Here, a low reduction in bias or even a small increase in the bias would not matter for modelling the impacts. Is there a way of setting a bias threshold that defines the 'acceptable' bias, and then consider only the noteworthy changes on biases above this threshold? This means to include only points in the analysis where the bias before or after correction is above this threshold. I think that such a discrimination is helpful to judge how problematic the application of univariate bias correction is for those biases that matter. One results of the study is that univariate bias correction cannot effectively reduce biases in multivariate hazard estimates when (iii) univariate biases are small. However, if the resulting biases in the hazard indicator are small, this will not matter for the respective cases.

I suggest accepting the paper for publication after minor revisions are conducted.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

Fig. 3
I suggest adding one line that indicate the type of each column for which WBGT and CBI are considered, i.e. RMSE, $\Delta q90$ and $\Delta q95$.

<u>Fig. 4 and 7</u>
I suggest using a discrete colour bar to improve the respective figures.

<u>Fig 5.</u>
It is difficult to identify regions in panel a). I suggest using another colour to indicate the regions, e.g. red.

<u>p.10 – line 21</u>
… period, *as longer* time …

<u>p.12 – line 23</u>
We thank Alex …

<u>p.17 – line 20</u>
… explain *a large* fraction …