

Interactive comment on “The effect of empirical-statistical correction of intensity-dependent model errors on the climate change signal” by A. Gobiet et al.

Anonymous Referee #2

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This study discusses the effect of empirical-statistical bias correction methods (quantile mapping, QM) on the change signals of climate simulations; in fact it has been previously shown that bias correction can alter the mean temperature climate change signal derived from multi-model ensembles in Europe. By means of an analytical analysis of the model error and its dependence on the value of simulated variable, the authors claim that the climate signal is artificially inflated by intensity-dependent model errors. By removing these intensity-dependent errors QM can therefore potentially lead to an improved climate change signal. The manuscript is very interesting and usually well written and deserves publication after some minor corrections:

1) Figure 4: I found the colors used for different lines very confusing (eg Feb, March, Aug and September are difficult to differentiate). I would prefer to group seasons according to a similar color schemes (e.g blue for winter, green for spring, etc.) Also, it is striking to me how the model error characteristic in, e.g., IP (SMHI) changes so drastically from Jan to Feb, passing from a positive to a negative slope. Is there any plausible explanation for that behavior? 2) Figure 5: is the bold line (“ensemble average error characteristic”) the ensemble mean of the individual models’ errors, or the error of the multi-model mean? As in many works it is claimed that the MM mean usually outperforms any single models, would it be possible to show the error characteristic for the MM mean as well? 3) Is there any reference for Eq 2? 4) I have some problems with the notation of eq 6 (and similarly, eq 8) Is Delta Y supposed to be Delta Yi ? And similarly is $cov(s, Dy)$ supposed to be $cov(s_i, Dy_i)$? If the authors chose to change the notation for clarity, they should specify it in the text. Unless I am wrong about the notation, but then I do not understand eq 6, as Dy is not defined in the text, for instance. 5) In fig 8 it is striking how QM and LC give sometimes opposite results. The authors briefly address this point claiming that it needs further analysis. In my opinion, the fact that the QM method applied here uses the same constant correction outside the calibration range is a major point. Would it be possible to perform a simple test (on only one month for only one model) by using a QM method with a linear correction even outside the calibration range and to compare it with both the original QM and the LC?

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