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Hydrology and Earth System Sciences Discussions

Interactive comment on "Climate model bias correction and the role of timescales" *by* J. O. Haerter et al.

Anonymous Referee #3

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1 GENERAL COMMENTS

The paper "Climate model bias correction and the role of timescales" submitted by J. O. Haerter, S. Hagemann, C. Moseley, and C. Piani presents the impact onto different time scale statistics as a consequence of unbiasing model outputs. They show that this impact is likely to be negative. They consequently propose a correction methodology working simultaneously on several time scales, namely the "cascade bias correction". They apply it on two different time scales, monthly-daily, and on three different time scales (three tier cascade), monthly-daily-hourly.

In the context of a more and more extended use of climate projections, the question of model output correction is of prime interest. Seasonal, monthly or daily time scale

fluctuations are generally not governed by the same process and therefore not solved in the same way by models.

Thus, the manuscript reviewed here is undoubtedly of scientific significance and the methodology proposed to address the problem, despite some limitations, an interesting step forward.

Reading this manuscript I however have some important concerns that drive me to ask the paper to be reconsidered after major revisions detailed in the Specific comments section.

I qualify the revisions of major since they imply (i) some restructuring of the paper, essentially due to its length, and (ii) some necessary clarifications : discussion about extremes, qualification of the method ("bias correction"?), relation between time scales.

2 SPECIFIC COMMENTS

2.1 Is it "bias correction"?

I would say "not only".The correction method does unbias the model but it also works on fitting the whole distribution. It is in fact a "quantile-matching" methodology such as in Deque (2007) that would be added in the reference. The method should then be qualified as model output statistical correction or statistical downscaling.

2.2 Length

The paper could benefit of shortening/removing some sections. Since the method is based on Piani et al. (2010), it is not necessary to explain it again (ch. 2) but to refer to this paper and to shorten the section.

This paper is submitted in an hydrological review, why not focus on precipitation only (even if temperature is of importance) and on non-gaussian distributions? Moreover, one doesn't need quantile matching to fit two gaussian CDFs (mean + standard deviation are enough).

I am not sure that the presentation of the energy balance in the Discussion section is necessary. I would remove this section and say a few words about it in the conclusion.

2.3 Extremes

As written in the first sentence of the introduction: "One of the greatest challenges facing modern society in a changing climate is the management of risk associated with hydrological extremes, namely ïňĆoods and droughts". But, even if the correction method presented here can deal with any distribution (non-parametric method), it works with the entire distribution. Hence, it is certainly not suited for extremes (focus on distribution tail, use of GPD...). It is important to stress that point.

2.4 Relation between scales

The correction method works separately on the different time scales, but phenomenons of different time scales are often closely related: e.g no rain events (short range time scale) over northern europe during strong euro-atlantic blocking regimes (medium range time scale). A short discussion on this topic and how to deal with it should be interesting.

2.5 Other comments

p.7875, l.5: replace "relative variables" by "anomalies".

p.7875, l.17: authors switch from subscript i,j to l,k. Why ?

p.7876, eq(6): replace T'ˆcor_l,k,h by T"or_l,k,h.

Deque, M., 2007: Frequency of precipitation and temperature extremes over France in an anthropogenic scenario: Model results and statistical correction according to observed values, Global Planet. Change, 57, 16–26.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 7863, 2010.