Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Multivariate bias adjustment of high-dimensional climate simulations: The "Rank Resampling for Distributions and Dependences" (R^2D^2) Bias Correction" *by* Mathieu Vrac

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Received and published: 14 February 2018

The paper presents an adaptation of the EC-BC (Empirical Copula Bias Correction) method previously introduced by the same author. EC-BC aimed at bias adjusting climate model simulations in a multivariate way (tackling spatial and inter-variable correlations), taking advantage of the Schaake Shuffle. Its main drawback was that the temporal evolution was then forced to follow exactly that of the observations used for the correction. The new R2D2 approach presented here is designed to tackle this problem.

The methodology is clearly described and carefully tested, and sounds attractive. I recommend the publication of the paper. Some points could be clarified.

1) The 1-dimensionnal CDFt bias correction is applied for both temperature and precipitation. Maybe just remind how precipitation occurrence is treated in the case of precipitation, although it is described in the reference (Vrac et al. 2012).

2) Experiment design: the defined winter and summer seasons are 6-month long, which, at least for temperature, still includes some seasonality. Considering months rather than seasons would probably have been better adapted to the distribution estimations, but I am aware that only 15 years for the calibration and validation periods is quite short. Do you think this could lead to better results?

3) Inter-variable correlation: as Spearman correlation is rank based and the correction too, maybe it should be better to check this point for another correlation type.

4) The difficulties linked to the use of PCA in the context of spatial correlation is properly discussed and handled. Could another technique, based on classification for example, have been used instead?

5) The results show that temporal correlations are diversely reproduced, and that the choice of the reference dimension has an impact

a. ERA-I and SAFRAN represent both observations of the same time period, and thus reflect the same temporal evolution. It could be interesting to see how the temporal dynamic is handled by the corrections. The temporal dynamic may be important for impact studies.

b. Can we imagine a way to choose an optimal, or at least some preferred, reference dimension? Could some temporal indicator be of some help? It would probably mean further investigations beyond the scope of the paper, but some thoughts could be added

Typos:

p6 l15: "wad" is written instead of "was"

p7 l12: "of the others steps" instead of "of the other steps"

p13 l19: "inter-site ad temporal perspectives" instead of "and"

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