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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Stochastic bias correction of dynamically downscaled precipitation fields for Germany through copula-based integration of gridded observation data" *by* G. Mao et al.

Anonymous Referee #2

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The authors have submitted a paper in which precipitation fields are rescaled based on copulas. While the idea is interesting (something similar was already published in HESS by van den Berg et al., 2011), it does not really make use of the advantages of copulas. Basically, van den Berg et al. perform a rescaling where the intra-pixel variability in a coarse scale observation is estimated based on copulas (leading to the pdf of the expected rainfall within one coarse scale pixel). In this paper, more or less the same is done, except that the mean or median of the pdf is used as estimation of precipitation value. So, the total information of the pdf is lost, and actually, one obtains

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a relation between the expected mean (or median) and an observation (the copula indeed corrects for bias). Actually, what is thus obtained is a kind of non-linear regression between REGNIE and (bias-corrected) WRF. My question then is: why should one go through copulas and shouldn't any kind of non-linear regression be done immediately? Why do the authors throw away all information within the conditional CDF obtained from the copula? Why did the authors rescale the REGNIE to 7 km and didn't they keep the 1 km scale (and then follow van den Berg et al?), as it is perfectly possible to compare different scales using the proposed framework.

some specific questions:

page 7195, line 15: why only consider parametric functions?

Figure 2 shows the density, while the paper is referring to cumulative probabilities (so c versus C)

page 7198, lines 24-25: it is not clear to me why step 6 is needed as in the end only the mean (or median) is used: this could be determined right away instead of first a random set from which the mean (or median) is calculated.

page 7199, last paragraph: operationally, you should also apply it to the (0,1) case, as you have no idea whether the REGNIE-data is 0 or 1.

page 7199: what are the proportions of (0,0), (1,1), (0,1) and (1,0) within the data used?, Is it also possible to show a scatterplot of observations versus RCM?

page 7202", line 7: the Frank copula also allows to model negative dependence.

page 7203 line 10: here you actually could do the same with a non-linear regression

page 7203, line 18: does this hold if you look at the blue line?

References: van den Berg M.J., Vandenberghe S., De Baets B., Verhoest N.E.C., Copula-based downscaling of spatial rainfall: a proof of concept, Hydrology and Earth System Sciences, 15(5), 1445-1457, doi:10.5194/hess-15-1445-2011, 2011.

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