

Interactive comment on “Trend-preserving bias adjustment and statistical downscaling with ISIMIP3BASD (v1.0)” by Stefan Lange

Anonymous Referee #1

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This paper presents the development, implementation, and evaluation of an evolved and generalized bias correction method tailored to the ISIMIP. The method is a significant evolution from its predecessor because it separates the bias correction (BC) and statistical downscaling (SD) portions explicitly, accounts for likelihoods of individual extreme events, and recasts the BC of individual variables in one single formalism. I have carefully read the specific choices for each of the 10 corrected variables and I find them to be reasonable and in line with best practice. For example, the use of upper and lower bounds and upper and lower thresholds is a logical extension of the common dry-day correction for precipitation. Similarly, the choice to draw random numbers from a power law rather than a uniform distribution (for those variables that require it) is an intelligent improvement. The same can be said about the introduction of the Logit function. The

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paper is well written, as succinct as possible and exhaustive. The illustrations are all useful and clear. I find that this work should be accepted after the author addresses a few minor issues. 1) If I understand correctly, the author uses univariate bias correction for the coarse grid. I accept that this is a progression from the former bias correction method (ISIMIP2) but, since the author does use MBC with an added conservation step (MBCnSD) for the fine grid, could this method not be applied to the coarse grid to begin with? Would the method not be far simpler? I would be interested in the author's reason for using univariate BC for the coarse grid. 2) The cross-validation is done by training on even years and validating on odd years (in a second step validation and training years are swapped). I would have divided the observational time-period in 2 consecutive and non-overlapping periods. The first for observation and the second for validation. This would allow for longer-term climate variability to be represented in the cross-validation effort. I think the author should write a few words explaining why his choice of cross-validation time periods is optimal.

Other minor issues: Page 2, line 16) The author claims to develop a new quantile mapping method that allows for controlled adjustment of biases in all quantiles. As far as I know, most QM bias correction methods do just that. Have I misunderstood something here? Page 4 line 26) “. . . tasmax, and tasmin are not adjusted directly. Instead, I adjust biases in pr and prsnratio. . .” The author passes, here and in other parts of the article, from a passive to an active (first person) voice. I suggest he chose one or the other. Page 7 line 19) x should be $x_{\text{hist}}^{\text{obs}}$, am I right? Also, y needs indexes as well, I think. This should be the case in all the math that follows. I understand that the author is trying to keep the formalism light. I suggest then that the author state that, in what follows, x is actually $x_{\text{hist}}^{\text{obs}}$, etc. . . Caption figure 4) 3rd Sentence : Panele (c-j) should perhaps be (c-f)? Page 12 line 8/9) Write “instead of conservative” in the place of “and not conservative”. Else it is not clear that we are comparing bilinear with conservative methods.

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