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Discussions

Interactive comment on "Impacts of climate change on temperature, precipitation and hydrology in Finland – studies using bias corrected Regional Climate Model data" *by* T. Olsson et al.

Anonymous Referee #2

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The authors apply different versions of the DBS method to bias-correct gridded daily precipitation (P) and temperature (T) data over Finland from five RCM projections. Also wind speed (WS) and relative humidity (RH) were bias-corrected, but with simple monthly adjustment factors.The bias-corrected data were used to drive the WSFS hydrological model system, and results were extracted for four catchments in different parts of the country. The results indicate that if the bias in raw RCM is large, a large bias may remain and trends may change after the application of DBS. The impact of DBS version is generally quite small.

General comments:

Today's RCM bias-correction methods certainly need further evaluation and development, and in that sense the paper is a welcome contribution. It is overall clear and well presented and technically the methods used and results obtained appear OK. My main issue with the paper is that I find the novelty and the new significant knowedge acquired rather limited. The need for bias-correction of RCM data for hydrological impact studies in Finland has been demonstrated in a similar fashion previously. Thus I do not see much added value in the comparison between uncorrected and corrected data done here. Also the future changes in P, T and discharge (Q) have been assessed previously. Then other bias-correction methods were used, but among them is the empirical quantile mapping which is likely to produce a similar result to DBS on the seasonal patterns in focus here (this is confirmed on l.24-26, p.2680).

As the DBS method is becoming rather widely used, it is indeed of interest to evaluate it and specifically reveal its limitations. The authors use different versions (1) with/without T-dependency on the wet/dry state and (2) with single or double gamma for P. These are, as I see it, method options. Which options that work best for a particular data set is of course interesting for the application itself, but of more limited general interest. But the discussions about the effects of model choices in terms of e.g. sample size for distribution fitting and distributional discontinuities are interesting. And the impact of the bias magnitude on the trends is a significant finding.

Bottom line: I think the work needs to be taken a bit further to be of more general interest for the scientific community. Some suggestions:

- Use the model selection analysis (condensed) as a starting point for further analysis of the performance of the selected model version.

- Concerning further analysis: It is written (p.2662, l.6-8) that a second paper will focus on extremes, this could well be done already here. Another possibility would be to look at not only annual Q cycles but also other variables in the hydrological model (snow,

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ET, soil moisture, runoff components etc.). Bias correction of P and T by distribution mapping generally produces a good annual Q cycle but other other variables may be less well reproduced, this issue needs more attention.

- Substantially reduce (or even omit) the results from non-corrected RCM data, highlight only any significant differences from previous results.

- Similarly concerning future changes, highlight only any significant differences from previous results.

Some specific comments:

- Section 2.2: Justify why these RCM projections were chosen.

- Fig. 6 should appear before Fig. 7 in the text.

- Results generally: In the presentation of the results, sometimes one catchment is used, sometimes two. Some justification for this choice would be good (e.g. influence of lake, etc). The same goes for the selected projections. All five projections are compared until Fig. 6. From Fig. 7 and on, individual projections (or a subset) are used instead of all five. Maybe you can focus on one projection and then give a general overview using all projections. Or better justify the choice of projection, period, etc.

- Fig. 6: How come the observations are different in each panel?

- Conclusions: Most of this section is a summary, either rename to Summary and conclusions or include only conclusions.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 2657, 2015.