Reply to Mr. Uwe Ehrets comments (in blue):

General evaluation

The study has been done thoroughly, the methods are appropriate and all conclusions are supported by the data. I particularly welcome that the authors state at p.10227/line 18-24 that results of Climate Change Impact Studies should be provided with and without BC to give the end user information about the impact of BC.

There is only one point I want to raise: What would be a justification for adopting the second of the proposed viewpoints in the conclusions (It is safe to use BC)? If we follow the principle of parsimony, then adding a model component without a clear justification and clear benefit with the only justification that it is safe to use makes no sense.

The benefit of still using bias correction is that end-users often require both a reference scenario that is coherent with observation and a future scenario. In this case, bias correction need to be used on both to fulfill their needs and remain consistent. Of course, if it is not needed for change signals, BC should not be used.

Minor comments

10206/18: This sentence suggests that BC is done on the output of HMs (which is not the case). I suggest reformulating this.

OK, replaced with "Therefore, biases in those outputs are often corrected to facilitate the reproduction of historic runoff conditions when used in hydrological models, even if [...]"

10208/13: You may want to add here

Haddeland, I., Heinke, J., Voß, F., Eisner, S., Chen, C., Hagemann, S., and Ludwig, F.: Effects of climate model radiation, humidity and wind estimates on hydrological simulations, Hydrol. Earth Syst. Sci., 16, 305-318, 10.5194/hess-16-305-2012, 2012.

Good idea! Yet, we introduced " The correction of other climate model variables (radiation, wind and humidity) seems to have less impact on hydrological climate change projections (Haddeland et al., 2012)" when discussing bias correction issues in 10210/7.

10210/14: Please explain in mire detail how the deltas are usually calculated. Also the passage '… to modify observed meteorological data..' can be misunderstood (the observations are not corrected) Please reformulate.

True, so we modified this to: "Bias correction of RCM outputs typically make use of one of two general approaches: Extracting deltas (differences between a future and a reference period) to be applied on observed meteorological data in order to construct future time series, or [...]"

10210/28: Please note the new reference for Ehret et al. (2012) ...

Of course!

10211/8: 'Additive factors' is impossible (either additive or multiplicative) ⓘ please reformulate

True, so we replaced it with "monthly additive correction."

10214/1-4: Please explain the method to derive 7LF2 in more detail. I did not understand it.

Maybe the following describes its better: "7-day duration Low Flow with a 2-year return period (7LF2): an (seasonal) indicator of long term low flow sustained over a period of 7 days. It is computed using a 7-day moving average of runoff and finally the 2 year return period of its minimum yearly values assuming a Pearson III distribution is analyzed (DVWK, 1983).

10217/1-4: Briefly explain the interpolation method for the observations. Was this also done with SCALMET?

No, it was not interpolated with SCALMET, because gridded datasets were available as outlined in 10218/14-19!

10217/10 and table 1: What are the perturbations of the CRCM and RACMO model runs? Perturbations of the Pilot GCM or the RCM?

We agree this is never specified, so we added after "Driving data for those models are outputs of the global climate models CGCM3, ECHAM5, HadCM3 and BCM." on page 10216 line 10 the sentence: "When multiple members are mentioned, they correspond to multiple runs of the driving models."

10221/9: Instead of 'complexity', I suggest 'realism' (as the justification of distributed models is not to increase complexity, but realism)

Yes, no objections.

10222: Header of section 3.2: I suggest 'Does bias correction of atmospheric forcing provide a more consistent representation of river runoff?' to make clear what is corrected.

Agreed.

10242/fig 7: For easier interpretation, I suggest to add indicators of the ensemble means.

Instead of the mean, a horizontal bar for the ensemble median was added to figures 7 and 8, because it is used in order to compare results with the statistical test of Wilcoxon. Below fig. 8 is shown.

All in all, thank you very much for your constructive comments! We think with your help some parts of the paper could be clarified and improved!
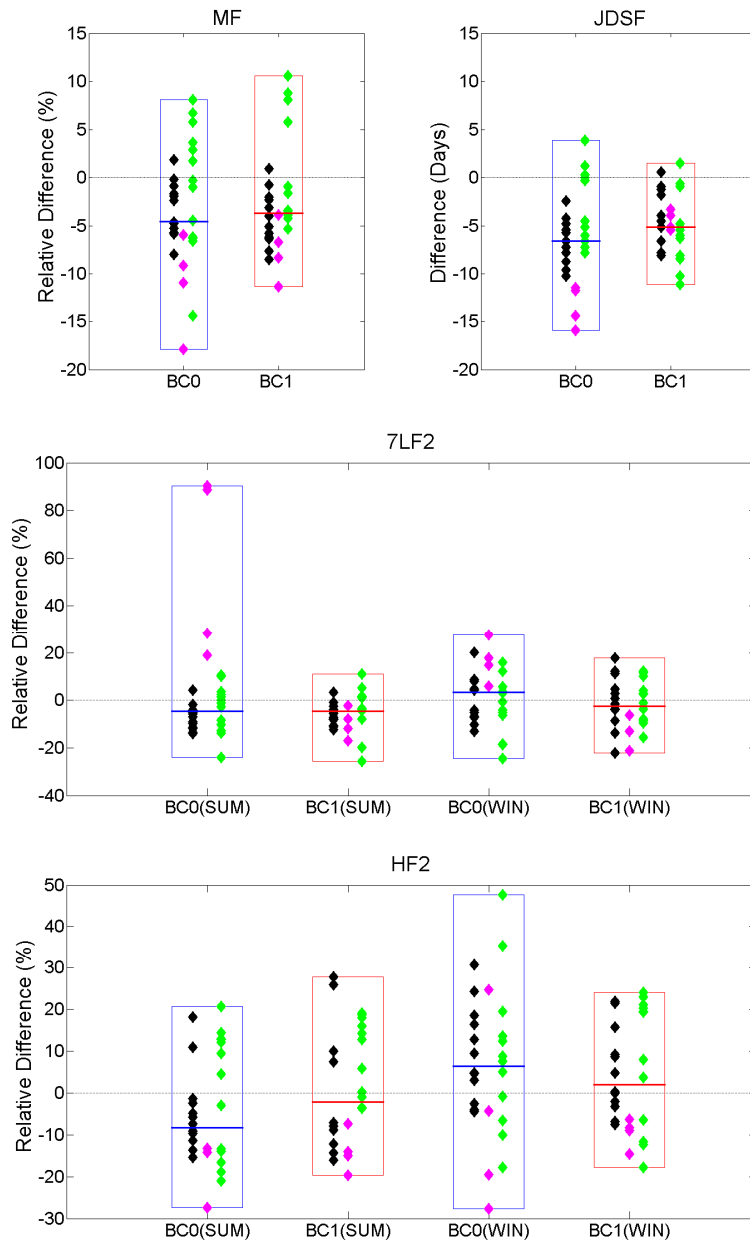
Yours,

Markus Muerth and co-authors

Fig. 8: Relative change of the indicators between reference and future period at Schlehdorf. The black dots indicate the RACMO simulations driven by ECHAM. Green dots specify RCA simulations driven by different pilots (BCM, ECHAM & HadCM); pink dots indicate the CRCM-CGCM simulations; horizontal bars indicate the median of all dots.