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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Senstitivity of water balance components to environmental changes in a mountainous watershed: uncertainty assessment based on models comparison" *by* E. Morán-Tejeda et al.

E. Morán-Tejeda et al.

enriquemoran@gmail.com

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Referee comments: I thank the authors for their response to my evaluation. I would like to shortly comment on two points:

Bias correction. It seems that this will be better explained in the revised version. However, I would like to make the authors aware that the bias correction is not the only procedure possible and the discussion about bias correction in climate-hydrological models is quite lively. There are different methods for bias correction and they yield different

results, see for instance Watanabe, S., Kanae, S., Seto, S., Yeh, P. J. F.,Hirabayashi, Y., & Oki, T. (2012). Intercomparison of bias correction methods for monthly temperature and precipitation simulated by multiple climate models. Journal of Geophysical Research: Atmospheres (1984–2012), 117(D23) or White, R. H., and R. Toumi (2013), The limitations of bias correcting regional climate model inputs, Geophys. Res. Lett., 40, 2907–2912, doi:10.1002/grl.50612 ; Rasmussen, J., Sonnenborg, T. O., Stisen, S., Seaby, L. P., Christensen, B. S. B., & Hinsby, K. (2012). Climate change effects on irrigation demands and minimum stream discharge: impact of bias-correction method. Hydrology and Earth System Sciences Discussions, 9(4), 4989-5037.

Authors: We thanks again the referee for his/her insights and we will go through those cited papers to improve our understanding on bias correction. However, we still want to stress that we did not perform bias correction of climate models, as our "delta method" (calculating differences between sub-periods in RCM outputs, and applying this differences to the observed climate) prevented the biases to be propagated in the analysis.

Referee: The description of Figure 3 is still not completely clear to me. The RCM simulation has been driven by global model simulations starting in 1950. Since these simulations do not include assimilation of observations, the modeled interannual variability is disconnected from the observed variability. In other words, if we would correlate the annual means of modeled and observed variables this correlation would be close to zero. The only connection between observations and model results is caused by the annual cycle and by the possible externally forced long-term trends. What does Figure 3 exactly show ? Does it show the correlation between modeled and observed variables over the mean annual cycle, i.e. a sample size of 365 ? It would not make much sense to calculate the correlations of the daily (or monthly) values over the whole observational period 1950-2010. The correlation of the de-seasonalized variables should be close to zero. This figure is poorly described in the text and in the caption - and also unfortunately in the author's response

Authors: The referee is totally right, and the correlation values displayed in Figure 3

are due to the intra-annual cycle, whereas correlation of yearly values is nearly close to zero. In the previous response we made clear that the Taylor diagram was based on monthly data (monthly values from 1961-1990). But if it is still not clear, we change again the caption and description of the figure so that is completely clear:

"Figure 3. Taylor Diagram showing the statistical agreement of the three RCMs with the observations, for minimum temperatures (Tmin), maximum temperatures (Tmax) and precipitation (Pcp). Data compared are monthly series for the control period. The statistical criteria for comparison include standard deviation, Pearson's correlation, root mean squared (RMS) error, and percent bias. Observations refer to the average of the 15 climatic series located within/near to the watershed. RCMs refer to the models output for the 25 km2 pixel lying on the watershed. Diagram elaborated with R package "openair""

We must say, though, that this figure does not have any analytical implication on the results, and it was only included for informative purpose to show the statistical agreement/disagreement of observations with RCMs. If the outputs from the RCMs had been used as inputs into the hydrological models, the errors displayed in the Taylor diagram would be of critical importance for interpreting the results. But once again, we only used the changes in precipitation and temperature projected by the RCMs, thus the statistics shown in the diagram are merely informative.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 11983, 2013.