Manuscript: Assessing climate change impacts on daily streamflow in California: the utility of daily large-scale climate data, E. P. Maurer, H. G. Hidalgo, T. Das, M. D. Dettinger, and D. R. Cayan, *Hydrol. Earth Syst. Sci. Discuss.*, 7, 1209-1243, 2010

Responses to referee comments (original comments in normal type, responses in *red italics*):

RC C158: 'New statistical downscaling method for large scale daily climate data used in hydrological impact studies', Anonymous Referee #1

Overall comment

The relevance of this study is very clearly described in the introduction. The study is a follow up of a previous studies of Maurer and Hidalgo and it can't be read without Maurer and Hidalgo (2008). The result is a compact description of a study that provides new results of interest for HESS in the scope of hydrological climate impact studies.

I feel the following points still need to be addressed:

1. In the introduction it is stated that the BCSD method works under the assumption that climatological intra-monthly variability does not change, while in reality it does change. In the evaluation of the different methods the focus is on low-flow, peak-flow and change in regime. But how well is the inter-annual and inter-monthly variability reproduced by the different methods. Might this be another criteria to confirm that the BCCA method outperforms the other methods?

We added a new Table 2 (the earlier Table 2 is now Table 3), and added two additional statistical tests to assess the role of interannual variability in the performance of the different downscaling methods. The new Table 2 and related findings are discussed in the first paragraph of section 3.2 of the revised manuscript. In summary, we find that differences in simulated flow distributions are due more to shifting central tendency than changing interannual variability.

2. page 1220, line 14-15: "the constructed analogues are than developed on absolute values". Although the CA method is clearly described in the cited paper (Maurer and Hidalgo, 2008), it would be helpful to give a short explanation of this step to make the BCCA method better understandable.

A summary of both BCSD and CA have been added to the first paragraph of section 2.2 of the revised manuscript.

3. In the CA part of the BCCA method a relation is made to large-scale predictors. Are predictant values of a single day related to predictor values of the same day, or has a period of multiple days been considered? One could expect that the value of the predictor influences the predictant value a few days ahead. Is it more important to take into account multiple time-steps when working with day-values instead of month values?

The revised manuscript now clarifies this. In the expanded first paragraph on Section 2.2 we now state that a moving window of +- 45 days around the target day is used in building the library to be used in constructing the analogue.

4. In section 3.2, page 1224, line 20 the suggestion is made that the difficulty in matching low flows is related to bias in the large-scale reanalysis. Does the author have any idea which variables this concerns and why these biases are not accommodated by both methods?

The discussion of Figure 8, in the third-to-last paragraph of section 3.2, has been expanded to clarify our interpretation of this. We reference other studies that have identified low flows in particular as problematic, and especially sensitive to errors in large-scale precipitation that is downscaled for hydrology. More importantly, the revised paragraph clarifies that while the one year depicted in Figure 8 shows a late season error in recession simulation, Figure 5 shows that, especially for BCCA, the seasonal flow timing is very well represented in general.

Minor comments:

5. Table 1. It would be interesting to see the elevation of the gauges to get an impression of snow influence, otherwise use a map that shows the elevations in Fig. 1.

Table 1 now includes the basin-average elevations for all gauges used in this study.

6. page 1211, line 17, typo: should read 'the downscaling procedure is'

7. page1214, line 21, typo: should read: 'In addition, the data'

8. page 1215, line 9, typo: should read 'comparable to recent GMCs'

9. page 1216, line 3, typo: should read 'there are also changes'

10. page 1216, line 23: patterns is patters

11. page 1218, line 1: should read 'large scale skill is well established'

12. page 1222, line 24: is this correct "4.5 6oC" ?

Thank you for pointing out these unfortunate oversight. They have all been corrected in the revised manuscript.

13. Fig. 7 and 9: Please repeat legends in figure and skip links to Fig. 7 in Fig. 9.

As suggested, we have added the legend to Figures 7 and 9.