

Interactive comment on “Hydrologic extremes – an intercomparison of multiple gridded statistical downscaling methods” by A. T. Werner and A. J. Cannon

Anonymous Referee #2

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General comments:

In their study the ability of seven different statistical downscaling methods is analysed to replicate properties of climate and hydrologic extreme indices. For this purpose, the authors are using different statistical tests and a split-sample validation approach. Four different reanalyses products are used as climate surrogates, which are downscaled to two gridded observational data sets. This is an interesting study, which is of certainly useful for the readers of HESS.

Overall, the quality of the paper is good, however, I think that mainly the methodological

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section needs significant improvement before publication. Since this may also require a repetition of statistical tests and rewriting of parts of the results, I recommend “major revisions”.

Major issues:

The description of the statistical tests (section 3.6) needs improvement:

- The test for “Pearson’s correlation” is mentioned (L6, page 6194), however, I do not understand at all. I guess the authors mean the test of significance for the calculated Pearson correlation coefficients. If this assumption is incorrect performed the author’s will have to clarify how this is done. Additionally, this is procedure assumes that the variables follow a normal distribution. I doubt this is true for the extreme indices this study focuses on.
- Similarly for the KS-test. The authors should at least provide information about the hypothesis, which are tested, the level of significance under consideration, etc.
- The Walker field significance test. I have no knowledge about this test, and I think the authors should give much more details about the test than a single reference only. It seems that this test is only rarely applied in hydrology and climatology.
- Likewise, the presentation of the results of the tests confuses me, i.e. mainly Table 6 – 12, Figure 7 and 9. In the captions of the tables, the “number of test passed” are mentioned, or “similarity in the distributions” is mentioned. Since the tests are not explained in detail in the methodological section, I have difficulties to follow. I also doubt that the number of tests passed is a good indicator, and I am wondering if the grid cells that passed the tests are somehow clustered in space, depending e.g. on the terrain. What do you mean by similar distributions? Is it the same family of a distribution with slightly different parameters?
- In Figure 7, you can obviously have dark and light grey boxes, but what does it mean?

Minor issues:

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- Reading the abstract is quite difficult due to the abbreviations, which are mostly quite similar (line 13-15). I suggest to leave out the abbreviations in the abstract. A table explaining the methods in brief at the beginning of the methods and including a list of the abbreviations would be very helpful for the reading process.

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