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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Higher statistical moments and an outlier detection technique as two alternative methods that capture long-term changes in continuous environmental data" *by* I. Arismendi et al.

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We provide a revised MS in a supplementary file - see link at the end of this document

1. In general, the paper is well referenced, logically presented, and the figures support the results. The methods suggested are potentially useful for many and are described in a manner that makes it easy to see the application. Improvements can be made with more careful wording related to the statistical methods, some additional references,

and some simple changes to the figures and tables.

R: We would like to thank Reviewer 1 for a thoughtful and constructive revision. In the new version of the MS we addressed all of the concerns from the reviewer and we incorporated the suggested modifications to the figures and tables. In addition, we modified the wording related to statistical methods and we completed the list of references.

2. The formula used for skewness is not simply the third standardized moment. It is the adjusted Fisher-Pearson standardized moment coefficient. The authors should state this, reference it, and perhaps tell potential users of the methods they are proposing why this version of skewness is desirable.

R: We are aware that in large samples, the differences in definition are unimportant, but for small samples very different values of skewness and kurtosis can be obtained by using the various existing definitions. We clarified this in the text as follows "Although time series of environmental data may include large datasets often they are incomplete due to missing values and errors. To account for a potential bias inherent to incomplete time series or in cases of small samples sizes, we used the sample skewness or adjusted Fisher-Pearson standardized moment coefficient and the sample excess kurtosis (Joanes and Gill 1998)."

Reference Joanes DN, Gill CA (1998) Comparing measures of sample skewness and kurtosis. Journal of the Royal Statistical Society (Series D): The Statistician, 47, 183-189.

3. Likewise, different statistical packages compute somewhat different versions of kurtosis. This appears to be closest to that of Sheskin, D.J. (2000) Handbook of Parametric and Nonparametric Statistical Procedures, Second Edition. Boca Raton, Florida: Chapman & Hall/CRC. The authors should verify this, state the version of kurtosis used, and reference it.

R: We addressed this comment in the response above.

4. Regarding the description of the Cramer test of whether or not the skewness coefficient is different from 0, the null hypothesis is misstated. The authors say "... we could not reject the null hypothesis that the distribution was skewed ("non-significant"). The null hypothesis is that the skew is equal to 0 (symmetric; Cramer, 1998). For parallel construction, the null hypothesis for the excess kurtosis should also be stated, that excess kurtosis is 0, or the distribution is mesokurtic (Cramer, 1998).

R: Based on the comments from Reviewer 2 we decided to remove this analysis in our revised MS.

5. The manuscript is generally well reference, however, there should be a reference for non-metric multidimensional scaling (N-MDS) unconstrained ordination when it is first discussed in section 2.3.

R: We have added a proper reference to this section.

6. I could not find a reference to figure 4 in the manuscript but did find a reference to figure 4 of the supplement. Because the supplemental figure is what was discussed, fig. 4 manuscript and fig. 4 supplement should be switched.

R: In the revised version, we moved figure 4 and 5 from the Supplement to the MS.

7. Results are discussed in terms of unregulated and regulated streams. To better highlight these important differences, all figures and tables (where relevant) should distinguish between regulated and unregulated sites. This would be very helpful for the reader. For example, in table 2, a line could be added between sites 5 and 6 with spanners indicating sites 1-5 are unregulated and sites 6-10 are regulated. Figure 1 for example, should have the term unregulated placed in 1b and the term regulated in 1d. That way at a glance, the reader could see the difference without reading the extensive caption.

R: In the revised figures and tables, we have incorporated this information to improve

their clarity and visualization.

8. For figure 1, the plot in position c is discussed first, and then the plot in position a - this happens on both pages 6 and 7. It flows better for the reader if the plot positions in figure 1 were switched so that the one in position c now becomes the one in position a, then the text can refer to a first. Also, currently a and c are paired and b and d are paired. Pairing a and b, then c and d is a more natural way of presentation, as is reading left to right. Organizing and labeling the figure as a in the upper left (higher kurtosis, positively skewed), b in the upper right (lower kurtosis, negatively skewed), c in the lower left (unregulated cluster), and d the lower right (regulated cluster), would be easier for the reader to follow.

R: This is a good point. In the new version of the MS, we have changed the layout of the plots for figure 1 to facilitate the reader to follow.

9. The authors are careful to document the stress in figures 4, S3, and S4. However, they do not provide enough information for readers to be able to interpret that value. For example, looking at the HDR boxplots with stress values of 0.17 and 0.16, they can have rather different shapes. Therefore, a sentence or two describing how stress was calculated would help.

R: In the new version of the MS we added a more comprehensive explanation about the stress. We added the following wording “The Kruskal’s stress value is estimated as the square root of the ratio of the squared differences between the calculated distances and the plotted distances, and the sum of the plotted distances squared (Kruskal 1964). A rule of thumb (Clarke 1993) suggests the following benchmarks: stress <0.05 – excellent ordination; stress <0.1 - good ordination; stress <0.2 acceptable ordination; stress >0.2 – poor ordination. The resulting coordinates 1 and 2 from the resulted optimized 2-D plot provided a collective index of how unique a given year was (Fig. 1c,d)”.

10. There are a few grammatical corrections that need to be made: line 3, page

7, change “may indicates” to “may indicate”; line 4, page 7, change “extremes” to “extreme”, or change sentence to something like “ . . . both extremes (cold and warm values);” line 12, page 10, change “this” to “these”

R: We modified the text accordingly.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C4543/2014/hessd-11-C4543-2014-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 4729, 2014.