Anonymous Reviewer 3

Review "Long-term variability of the annual hydrological regime and sensitivity to temperature phase shifts in Saxony Germany"

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The paper deals with the variability of the hydrological regime (seasons) in Saxony Germany and the influence of temperature on this variability. The objectives of this paper are
1) derivation climatology timing
2) evaluate interdecadal variability timing hydrological regime
3) determine processes that govern observed changes in timing hydrological regime
by looking at runoff ratio using harmonic method of Stine et al (2009) (objective 1)
by looking at circular statistics (?)
by looking at cumulative departures of the average (objective 2)
by looking at correlation analysis with other climatic variables (objective 3)

The paper and the approach taken is very interesting (I am not an expert in this area), overall the paper is well written but the paper suffers a bit from an unclear focus and many research lines. There are many techniques introduced and it is not always clear what the purpose is of the introduced technique. When the focus of the paper is improved and the relation between methods<->objectives is highlighted more clearly, the paper can be published in the HESS journal.

Comments:

page 818 : why show complex demodulation equations1-4? not clear from text.

page 819/820 : 2.3 why introduce descriptive circular stats? not clear from text.

page 820/821: CUSUM method not very clear from description.

remark: restructure methods section so that it corresponds with the 3 objectives of the paper, this will allow to introduce all relevant methods applied in the paper in a structured way ('this method is used and introduced for this or that purpose…').

page 824/827: After reading 4.1/4.2 it becomes clear eq 1-4 are used among a range of other methods (robust method, cluster analysis, PCA etc) which are not described in the material and methods section

page 825: cluster analysis introduced here => should be introduced as a tool in Method sections (and linked to objective. What is it used for?)

page 826 Line 3: Figure 5 text not corresponding to caption (only annual phase is mentioned smoothed phase estimates not). Two methods are used but text remains unclear about the benefit of each method.

page 826 Line 12: Unclear. Cluster group 2 appear to have a later annual phase than average (what is average? over what? over which period? 1950-1980) the annual phase of cluster 1 appear earlier. During other periods the phase difference is smaller (where can I find these results or are these not shown in figures/tables/graphs?

page 826: Line 15 PCA introduced => should be introduced as a tool in methods section (and linked to objective. What is it used for?)

page 826 Line 28 Circular density plots should be introduced as a tool in methods section (and linked to objective. What is it used for?)

page 827: Figure 8 very difficult to understand.

page 827/828: unclear focus, what is really important to reach objective 3?

page 829: snow not mentioned in introduction/objectives

page 831: interesting conclusions on φ_RR are reached but does not return in conclusions.

page 831/832: the discussion section is much clearer than the results section (here becomes finally clear what the benefit is of the different approaches (this should be made clear in section 2)

page 833: air pollution mentioned (not mentioned before)

page 833: NAO introduced (not mentioned before)

page 824-835: I recommend a Results and Discussion section instead of two separate sections.

page 835: Conclusions not very strong (and softly related to objectives) given all the hard work in the paper. Clearer statements are given in discussion section

page 835: In the conclusions remarks about the acid rain, forest die-back etc from the 70's-90's are mentioned as possible important I would expect these to be mentioned together with possible climate change in the introduction and limit the scope there instead of in the conclusion section