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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Event-scale power law recession analysis: Quantifying methodological uncertainty" *by* David N. Dralle et al.

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The authors present a well-written study of an event-scaled recession analysis method. The paper is in the scope of HESS and interesting for readers that focus on low flows, recession behavior, drought and hydrograph analysis. In the paper recession analysis is subdivided into recession extraction and the fitting procedure. Then two "configuration sets" for each of four procedures are used to evaluate what aspect of recession analysis influences the projected recession behavior most. The method description is complete enough to reproduce the approach. However, the paper has it weaknesses in structure, mixture of content in different sections and in the visualization of the results. I have doubts if the choice of graph types (only boxplots) to illustrate the work is the best practice. I suggest consideration for publication after moderate revisions. The paper fails - until now - to put the developed method into a valuable perspective

for other researches and hydrological analyses.

Major comments

- The introduction is rather short, but leads directly to the mentioned research gap. However, please consider adding some more details why exactly the four mentioned methodological choices are most important to conduct a reasonable event-scale recession analysis? Also some more information about the choice of a "good" catchment set (with specific characteristics) is missing here, since one could argue that length, beginning and end (definitions 1-3) of recession events depend on the specific streamflow regime of a catchment. Would the results change if one compare rainfall- to snowfall-dominated catchments and so on?

- I would assume that with the description of the climate region (P3L22) a pronounced streamflow regime with low inter-annual streamflow variability could be expected. In the perspective of an improved "event-scale" analysis I wonder why these regime type would be very beneficial for such an analysis? Perhaps it would be better to use more erratic streamflow regimes since they will "produce" more distinguishable recession events with different features? Please comment on that in section 1 or 2. An overview of the catchments - or even better a simple graph showing the regimes or the variability of streamflow would be useful for the reader.

- I really like the idea of the binary nomenclature. However, for the reader it would be easier to present a direct link to the for variables: 1111 could be "MSCL", 0000 could be "mscl", 0101 could be "mScL", so using lower case for e.g. the more restrictive feature an upper case for the more versatile feature in each of the four classes M, S, C and L. I know this would be a little bit of work, but it is worthwhile to consider this as easier, more direct "coding".

- The peak filtering approach is very interesting. The only reference the authors gave here is a Math Works webpage. As a good understanding of the peak filtering procedure is needed to judge the results and discussion later on, it would be helpful to

have a small sketch/graph about this procedure as long as no other literature on that approach exists. The readership will also benefit if 2.2.4 (recession end) is somehow illustrated.

- The research questions are placed into the Method section (P7L11-L26). This is not common practice. I recognized that these questions are derived from the developed method catalogue above, but for the sake of clarity and a good paper structure these questions should be firstly outlined at the end of the Introduction. There the reader is anyhow a little bit disoriented without more guidance, what questions this paper wants to answer later on.

- The authors stated that the median and IQR is appropriate to evaluate the ranking of the catchments according to the "recession behavior". Why are these statistical metrics used? Is that the best choice to evaluate and answer question 2? (P7L16-20). Later on (2.3.2) the Spearman rank correlation is introduced. Please streamline these method explanations, they are mixed up a little bit.

- The methods section is well written and the reader can follow the idea of analysis. The authors could, however, consider to present some kind of flow chart that explains the 16 method combinations, the shared and unshared analysis, the MWU test, the 512 comparisons and so and so on. As this paper present novel and interesting methods for recession analysis, it seems to be important to illustrate an overview of the complete method/approach.

- I found very often a mixture of results and discussion (e.g. P10L12-21), please put some effort into the revised version to clarify the content of different sections (method, results, discussion).

- The streamflow data length varied greatly between the catchments (35-99 years of data). It would be better to show the periods of record for each catchment. If data is not collected more or less during comparable periods, the authors should comment on the potential effect of different data periods and different data length (e.g. recession

analysis in very long time series can be blurred by changes of recession behavior over time or recession behavior in different decades could be a caused for different parameterization later on).

- In summary the tables and graphs are rather poor -or at least a little bit uninspired -illustrations of a very interesting and comprehensive analysis.

Minor comments

- The abstract can be improved for a broader readership by adding some limitations, implications, and recommendations at the end of the abstract.

- Would be easier to read "dQ/dt" and change q to Q in Equation 1.

- Many papers for dQ/dt-Q-fitting are mentioned (P2L5-14), but also the key paper from Kirchner (2009) should be added here for the reader.

- Please comment a little bit more on why numerous studies have focused on event-scale recession analysis (P2L16) instead of using a classical analysis.

- Section 2.2.2 gives the impression that minimum length is a relatively new feature in recession analysis (cited papers are not older than 2012). I think this "rule" is relatively old. At least the authors can prove that the timescales of 4 and 10 days are valuable and in line with the literature.

- Please explain more detailed how the fitting for L=1 and L=0 is technically done (P6L27-29).

- Readers are referred to Dralle et.al (2015) to understand the scale-corrected recession scale parameter. As this step is again important to validate the results more explanation for this step is needed here (P7L2).

- Please clarify what is meant by "higher order moments" (P7L23).

- Where is the mentioned illustration of the patterns for the Elder Creek water-

shed (P8L24+25). This is confusing for the reader: “These plots provide visual representation. . ..” (P8L25,26) – where?

- Only the last two sentences of the first paragraph in 3. Results are really results. Please revise this paragraph. I don’t think that an explanation about Spearman rank in general is actually needed here.

- Some of the graphs are somehow blurred in the PDF (e.g. Fig2+3), please check the alpha value or increase the hue of the colors.

- Please highlight in each Âňfigure caption whether the graph is showing boxplot for all catchment or only for the example Elder Creek!

- Where is the “subplot” (P11L3)? Is the specific line in the heatmap meant here?

- Please illustrate/clarify (table or graph) the important results/discussion of section 4.2. The link to Fig 4 is a little bit weak here.

- Remove Eq.3. and explanation around the W metric from discussion to method.

- Author contributions are missing.

Fig3: Add method code legend (0000,0001,etc), remove graph title, this graph is perhaps simplified by use of boxplots, but it is not clarified. What can we learn from this graph? In my opinion this is poor graph only showing the range of MAPE for all methods and a little bit the spread of values in each boxplot. Please consider re-arranging the single boxplots (e.g. all xx10 beside each other to highlight the small MAPE for this group). There is an attempt to guide the reader through the graph (P10L4-11), but graph and text correspond not very well to each other. Please consider changing the coding for the methods, even in the text the authors mentioned that C and L subdivide the results into some groups. Please illustrate these finding also in the graph. It is worthwhile to consider an other type of visualization here (perhaps a line plot?).

Fig4: The same is true for Figure 4, are boxplots here really the best choice, I don’t

think so, because it would be interesting to “follow” the a,b and Tr values of a specific catchment for all the methods. I cannot see if this catchment with the lowest a or b value for let’s say method 0001 is also the lowest for other methods (e.g. 0011 or 1001). Again, it would be helpful to have a legend here with the method coding (M-S-C-L).

Fig5: Legend is “not shared”, in the text it is often “unshared”, please make this consistent.

Tab2. All relevant information is there, but the table is not well illustrated and hard to read. A “decision tree” or similar approaches would be

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