Hydrology and Earth System Sciences Discussions

Interactive
Comment

Interactive comment on "Exploring the physical controls of regional patterns of flow duration curves – Part 4: A synthesis of empirical analysis, process modeling and catchment classification" *by* M. Yaeger et al.

Anonymous Referee #1

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General comments

Te paper reports a synthesis of the results from three papers, analyzing flow duration curves (FDCs) in different ways, and some own analysis. Basis of all work is a huge amount of catchments in different parts of the US. This is a new and exciting view on FDCs. The paper addresses relevant scientific questions within the scope of HESS.

The idea and theory behind this paper is very interesting and important, but the paper

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itself shows some weak points in analyzing the data of the connected papers. Many statements of the synthesis are based on visual inspection of ambiguous figures without considering the size of classes or groups. Therefore often the significance of a statements is unclear and conclusions are vague. Some conclusions from visual inspection are not comprehensible; the paper seems to be immature. Therefore, the work is ranked 'Major revision'.

Bases for the synthesis are three papers which are in review process with revisions proposed. Therefore, I propose to finish the revision of this after after the end of the review process of the basis papers - when the three papers appear sharpened through the review process. Maybe then, you will gain new insights, clarifying the synthesis.

This is a review of the fourth part of the four-pronged study and refers only to this paper. Content of parts 1 to 3 of the study is taken "as is" and not commented because each paper has to be self-contained, even when they are strongly connected.

Some Specific Comments

Connections to papers part 1 to 3: There are summaries of the other three papers in the introduction and in the discussion. Why? One summary of each paper (in the introduction) with a short overview of data, methods and results would be more reasonable. Although the paper has to be self-contained, it should be easy reading up between them. Are there differences between the papers, concerning for instance the data base? If there are differences: why and what consequences do they have for the synthesis? Use all papers the same acronyms for the same signatures?

Page 7144 and Fig. 5: - "Again, we see two of these classes have a smaller range of FDC variability than the other two." Which two do you mean? b) and d) or b and c)? And what does this mean? - "The visual mapping presented here shows strong regional gradients ..." Please explain where I can see the regional gradients in Fig. 5.

Page 7147 and Fig. 7: "... catchments where vegetation featured in the dominant

process generally tended to have larger values of κ and a wider range of κ values than those where other processes dominated ...". For me, this statement is not visible in Fig 7: Process classes "Vegetation" and "SubQf, Vegetation" show a huge number of small values for κ and only a few higher values (outliers with special properties?). The values of these classes seem to be not far away from them with the additional process "Snow". For process class "Snow, SubQf" are only 3 values visible, and their range is not so different from the other ones, expect very low values. If this class consists of only three catchments, a comparison with the other classes may be misleading!

Page 7150 and Fig. 12 and 11: The problem with the statement here is that you have only five catchments in four different classes with very high slops of the FDC – out of 197 catchments. And there is a large data gap for FDC-slope between 7 and 10. A statement based on these five catchments seems to be very vague!

Page 7157 and Fig. 12: First statement: FDC of MT and KS in Fig. 12 are described to have a "as much steeper slope overall" Second statement: FCD in Fig. 12 of PA and VA, overlying the FDC of KS: "not substantially different from the MT catchment described earlier" – if FDC of PA, VA and KS is the same, and not substantially different from the MT catchment, than MT and KS must be similar too! If there are differences between the FDCs of PA, KS and VA, they are not apparent in Fig 12. Maybe another scale of the ordinate (between 10 and about 10-1) shows differences.

Technical corrections:

Page 7135, next to last line: ... flow days., was introduced ... Pages 7139, 7142 and 7143: formulas are not complete (Result/Signature is missing) Page 7159: first sentence in "Conclusions": o "... analysis brought to light regional patterns ..." ...brought light into regional ...? o over or nearly 200 catchments? Fig. 6: θ or κ? Fig. 12: "log" is missing in the name of teh ordinate

Language:

The authors often use very long sentences, mostly hard to read, sometimes also due to syntax errors. Examples: - Page 7133: This transfer function between the variability... - Page 7149: "... examine more closely the climate and catchment properties transformed by the FDC." FDC transforms the climate and catchment properties? - Page 7158/59: Last sentence: very long and unclear - Page 7159: Syntax of first sentence in point 5 A more precise language with shorter sentences would improve readability of the paper.

Presentation Quality / Figures:

Some figures are not clear. Some statements depend on the order of plotting and signs/FDCs are covered by other signs/FDCs. - Example1: Fig. 5 c): the plot is blue on red, if you plot in another way (red on blue) the main aspect of the figure may be red. On the other hand, FDCs of IACJ, IVD or LPM are nearly not visible. - Example2: Fig. 6: Numbers of catchments per class are not visible: are there two or twenty similar values for XVM? Are there 6 or more values for XADB? Values have to be ordered by size before plotting and sings must allow seeing number of catchments.

Figure.6: - Abbreviations in the legends are not explained. The range of values may be a function of size of classes and/or outliers. - Size of classes is not clearly visible. Comparison of classes with only one or two values with large classes without well-founded explanations will lead to not significant results.

Page 7158 and Fig. 13 - I can only identify one catchment of group LBMH, two catchments of IHM, and three catchments of ISQJ in Fig. 13: are this all catchments of these classes or are other catchments not visible in this figure? Maybe another order of plotting them can underline the statement in the text. - There is a lot of free space in Fig. 13 and simultaneously many signs one upon the other: Another scale of the ordinate with a diagonal reference line can bring more insights in this figure. Another way for more information would be the reduction of numbers of (important) catchment classes.

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