

## ***Interactive comment on “A global evaluation of streamflow drought characteristics” by A. K. Fleig et al.***

### **Anonymous Referee #1**

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#### General comments:

This paper presents outcomes from a comparative study which aim was to evaluate methods for calculating drought characteristics (DC) for different hydrological regimes. The applied methods are an extension of the threshold level method (Yevjevich) to daily discharge time series as presented by a part of the authors in precedent studies. While the precedent studies were focused on development of a method for a particular hydrological setting, the study at hand is focused on a global evaluation of the method for a broad range of hydrological settings. This objective is a novel, valuable contribution and hence merits to be published in HESS.

The paper is interesting and the scientific content is generally good, whereas the presentation could be improved. It is not always easy to distinguish between reviewed

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methods and the methodology of this study. In particular chapter 3 could be structured more clearly in this sense. The title "A global evaluation of streamflow drought characteristics" reflects the content of the paper well. However, the criteria for this evaluation should be presented more explicitly (e.g. in abstract and at the end of the introduction).

Specific comments:

It is argued that a kind of pooling is necessary when deriving drought characteristics from daily discharge series, and the pooling parameters are optimal when the average DC are not sensitive to a change of the pooling parameters. I guess that a discussion of the reasons of minor droughts is necessary to underlay this thesis. Pooling generally adulterates the statistical distribution of DCs, and this adulteration is different for different hydrological settings, as it can be seen from Figure 6 and Figure 7 of this paper. The influence is again much larger on alternative characteristics such as variance, maximum or minimum of drought duration, which are not subject to this paper. In this light, the justification of pooling might be to filter out artificial influences on the low flow regime. Then pooling parameters could be chosen depending on the time scale of the perturbations at a specific river. E.g. the interevent time criterion  $t_c$  could be set to 2 days for measurement errors of daily discharges, and 7 days for perturbations from weekly storage schemes. The value/necessity of pooling should not be mixed up with the exclusion of minor droughts within the Frequency Analysis since both analyses are independent and different criteria for removing minor droughts are used for the frequency analysis.

Page 2428, line 5: Abstract "...streamflow drought characteristics are evaluated based on their application to daily streamflow series from a wide range of hydrological regimes." Add evaluation criteria.

Page 2429, Chapter 1 Introduction: It is not clear from the presentation (1) what is the scientific basis of the study (precedent studies of Tallaksen et al.), (2) which questions have not been addressed by precedent studies, and (3) which of these questions are

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addressed in the study at hand. I suggest modifying the introduction in this sense.

Page 2429, line 28: "Thus some standardisation of drought characteristics is preferable,..." Could be more explicit, why and which standardisation?

Page 2430, line 19: "A more detailed discussion of 20 low flow characteristics is given by Fleig (2004)." Give more details or skip.

Page 2431, line 10: "In order to allow some standardisation of streamflow drought characteristics the applicability of three pooling procedures..." The meaning of this sentence is not clear for me. Same paragraph: Make clear that the aim of the paper is not to present novel methods, but to evaluate existing methods. Present the evaluation criteria.

Page 2434: Chapter 3 - Threshold level method: Please say explicitly what the aim of this section is, a review of methods, or a presentation of the methods used in this study. The limits between literature and the methodology of this study should be crystal clear.

Page 2424, lines 13-22: Are there objective reasons for the proposed thresholds?

Page 2437-2439: Chapter 3.3 does not really fit to the methods section; I would suggest moving it to discussion.

Page 2438, line 9: How are fixed seasons defined?

Page 2444, line 5-16: I guess it should be added that pooling always adulterates drought characteristics, and this adulteration is different for different hydrological settings / regimes (see Figure 6). But if daily discharge time series suffer from artificial influences, pooling is an appropriate and recommended way to get more realistic drought characteristics.

Technical comments:

Page 2430, line 27: This paragraph is not clear for me, could be rephrased e.g. to: "The most important measures to cope with drought are design events of a specific

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frequency. A review of ..."

Page 2435, line 5: avoid repetition; I suggest rephrasing into: "Mutually dependent drought events can be combined into..."

Page 2435, line 16: Replace "Furthermore" by "Alternatively"

Page 2436, line 17-20: could be tightened.

Page 2439, line 2: ... in this study?

Figure 9: SPA (LOWER lines)

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