Hydrology and
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Discussions

Interactive comment on "Heterogeneity measures in hydrological studies: review and new developments" *by* A. I. Requena et al.

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The authors thank the reviewer for the time spent in this revision as well as for her comments.

The present study is based on synthetic regions that are simulated by a Monte Carlo procedure. The definition of these regions is presented in the second paragraph of Sect. 2 "Assessment of a heterogeneity measure". First, the authors agree with the reviewer that this can be more clearly highlighted as a new Sect. 2.1 "Synthetic regions". In addition, the following words marked between hyphens will also be added to the text: "The procedure is based on synthetic regions generated through Monte Carlo simulations from a representative – flood – parent distribution [. . .]".; "A region is defined by its number of – gauging – sites (N), at-site data length (n), [. . .]".

Since the regions are simulated, the amount of available flood data is very large and the regions present a variety of situations. This can be seen for instance by looking at Figs. 1, 2 and 3. A large amount of simulated data is essential to perform the proposed assessment procedure through which the potential heterogeneity measures are evaluated according to different factors and criteria.

Finally, the authors think that it is important to highlight the purpose of this study. The heterogeneity measure identified by the four-step assessment procedure proposed in this study will be used for quantifying the degree of heterogeneity of a given region. This is a part of a whole regional frequency analysis in which a given region would have been previously defined by using climatic, hydrologic and/or physiographic descriptors, a given delineation method, etc. The heterogeneity measure will be then applied on the flood data of the given defined region to quantify its degree of regional heterogeneity, in an analogous way to when homogeneity tests are applied. Note that the heterogeneity of a given region in this study, as well as in the literature, is based on differences in any feature of the at-site frequency distribution among sites (e.g. Hosking and Wallis, 1997), where the L-variation coefficient may be considered as representative of them (e.g. Viglione, 2010). This is the reason of the use of simulated flood data in this study. This information can be found over the manuscript (Sect. 1, 2 and 5).

The use of simulated data in the assessment of new techniques in regional frequency analysis is a very well established approach and it has been used in a number of publications (for instance Hosking and Wallis, 1997; Seidou et al., 2006; Chebana and Ouarda, 2007). In fact, this is the only way to deal with issues related to data quality. These issues were rightfully raised by the reviewer. If observed data is used, we will be faced with issues related to the size of the record, sampling uncertainty, ignorance of parent distribution, ignorance of the true nature of the link between physiographical-meteorological variables and hydrological ones, etc. The authors agree that this element needed to be more clearly presented in the manuscript and the revised version will have the necessary explanations. The authors wish to thank the reviewer for having

pointed out this element.

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