

Interactive comment on “Non-stationarity in annual and seasonal series of peak flow and precipitation in the UK” by I. Prosdocimi et al.

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Point to point authors' reply to Referee 3 report (referee's original comments in italic; changes done to the original text in the manuscript in red).

General comments

- *Page 7, line 10, is each catchment represented at least by one streamflow station? From the text it is understood that rainfall gauges are available at each catchment because average rainfall values are used.*

Yes, each catchment is represented by a stream-flow gauge, so nested catchments might be represented by more than one station. We changed the wording

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to “446 stations” to avoid any confusion.

- *Page 7, line 19, the reason of using log normal distribution instead of using other extreme distribution functions should be given. Log normal is used for both river flow data and daily rainfall. Distribution characteristics should be different for both variables.*

As the referee points out the log-normal assumption might be too restrictive for some river flow stations and for the daily rainfall maxima. This working assumption was maintained in order to compare the results obtained in this study with those by Vogel et al. (2011) and to simplify the interpretation of the magnification factor throughout the different models. Laio et al. (2009) showed that the log-normal distribution seem to be an acceptable distribution for most of the AMAX series in the UK. Further, the normality of the model residuals is tested for each fitted model, so that (log-)series which exhibit a strongly non-normal behaviour are excluded from the general discussion.

- *Page 10, line 17, storminess is more often describes windy weather and not always produce rain and therefore it may be named differently.*

We have removed references to the concept of “storminess” from the text and rather use the term “potential for large rainfall events”.

- *Page 10 line 25, how are the covariate values of the 25th, 50th and 75th percentiles of the R^2 are found?*

For each annual river peak maxima series a univariate model with only the 99th percentile of yearly rainfall ($\mu(t) = \beta_0 + \beta_2 r_t$) was fitted. For each model the covariate corresponds to the r_t covariate, so it is extracted as the 99th percentile of yearly rainfall. We have made this more explicit in the text.

The 25th, 50th and 75th percentiles of the R^2 for a model with only the 99th percentile of the daily rainfall as covariate ($\mu(t) = \beta_0 + \beta_2 r_t$) fitted to all the 446

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annual peak flow series in the dataset are equal to 0.1, 0.2 and 0.3.

- *Page 12, line 3, the reason of selecting 10 yr decadal magnification factors for annual and seasonal maxima series of river flow and daily rainfall data should be explained.*

A note was added in the beginning of Section 4 specifying that the choice of $\Delta_t = 10$ has very little impact on the interpretation of the results presented throughout the paper and was mainly done to be able to compare the results presented in this paper with those of Vogel et al. (2011). Projections of changes in the next 10-years would be useful for practitioners, who could have a feel of the shorter-term potential changes in each series.

Finally, given the specific form of the magnification formula $M_{\Delta_t} = \exp\{\beta_1 \Delta_t\}$, results derived using a different Δ_t would simply be proportional to the ones obtained when taking $\Delta_t = 10$.

- *Page 25, line 5, Conclusions section should be narrowed and give more specific and short conclusions as bullets. Large part of the text available in conclusions can be converted to summary section. So, Conclusion section can be organized as Summary and Conclusions.*

We have now converted what was the *Conclusion* section into a section called *Summary* and have added a new Section called *Conclusions* which contains a bullet point summary of the main results. We hope this improves the readability and clarity of the manuscript.

Technical comment:

- *Page 3, line 24, what QMED stands for? It refers to the median of the river flow for each stations, the reference to QMED/RMED have been removed from the captions of Figure 3 and 5.*

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- *Page 7, line 19, 2-Parameters should be 2-Parameter. Changed, thanks for pointing this out.*

1 References

References

- Laio, F., Di Baldassarre, G., and Montanari, A.: Model selection techniques for the frequency analysis of hydrological extremes, *Water Resour. Res.*, 45, W07416, doi10.1029/2007WR006666, 2009.
- Vogel, R.M., Yaindl, C. and Walter, M.: Nonstationarity: Flood Magnification and Recurrence Reduction Factors in the United States. *J. Am. Water Resour. As.*, 47, 464-474, 2011.

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