

# ***Interactive comment on “Spatial Patterns and Characteristics of Flood Seasonality in Europe” by Julia Hall and Günter Blöschl***

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## Interactive comment

This is a very well-written and interesting paper that covers a lot of different aspects of flood seasonality across the European continent. The beauty of the study lies in its large spatial scale and the large number of different aspects that the authors consider. Another aspect of novelty relates to the distribution of flood seasonality, as up until today the mean date has been in focus, which can be misleading in the context of flood generating mechanisms.

As – in my eyes – there are no serious issues that can be addressed, I would like to highlight some more general suggestions for improvement. What I miss a bit is

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a more pronounced link of the results presented to the meteorology. I think it would make the paper even better if the authors tried to link their observations to dominant precipitation patterns and/or weather situations across Europe. The authors highlight the strong influence of the flood timing to geographical location and, indeed, some aspects have been addressed in the discussion and conclusions (Page 25 Line 26 to Page 26 Line 11). However, some more information on the dominating weather/climate processes would contribute even more to the goal of “advancing the understanding of geographical and climate sensitivity of annual maximum floods (...) across Europe” (Page 26 Line 24-25). At this stage, I find the related section a tad too short, especially when considering the efforts behind all the different analyses presented.

Response: Linking the observed spatial and temporal patterns of floods in Europe to the dominating weather/climate processes is indeed an important research topic. However, given the variety of processes associated to floods across Europe we believe that such a detailed analysis would be beyond the scope the current study and rather merits a separate study that builds on the results from the current manuscript

Having mentioned the link to meteorology above, facing a warming climate, it may be interesting to shortly address how the flood seasonality may change in the next decades across the clusters and what this could mean from a disaster risk perspective, i.e. “better flood estimation and forecasts” as the authors state. There are some obvious changes with increasing temperature such as earlier spring floods in mountainous catchments, but maybe there are some aspects the authors can address for Europe of which the reader may not be instantaneously aware of. This could be a short paragraph.

Response: It is indeed of importance to investigate how the flood timing might change in future, however we believe that this would go beyond the scope of the current manuscript. The nature of future changes in the annual maximum flood timing across Europe is still understudied (albeit the existence of a few regional studies) and therefore we believe that the analysis of future changes deserves a detailed study on its

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own. This could for example be done in combination with the detailed analysis of the current dominating weather/climate processes and how these are projected to change in future.

What I would also recommend is for example to add some aspects on the applicability of the results in practise. The authors mention better flood estimation and forecasts but I think it may be good to add a few sentences that are a bit more specific. Response: We will elaborate on this in the revised version.

Further comments: - Page 6 Line 9: Can you be a bit more quantitative and mention how small the differences of the R-Value are considering shorter and longer observation records?

Response: Further elaboration will be added.

- As the number of gauges considered vary in the different analyses, it may be helpful to add the number of gauges considered in a short sentence to the figure caption ("n of m stations were considered" for instance)

Response: Will be added.

- Page 11, L 10-11: Can you try to explain why you are facing the phenomenon of an unclear distinction in these transitional areas? Explanation on the phenomenon is given for mountainous areas thereafter but it would be important to find some explanation also for the other less distinct areas.

Response: The explanation is already given in L 11-12. "the AMF of these stations tend to occur in March and April around the cut off date separating the winter- versus summer half-years."

- Page 11 Line 18-20. For the sites with low R-values but no uniformity (assuming skewed or bimodal distributions), have you looked into the actual distributions for confirmation?

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Response: Yes, we performed a visual inspection and distribution was indeed not uniform. In L 20 the word likely will be removed to increase clarity.

Minor comments: - Page 1 Line 10 I suggest "at continental scale"

Response: Article in the sentence will be removed as suggested.

- On page 2, figure 1 is mentioned in line 5 but at this point it is not mentioned yet that 4105 of the 5565 gauges are analysed. This is a bit misleading as the figure says 4105 gauges. I would recommend reordering the text so that the reader already knows about the 4105 gauges (i.e. cleaned database) when the text refers to figure 1

Response: The first reference to Fig 1 will be removed and the one to Fig 2b will be moved further down to avoid misinterpretation. Additionally, the Figure caption already states the number of stations that is shown in Fig 1.

- Page 2 Line 24 I suggest "at continental scale"

Response: Article will be removed as suggested.

- Page 2 Line 30 suggest for better readability“(...) characteristics, and are followed (...)”

Response: Placement of commas will be adjusted as suggested.

- Page 3 Line 18/19 I would reorder and first mention figure 2a and then figure 3

Response: Order will be swapped as suggested.

- Page 14 Line 4 “Figure 8 depicts”

Response: Parenthesis will be removed as suggested.

- Page 20, Line 11: “Figure 14 shows the (...)”

Response: Comma will be removed as suggested.

- Figure 9 is not referenced in the text

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Response: The Fig. 9 is already mentioned on page 14, line 5.

Comments on figures:

-The figures are of very high quality in general, but I hope that the resolution of the figures will be higher in the final paper as it is not ideal (too low) in the discussion paper.

Response: Figures will be of high quality in the final version. Low resolution is due to the import into Word.

- In general, many figures refer to the colours for the mean timing of floods as presented in Figure 4a (e.g. Figure 6). If possible, you may consider adding the colour circle to each figure for example as a bar legend below. I think it would improve the readability

Response: Legend for coloured points will be added in Fig 6.

- Figure 1. You may consider using darker cycles (black) or dots as the spatial distribution in some regions (e.g. Scandinavia) is a bit difficult to detect.

Response: We prefer not to use filled circles (i.e. dots) as this covers the underlying topography and does not allow to depicting station density. Instead we will make the colour of the circles darker to increase visibility.

- Figure 8b. No idea if this is possible, but can the European boundaries added to the bottom of the plot, which would be really nice?

Response: Country borders will be added to the 3D plot.

- Figure 9. You may consider making all text black as it is difficult to read with brighter colours, especially when printing it (same for figure 11, 12, 13, 15)

Response: For better readability the coloured text will be printed in bold letters in all Figures. This allows text to be read without difficulties in the final publication with high quality resolution.

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- Figure 9, 11, 12: maybe you can explain “n” in the caption

Response: Explanation will be added.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-649>, 2017.

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