

Reply to reviewer's comments

We thank the reviewer for their thorough reading of the manuscript and their valuable remarks that helped us to improve the manuscript. In the following, the original reviewer comments are given in italic and all line numbers and figure numbers refer to the original submitted version that was reviewed if not mentioned otherwise.

Reply to review of reviewer 2

Thank you for addressing all my comments. The paper is a very worthy addition to the compound flooding literature- congratulations!!

We thank reviewer 2 for all the suggestions made which helped us to improve the manuscript.

* *L19: Remove "flood".*

We removed "flood" as suggested.

The area of the river in which two or more of these drivers influence the water level are called transition zones (Bilskie and Hagen, 2018).

* *L31: To me the "flood" is the response variable. I proffer "discharge and storm surge events" is more accurate.*

We changed line 31 accordingly:

The occurrence of extreme [discharge and storm surge](#) events either simultaneously or in close succession can lead to severe damage, which greatly exceeds the damage those events would cause separately (de Ruiter et al., 2020; Xu et al., 2022).

* *L71: I feel there is a sentence missing here briefly explaining how the randomization test works after re-arranging the time series.*

We assume that the reviewer intended to write "L81" and made the following changes starting from line 80:

For this, we randomised our datasets [in a bootstrap process and investigated the number of compound extreme events in them, which resulted in a probability distribution in case of independence. Rivers with a number of observed compound extreme events outside of the 95% confidence interval of two standard deviations might have a common large-scale driver.](#)

* *L73: Remove "based".*

Removed "based" as suggested from line 73.

An alternative approach is based on Monte–Carlo simulations where the dependence between joint extremes is studied by randomly rearranging one of the time series.

* L115: *Is this more specific that it is a “lower number of independent extreme events for a specified quantile threshold”. And so the next sentence is “Smaller rivers, however, usually have rather short extreme events, and consequently a larger number of independent extremes for the same quantile threshold.”*

We incorporated the suggested changes to the sentences starting in line 114:

Large rivers like the Elbe show the tendency of having very long extreme events that can last for several weeks, therefore resulting in a lower number of independent extreme events for a specified quantile threshold. Smaller rivers, however, have usually rather short extreme events, and consequently a larger number of independent extremes for the same quantile threshold.

* L267: *Grammar. “... remained persistent throughout ...”. I suggest removing “remained” as it is superfluous here.*

We changed “remained” in Line 267:

The pattern of western facing coasts having a higher number of compound flood events than expected by random sampling is persistent throughout different time periods, even though it is somewhat more pronounced in the more recent one.

* L268: *“This is seen by the generally higher number of rivers above the 2σ interval, indicating that compound flood events can potentially occur in these months.” This sentence does not make sense. What months are you talking about. Be sure to check that you’re not just repeating the previous sentence.*

We decided to remove this sentence since it is repeating the information of the previous one.

* L274: *Remove”)”.*

Removed “)” from the previous sentence in line 274:

As a first test, we changed the lag from zero to three days which is shown in Fig. 4d.

* L305: *Could this also be because different Großwetterlage lead to similar climatic conditions in Ireland because it is so far from Germany i.e. the location where the weather types are derived for.*

According to the KATALOG DER GROSSWETTERLAGEN EUROPAS (1881-2009) [roughly translates to “Catalogue of the Großwetterlagen of Europe”] by Werner and Gerstengarbe (2010), the Großwetterlagen are defined over a large domain that includes Ireland. An example of the domain can be seen on page 120 of the following document. Furthermore, the Großwetterlagen are not specifically derived for Germany.

Link to Document: <https://www.pik-potsdam.de/en/output/publications/pikreports/.files/pr119.pdf>

* *L364: Grammar: Consider changing to “using ensembles from climate models that cover longer time frames, e.g. 50 years or more.”*

Future work can further examine these findings by using **ensembles** from climate models **that cover** longer time frames, e.g. 50 years **or** more.