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Discussions

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Interactive comment on "Patterns of extreme weather associated with observed and proxy River Ammer flood records" *by* Norel Rimbu et al.

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I started my review of this manuscript without looking at the literature, considering this study on its own, and providing comments on how the present study could be improved. I was just very familiar with the nice study by Czymzik et al. (2010) and Barton et al. (2016), used as a cornerstone for the present manuscript.

This manuscript presented here by Rimbu et al. titled 'Patterns of extreme weather associated with observed and proxy River Ammer flood records' investigates the relationship between the frequency of River Ammer floods and extreme temperature and precipitation anomaly (daily max temperature and heavy precipitation days). Of particular interest, they integrate into this comparison anomalously high discharge data

obtained from observations (instrumental period) and the occurrence of flood layers for a 5500yr long record, with the aim to find common large-scale climate patterns. Recent work in flood science (e.g. PAGES Flood Group) has identified the direction to improve our understanding of past flood events on different time-scale in the anticipation of the development for such events in the near future. Integrating instrumental and proxy records together with large-scale climate variability is one way 'to provide valuable information about long-term flood trends' (cited from this manuscript).

Figure 6 and figure 7 interestingly illustrate the blocking frequency anomaly over northern Europe. This blocking is related to extreme temperature and precipitation anomalies, consistent with the cloud coverage dataset and all associated with River Ammer Flood days in summer.

This is an interesting result, however, as it stands, this manuscript lacks comparison with other records in the region and literature review to provide a regionalization and validation of this signal. Moreover, I consider that a lot of information remains hidden, masked by: (i) a correlation between river discharge and -1day local precipitation that is not shown, and used as the basic principle for all maps generated in this study (ii) composite maps that do not differentiate specific and differed atmospheric circulation patterns and mechanisms playing a role in producing a flood year => composite maps oversimplify circulation patterns. Although this simplification is necessary to extend to the 5500yr record, the limits of such simplification are not presented; ultimately, uncertainties in the model presented are omitted (iii) the misuse of the term 'frequency' in several places of the text

At that stage, I would have recommended a decision towards 'major revision' to the Editorial Board of the Journal Climate of the Past.

This was before reading the very recent paper published by Rimbu et al. (same group of authors) in the same Journal Climate of the Past: Rimbu et al. 2016: 'Atmospheric circulation patterns associated with the variability of River Ammer floods: evidence

from observed and proxy data'.

This recently published study is a well-developed and a high-stand publication with a major impact on the international community. It provides maps for specific cases of flood events during the instrumental era, integrating a very clear discussion on possible large-scale circulation patterns and mechanisms that could play a role in the generation of flood events in the River Ammer (observed discharge >125m3.s-1, and flood layers for the long sediment record).

In this context, I personally consider that the present manuscript submitted for review by Rimbu and colleagues –using the same river dataset– does not provide sufficient novelty and high-impact information, method or results necessary for publication in your Journal

=> I do not recommend the present study for publication in the Journal Climate of the Past.

My decision is supported by the following general and specific comments about the text and figures:

The present study provides very few novel material as to what has been published so far, to a very least a supplementary material to the study by the same group of authors Rimbu et al. 2016 published in this same journal.

What differs?

. Rimbu et al. (2016) investigated the relationship between the frequency of River Ammer floods (high discharge from observations, and the occurrence of flood layers for the long record) and atmospheric circulation (large scale climate fields)

. Rimbu et al. in the present manuscript investigate the relationship between the frequency of River Ammer floods (high discharge from observations, and the occurrence of flood layers for the long record) and extreme temperature and precipitation anomaly (daily max temperature and heavy precipitation days)

C3

Titles too close (8 terms in common!): [patterns-associated-River-Ammer-Flood-Observed-And-Proxy]

Rimbu et al. 2016: Atmospheric circulation patterns associated with the variability of River Ammer floods: evidence from observed and proxy data

Rimbu et al. this manuscript: Patterns of extreme weather associated with observed and proxy River Ammer flood records

Figures are recycled:

. Fig1 is the exact same as Fig1 in Rimbu et al. 2016 . Fig2 is the same as Fig2 in Rimbu et al. 2016 . Fig5a, and Fig7a are Fig5a and 6a in Rimbu et al. 2016 . Fig3b and fig5c are very similar to Fig5c from Rimbu et al. 2016 (maximum daily temperature and extreme temperature indices vs. Temperature anomalies for flood years)

The structure and some sentences are recycled

General comments

. 'A correlation analysis reveals that River Ammer discharge between 1926 and 2015 is correlated at maximum with previous day local precipitation (not shown)' This sentence is the cornerstone of the entire manuscript and the generation of all composite maps. This sentence does not reveal whether there is a significant correlation between river discharge and precipitation and whether it is significantly higher for -1day than for the d-day. This analysis should be shown and discussed in details (e.g. showing autocorrelation function with several days before and after flood days)

. Composite maps are necessary to generalize the large-scale climate situation for its extension back in time. However, by not looking individually at the different conditions for the generation of a flood day, uncertainties are fully omitted. E.g. specific cases are well discussed in Rimbu et al. (2016) such as for 19 and 20 July 1981, 2 days associated with similar atmospheric circulation patterns, but which differ from the mechanisms of other years. => Is the interesting blocking anomaly similar: (i) for each

of the 20 flood days over the period 1926-2015? (ii) for each of the ∼41 flood days over the period 1871-1999? =>How many % is the pattern presented here valid for?

. An important part of the discussion is missing (because taken for granted) about the comparison between the occurrence of flood days observed through >125m3/s discharge and the occurrence of flood layers for the period in common 1926-1999. Indeed, a perfect match is not possible due to the chronological uncertainty in the varve record (although well dated). => How does the likelihood of generating a flood layer with discharge >125m3/s (Czymzik et al. 2010) allow a comparison of composite maps generated from the 2 datasets? This needs to be discussed. E.g. Fig6 built from floods observed in 1959, 1965, 1966, 1970. . . Fig7 built from flood layers found for 1958, 1959, 1965, 1966, 1970. . . Suggestion: (i) Comparable maps with corresponding flood years (instrumental vs. layers) (ii) Filter of 3 to 5 years applied before mapping

. The use of the different time windows of analysis is rather confusing: (i) 1926-2015, (ii) 1871-1999, (iii) 1901-1999. This requires standardization for comparison or a better structuration in the text.

. As it stands, the manuscript is difficult to follow, especially in what deals with the mechanisms that connect high frequency of blocking over NE Europe and high daily flood frequency in River Ammer. Indeed, studies by Barton et al. (2016) and Rimbu et al. (2016) are taken for granted. An additional figure summary illustrating large-scale climate mechanisms would be very helpful in order to better follow the comparison between figures 4, 5, 6 and 7.

General comments on the figures

. Figures are not easily accessible for a non-European readership. I suggest localizing Ammersee on each figure.

. Figures are rather descriptive and provide a very little comparison with the literature. The present manuscript would greatly benefit from the comparison with other

North-Alpine flood records or other European records. This is particularly true for the very descriptive figure 10, which greatly misses an interpretation/ contextualization/regionalization.

. The use of the different time windows of analysis is rather confusing: (i) 1926-2015, (ii) 1871-1999, (iii) 1901-1999. This requires standardization for comparison or a better structuration in the text.

Fig.1 Poor figure that does not provide any new information, and the exact same figure as Rimbu et al. 2016. Sorry but this is unacceptable scientifically. Country? Catchment size? Elevation? Distance River-lake? Climate/weather?... Although River Ammer has been widely described elsewhere, a short introducing paragraph in the text would be appreciated

Fig.2 Consider localizing of River Ammer on the maps. How many points (and which one) were used for this composite maps? (I guess those with D>125m3/s on Fig1b, please specify) Suggestion: a similar maps at -2day, -1day, d-day would be very valuable for the discussion

Fig.3 Consider localizing of River Ammer on the maps. How many points (and which one) were used for this composite maps? Remark: positive and negative values cannot be seen when printed in black and white

Fig.4 Consider localizing of River Ammer on the maps. How many points (and which one) were used for this composite maps? Remark: positive and negative values cannot be seen when printed in black and white

Fig.5 Consider localizing of River Ammer on the maps. Please consider 'Number of daily floods' rather than 'frequency' I don't see how extreme precipitation (r10mm) and extreme temperature (TX90) are associated with floods in River Ammer here. Fig.6 Consider localizing of River Ammer on the maps.

Fig.7 Consider localizing of River Ammer on the maps.

Fig.8 Consider localizing of River Ammer on the maps.

Fig.9 Consider localizing of River Ammer on the maps. Country delimitations

Fig.10 How does this descriptive record from Ammer flood layer record compare with solar activity or other records? E.g. Is the reconstruction of total solar irradiance by Steinhilbert et al. (2009) in phase or not with this Ammer record?

Specific comments

L74-76: consider adding 'for/in Europe' or adapting literature worldwide

L77: Floods are related to circulation regimes, not the reverse

L85-88: this paragraph does not provide more valuable information; consider removing (Rimbu et al. 2016a is better cited later)

L144: See general comments; this correlation analysis –cornerstone of this study– should be shown

L175-179: 'During periods with more River Ammer flood days [. . .] positive anomalies of heavy rain [. . .] extreme high-temperature anomalies occur'. Fig 5b and 5c don't illustrate this sentence. Are these maps generated for the entire period? If yes, L175-179 cannot be formulated Are they generated for high-frequency periods? If yes, two or more maps are needed for high-frequency periods such as for 1950-1980, and low-frequency periods such as for 1980-2000 => Overall, the term 'frequency' is misused in several places of the text, which confuses the reader.

L184: 'positive blocking frequency anomalies are recorded in the region', Fig6 shows blue colour in Southern Germany=negative blocking frequency anomalies!

L240: add 'in' between changes and large

L247: consider the correction 'as the majority of River Ammer floods occurs'

L252: emphasized

L259: form in the southeast

L260: advective forcing may lead to

L263: European Alps (Wirth et al. 2013). This refers to the Central Alps, which is different from the Northern Alps (Glur et al. 2013; Wilhelm et al. 2014, 2016), Western Alps (Amann et al. 2015), and Southern Alps (Wirth et al. 2013b).

L292: Europe is associated

L307: Analysis of different proxy data... Comparison with other published data would be a way to get the present manuscript better suitable for publication

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