

Interactive comment on “Atmospheric circulation patterns associated to the variability of River Ammer floods: evidence from observes and proxy data” by N. Rimbu et al.

General comments:

Greetings to the authors of the manuscript submitted to *Climate of the Past*. The paper is written in a comprehensible style, easy to follow and addresses significant hydroclimatic questions. The authors use well-known statistical methodologies for data analysis and rely on widely used data sources. It is a discussed fact that floods occur in clusters which are separated by breaks of several decades. Based on observational Ammer discharge data and flood layer time series from varved sediments of Lake Ammersee (southern Germany) from 1766 to the present, the authors study the connections between flood frequency and atmospheric circulation variability. The analysis reveals that the floods in the river Ammer are associated with enhanced moisture transport from the Atlantic Ocean and the Mediterranean towards the Ammer region, a pronounced trough over Western Europe as well as enhanced potential vorticity at upper levels.

However, a number of critical issues require some attention.

Specific comments:

- 1) Page 4485, line 24: The acronym of the Summer North Atlantic Oscillation is exactly SNAO. It is quite wrong to use NAO for this atmospheric variability pattern.

Folland et al. (2009) review the temporal evolution and surface impacts of the SNAO, despite the fact that the SNAO-like patterns have previously been identified by e.g. Barnston and Livezey (1987). Lack of analysis has led to disagreement in the scientific literature about the pattern. An important part of this confusion arises from the more northerly position and smaller spatial extent of the SNAO compared to its winter counterpart, with the southern node over northwest Europe, rather than the Azores–Spain region, and a smaller-scale Arctic node. In spite of the fact that the SNAO has different characteristics than the winter NAO, it provides a similar paradigm for understanding the variability of summer climate. Bladé et al. (2011) describe the positive phase as a decreased pressure over Greenland and an increased pressure in north-western Europe. If it is compared to the winter NAO, the SNAO teleconnection is displaced northeastward, it is more zonally and meridionally restricted and the centres of action show a more southwest-to-northeast orientation, with more meridional advection over Northern Europe.

2) Page 4498. Line 20. It is correct to use the 250 hPa geopotential level to identify areas of convergence and divergence:

- but these variables have not been defined in the Data and Methods section. I suppose the data of 250 hPa geopotential level is downloaded of the 20CR website, but, the data of convergence and divergence, are they downloaded of the same website?
- Moreover, one doubt has emerged of the analysis of the Figure 3: The connection shown in Figure 3a between the Atlantic and African jets, cannot be an artifact not real due to the construction of the composite?

3) Respect to the sections 3.2 and 3.3 and the composites of the figures 5, 6, 7: The authors written in Page 4490, lines 22-28: “For example, the circulation associated to the River Ammer flood on 14 June 1959 (not shown) is a typical omega blocking circulation with heavy precipitation produced on the eastern side of the block. However, most of the River Ammer floods $25 > 125 \text{ m}^3 \text{ s}^{-1}$ are related to synoptic patterns that are similar to those that characterize the 19 to 20 July 1981 flood, which is consistent with the composite analysis shown in Fig. 2.”

My doubt is: the configuration presented in the figures 5, 6 and 7 that explains the atmospheric circulation for the pre-instrumental and historic floods in the river Ammer, is it similar to the atmospheric configuration that caused the flooding of 14 June 1959? This configuration in Omega is presented by Peña et al., 2015 for the Swiss summer floods for the north flank of the Alps (Atlantic influence) and they differ from the floods in the southern Alps slope (Mediterranean influence).

Technical corrections:

- Page 4484, line 22: please change Peña et al., 2014 by Peña et al., 2015.
- Page 4498, line 19. Change the order of the quartiles here or in line 18 in the expression “the upper and lower quartiles”.
- Page 4498, line 21: is it “<” or “>”?
- Page 4490, lines 24-27 Would be possible specify the number exactly?
- Page 4492, line 7: space after the comma
- Page 4493, line 27: please change Peña et al., 2014 by Peña et al., 2015.
- Page 4495, line 12, citation correct is:
- Czymzik, M., Brauer, A., Dulski, P., Plessen, B., von Grafenstein, U., Naumann, R., and Scheffler, R.: Orbital and solar forcing of shifts in Mid- to Late

Holocene flood magnitude in detrital layers from varved sediments of pre-alpine Lake Ammersee (southern Germany), *Quaternary Sci. Rev.*, 61, 96-110, 2013.

- Page 4495, line 23: please change “2010” by “2011”
- Page 4496, line 15: please change “2013” by “2014”
- Page 4496, line 20: please change “Hydrol. Earth Sci.” by “Hydrol. Earth Syst. Sci.”