Clim. Past Discuss., 11, C2819–C2821, 2016
www.clim-past-discuss.net/11/C2819/2016/
© Author(s) 2016. This work is distributed under
the Creative Commons Attribute 3.0 License.

Climate of the Past Discussions
Open Access
EGU

Interactive comment on "Solar modulation of flood frequency in Central Europe during spring and summer on inter-annual to millennial time-scales" *by* M. Czymzik et al.

Anonymous Referee #2

Received and published: 4 January 2016

General comment: The paper addresses the important topic of solar forcing induced regional climate changes. The work relies on a correlation analysis between solar activity and discharge data for the instrumental period and a similar analysis between proxy records of solar activity and flood layer frequency in sediment records. The authors provide a possible mechanism for this correlation through the ability of solar activity to modify the mid latitude stormtracks and a possible delayed response due to ocean heat uptake. The paper addresses a very relevant scientific question which is within the scope of CP, in an overall well-structured and clear way. The scientific methods and its underlying assumptions are however not as clearly outlined. There is basically no information on the statistical method used for calculating the p-values

stated in the text and overall the statistical methods are poorly described making it hard for fellow scientists to reproduce or judge the statistical findings.

1. From figure 2 is seems clear that there exist serial correlation in the data and the number of independent observations will be less than the number of data points. This has to be taken into account when the p-values for the various correlations are calculated. If this is not done the p-values will be misleading. See for example Zwiers and von Storch, 1995 http://journals.ametsoc.org/doi/abs/10.1175/1520-0442(1995)008%3C0336%3ATSCIAI%3E2.0.CO%3B2 For the proxy data this becomes an even greater issue as the data is smoothed which will increase the serial correlation even more. Thus, the question arises if the correlations stated in the text really are significant. As there is no information on how they are calculated this is hard to judge and I encourage the authors to have a serious look at this issue as the strength of their main conclusions relies heavily on the correlation analysis being done properly.

2. The physical mechanism proposed is the solar top-down mechanism where changes in solar UV change the stratospheric temperatures and then changing the near surface circulation. A mechanism that only work during the extended winter. To explain the 1-3 year lag in response of the flood frequency to the TSI the authors cite Scaife et al. (2013) and their simulated delayed circulation response due to accumulation of heat in the ocean mixed layer and later release of this heat. As the the solar top-down mechanism this mechanism will only be active during winter when the heat flux goes the right way (from the ocean to the atmosphere). For the above mechanisms to be important also for summer an additional mechanism is needed, by citing Ogi et al. (2003) the authors suggests that the ice cover in the Barents Sea or snow in Siberia may transfer the signal into a summer signal and thereby influence their summer flood record. The chain of reasoning that the winter solar top-down mechanism (or delayed winter solar top-down mechanism) is influencing the summertime flood records in the author's region of interest should be substantiated by some proper analysis and not just by a few references. In its current state the manuscript does not offer any real

CPD

11, C2819–C2821, 2016

analysis of the proposed mecahnism and (at least for me) it is not easy to grasp from the cited liteature how the delayed mechanism of Scaife and the faster winter NAO to summer response of Ogi could work together in the region analysed in this paper. As a starting point the authors should at least show that there is a significant correlation between TSI and the flood record on the timescale of the proposed mechanism (0-3 years) by bandpass filtering the data to get rid of the correlation possibly coming from covariations on other timescales. Then do some analysis on the connection between the solar activity (lagged) and the circulation patterns found to be important for the flooding in the River Ammer (Rimbu et al., 2015 under review).

3. Spectral analyses: According to the text all time-series (Ammer flood frequency, Hohenpeißenberg precipitation event and SLP) depict a 9–12 years significant oscillation at the 95% level. How is this significance calculated? It is not stated (but from the values it seems to be tested using white noise?). As the time series have serial correlation (which is amplified by the smoothing done prior to the spectral analysis) the confidence levels should be calculated using a red noise process with the same autocorrelation as the smoothed time series.

4. Wavelet analysis: What wavelet transform is used? Is the wavelet power spectrum done on the raw flood layer time-series? If not the periods up to 30 year will be smoothed and should not be shown. If it is why does the 11 year oscillation from the spectral analysis not turn up? How is the confidence calculated?

Interactive comment on Clim. Past Discuss., 11, 4833, 2015.