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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Exploring the link between drought indicators and impacts" *by* S. Bachmair et al.

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We thank referee #1 for the feedback to our manuscript. We much appreciate all comments and suggestions and will provide a detailed reply to each comment later on. At this point we would like to address the referee's major concern, namely the selection of the years to include in the analysis. We hope to clarify this point through further explanations and hope to convince referee #1 about the appropriateness of our choice for analysis.

With the correlation analysis we explore the relation between drought magnitude (SPI/SPEI/other indicators) and impact magnitude (no. of impacts). We do not explore the trigger for occurrence in this part. Hence we think that a sub-sampling of

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drought years (here: years with at least one drought impact occurrence in Germany) is generally permittable. We exclude years where drought conditions may have occurred but no impact reports are available given the undoubtedly biased temporal coverage of EDII entries. We agree with referee # 1 that the method of censoring the timeseries via impact occurrence is subjective. However, we think that including the entire timeseries despite knowing that for some years the impact data in the EDII are not representative leads to biased results as well. Before deciding for the censored approach (limit timeseries to drought years) we conducted the analysis both considering the entire time period and drought years only. Please see a comparison of the results of both approaches in Figure 1, which displays rank correlation coefficients between timeseries of drought indicators and drought impact occurrences per federal state based on the entire timeseries (left panel) and based on drought years only (right panel). While the strength of the correlation is generally weaker when considering the entire time over drought years, the patterns of correlation stay largely the same (SPEI higher r than SPI, highest correlation with intermediate accumulation periods of SPI or SPEI etc.). We would like to emphasize that the aim of our study is to intercompare the performance of different drought indicators regarding the meaning for impact occurrence. Since the correlation patterns are very similar for both approaches we think that choosing one or the other approach does not affect our overall conclusions. In contrast, since our focus is on the meaning of different indictors for impact occurrence we preferred to limit our analysis to times where EDII entries are known to be more representative.

In terms of the suggested hit rate/false alarm rate analysis we would like to stress that a definition of drought via an indicator strongly depends on the choice of indicator and threshold used for delineating drought conditions. We ran a test based on SPEI-3 (drought conditions when SPEI-3 <= -1) for each federal state that showed that drought impact occurrence is always associated with drought conditions in the respective year, yet the timing of impact occurrence and drought conditions according to SPEI-3 may be lagged/preceding. In contrast, we found several years where drought conditions were identified but no impacts were reported, e.g. most of the 1980s, periods in the

NHESSD
2, C3465–C3468, 2015

1990s, between 2007 and 2011. As referee #1 pointed out drought conditions may not always result in drought impacts. However, we think that due to the way of searching for impact reports in Germany, which focused on known drought events, the absence of impact reports in the EDII comes from a lack of publishing or finding drought impact reports rather than no occurrence of impacts. Clearly, this highlights the difficulty of working with this type of uncertain data, which is strongly influenced by whether or not an impact becomes reported and/or found during the search for EDII entries. Because of this uncertainty, from our point of view there is no clear “right” or “wrong” in terms of limiting the analysis to years with drought impact occurrence. One needs to keep in mind, however, that since we base our definition of impact occurrence on entire Germany, years with no impact occurrence in a specific state are still included in the analysis. As referee #1 stressed, the issue of censoring the timeseries should be kept in mind for the purpose of predicting impact occurrence. We will add this point to the discussion of the manuscript.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7583, 2014.

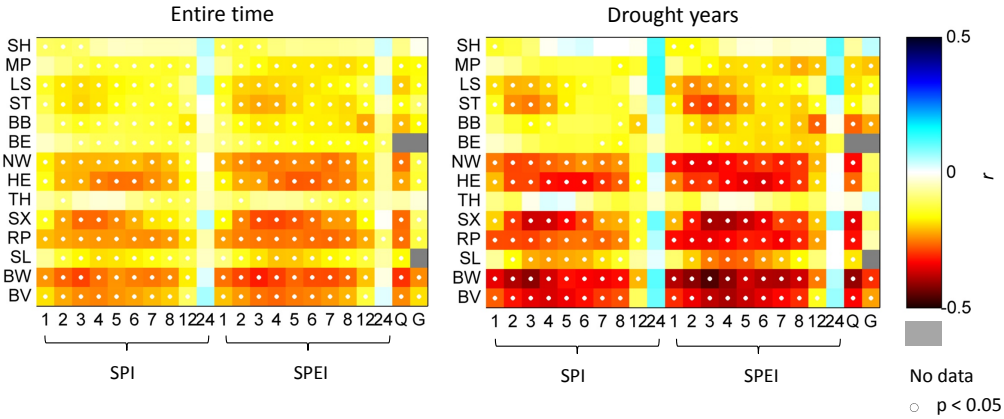

Figure 1: Rank correlation coefficients (r) between timeseries of drought indicators ($\overline{SPI}$ or $\overline{SPEI}$ or streamflow ($\overline{Q}$) or groundwater level ($\overline{G}$) percentiles) and drought impact occurrences (I) per federal state. The left panel displays r based on the entire timeseries (n=504), while the right panel shows r based on the months of selected drought years (n=204). The right panel is the same as the top left panel in Figure 3 of the manuscript except for the adapted colour scheme as suggested by referee # 1.

Fig. 1.

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