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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A quantitative analysis to objectively appraise drought indicators and model drought impacts" *by* S. Bachmair et al.

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We thank the reviewer for the generally supportive feedback on our manuscript and much appreciate all comments how to improve it. We respond to the major concerns right away in this online reply. Details on the implementation of all specific comments will be provided with the revised document.

Length: The reviewer highlighted the need to shorten the manuscript, especially some parts of the methods, the results, and some discussion aspects. Thank you for making detailed suggestions on this. We will move a detailed description of the random forest methodology to the appendix. We will also shorten parts of the results and discussion as suggested, especially since the reviewer confirmed good interpretability of the

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figures.

“Too much at stake”: Regarding the suggestion to move parts of the paper (streamflow and groundwater as additional indicators; random forest (RF) predictions) to a separate paper, we prefer to leave the structure as is. We think that evaluating hydrological indicators in addition to SPI/SPEI provides further insights. We also think that that the RF predictions add further value by providing the opportunity to learn about the EDII data, yet this would not make a separate paper. After shortening the manuscript in the suggested way we are confident that the readability will improve despite keeping the overall structure.

Uncertainty of EDII data: It is correct that the impact report data has several sources of uncertainty and the quantification of this information as well. We discussed this transparently as the reviewer confirmed and this is also reported in other papers that we refer to (Stahl et al. 2015, NHESS; Bachmair et al. 2015, NHESS). Since the paper was suggested to be shortened, we would not like to further expand on this issue. The point of the paper is to explore the value of impact report data for indicator validation despite the obviously uncertain impact data. Also, the RF method (bootstrap sampling) provides a way to incorporate the uncertainty of the impact data. Regarding other methodological choices (reviewer mentioned: regionalization, thresholds, aggregation, minimum number of events, indicators, etc.) we aimed to reduce the uncertainty of results. For instance, while the threshold of a minimum of 10 months with impact occurrence is arbitrary, it at least transparently discriminates areas with very little data, where the risk of drawing misleading conclusions may be higher. Regarding the aggregation of indicator data we would like to refer to a study by Bachmair et al. 2015 (NHESS) and additional work, where different metrics for spatial aggregation (mean, median, 10th percentile, maximum, % area in drought) were investigated and resulted in only minor differences.

Quality checks of indicator data: The E-OBS data used for SPI and SPEI calculation is a published data set and we refer to Haylock et al. (2008) for detailed information

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about this data. For Germany, streamflow and groundwater data used were the officially published data by the authorities that produced or provided the products or data and data were quality controlled and homogenized by the providers. For the sake of comparability with other studies it does not appear useful to apply further corrections in addition. For UK streamflow data, the National River Flow Archive staff quality control UK streamflow data as part of an annual data acquisition process, any queries are returned to measuring authorities to be resolved before data is loaded to the NRFA and released for general use. We therefore believe the indicator data are of good quality. Further, the spatial aggregation (mean) of indicator data over the NUTS1 regions will smooth the input data, meaning that any local discrepancies would be difficult to detect.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 9437, 2015.