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Interactive comment on "Reconstructions of Droughts in Germany since 1500" *by* Rüdiger Glaser and Michael Kahle

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We thank the rev.2 for the helpful comments and corrections very much!

This manuscript is a general approach to study of drougths in historical dimension, using a large database. Different indices are implemented with overlapping to instrumental data period with more complete indices availability. Historical dimension of drought is faced with a correct approach, considering it's a complex phenomena not easy to identify and evaluate in historical time, where not all information already is available for researchers. Justification of research is also well focused, with scientific and social preoccupation becase of increasing frequencies and severities of present drought events. Definition of drougths. Authors describe from a general and integrated point

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of view. Avoiding conceptual problems. Correct references, and historical approach, where conceptual definitions are not so easy. A complete conceptual development could take too pages. Context of manuscript, working on historical dimension, don't justify so detailed conceptual analysis. Use of large database avoid the massive reference of sources and data previously available for this analysis. Bibliography is updated and complete. Absolutely adjusted to proposed research. Figures are well displayed and helps to understand results of manuscript. This manuscript, is a first analysis to show potential developments of historical droughts using quantitative and quantified information.

GENERAL ASPECTS + Title is too short. A subtitle could complete definition of proposed analysis.

Answer: Right. We have now a longer subtitle added

Table 1. Very interesting proposal. Putting in relation drought duration with drought severity seems logic and useful to study drought in historical time, where information about definition and development of indices is not so complete and detailed as we would like. But, just a question about it. For a large natural region, as Germany or Central Europe, proposed table of criteria of classification is enough? Area under study is enoughly coherent or homogeneous to use only one system of criteria? Authors consider it would be possible application of similar method to be applied in different natural regions? Have they explored on this matter? Extension of this method to a larger spatial scale would be a good research path. Potential application of this method in other regions seems very useful. Authors could suggest any consideration about it?

Answer: This is indeed a crucial question, we discussed within the author team several times – there are different natural landscape types- true – But we decided to adjust our approach to the existing modern DWD concept, in which the whole of Germany is represented by one indicator as pointed out in table 1. It is a question of spatial scaling.

Concerning method proposed for indexing drought phenomena, manuscript show a

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single construction of index. Related with previous questions. All information available for Germany is reduced to one index with proposed method. Authors consider this only index is representative of drought variability for all Germany? On the other hand, it exist any wheighting process or statistical method to generate this index considering different climatic contexts? All information is considered in a similar way or level? Any clarification about it would be useful.

Answer: As pointed out in the previous paragraph, we adjusted our approach to the modern existing drought index – to find a comparable one dimensional representation. But analyzed and used a highly resoluted monthly time scale. The focus on the time means, that we could refer to the duration and the strength which is necessary to derive the chain of effects and the socio-economic dimension. The method itself is transferable, whenever SPI makes sense for the relevant regions - the results and conclusions in this article refer to modern Germany.

Line 206. "The consequences and impacts (of drought) on the environment and society can also be reconstructued very well". This matter has increasing interest. In-tegrated approaches for natural and social dimension of hydroclimatic extremes. But authors only mention this potential in one sentence. It could be possible additional description of these potentialities, under point of view of authors? Sources, density and diversity of available information... For example, what oppinion about complementary sources, as economic (taxation records, tithes, market oscillations of prices... or other related aspects, as records about water resources. Any consideration about this dimension of drought impacts, would be interesting to reinforce sentence of line 206.

Answer: We have now a differentiated explanation in paragraph 3.2. where we describe the historical pathways and drought categories in detail, especially the chain of effects.

Section "Outstanding single years". Lines 244-252. A more detailed description or analysis was expected. A short relation of years with drought, not chronologically ordered, with no clear explanation about severity or duration of respective drought char-

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acteristics. Please, could you explain into text what characteristics or reasons justify for every date singularity of drought recorded? Why these years are "outstanding"?. What they have in common? Any figure about characteristics of singularity: duration? Extension?, severity? any combination of magnitudes? Considering important dimension of database tambora.org, manuscript could include a more detailed analysis about extraordinary drought events? It would be an excellent opportunity to exchange knowledge of these events to other colleagues, promoting comparative analysis in different spatiotemporal scales.

Answer: We reorganized this paragraph, explained the character of single years more detailed and even added a new derived view graph for better understanding and visualization. There is also now a table containing the list of extreme events as derived using the different indices.

SPECIFIC ASPECTS+ Lines 128-129, 152, 214, 239.

Definition and use of concept of "cascade effects"(as impacts of droughts). Term is clear, but it could be improved with a more adjusted concept? Could be possible change "cascade" by "cumulative" effects? In fact, acascade is water flowing downstream, meanwhile impacts of drought are increasing byaddition in the same place. On the other hand, use of water-related phenomena, whendrought is an important absence/shortage of water..... it seems even ironic!

Answer: This is indeed very funny, but an often cited concept, because the duration of dryness is leading to different drought types (agrarian, hydrological and socio-.economic). We also used the term “Chain of effects” as well as “pathway”, which makes it somewhat clearer.

Line 166. Exclamation sign. Better final point. Answer: Absolutely right. Done.

Lines 167-168. Unclear. Please, complete or clarify sentences. Answer: We reworked these sentences – and made it clearer and more understandable.

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Line 172. Formula doesn't appear clearly showed in text. May be by any editing prob-lem. A black dot covers partially final part of formula. Answer: This is indeed an editing problem, which does not appear in the original MS. Line 265. "Prominet" by "prominent" Answer: We corrected and rewrote the whole paragraph.

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2019-104/cp-2019-104-AC2-supplement.pdf

Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2019-104, 2019.

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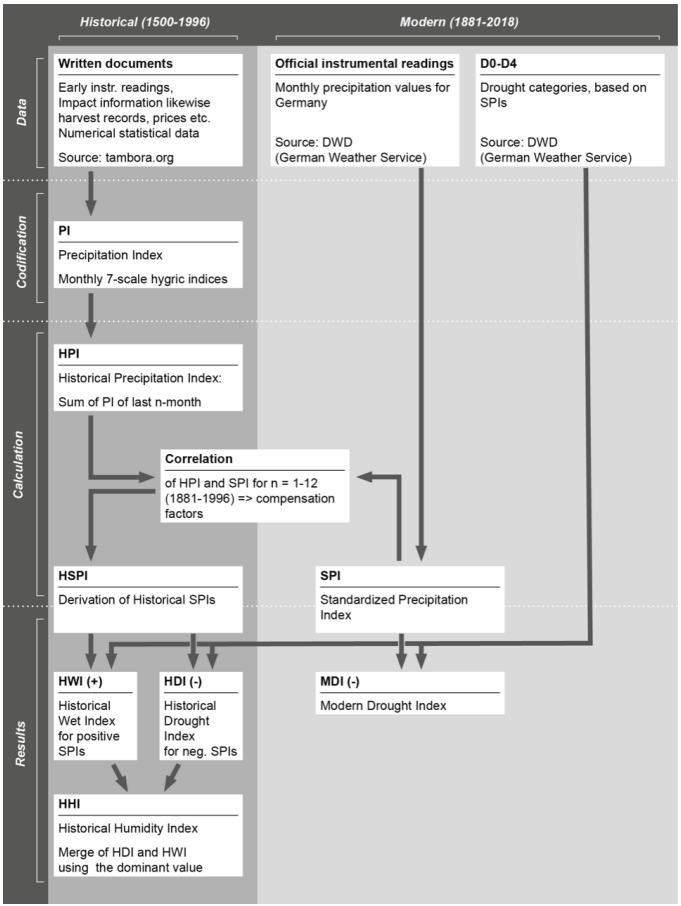

Fig. 1. conceptual design

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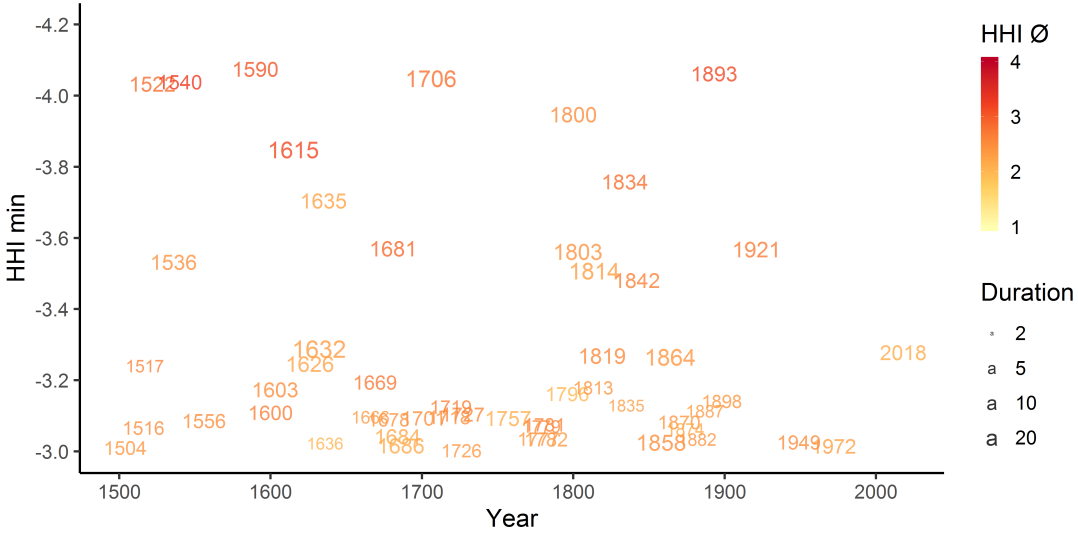

Fig. 2. year cloud

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