

Interactive comment on “Documentary data and the study of the past droughts: an overview of the state of the art worldwide” by Rudolf Brázdil et al.

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Anonymous Referee #2 Received and published: 12 October 2018

This extensive manuscript provides a thorough overview of historical drought studies based on documentary evidence for most of the world. The focus is more on Europe and Africa than other areas, but that makes sense given the author list. The article is very long but well written, and I recommend that it be published once the authors have considered the following points:

RE: We would like to thank the anonymous referee #2 for very useful critical comments

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and suggestions. Apart from the authors' list, the reason for having more papers related to Europe is simply that the greatest volume of documentary-based research into historical droughts is produced for Europe. Regarding Africa, intense research is found in southern Africa, while the rest of the continent is generally underrepresented. Thus, the proportions in the paper represent the different density of scientific research in the various areas of the world.

Major comments: - There's no real discussion in this article about the limitations of documentary sources when it comes to climatological analysis - the impact of non-climatic elements in many of the evidence types mentioned in section 2, and the subjective nature of human memory. Will this be covered in a separate article in the special issue? If not, I think it is worth adding a paragraph or two about it in the discussion. If there will be another article focussed on this, please mention it. RE: No, nor do we plan an article on this topic. We believe that we have clearly pointed out in the second paragraph of Sect. 3 the key points of historical-climatological analysis: (i) use of primary sources, contributing to avoiding erroneous data, (ii) source-critical approach to eliminate effects of non-climatic factors, (iii) cross-checking of data from a spatial and temporal point of view, (iv) careful analysis and interpretation of evidence available. We know that “the subjective nature of human memory” is sometimes used as an argument against the value of documentary data, but it has no importance in working with documentary evidence if the above mentioned points are applied. The present article aims to provide an overview of existing papers and knowledge, and does not really intend to discuss methodological problems of historical climatology or cover and solve all current questions and problems of a research area (see e.g. extensive references to this topic – at least Brázdil et al., 2005, 2010). We have reworded the corresponding paragraph to address your comment: “The extraction of drought information from documentary sources requires a source-critical approach generally applied to scientific work in historical climatology (for more detailed discussion see e.g. Brázdil et al., 2005, 2010). It includes the following important steps: (i) the use of primary sources to avoid possible errors that may appear in secondary sources (e.g. weather compilations as mentioned

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in Sect. 2.14, or information from hearsay, i.e. events not directly experienced by the author); (ii) a source-critical approach to eliminate the effects of non-climatic factors (e.g. to avoid possible 'social bias', taking in account broader socio-economic knowledge related to the given source); (iii) cross-checking of data from spatial and temporal perspectives by combining different types of documentary sources; (iv) careful meteorological (climatological) interpretation and analysis of the available evidence based on knowledge of recent climatic patterns in the area. Applying these principles allows the true spatial extent, duration, severity and impacts of individual drought events to be identified."

- It's not clear to me why the Americas and Australia are grouped together in section 4.1 and 4.3. Drought responses there are almost anti correlated, particularly rainfall variability driven by ENSO. Is it for colonial reasons, or because similar methods are used? If so, please state that explicitly. You also mention New Zealand in section 4.4.3 (page 26), but this is not included elsewhere. It would be better to split America and Australia into two separate parts: The Americas, and the South Pacific, including Australia, NZ and possibly Pacific Island studies (if there are any). RE: The reason for such division is based on the simple fact that the corresponding papers dealing with documentary-based droughts are much less frequent compared to Europe, Asia (China) or Africa. By splitting "The Americas and Australia" into two parts, Australia (or as the reviewer suggests South Pacific) would be represented by only one paragraph in Sect. 4.1 (page 18) or only one sentence in Sect. 4.3 (page 22). We are not aware of any published studies on historical drought from New Zealand or the Pacific Islands. For this reasons it seems to be more reasonable to have The Americas and Australia together as "a remaining regions of the world".

-Somewhere in section 2, I wonder if you could mention information that falls between documentary and instrumental. Things like counts of rain days derived from weather journals and newspapers, or crop yield totals. I don't think this needs its own section, but could be slotted into others to show that it's not only words that can be useful.

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RE: In Section 2 we reported the basic types of documentary evidence which cover the pre-instrumental period. Many of these data sources continue in the instrumental period. It seems that there is not "anything" between documentary and instrumental data/periods. For example, counts of rainy days derived from some types of documentary sources described in Sect. 2 can be used for the creation of precipitation indices. We see the use of crop yield totals or grain prices as more problematic since, without additional information, such data do not necessarily express the real effects of droughts.

-Section 4.2 confused me a bit. Are these the biggest events to be found in the many paper listed in section 4.1, or large overarching droughts that affected many countries? I think it's the latter, but this could be clarified with an introductory sentence or two, or by reshaping the section to focus on the timing of events. You could even tighten this section, removing reference to droughts that only occur in one country. RE: To explain our motivation for separating both sections: In Sect. 4.1 "Long-term precipitation and drought series" we present studies dealing with long-term series of droughts. The following Sect. 4.2 "Individual and major droughts events" aims at presenting contributions that discuss individual (important) drought episodes or only drought cases that do not represent long-term chronologies as in Sect. 4.1. To distinguish between both sections, we added the following sentence at the beginning of Sect 4.2: "While the previous section (Sect. 4.1) concentrated on papers dealing with long-term fluctuations in droughts, this section reviews studies oriented towards complex analyses of either one particular extreme drought event with its human consequences or a few such severe drought episodes. For example, Pankhurst (1966) reported 1888, a year of major El Niño, as excessively dry and hot in Ethiopia, ..."

Minor things: -Page 2, line 38: I don't think you need 'the' before Climate of the Past
RE: Accepted and corrected.

-Page 4, line 32: 'Related legal trials' instead of 'Legal trials related' RE: Accepted and corrected.

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-Page 4, line 33: 'fashions' rather than 'fashion' I think RE: Accepted and corrected.

-Page 9, line 27: using numbers, hyphens and minus signs together is confusing, can you use an equal sign or colon instead? RE: Accepted and changed as follows: "For instance, 3-degree (-1: dry, 0: normal, 1: wet), 5-degree (-2: very dry/drought, -1: relatively dry, 0: normal, 1: relatively wet, 2: extremely wet) or 7-degree (-3: extremely dry, -2: very dry, -1: dry, 0: normal, 1: wet, 2: very wet, 3: extremely wet) scales are the most widely used in Europe (e.g. Pfister, 1992, 1999, 2001; Glaser, 2001, 2008; Dobrovolskiy et al., 2015a) and Africa (e.g. Nicholson et al., 2012a, 2012b; Nash et al., 2016b, 2018)."

-Page 13, line 9: As above RE: Accepted and changed as follows: "A 5-degree scale was used for classification: 1: very wet, 2: wet, 3: normal, 4: dry, and 5: very dry."

-Page 13, line 27: 'Droughts were more extreme in these centuries than in the 20th century'. This sentence could be clarified. RE: Accepted. The corresponding part of the manuscript was changed as follows: "Wang et al. (2015), using documentary-based drought data from Eastern China for the period 1470–2000, reported a higher number of droughts during the 16th and 17th centuries than in the 18th and 19th centuries. Droughts were more extreme in these four centuries than in the 20th century."

-Section 4.1.2: No mention of Japan? RE: We did not find any Japanese paper dealing with droughts based on documentary data. Moreover, communication with a leading Japanese historical climatologist, Prof. Takehiko Mikami (former Tokyo Metropolitan University) revealed, "no systematic papers on drought history in Japan have been published" and "drought disasters in historical times were much less than flood disasters in Japan."

-Page 15, line 6: The term Nilometer could be explained better RE: Accepted and corrected. The corresponding sentence was complemented as follows: "While, strictly speaking, an indicator of rainfall over the Nile catchment areas in Ethiopia (Blue Nile) and equatorial Africa (White Nile), Nilometer records from Cairo (stone structures at

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which levels of the River Nile were recorded with respect to a vertical column, a series of steps leading down to the river, or a deep well with culvert; see Popper, 1951) also provide a near-annually resolved drought chronology for north-eastern Africa dating back to the 7th century."

-Page 18, line 21: 'most severe' rather than 'severest' I think RE: Accepted and corrected.

-Page 20, line 32: 'above effects' is unclear to me RE: Accepted. The corresponding sentence was changed as follows: "Relatively few studies have investigated the effects of external forcing and large-scale climate drivers for drought series in Europe (e.g. Pongrácz et al., 2003)."

-Page 22, line 27: 'Ashcroft' rather than 'Aschcroft' RE: Accepted and corrected.

-Page 23, line 14: thank you for teaching me the word 'transhumant', I've never seen it before RE: OK.

-Page 24, line 12: add 'the' before 'instrumental period' RE: Accepted and corrected.

-Section 4.4.1, final paragraph: I like this qualifier, and am sure there are many other sources of information about the pros and cons of environmental determinism. Perhaps the authors could provide another overarching reference to this topic? RE: The paragraphs and the chapter are not built to discuss environmental criticism to any more specific level, and we do not intend to go into the problems of the rather broad and well-discussed field of environmental determinism in more detail. To start referring to papers on general environmental determinism would suggest that we also intend to deal with this problem in more details in this paragraph or in the paper itself.

-Page 25, line 13: errant bracket RE: Accepted and corrected.

-Page 25, line 36: 'most immediate impact' on what? RE: Accepted and corrected as follows: "For this reason, such events may have the greatest and most immediate impact on society (e.g. in water supply and food production) of all climate changes."

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-Page 28, line 21-22: this sentence is a bit clunky and could be rearranged RE: Accepted. The corresponding sentence was changed as follows: “But corresponding papers differ in the density and quality of documentary data used for identification of droughts, in definitions and selection of droughts, in the areas analysed, as well as in the time periods covered.”

-Page 28, line 24: add ‘well’ before correlated RE: Accepted and corrected.

-Page 31, line 23: remove the ‘s’ from sources RE: Accepted and corrected.

-Section 6: it sounds like another area for concerted effort is cross regional comparisons of historical droughts. RE: Accepted and corrected. We added it to the point (ii) as follows: “Cross-regional comparisons of past droughts.”

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