

## ***Interactive comment on “The extreme drought of 1842 in Europe as described by both documentary data and instrumental measurements” by Rudolf Brázdil et al.***

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Review of ‘The extreme drought of 1842 in Europe as described in Europe by both documentary data and instrumental measurements’ by Brázdil, Demarée, Kiss, Dobrovolny, Chromá, Trnka, Dolák, Reznickova, Zahradnicek, Limanowka and Jourdain.

The paper describes in great detail the drought of 1842 in Europe, both from the perspective of instrumental observations as well as from documentary data. This results in a comprehensive paper on this drought where the spatial extent, temporal characteristics and relation to the atmospheric circulation are discussed and many of the details and impacts are highlighted.

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This reviewer is much impressed by this study - the research efforts that have gone into this paper in finding the documentary data is stunning. Although the use of newspaper articles and diary entries are not used for the first time in connection with observational data to produce a view on a particular climatic extreme, it is still a very novel approach and the current paper will probably set a standard. However, there are some aspects of this study that require further work. As the background of this reviewer is in climatology and observational data, much of this work relates to the instrumental data and the relation between the drought and atmospheric circulation, and to place the findings for 1842 in a broader (historical) perspective. The motivation for this study and its relevance for the community need to be highlighted a little better. Finally, there are a few smaller issues related to the use of documentary data and the conclusions that can be drawn based on these type of data.

The group of Kerstin Stahl and Veit Blauhut (University of Freiburg) and Lena Tallaksen (University of Oslo) have done much work on classifying impacts of drought, which might be helpful in presenting the impacts of the 1842 drought in a more systematic manner.

Overall, this is a paper that deserves to be published and my advice to the editor is to accept conditional on some changes.

Major issues

\*) Introduction: I understand that 1842 is interesting because of the possibility to combine instrumental and documentary data sources. But why is 1842 interesting (and not another dry year)? What are we likely to learn in the interpretation of modern droughts? Can you link any societal issues or changes to the impact of the 1842 drought so that we might understand societal changes which happened in response to this drought better?

\*) page 5, 1st paragraph. The authors are right in noting that systematic efforts to homogenise data - especially daily data - do not really exist. For Europe, there are new

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efforts (Squintu et al. 2019a; 2019b) but it is unlikely that this will give homogeneity adjustments for as early as 1842 (because of the lack of reference data for this early period). However, even daily data that is not homogenized will be useful. Below is a summary of daily data that is available in ECA&D for 1842, and it would add to the importance of the study to include these daily data, along with the daily data of Prague, in favour of the monthly (less informative) data now included. ECA&D staff is more than happy to provide these data (under restrictions). Some of these instrumental data might be used to validate the documentary sources, since it is a little strange that e.g the Wiener Zeitung is used as a source for Scottish precipitation (and not a UK paper) (page 7, line 32).

\*) page 7, lines 29-42. I am a little uneasy about using reports in newspapers on meteorological observations. In my view, newspaper reports, and other documentary evidence, is a perfect source for impact information. There are many fine examples of this in the current paper. A discussion of meteorological observations in a newspaper, which is not impact information, should be accompanied by a brief analysis of actual observations to back these claims. We are, after all, climatologists.

\*) page 16, 1st paragraph and figure 8 and figure 3 (lower figure) A historical perspective is needed here. To appreciate the prices or cumulative precip totals or water levels, you need to make clear that the 1842 values were outside the range of what can be expected to be 'normal'. Give, if data permits, the 5th percentile of driest years in some reference period or (for prices) index the prices using a 'common' year.

Other issues the authors may want to look at

\*) page 6, line 9: would it be a possibility to have electronic Supplementary Data which might make these information available?

\*) page 6, line 25: Both the SPEI and Z-index require an estimate of the potential evapotranspiration. I take that the Thornthwaite formula is used, but this is not specified. Also, these indices require a calibration period. What period is used? This is not

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specified (and will strongly affect results).

\*) page 7, line 22. Using the SDII (Simple Daily Intensity Index) might be useful here?

\*) page 7, line 42. Do they really lack sufficient systematic character to cite? Perhaps this is true, but it likely reports on the most extreme situations, not only related to local conditions but also in the eyes of the journal editor. This will indeed give a randomness in reporting, but in this randomness, the underlying phenomenon may have spatial consistency. These reports give, at least, an indication of the spatial extent of the most extreme situation.

\*) section 4.2: Can you comment on similarities between these SLP patterns, where high pressure seems a constant factor, and other (modern) droughts? Or to put it differently, is the circulation which led to the 1842 drought a unique one-off situation or do you see some similarities between the driver of this drought and other droughts?

\*) page 9, line 17. Perhaps a little more information is needed here on the zero point. Is that also a supposed minimum as in an earlier example, or some other reference?

\*) page 9, line 42-48. These islands in the southwest of the Netherlands are surrounded by sea water and have no rivers or freshwater lakes. This makes them vulnerable to drought. The situation is likely to be worse there than for other parts of the Netherlands.

\*) page 11, line 19-26 and page 15, line 1-8. The relation to drought is not clear - there is only a claim in the newspaper. The drought and pests plague may be coincidental without the drought being a cause. Please present independent evidence that drought relates to the outbreaks of these worms/insects.

\*) page 12, line 49-51. I'm confused what this report actually means, apparently it is salt water intrusion in the waterways which will make the water useless for irrigation or drinking. But for a period of half an hour? I'm not sure if that is even possible.

\*) page 13-14, lines 43-23. I don't see why this is added to the text. It does not clarify

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the impact of the drought, it only gives information on the science of that period (which is not the topic of the paper).

\*) page 14, lines 36-43. This text requires a little more interpretation. The difference between the ranking based on SPI and SPEI is confusing otherwise. Clearly, the amount of precipitation was very low (making the SPI very negative), but the temperatures were not that high (especially in winter and spring), making the estimate you make for PET relatively low. This is the only reason why the SPEI gives such mundane values. You see that the scPDSI, which is based on a water balance (in contrast to the SPEI) does not give as much weight to the PET value as the SPEI (it calculates the actual evapotranspiration) and gives a drought ranking that is more in-line with the SPI value.

\*) page 15, line 19-26. here additional interpretation is needed as well, why do these trees not pick-up the drought signal? Are they living in conditions which are temperature stressed rather than moisture stressed?

\*) page 16, line 25-41. The increase in the slaughter of cattle because farmers are unable to provide fodder or water, must have decreased the price of meat - any clues for that?

Very very minor issues

\*) page 2, line 19. Would 'Shortage' be a more appropriate translation than 'Poverty'?

\*) page 13, line 35: I would expect that it was NOT permitted to smoke a pipe....

\*) caption fig 10, the year should be 1873

\*) caption fig. 4, These are Monthly variations (not annual)

Squintu, A.A. et al. (2019a), doi:10.1002/joc.5874

Squintu, A.A. et al. (2019b), Building long and homogenous temperature series in ECA&D: blending of neighbour series, J. Applied Meteorology and Climatol. (submitted).

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| 17 | Uccle | be | tg | 1833-01-01 | 2008-01-31 |

| 17 | Uccle | be | tn | 1833-01-02 | 2011-01-23 |

| 17 | Uccle | be | tx | 1833-01-06 | 2011-09-30 |

| 27 | Praha-Klementinum | cz | rr | 1804-05-01 | 2005-04-30 |

| 27 | Praha-Klementinum | cz | tg | 1775-01-01 | 2005-04-30 |

| 27 | Praha-Klementinum | cz | tn | 1775-01-01 | 2005-04-30 |

| 27 | Praha-Klementinum | cz | tx | 1775-01-01 | 2005-04-30 |

| 11744 | Dresden (Mitte) | de | rr | 1828-01-01 | 1992-11-30 |

| 11744 | Dresden (Mitte) | de | tg | 1828-01-01 | 1915-12-31 |

| 11744 | Dresden (Mitte) | de | tn | 1828-01-01 | 1915-12-31 |

| 11744 | Dresden (Mitte) | de | tx | 1828-01-01 | 1915-12-31 |

| 48 | Hohenpeissenberg | de | rr | 1781-01-01 | 2019-06-30 |

| 48 | Hohenpeissenberg | de | tg | 1781-01-01 | 2019-06-30 |

| 49 | Jena Sternwarte | de | hu | 1824-11-20 | 2019-06-30 |

| 49 | Jena Sternwarte | de | rr | 1826-12-01 | 2019-06-30 | | 49 | Jena Sternwarte | de | tg | 1824-01-01 | 2019-06-30 |

| 49 | Jena Sternwarte | de | tn | 1824-01-01 | 2019-06-30 | | 49 | Jena Sternwarte | de | tx | 1824-01-01 | 2019-06-30 |

| 28 | HELSINKI KAISANIEMI | fi | tg | 1828-10-04 | 2001-12-31 | | 271 | Armagh | gb | hu | 1838-01-02 | 2008-12-31 | | 271 | Armagh | gb | rr | 1838-01-01 | 2001-12-31 |

| 257 | CET Central England | gb | tg | 1772-01-01 | 2003-05-31 |

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274	Radcliffe Meteorological Station Oxford	gb	rr	1827-01-01	2019-04-30
274	Radcliffe Meteorological Station Oxford	gb	tg	1815-01-01	2019-04-30
274	Radcliffe Meteorological Station Oxford	gb	tn	1815-01-01	2019-04-30
274	Radcliffe Meteorological Station Oxford	gb	tx	1814-12-31	2019-04-29
169	Bologna	it	rr	1813-01-01	2007-12-31
169	Bologna	it	tg	1814-01-01	2003-12-31
169	Bologna	it	tn	1814-01-01	2003-12-31
169	Bologna	it	tx	1814-01-01	2003-12-31
171	Genoa	it	rr	1833-01-01	2008-12-31
172	Mantova	it	rr	1840-04-01	2008-12-31
173	Milan	it	tg	1763-01-01	2008-11-30
173	Milan	it	tn	1763-01-01	2008-11-30
173	Milan	it	tx	1763-01-01	2008-11-30
380	Padova	it	tg	1725-01-12	1997-05-31
380	Padova	it	tn	1774-01-01	1997-05-31
380	Padova	it	tx	1774-01-01	1997-05-31
381	Palermo	it	rr	1797-01-01	2008-12-31
85	St. Petersburg	ru	tg	1743-03-04	1999-08-31
10	Stockholm	se	tg	1756-03-27	2003-12-31
426	Uppsala	se	rr	1840-01-01	2001-12-31
426	Uppsala	se	tg	1840-01-01	2001-12-31

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| 426 | Uppsala | se | tn | 1840-01-01 | 2001-12-31 |  
| 426 | Uppsala | se | tx | 1840-01-01 | 2001-12-31 |

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-77>, 2019.