

Response to comments by Neil Macdonalds

This is a well written and detailed paper exploring the impact of weather and climate on societies during the Thirty Years War in Central Europe. The paper provides a detailed analysis, which is sound and robust, in places some additional detail is required to improve clarity or expression, with an annotated copy of the manuscript attached to help the authors undertake these changes. I have also flagged in a couple of places sections where I felt the arguments presented warranted reflection.

In reading the paper to disentangle the human from the environmental factors I felt it would be beneficial to have a records or data from outside the area impacted by the TYW, as such I have added some comments based on English datasets for the comparable period, which help to show this. I hope this is helpful, and was actually added before I had read the final line of your conclusion which makes this exact point.

I have also suggested some additional references that may be of interest.

Neil Macdonald
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RESPONSE: We would like to thank the referee Neil Macdonald for proposed corrections in the manuscript, which were completely accepted. As for further comments, we are trying to respond below referring to the original line/part of the referee comment directly in the manuscript:

The beginning of the manuscript: I appreciate outside your regional scope, but W.G Hoskins wrote an excellent paper on grain/climate for this period based on English data.

This is of interest for two reasons, the first is that it suggests harvests in England were good during this early period "the year 1620 saw the most abundant harvest within living memory". However, the 1630s-40s were poor with high prices, with wet weather key; the 1650s were better. This mirrors the records seen within this paper for C. Europe. It does though suggest that there would likely have been poor harvests in Europe under normal conditions, therefore the TYW exacerbated these impacts.

The second point is that it can be beneficial to use a country with limited impacts from this period, the English reformation occurs earlier and they have limited input into the TYW (recent evidence suggests 50,000 soldiers in Dutch (+other) forces may have been British), so could offer a good contrast, which would help distinguish the socio-economic from environmental drivers. [You make this comments in the final sentence I note having now finished the paper.]

Hoskins W.G. 1968. Harvest fluctuations and english economic history, 1620-1759, The Agricultural History Review, 15-31

A scanned copy can be found at <https://www.bahs.org.uk/AGHR/ARTICLES/16n1a2.pdf>

RESPONSE: Accepted, the following sentences comparing situation in England, Switzerland and Germany were added to the last paragraph in Section 6.2:

“For example, in England (with limited input of the TYW), harvests from 1626 to 1628 were excellent, while a sequence of deficient harvests appeared between 1646 and 1649 (Hoskins, 1968). In the neutral Swiss Confederation, albeit situated closer to the military conflict than England, spelt prices in Zürich peaked in 1622 and 1623 due to a harvest failure in 1621 and a coin debasement in 1622. Another peak in 1627 and 1628 resulted from a widespread harvest failure on the continent (see also Sect. 5.3). Prices peaked between 1632 and 1638, when war

raged several times near Switzerland, and the Confederation had to provide horses and grain (Schmidt, 2010). Prices in the 1640s were relatively low, except in 1642 (Schmidt, 2010; Studer, 2015). In Nuremberg (Germany), rye prices were high from 1621 to 1628 and again from 1632 to 1636, while those in the 1640s were unremarkable low up to 1648 (Bauernfeind, 1993; cf. Fig. 14). Probably, the spatial distance from the war seems to have mattered, apart from crop failures.”

Line 22: “Remarkably below-mean values, centered around the 1630s, characterized precipitation and drought fluctuations.” - this does not make sense

RESPONSE: Accepted, the sentence was deleted.

The first paragraph of Introduction: See some of the work by de Kraker for Low countries

RESPONSE: Thanks for this comment, but we did not find any his paper relevant directly to the topic to be included in Introduction. The period of the Thirty Years War was covered only in Hydrological Sciences Journal, 2006 (floods), Environment and History, 2013 (storminess), Hydrology and Earth System Sciences, 2015 (flooding in river mouths), and Water History, 2017 (the removal of ice on waterways), i.e. only with storminess and floods, outside of Central Europe.

The first paragraph after Fig. 3: Would it be possible to state the number of datapoints, or datasets that are contributing to the records at each point in time? This is often low with high uncertainties

RESPONSE: Accepted. We are aware of the problem of uncertainty, which applies to all used reconstructions. Therefore, it is difficult to discuss it in greater detail in this paper. We believe, that existing higher uncertainty of that data before 1750 is well explained by sentence added to point (iv) in Section 3.2: “Despite the fact that this precipitation dataset uses especially for the early 17th century a limited set of input proxy data (see Fig. 1 in Pauling et al., 2006) as well as rather out-of-date climate model for the gridded reconstruction (Ljungqvist et al., 2022), it is the only available spatial precipitation reconstruction with a seasonal resolution.”

Line 291: state dataset used to calculate scPDSI

RESPONSE: Thanks for this comment. It is explained in point (v) in Section 3.2 as follows: “(v) Seasonal and annual self-calibrating Palmer Drought Severity Index (scPDSI; Palmer, 1965) for the Czech Lands (1501–2015 CE) (Brázdil et al., 2016), derived from Central European temperature and Czech precipitation reconstructions (Dobrovolný et al., 2010, 2015).” It means, that scPDSI values were calculated using quantitative temperature and precipitation reconstructions, described in the same section under points (i) and (iii).

Sect. 5.2, the first paragraph: how do you define hot days here? $P > 0\text{mm}$?

Fig. 9: define permanent frost.

RESPONSE: Accepted. We added related explanations to the first paragraph of Section 5.2 as follows: “As is characteristic for analysis of qualitative daily weather observations (e.g., Pfister et al., 1999; Brázdil et al., 2003, 2019; Domínguez-Castro et al., 2015; Harvey-Fishenden and Macdonald, 2021), Lenke (1960) calculated corresponding numbers of days according to weather phenomena observed and reported by Hermann IV as follows: frost day – any occurrence of frost during the day; persistent frost day – frost continuing the whole day; hot (very hot) day – any occurrence of heats during the day; precipitation day – the occurrence of rain, rain with snow, snowfall or hail/sleet during the day.”

Line 409: “May witnessed an over-reproduction of cockchafers, causing damage in Bohemia ...” cockchafers explain??

RESPONSE: Accepted, we changed this sentence as follows: “May witnessed an over-reproduction of cockchafers, causing damage to fruit trees in Bohemia (AS11; Lisa, 2014).”

Sect. 5.4.1, the first paragraph: Is one of the key factors here that war also leads to loss of the young and often male parts of communities, which can result in reduced capacity to farm, this is well documented across France during the Napoleonic wars.

RESPONSE: Accepted. The following part of the manuscript was corrected as follows: “The obligation to house troops, which fell upon the townspeople wherever the soldiers happened to be, furthermore led to the draining of local resources, scarcity of grain and food, hunger, poverty, the risk of diseases spreading, and general hardship for all involved. The war also contributed to the loss of able-bodied young males, which resulted in a reduced capacity to farm. Moreover, the destruction of dwellings and tools and the loss of cattle need to be mentioned (Asch, 1997; Wilson, 2009; Münkler, 2017; Stoffel et al., 2022).”

Line 499: “Documentary sources indicate that the overpopulation of mice ...” Provide source to support

RESPONSE: This introductory sentence of this paragraph expresses generally occurrence of mice and their damaging effects to express effects of mice to grain crops. Following sentences cite already corresponding sources where such information appears. We believe that any other sources are not needed here.

Line 626: General pattern in England during this period, based on sources such as Broadberry et al 2015.

RESPONSE: Thanks for this comment, but we believe that description of general patterns in England is out of scope of this paper.

Line 631: Hoskins noted above argues this in England post 1650s

RESPONSE: Thanks for this comment, but looking on the rather general statements from Pfister and Wanner (2021) in lines 626–632 we do not see as suitable and consistent with points (i)–(iv) to add here in point (v) this local citation by Hoskins (1968) paper.

Lines 637-638: “Subsistence crises and famines were primarily caused by the war and its effects, devastating farmland, decimating livestock ...” I am uncomfortable with this - an argument could easily be presented that the crises and famines would have happened anyway because of the weather, but are likely exacerbated by the war... similarly plagues etc,

RESPONSE: Accepted and corrected as follows: “The war shifted the balance between the determinants in Fig. 13. Climatic factors and wars interacted in a destructive synergy. Their effects devastated the available farmland, decimated livestock, burdened subjects with war taxes and tributes, made the populations more susceptible to disease, and led to a significant loss of the workforce through death, disease, and military duties, which likely exacerbated subsistence crises, food shortages, and famines (Outram, 2001; Slavin, 2016).”

Figure 14: explain what the lines mean here

RESPONSE: Accepted, following sentence was added to figure caption: “Horizontal lines indicate mean prices for three different time intervals (1500–1567, 1568–1629, 1630–1670).”

Lines 691-694: “The large armies, numbering in the thousands, significantly increased the demand for grain.” Would be good to document this more earlier within the manuscript if any evidence remains.

RESPONSE: Thanks for this comment. This was mentioned, albeit a bit more indirectly, in lines 459–466. Here we discuss that all powers, except for the Dutch, had insufficient means to support their troops adequately with logistics, including food and grain, which was part of the reason that led some soldiers to undisciplined behaviour including looting.

“It is important to investigate the significance of climatic variations and extreme events using the example of territories that were spared from war, although it should be noted that epidemics did not stop at territorial borders. This study serves as a starting point for such investigations.” Would be good to document this more earlier within the manuscript if any evidence remains.

RESPONSE: Thanks for this comment. We agree fully with the referee, but in this extremely broad and complex topic it is extremely difficult to bring evidence for every aspect mentioned in our paper. From this reason the last sentence of the paper was complemented as: “This study serves as a starting point for such future investigations.”

References: Recommend to cite:

Adamson, G. C., Nash, D. J., and Grab, S. W.: 2022. Quantifying and reducing researcher subjectivity in the generation of climate indices from documentary sources, *Clim. Past*, 18, 1071–1081

Harvey-Fishenden, A., & Macdonald, N. (2021). Evaluating the utility of qualitative personal diaries in precipitation reconstruction in the eighteenth and nineteenth centuries. *Climate of the Past*, 17(1), 133-149. doi:10.5194/cp-17-133-2021

RESPONSE: Accepted. The first paper was cited at the end of the first paragraph of Sect. 5.2.1 as follows: “This discrepancy may be attributed to problems with the documentary data (missing monthly indices) and the different precipitation variability observed across various parts of Central Europe as well as in potential subjective generation of precipitation indices (see e.g. Adamson et al., 2022).” The second paper was newly cited in the first paragraph in Section 5.2 (see point above).