

Reply to Reviewer 1

Overview

This paper is generally well written and informative. I have a few comments below, suggesting that more could be made of the CET and the long Dutch instrumental record, and possibly the longer Dutch proxy record.

The most informative part of the paper is the determination of the very cold periods during the 1739/40 winter across Europe and the later cold spring and summer seasons. The diary information you have found links well with the few long instrumental records. Putting the diary information into monthly and seasonal context is good. Often diary information is given without this context.

You later discuss possible causes. The poor harvests might have been due to severe cold in winter, the freezing of rivers, canals and lakes, which took a long time to thaw, so planting was delayed across much of the continent.

The sea froze off the eastern UK coast in the winter of 1962/63, but there doesn't seem any mention of this for 1739/40, even though they had similar cold temperatures. 1962/63 is a more recent extremely cold winter that would be a good comparison. I see you have used winters from the early 1940s though. As an aside, the River Thames didn't freeze in 1962/63 as after London Bridge was replaced in the 1830s, the river became tidal upstream of London. From the 15th century up to bridge replacement in the 1830s the Thames wasn't that tidal above London Bridge. There is more on this in Jones (2008).

Thanks for the comment. Concerning the use of Dutch and UK data, see below. In the revised manuscript we will add a comparison to 1962/3.

Specific Comments

1. Line 32, Jones and Briffa (2006) is much more about the British Isles (maybe more so than Manley (1957) but it does provide long temperature series that are in the Netherlands and Germany. You have referred to Dickson (1997), but a couple of points about 1740 are worth mentioning: (1) It is referred to as the Forgotten Famine (the Potato famine just over a 100 years later is more well known) – you mention this a page later. Similar numbers to the 1840s left Ireland, about half to the North America and the rest to Britain. (2) During the 1739/1740 winter, the River Shannon froze over, something it's not done since. It is unsure from the Dickson book where the quite wide river did freeze over. Unfortunately there is no instrumental data from Ireland in 1740, which makes the Shannon freeze over more important.
Thanks for this comment. In the revised manuscript we will better discuss of the Jones & Briffa paper with respect to the Irish famine and River Shannon freezing. We will also add a reference to the paper by Mateus in "Weather" for the question of instrumental data in Ireland (<https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/wea.3887>)
2. Line 46, with respect to the warm 1730s in CET, the temperatures in this decade have only recently been exceeded (since the 1990s). The warm 1730s allowed for a dramatic increase in population of Britain and Ireland (more children survived), which might have made the impacts of 1739/40 much greater. Your later discussion doesn't seem to fully note the contrast of the cold 1739/40 compared to the very mild 1730s, especially the mild autumns in the decade.
We will add a comment on this interesting fact here as well as later in the discussion.

3. An interesting aside about 1740 in the CET record. Using the 1961-90 base period, no year has ever had all anomalies of the same sign until 2023. Last year they were all positive. 1740 came close to being all negative, but for September.
[Thanks for this comment.](#)
4. With Uppsala in Table 1 it is worth reading the 2002 paper in some detail. All the data before about 1739 come from a thermometer in an unheated room. If you plot the daily data, there appears to be a cut-off below which really cold temperatures in Uppsala were not measured. This does include the warm 1730s though. 1740 is the coldest year for CET, De Bilt and Berlin, but it does not appear that abnormal in Uppsala. The Q is whether this is real and was central and northern Fennoscandia not as cold as the other three locations. Uppsala would be well inside the Scandinavian High. This could be contrasted with the use of 1940 in Figure S1, which implies that northern Scandinavia may have been less cold? The less cold nature of Uppsala is mentioned later around lines 212-214.
[Thanks for this interesting point. We will add footnote to the Table and a discussion to lines 212-214](#)
5. On line 153, you earlier referred to the winter of 1708/09. Better to do this again and to the one you're discussing as 1739/40 and later in the paragraph. Later in the paper you refer to winters by the January, which can be confusing.
[Thanks, we will be more clear by always wiring 1739/40 and 1708/09, respectively.](#)
6. The Dutch temperature series in van Engelen et al (2001) can be used to compare 1739/40 with 1708/09 and much earlier cold winters. The series goes back to about 1250 for almost all years, and is instrumental from 1706. This series classifies 1739/40 as 8, but gives a 9 to 1788/89 and 1829/30. For these winters values come from the long De Bilt record. 1708/09 is also an 8, but 1683/84 a 9. So the Dutch series wouldn't undoubtedly say 1739/40 was the coldest, for the 18th. As you point out though exactly when the coldest periods occur can have important effects on harvests and phenology, and 1740 was cold until September.
[Thanks. The Discussion section will be extended with a subsection on the comparison of this winter to other winters and on the contrast to the 1730s \(see also comments above\). There we will go into a bit more detail on the Dutch series.](#)
7. The Dutch instrumental series back to 1706 is described in Labrijn (1945). I got a scanned copy of this from KNMI, and it is still available, but I can't get google to find it. It is worth getting, as it is more informative than Manley (1974). Important parts of it are summarised in English.
[Thanks. We add a brief discussion of the Dutch records. We have the De Bilt series only as monthlies, not as dailies. As all monthly series \(including De Bilt\) were assimilated into ModE-RA, we did not mention them specifically. In the revised manuscript we will mention the Dutch series explicitly \(and add the reference\) and briefly discuss the series used in ModE-RA.](#)
8. The Thames had its greatest frost fair in 1739/40 in terms of length. I can't recall, though, the reference I read many years ago about this.
[Thanks, we will search the reference and mention this.](#)
9. Good discussion of the circulation types in the following few pages. You note the odd values at some sites in some periods. It is quite difficult to check these, when the sites are not that close.
[Thanks](#)
10. The temperature anomaly maps in Figure 6 seem to suggest that Uppsala wasn't as cold relatively as the other sites, but did it influence all that is further north?
[Probably the influence was large, although there are other documentary records from Stockholm and from several other locations in the Baltic sea region. We will add a brief sentence.](#)

11. Line 336-338. You refer to 1740 as being very cold, but then mention 1829? The winter 1829/1830 was also very cold. Here you refer to winters by the December, better if you gave both years.
[Thanks, yes, we mean 1829/30, this will be corrected.](#)
12. Just after this there are attempts to compare 1740 with respect to other years and winters, but this could also be undertaken with CET. Here 1740 was the coldest year (since 1659) at 6.9 deg C. The warmest years were 2022 and 2023, which were both 11.1 deg C, so only a 4.2 deg C difference. For CET, this is almost the same as you have in line 342, but you're talking about a west European average?
[Yes, this text is explaining Fig. 9, but we will add a comparison to CET in the discussion \(new subsection mentioned above\).](#)
13. Lines 359-368, there has recently been a paper in Nature by Esper et al, which gives summer temperature estimates back 2000 years (for parts of the NH). Maybe worth comparing with that but this is summer. The coldest summer in the last 2000 years in the series was in 536, so much earlier.
[Thanks, we add this comparison to the discussion.](#)
14. I've always wondered what might have caused 1739-40. The Japanese volcano is not large enough and the ice cores don't show a major dust/acid layer. The ENSO influence is not that strong. It could just be a natural circulation occurrence!
[We fully agree.](#)

References

Jones, P.D., 2008: Historical Climatology – a state of the art review. *Weather* **63**, 181-186.

Labrijn, A.: The climate of the Netherlands during the last two and a half centuries, Tech. Rep. KNMI No. 102, Royal Netherlands Meteorological Institute, mededelingen en Verhandelingen, 1945. 2518

Labrijn, A.: 1945, K.N.M.I., Mededelingen en Verhandelingen no 49, Staatsuitgeverij, 's-Gravenhage.