

Anonymous Referee #3

General Comments

This original study is very interesting because it shows how grain records (rye, barley, and oats in this case) from public granaries may be used as proxies for evaluating grain harvests in relation to weather and climatic patterns. It is a (first) and promising attempt using granary data for historical-climatological research.

This paper is based on a set of unpublished historical granary data coupled with long-term series reconstructed for three basic climatic variables already available (temperature and precipitation series + scPDSI) and well-studied for the Czech Lands territory. In addition, the few existing biases for their use are also explained (ligne 481 to 487).

The choice of data processing (selection of four annual grain variables) statistical analyses (Spearman's rank correlation coefficient) is wise, easy to understand and clearly describe. There's no excess statistical analysis, which is a very good thing.

The use of four different types of weighted grain indices is a good way of getting around the problem of missing data. This methodology could be used as an example when analyzing similar data available throughout Europe, and for other crop types.

In the section "4.4.1 Extreme harvest years and documentary data", for the early 19th century, documentary weather data for the selected years of poor grain harvests & of good grain harvests are very impressive and precise! The role of climatic factors in a good or bad harvest is thus easy to identify.

RESPONSE: We would like to thank the anonymous referee #3 for evaluation of our paper and raising several critical comments, which we are trying to answer below.

Grain data from public granaries therefore appear interesting to identify bad or good grain harvests in relation to weather and climate patterns, but could they also be used to identify other specific environmental factors such as pest insect attacks (e.g. locusts or beetles) in crops? Of course, these phenomena are often influenced by climatic conditions but this aspect is not mentioned in the article.

RESPONSE: Accepted, the following text was complemented beyond the slightly changed sentence on line 479 in Section 5.1 as follows:

“... or reductions in stored grain due to official misappropriation or pests (e.g., insects, mice). Year after year, 1% of stored grain in each granary was subtracted due to pests and storage manipulation. In case of a greater damage to grain, the state administration (district office) assigned purchases of grain at the most favourable market price and from such money to procure fresh grain immediately. Whenever such purchases were recorded in granary records, they were differentiated expressly from borrowed grain due to weather. Substantial loss due to pests and insect attacks was reported in 1796 at the Albrechtice domain (“A worm spoiled part of stored grain.” – AS8) or in 1837 at the Kašperské Hory domain (“473 měřice, [i.e. 29,085 L] of rye from the granary was distributed interest-free among serfs due to a worm danger.” – AS9).”

As for locusts, the last intense locust outbreak in the Czech Lands occurred in 1748-1749, i.e. outside of the period analysed in our paper – see Brázdil, R., Řezníčková, L., Valášek, H., Kiss, A., Kotyza, O. (2014): Past locust outbreaks in the Czech Lands: do they indicate particular climatic patterns? *Theoretical and Applied Climatology*, 116, 343–357, doi: 10.1007/s00704-013-0950-9, for more details.

Ligne 540 to ligne 552 : This paragraph about other important non-climatic factors for years of bad and good harvests, especially conflicts and wars at that time, is particularly welcome, as it avoids the (potential) criticism of an overly deterministic vision.

RESPONSE: Thank you.

The change in crop type (here the increasing importance of potato growing) as a factor influencing cereal production should be further explored, in connection with the evolution of cultivation methods in the early 19th century. The Industrial Revolution in the 19th century brought technical and technological advances which had an impact on the development of arable farming. Scientific advances, such as mechanisation and artificial fertilizer improved yields.

RESPONSE: Thank you for your constructive comment with respect to potential future research.

Ligne 555 : "*Specifically, it identifies bad or good grain harvests in relation to weather and climate patterns, situating them within the broader context of the Czech Lands in the late 18th and the first half of the 19th century*", it's ok ! But, as the dataset in the article concerns only the Czech Republic, the data is not combined comparatively across wider areas, I'd suggest changing the title slightly from "for historical climatology" to "for historical climatology in Czech Republic".

RESPONSE: We would like to preserve the original title of the paper. The Czech Republic is used here as a case study to demonstrate that this type of data and the proposed methodology of their analysis can be used for historical climatological research in general, irrespective of the country in question – please see our expressions on lines 557-566.

Maps, charts and graphs are clear, well presented and easy to interpret. The English is very good, as is the style.

RESPONSE: Thank you.

The article is perfectly suited for *Climate of the Past* and deserves to be published with just a few minor revisions.

RESPONSE: Thank you.

Specific comments (about the references used):

Various works are cited for different European and Asian countries (China), but for France, only the work of Kaplan in 1977 is cited.

The question of grain harvests and grain management has, however, been discussed at length from various angles in the masterpiece of the French historian Jean Meuvret, published in 1977, "*Le problème des subsistances à l'époque de Louis XIV*" I. La production des céréales dans la France du XVII^e et XVIII^e siècle. & II. Le commerce des grains et la conjoncture (J. Meuvret, Mouton & Cie and École des Hautes Études en Sciences Sociales, Paris, 6 vol.).

These works cover much of the 17th and early 18th centuries, and regularly refer to granaries, so they could have been cited. However, the authors may not be familiar with these works, which are unfortunately only available in French, not widely distributed and not easily accessible.

RESPONSE: Thank you for reminding us of these important works. We now cite the papers in the text and references as:

Meuvret, J.: Le problème des subsistances à l'époque de Louis XIV. Tome I: La production des céréales dans la France du XVIIe et XVIIIe siècle. Paris-La Haye et École des Hautes Études en Sciences Sociales, Paris, ISBN 978-2713200342, 224 and 224 pp., 1977.

Meuvret, J.: Le problème des subsistances à l'époque de Louis XIV. Tome II: La production des céréales et la société rurale. École des Hautes Études en Sciences Sociales, Paris, ISBN 978-3110985658, 286 and 275 pp., 1987.

Meuvret, J.: Le problème des subsistances à l'époque de Louis XIV. Tome III: Le commerce des grains et la conjoncture. Éditions de École des Hautes Études en Sciences Sociales, Paris, ISBN 978-2713208867, 191 and 162 pp., 1988.

There's also Abbott P. Usher's book : "The history of the grain trade in France 1400-1710, Cambridge Harvard University Press, 1913" (book in open access), which refers to the granaries, but this French-centric study is now a little outdated, and we prefer to use J. Meuvret.

RESPONSE: We follow your recommendation and we are now citing only Meuvret (1977, 1987, 1988).

Technical corrections about the bibliography:

For France, the work of "Gast, M. and Sigaut, F. 1979" appears in the references but not in the text. A correction is therefore necessary.

RESPONSE: Accepted and complemented on line 56.