

## ***Interactive comment on “The early Spörer Minimum – a period of extraordinary climate and socio-economic changes in Western and Central Europe” by Chantal Camenisch et al.***

**Anonymous Referee #3**

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### General comments

The discussion paper titled "The early Spörer Minimum - a period of extraordinary climate and socio-economic changes in Western and Central Europe" is very stimulating and makes a valuable contribution to historical climatology. This article is undoubtedly within the scientific field of CP.

Based from climatic data and existing historical information, the major contribution and novelty of this paper is the systemic approach used to precisely measure the relationship between climate and societies for a short period of time (the 1430s) at a large spatial scale (mainly Central and Northwestern Europe) with a wide range of examples and comparisons. In itself, the constitution of an international team bringing together

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most of the disciplines involved in climatic subjects is a recent and undeniably innovative approach.

The summary is concise and reflects the content of the article. The many references to previous researches are always relevant and systematically connected to the argumentation, so the contributions of the authors are evident. The overall presentation is clear and well structured, with a fluent and precise language.

I highly recommend publication of this article, after some revisions. As a historian, my comments are focused on this matter: I hope that it does not diminish the results of this inspiring paper.

1) The title reflects the content of the article but it should perhaps more clearly highlight its main contribution and its novelty, i.e. identify through a multifactorial approach the relationships between climate change and the social, economic, political, cultural and religious impacts in a short time scale. Somehow, this article aims to define or redefine the early Spörer Minimum from a Human point of view.

2) The summary speaks of "an end-to-end assessment": "a systemic (or systematic) survey" could perhaps be more comprehensive and better reflect the method used in the paper as illustrated in Fig. #1 and Fig. #8?

3) The relationship between famines and epidemics seem obvious and is mentioned several times in the paper (page 3, line 10; page 7, line 29; page 9, line 10-24; page 11, line 16). This matter is still debated, especially regarding the plague [Saluzzo, J.-F. : Des Hommes et des germes, Presses Universitaires de France, Paris, 2004 ; Audouin-Rouzeau, F. : Les Chemins de la peste. Le rat, la puce et l'homme, Presses Universitaires de Rennes, Rennes, 2003]. One or more localized examples emphasizing the chronological sequences famines-epidemics could be useful. Moreover, cases of ergotism (St Anthony's fire) are often perceived and described wrongly by the ancient as "epidemics", especially during subsistence crises.

C2

4) The question of food trade requires some clarifications. Can we assume that international or interurban food trade (mentioned in page 10) is the standard in the fifteenth century? Or rather an exceptional measure during subsistence crisis? As shown in 1437 in Switzerland (page 10, lines 24-33), "municipal selfishness" may generally impeding the dilution of subsistence crisis by trade. For example, Flemish cities are opposed to the free movement of grains desired by the Duke of Burgundy in 1473 [Goddard, J. : Dans les Pays-Bas bourguignons. Un conflit de politique commerciale, dans Annales d'histoire sociale, 1, 417-420, 1939].

5) Climate impacts on livestock are clearly exposed. A clarification may be useful: Did mass slaughter appear during the most intense crisis, contributing to aggravate the phenomenon? To what extent meat consumption is common in the first half of fifteenth century?

6) The construction of municipal grain storage capacities to avoid future subsistence crises is indicated in the summary (page 2, line 5) but deserves to be developed in the article. This is probably one of the most emblematic measures of adaptation of cities to climate change in the fifteenth century. These buildings often left their marks in the urban landscape till today. Several examples are directly related to the climatic context of 1430s: a "Kornhaus" was built in Cologne in 1439 and a second, much greater, was built from 1441, a "Kornhaus" was built in Strasbourg in 1441, etc.

7) Several (often extreme) cultural and religious responses are clearly discussed on page 11 but should perhaps be postponed towards the end of the article. Religious responses are a last resort after the failure of any other public policy (eg grain storage capacities, market interventions, etc.) to mitigate a subsistence crisis. The official violence (eg witch hunting, see Wolfgang Behringer) then becomes the last way to avoid the political crisis.

8) The fifteenth century context is complicated by the permanent state of war throughout much of Europe (pages 11-12). Any passing troops push regularly rural populations

C3

to take refuge in cities with their food reserves, so that geopolitical stress may have (in an apparently paradoxical way) contributed to attenuate some subsistence crisis (at cities scale)?

9) If offshore fishing is suffering from climatic change due to displacements of migratory routes of fish stocks, does it helps to promote the development of inland freshwater fisheries? Or the development of fish farming (ponds, lakes)? When markets were unable to respond to the demand for fish during fasting (such as Lent), religious authorities may deliver exceptional authorizations to consume usually banned products (eggs, meat). Another form of (religious) adaptation to climate change?

As a conclusion, the many and very rich examples present in the paper show a massive implication of the civil or religious authorities at all spatial scales (states, cities) throughout Europe to mitigate or avoid subsistence crisis. Is it the same in earlier times? Otherwise, can we consider the 1430s as a matrix for subsequent crisis?

Specific comments and technical corrections

Page 2, line 3: "The particularly cold winters and normal but wet summers", maybe must it be specified that the summers are "normal" for temperatures?

Page 2, line 15: Go to the line before "The past climate is reconstructed from..." (change of subject)?

Page 3, lines 7-23: a paragraph to shift towards the end of the introduction (eg page 4, between lines 4 and 5) to better respect the plan of the article?

Section #4. Climate and weather impacts on the economy and society during the early Spörer Minimum: the structure of this section should be clarified by following more strictly the structure of Fig. # 8 or by displacing some paragraphs in a more linear order, eg 1) geopolitical context (the Hundred Years War, etc.) 2) extreme events and their impacts 3) grains 4) livestock 5) fishing 6) food trade 7) famines and plagues 8) public policies (grain storage, etc.) 9) religious and cultural responses.

C4

Figures Fig. 1: "infrastructure for grain storage" rather to place in the "socio-economic factors" box? In the "socio-economic factors" box, add "control of trade in goods", "price control", "market interventions", etc.?

Fig. 2: For readability, do not separate the cards of their legends (table 1)?

Fig. 9 "W (B / A) YPS" → clarify?

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