Comment on cp-2021-117
Anonymous Referee #1

Referee comment on "Climate history of the principality of Transylvania during the Maunder Minimum (MM) years (1645–1715 CE)" by Martin Stangl and Ulrich Foelsche, Clim. Past Discuss., https://doi.org/10.5194/cp-2021-117-RC1, 2021

Review: ‘Climate history of the principality of Transylvania during the Maunder Minimum (MM) years (1645 - 1715 CE)’

First of all: I would like to express that I appreciate the efforts of the two Austrian climate scientists, and the paper has also some positive sides which can be further explored, and I agree with the authors that studying Transylvanian historical climate is indeed an exciting topic, and worth for further consideration. However, the paper in content, methodology, source density, analysis and the results does not reach the basic requirements of the journal Climate of the Past, and therefore the suggested itineration is rejection. I provide some of the major (and occasionally, when I find necessary, smaller) points chapter by chapter. As you can see, I have several comments and suggestions: I invested a lot time and energies into this review with the hope that it helps your overall understanding of historical climatology, and also to better understand the region, the topic, the history and the sources of the region you are writing about. In many cases I did not provide full references of the literature I am suggesting, because they are either really basic and well-known and/or they are easy and obvious to find with the information I provided.

1) Chapter 1: Introduction
After a lengthy introduction on the well-known Maunder Minimum, and referring to the EU project ADVICE (which was, of course, far not the only EU project where extensive attention was dedicated to the climatic conditions of the Maunder minimum), the authors then turn to the historical-geographical background of the Principality or Duchy or Grand Duchy (names depend on the period and the actual status of the state/country) of Transylvania. Unfortunately, the authors only refer as a historiographical background to the rather general book of Cernovodeanu and Binder from 1993, written in Romanian (where the Transylvanian part – including the Maunder Minimum period - is almost entirely based on the data compilation of Antal Réthly, written in Hungarian), and fails to utilize or even mention all the rest of the scientific literature in historical climatology where Transylvanian sources were utilized, and therefore the authors make the false conclusion that – apart from the Cernovodeanu-Binder book – nobody else analysed these sources before, and also to the false conclusion that no year-by-year analysis had been carried out so far (see e.g. the extensive works L. Rácz regarding historical Hungary including Transylvania, the seasonal indices developed for the period between 1500 and 1850 – the Maunder Minimum period has been also specifically discussed in a separate paper – all available in English; other published works of the Hungarian Met. Service in English; then the EU-project Millennium where the Carpathian Basin evidence was again reanalised and quantified, also separate for Transylvania, regarding the period 1500-1870; see e.g. Dobrovolný et al. 2010). This leads to the falls conclusion that the Transylvanian source materials would have never been studied year-by-year alone or as part larger regional annual/sub-annual analysis works (they were not only studied, but re-studied a number of times in the last decades; and most of the results are available, actually, freely online in English – very easily reachable).

The authors also fail to mention that – from historical, source availability/interpretation and understanding and perception point view – crucial circumstance that Transylvania until 1541 (in fact, officially until 1570 – only at that time the Principality was officially born) was an integrate part of the Hungarian kingdom, and when in a legal sense the Transylvanian Principality was annexed by the Habsburgs (in legal sense in 1699, but in reality only in 1711; but kept a separate in a legal-administrative sense from Hungary until 1848), they claimed the rightful possession as kings of Hungary. It is also important because the authors are seemingly not aware of the fact that during the times of the principality there is a primary importance of Hungarian nobility and Hungarian literacy within the Principality – largely neglected by the authors, and because of that, they overgeneralised the information available in the German-speaking areas of Transylvania (mainly at the south), which formed only a rather small part (and a minority of the population) of Transylvania. The complete negligence of these facts become even more important when the authors actually analyse the period, covering the period from 1500 onwards.

The authors use incorrectly the term ‘Transylvania’ (and never realise it): historical Transylvania and the Principality or Grand Dutchy of Transylvania have significant territorial differences (which has also significant importance in spatial interpretations), what I will explain more in the review of the next chapter.

The authors claim that they have used everywhere the original sources and then (re)extracted the climatic/weather content from these original sources. This would mean
that the authors actually have read the original German, Hungarian (and occasionally Latin?) sources, original texts. As we will see later, at least with the Hungarian sources, it was quite surely not the case. It is also strange that – if they have read and utilized sources also on other languages, why they only provide quotations written in German (and neglect those in other languages they claim to have read and utilized)?

As for the remark of the authors of the #neglected Eastern Europe’, just 2 reflections:

- By none of the geographical or climatic (or historical) definitions Transylvania or the rest of the Carpathian Basin belongs to ‘Eastern Europe’. According to all broadly accepted definitions these regions belong to Central (or East Central) Europe. As Romania is also part of the Balkan in some definitions (more correctly its parts east and south to the Carpathians), sometimes it is listed to South-east Europe. But never to Eastern Europe.
- As for the supposed ‘neglection’: from a historical climate research point of view, this region belongs one of the better studied regions, and it is more extensively studied (prior to the authors wrote their paper) and covered by scientific papers than the majority of Europe (see more detailed information in the next chapter).

2) Chapter 2: Study area and historical sources

The authors provide a brief general overview of the climatic conditions of Transylvania. However, the authors fail to mention which Transylvania are they talking about? Because their climatic description refers only to the (medieval) historical areas of Transylvania only. However, the authors in the title of their paper suggest they deal with the (entire) Grand Duchy of Transylvania – but exactly the locations they mention (and what they fail to mention) prove that they do not deal with the entire Grand Duchy.

The medieval (historical) Transylvania only included the Transylvanian counties east to the Bucea in Romanian (Királyhágó in Hungarian). The Grand Duchy of Transylvania included historical Transylvania, the Partium (counties in the eastern part of the Great Hungarian Plain – today mostly belongs to Romania) and the eastern part of the Bánság or Banat area (today mostly belong to Romania, partly to Serbia) in the south-eastern part of the Great Hungarian (or Pannonian) Plain, and there was a broader area in the north, today’s Transcarpathian Region (today belongs to Ukraine) and Maramureș County (today northern Romania) that partly or entirely also belonged to the Principality or Grand Duchy of Transylvania, but was never part of historical Transylvania. The area of historical
Transylvania is 57,000 km$^2$, while the area of the former Grand Duchy of Transylvania is (even if we only take its base areas) over 103,000 km$^2$. Thus, the Grand Duchy was around twice the size of historical Transylvania, and while historical Transylvania was mainly a hilly/mountainous area with hill/mountain basins, the rest of the Grand Duchy was almost entirely plain, located over the mountains, west to historical Transylvania. The authors seemingly failed to notice this rather major difference.

Table 1: the list of place names suggest that the authors are not entirely familiar with the grammar of Romanian and especially the Hungarian names and/or they failed to copy them punctually (this particularly concerns the inconsequential use/lack of hyphens and special characters). The list also suggest that the authors only used part of the contemporary sources available and used in historical climatology research up to now. It also shows that they can cover, even within historical Transylvania, only a small part, and also that while they use most of the published German sources, they only use selected Hungarian sources, and no documentation written (in the official language of administration and often also that of science) in Latin. This causes a strong spatial representation of the German “Seven Seats” that covers only a small area (mostly concentrated in the south), while we will know almost nothing about most of Transylvania. Although it is not clear, why to list everything in 3 languages here, when this information is easy to reach anyway, and the authors do not use this information later in their paper. Instead, a map that provides spatial information of these locations should have been included. Now there is a description but no any map at all in the paper. A map would have immediately provided information about the spatial distribution of these locations (never mind, I know all these locations – and also all the sources you used, but perhaps this is not case with 99% of the potential readers).

In the rest of the chapter the authors provide examples of the sources they referred to. I agree with the authors that e.g. Kraus and Miles are reliable sources for this period, but the few key (German) sources the authors listed are all included in Antal Réthly’s source/data compilation (1970) and as such, they were several times utilized in climate reconstruction in the past decades. Moreover, the few sources/examples – exclusively German sources – the authors list here are just a small part of the database they used, and we do not receive any information the authors referred to in the following chapters, and – particularly – they do not provide any information about the source credibility of the non-contemporary sources and data compilations they also used in their descriptions (and the overview figures), and which formed an integrate and visibly important part of their database. Thus, most of the historical critical analysis is missing and source credibility questions are only listed here in those few, unambiguously contemporary cases, examples, when they used contemporary sources, while entirely missing with all the rest (i.e. most) of the evidence they used. There is also nothing about how the authors treated contradicting source information, although in the study period the sources the authors listed in their work sometimes do contain contradicting information. I.e. except for a small minority of the sources that are unambiguously contemporary, source critics and any sign of critical source evaluation is missing from the paper.

The authors here again repeat that the only ‘extensive’ work available for this period for Transylvania is the Cernovodeanu-Binder (1993) book so, again, this is, naturally very far from the truth. Many of the systematic analysis works and descriptive climate history literature that extensively utilized on a level of seasonal/annual resolution the Transylvanian sources the authors presented (and also other sources, the author did not
list here) are listed and referred in the following paper: Kiss 2009 (in English, freely online available). Just to list a couple of examples, published in English (freely available online; much more listed you can find in Kiss 2009: Historical climatology in Hungary: Role of documentary evidence in the study of past climates and hydrometeorological extremes. *Időjárás* 113/4 (2009): 315-339):


Nevertheless, I have to add that I could list at least another dozen further papers and books where the Transylvanian evidence the authors also described and basically the database they used in the current paper were already extensively utilized in quantitative (or descriptive) high-resolution climate reconstruction.

A common characteristics of these works is that the authors of these papers/book used the database presented in the Réthly (1970) compilation (the data provided by the authors of the current paper is basically based on the same sources/database). Another common characteristics is that most of the 17th-century analysis is primarily based on Transylvanian (and partly present-day Slovakia, and West-Hungary, particularly Sopron town narratives), thus Transylvanian sources primarily influence the results (and the quantitative reconstruction outcome) of these works. Lajos, for example, also provides a description of some of the (Transylvanian) narratives of the period.

Furthermore, in the framework of the Millennium project, a new analysis (with applying source critics, and almost entirely based only on contemporary sources) have considered to divide historical Hungary and the Carpathian Basin into major regions, based mainly also on the sources included in the Réthly collection (partly of additional sources) Thus, a separate analysis and quantitative reconstruction have been carried out and presented also for Transylvania separate for the period between 1500 and 1870; as unfortunately, however, the dataset available for the different parts of the Carpathian Basin are not yet
enough for separate quantitative reconstructions (i.e. also the database the authors used is not enough for such an analysis), finally the joint, historical Hungary (covering almost the entire Carpathian Basin) quantitative temperature and precipitation reconstructions were used as comparative data series in the 500-year Central European temperature reconstruction (see Dobrovolný et al. 2010).

Thus, by utilizing these Transylvanian sources, the authors by far are not the first one, and a significant quantity of related scientific literature was completely neglected by the authors.

These basic methodological problems in spatial and historical as well as source understanding, and also lacking the knowledge (and lack of utilization/comparison) of previous analyses works altogether could have led to rejection, because these circumstances fundamentally influence all analysis and conclusions of the authors.

3) Annual characteristics of the MM in Transylvania

First of all: Climate of the Past is not the journal where this kind of lengthy plain descriptions, without any particular analysis, quantitative results are to be placed. Maybe the authors also noticed that where these kind of descriptions they found about other areas to compare with, were all in books and not in journal papers. Or alternatively, in low impact or non-impact factor journals – but the authors will definitely not find these kind of descriptive works in such a journal as the Climate of the Past. So, already based on this chapter I should suggested rejection, too. The authors provide plenty of descriptive information, but mostly the authors cannot follow (unless they know the actual source) which area actually the reports refer to, and how representative the information is for the entire Transylvania (and historical or the principality of Transylvania?).

Second: In this part of the paper the authors use some contemporary sources (they listed in the previous chapter), but also non-contemporary sources and even data compilations (of sometimes rather low quality) equal to contemporary sources mixed – without making any qualitative (or quantitative) differentiation. The compilation and literature entries the authors referred sometimes also contain overgeneralisation (e.g. Cernovodeanu-Binder mostly do not directly refer to their sources; they just have ‘conclusions’ on weather, which are often overgeneralized and used for filling up some gaps and the sources, too. So, one has to treat their descriptions with some caution).
This altogether shows the complete lack of historical source critics, which is a basic methodological requirement in historical climatology, and would be again alone a reason for rejection.

Third: while German names/sources referred correctly, there are more problems with Romanian language, but there are really basic problems is the highly corrupted grammar and the general use of Hungarian language in the paper, although it would only be the question of simple retyping of book titles. For example, almost all hyphens are missing, and even in those very few cases when they put hyphens, often the wrong hyphen to the wrong place.... And these are not only isolated mistakes. There are mistakes/missing hyphens in almost every word.

Although, when interpreting the historical sources of a particular region, one would expect some discussion of the sources at the beginning of the paper (including Hungarian sources they used, as I mentioned before), where at least some Hungarian names would have also popped up – they did not do that. But my main concern is rather that if the authors have so basic difficulties and do not even manage to retype Hungarian names and words (let alone entire book titles) – how did they actually read (or who read) and climatology interpreted the 17th century Hungarian sources?

Fourth: locusts – yes locust invasions were very important; in fact, if the authors found it so important as they emphasised, they could have collected much more data (there is an ‘ocean’ of data on locust invasions, and how local population associated them with droughts and military actions) related to these invasions and their background, or at least refer to some related works.

4) Annual comparison with data from Germany, Austria and Switzerland

Some remarks to this comparison:

The Glaser 2008 has been updated and published in 2013.

Pilgram, what the authors use very often for the comparison with Austria is a well-known dubious-quality compilation, and because of its low source quality, mostly out of use of
the decades. I recommend the authors to avoid its direct utilization.

As for Peinlich: this book is primarily on plagues, with occasional reference on weather as a side line. As the references are sometimes rather missing details, maybe for next time it is useful to check the reliability of the information (from the reference this 19th-century book gave).

General remark: there is far far more information is available to compare with – even in the German speaking areas the authors referred to. Moreover, the authors also dedicate some special attention to locust invasions – which again have much more published literature to compare with, even in the German-speaking areas. However, it is rather strange, that while the authors compare the Transylvanian data to remote German-speaking areas, they entirely neglect comparison with data and reconstructions within the Carpathian Basin or, for example, the nearby Poland (apart from the Hungarian reconstructions, for Poland also several reconstructions exist). You could have also compared your results to the Vienna temperature reconstruction of Maurer et al (2004), regarding the Vienna region, and also the wine and grain-based late spring-early summer temperature reconstruction regarding to Kőszeg, Hungary (Kiss et al. 2010) – all these reconstructions cover the Maunder Minimum.

Moreover, I was also missing any comparison to some non-documentary series. Just to stay in the same area, tree-ring based temperature reconstructions exist and have been published even in Transylvania (e.g. check the works of Ionel Popa and his colleagues – all available online, in English). Or the tree-ring based temperature and precipitation reconstructions in Slovakia and Hungary etc.

I also miss the comparison with the 500-year Central European temperature reconstruction (monthly, seasonal and annual reconstruction; Dobrovolný et al. 2010). Of course, if the authors had used or known about this paper, they would have immediately realise that the Transylvanian database (both individually and as part of the Carpathian Basin reconstruction) has been already compared to the Central European reconstruction, and also to the Swiss, German, Czech and Polish month/seasonal series between 1500 and 1870 (included in the Dobrovolný et al. 2010 paper).

In the comparison, one very important point was also totally neglected: comparison of modern climatic conditions (long-term climate variability) of the compared areas. Based on that, the authors could have had a rough estimation whether or not they should expect much similarities between these datasets or not.

5) The ‘decades before and after’ and the comparison to solar activity
In this chapter the authors provide an overview (based on unknown data) of base winter and summer information (decadal, using numbers), and compare it to some sunspot activity data.

Telling the truth, given the fact that for this kind of data representation the scientific already for decades provided quantitative reconstructions (in the form indices), this approach is a step back. Neither in the main text nor in the figure caption we gain any information about the database/sources of these figures.

The way how the authors try to compare the weather data to the sunspot numbers is also not entirely clear. What is the actual climatological basis of this direct comparison? And why the authors think that decadal variability is only dependent (and directly dependent???) on solar variability? And why only use than sunspot numbers (and no other solar activity reconstructions – there are many, also e.g. many isotope-based). Also: what about the other factors influencing climate and weather (and for which plenty of reconstructions are also available)? This interpretation/comparison is rather problematic and unclear.

The source-related figures: If these are the only sources the authors used, based merely these sources (especially when applying source critics), the authors could not have provided the figures/charts presented in the paper. Or at least not only for historical Transylvania alone. So, they most probably used other data, too (and it is also not clear what was the quality of the data). It is therefore not clear what is exactly the source of their figures, but it would be a basic requirement to refer the sources of the figures. The quantities look like as if the authors would have taken the data mostly from the Réthly compilation (or the Cernovodeanu-Binder book and some Romanian compilations, which are also almost entirely based on the Réthly database).

Figures 2 and 4 seem to be a bit unclear in representation: what do the columns exactly represent? If they represent decades, why every years ending with ‘5’ are only provided as a timescale? It is not really clear even whether the graphs represent rather data availability situation or the fluctuation of climatic parameters. For example, a figure on the data density would have been vital here – not talking about the spatial distribution of this data (i.e. reported in the high mountains or in the lowland/basin areas etc.). authors mean the decades from the middle of the decade to the middle of the next decade, why did they do that (and why not the more usual full-decade sums)? This information should be also included in the paper somewhere.

I agree with the authors that one should be extremely careful while making any comparison between sunspot numbers and Transylvanian climate. But it is really unclear
what the authors mean under ‘At best, one could see this as an indication and wait for future evaluation of climate data from the entire German-speaking area’. ?? Why to wait for data ‘from the entire German-speaking area’? The authors claim at the beginning of the paper that they read and extracted the weather-related information from the original sources. Then what the authors are actually waiting for ‘from the entire German-speaking area’? There is quite much already published from the ‘German-speaking area’ – and several times already utilized in climatic reconstructions. These are not new things to write about. What would be new is the investigations and new findings in the unpublished source materials – and that would be worth for Climate of the Past publication. Another question is: why only the ‘German-speaking’ area? It is clear from the paper that the authors live in the false illusion that the German minority (forming only a small of the Transylvanian population) produced most of the weather-related information in 17th-century or the entirely early modern time period. This is, of course, not true: most of the literate intellectuals, the entire nobility, the prince’s court were Hungarian (as most of the population was Hungarian and Romanian – the latter in ever growing numbers throughout the early modern period), and in fact the 17th century was a heydays of not only the principality but also the Hungarian literature, memoir and diary writing in Hungarian and Latin (the sources written in the latter language the authors almost entirely ignored as such - although it was the official language of the state and the science), not talking about the vast amount of state, public and urban administration documents in Hungarian and Latin.

Moreover, these Hungarian sources are also rather richly published (there is an entire section of Monumenta Hungariae Historica dedicated to Transylvanian writers), and since the early 1970s a huge amount of Hungarian sources were published, and being published even now – yes, there is really an ocean of published Hungarian and Latin literature for Transylvania that quite much exceeds the contemporary, published German sources (though, I agree with the authors the German literary participation to the Transylvanian written heritage is very important, and overrepresented compared to the size of population). The authors rather visibly only used some of the sources that were not written in German, the compilations referred to, and did not make practically any further search. Though it would not have been difficult as many of these are published. Moreover, there is a huge quantity of archival materials published online recently (printed and manuscript) which are also not difficult to search (though it certainly requires time and some historical knowledge). Also, entire research groups – even nowadays – in Cluj and Bucharest are dedicated to publishing Hungarian (and Latin) early modern sources…. So, there is really a lot of easily reachable materials, and not only in German (by the way, the authors visibly did not even explored fully the published evidence in German).

Shortly: due to the missing historical knowledge, the authors are quite mislead about the source conditions and source availability in Transylvania.

6) Summary
However, I fully agree with the authors that the database the authors used in their Transylvanian paper is too scarce and qualitatively heterogenous. But this is not true for the actual general source density in the region for historical climate research – it is rather that the authors failed (or did not try) to utilize more sources (even from the published materials). Part of the reason for this that while the authors had a very targeted focus on sources written in German, quite much (or entirely) neglected sources written in other languages – which by the 17th century gained a majority within the territories of the Principality or Grand Duchy of Transylvania. This is partly (or largely) due to the fact that the authors did not include in their investigations historian experts of the area (it is far not enough to ask the opinion of one German historian in Sibiu in one specific question).

My overall conclusion is that this is scientifically a weak paper (sorry, but it is very obvious), and it is both from methodological and source/database point (a technical/structural point of view) very far from the standards of the journal Climate of the Past. It would be even problematic to accept to much lower impact factor journals; but Climate of the past is definitely not the appropriate target journal for this paper.

To say also something positive: I liked the precise in-text references, with the relevant page numbers (mostly) added.