

Manuscript: Climate simulations and pollen data reveal the distribution and connectivity of temperate tree populations in eastern Asia during the Last Glacial Maximum

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## **Reviewer 1**

Minor comments: Line 83: ...a very low resolution of T31. Comment: what is T31? The readers know that they can find the details in the mentioned papers, but I suggest you specify what exactly this acronym means, especially for nonmodellers. Please, explain briefly. Maybe you can already specify also the model resolution. (see next comment).

**Done**

**i.e. a spectral representation which resolves waves down to 31 on any great circle on the earth corresponding to approx. 3.75°. now line84-87**

Line 97: (corresponding to approx. 3.75°)

Comment: this is the T31 model resolution? you can move this above. (see previous comment).

**Removed because it has been said above**

Lines 135-136: Lower CO<sub>2</sub> concentration in the atmosphere during the LGM has caused a decline of pollen production. Comment: Can you add some references?

**Done already in the original text line 137**

Line 164: CTR. Comment: please, specify what CTR is and its meaning. It is the first time you introduce it.

**done**

Line 164: (Dee et al. 2011; ECMWF-ERA. 2019) (ERA). Remove the space before (ERA)

**done**

. Line 258: delete "." before away.

**done**

Line 261:delete "." the second dot after "in the other climatologies".

**done**

Line 283: Asia is missing after Eastern.

**Done**

Line 288: I think a full stop is missing after "vegetation types".

**done**

Lines 288-290: we add also a maximal winter temperature (Tmax) which the climatological temperature must fall below to allow deciduous tree will grow, suggested by Sitch et al. (2003) and Roche et al. (2007). Comment: please, rephrase the sentence.

**done**

Line 290: remove the space before (Table 1) and add a space before Sitch et al.

**done**

Line 484: after 5°C, a "(" is missing.

**done**

Line 496: By extending the view of our investigation for the whole of Eurasia (Fig. 9).  
Comment: Where do the European pollen info come from? Maybe, it is better to specify.

**done**

Line 503: Generally, the estimates of possible temperate deciduous tree growth in the LGM in eastern Asia. Maybe in this sentence, it is missing "by model results?".

**done**

Line 504: Therefor "e" is missing.

**Done also done in 417 and 507**

Line 548: future climate change. Maybe it is better to delete "future" and write "on-going".

**Done perhaps better "possible"**

Comments to Figures and captions: Fig. 1: if it is possible, make thinner the dashed grids and numbers not bold

**Not possible at the moment and in a foreseeable time**

and a little bigger, would help for a better reading.

**Done a little bigger numbers also for other plots**

Add °C close to the colour scale bands. Fig. 3: add °C close to the scale.

**Done also for Fig.1**

Fig. 4: upper right panel and lower right panel: move 40°N a bit up, it is not aligned.

**Done corrected as well for other plots**

Fig. 6: 1) Please, correct the position of the latitudinal degrees at the left side of both panels.  
2) Is there missing an explanation/colour scale? It does seem so, also considering the scale in Fig. 9.

**Done corrected as well for other plots**

Fig. 6 Caption. Instead of "Darker colours" maybe it is better to write green. I suggest you use a contour black line for each red marker to make them more visible. Instead of "otherwise filled markers" maybe it is better to write red markers.

**done**

Fig. 7: Please, make the markers of pollen sites a little bigger, especially the marker in Taiwan.

**It is the balance between large markers and not obscuring the land-sea contours especially for Taiwan . Therefore, we had already chosen for the present over Japan only dots. We did not do anything in this respect**

Caption of Fig. 7: 1- Areas with topography above the 850hPa level are erased. Erased or blue coloured? 2- Maybe it is better to specify also in the caption that the V10m are the north-easterly 10 m winds.

**done**

Fig. 9: please, add which is the unit of the colour scale.

**done**

Table 2a. It is better to enlarge the column with the Alt/depth in m. Tables 2a and 2b: Check the double spaces in the author's list.

**done**

## Reviewer 2

This paper focuses on the past climate estimation for Eurasia for the Last Glacial Maximum (LGM) using climate modeling, and then simulates the potential distribution for the deciduous-broadleaved trees by combining these estimated climatic limits. Finally, the potential refugia of the deciduous-broadleaved trees are concluded and assessed by the pollen data. Generally, the manuscript is well organized, I would recommend this manuscript for publication in *Climate of The Past*. However, it needs to be improved before it can be accepted, and I do have comments and suggestions hereafter.

There are many literatures at least few of them published in English about the glacier refugia in East Asia, including that based on modeling, pollen mapping, and phylogenetic data, for instance, biome modeling by Anne Dallmeyer, Jian Ni. In this manuscript, authors cited too few literatures about the previous studies in East Asia. Authors should add and discuss them in this manuscript.

In lines 76-79 we explain our aim, not to repeat using BIOMEs, as we want to use mainly variables which can be validated. The coupled models, at least those from the Max-Planck Institute for Meteorology are based for BIOMEs on the program JSBach, the code of which we investigated for finding ideas regarding limitations for tree growth had similarities with our choices but need quantities which can hardly be validated, e.g. soil parameters

**We cannot find a paper Dallmeyer and Ni perhaps the nearest article from these authors is**

Dallmeyer, A., Claussen, M., Ni, J., Cao, X., Wang, Y., Fischer, N., Pfeiffer, M., Jin, L., Khon, V., Wagner, S., Haberkorn, K., and Herzschuh, U.: Biome changes in Asia since the mid-Holocene – an analysis of different transient Earth system model simulations, *Clim. Past*, 13, 107–134, <https://doi.org/10.5194/cp-13107-2017>, 2017  
However this does not cover the LGM

We have already referred to

Tian F., Cao X., Dallmeyer A., Ni J., Zhao Y., Wang Y. and Herzschuh U.: Quantitative woody cover reconstructions from eastern continental Asia of the last 22 kyr reveal strong regional peculiarities. *Quatern Sci Rev*, 137, 33-44, 2016

2) The weaker impact of LGM climate on vegetation in East Asia than European should be caused partly by the absence of continental ice sheet. Authors should add discussion about that.

**We have mentioned the larger Eurasian ice sheet (line 51). And in other places of the manuscript we mentioned the smaller ice cap in Asia, eg. Lines 89 and 540.**

3) Why the authors excluded *Betula*, *Alnus* and *Fagus*? They are quite important summer-green and broadleaf pollen taxa in pollen spectra from East Asia. Authors should explain that. In addition, in the list of pollen names, what is represented by “others”?

**We worked exclusively on warm temperate broad-leaf trees, In order to focus the work and also to make the comparison to our previous work on Europe more straightforward.**

**Others are for example Carpinus (see table 2, line 377). To make it clearer we did already add this information in line 152 too.**

4) In this manuscript, there are a lot of results are marked as "(not show)", why not present them as an appendix?

**It is not really worth it because most of the information in the not shown figures can be deducted from the available figures.**

**The one on line 178 we preferred to show C&L and their difference with ERA because together one can recognize the argument and the difference map gives more information than an ERA panel. The same applies to the one in line 180 it is said that we do not expect any impact on our result**

**The one on line 222 because those areas are too far outside our area of interest.**

**For the one in line 483 we refer already to Fig.S1.1 as an alternative and we have referred as well to Fig.S1.2, which contains also information for March We replaced this by referring to appendix S1 which is dealing with the progression of the monsoon**

5) There are some sites from the South China behave pollen data during the LGM in the dataset of Cao et al. (2013), why authors presented only few of them?

**We kept the deciduous temperate trees which make the comparison to our previous work on Europe more straightforward**

6) The conclusion is quite long, and some content should belong to the results or discussions parts.

**We have moved lines 509 - 520 to Section6 line now 526- 536 and**

**Line 533 -542 . to Section6 line now 474-483**