

***Interactive comment on “Reconstructing glacier-based climates of LGM Europe and Russia – Part 2: A dataset of LGM climates derived from degree-day modelling of palaeoglaciers” by R. Allen et al.***

**Anonymous Referee #1**

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General comments

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This manuscript makes use of the model described in Part 1, to reconstruct LGM climate variables from LGM glacier distribution. This therefore provides an alternative to other, independent, climatic reconstructions for Europe, at a continental scale. As such, this work is very valuable and should be published, after improvements of the

manuscript suggested below (and in my review of Part 1).

1- The authors start with general considerations on proxy data sets, based on recommendations by Kohfeld and Harrison (2000) and Harrison (2003). They use these recommendations as a guideline for the development of their own, glacier-based, data set. Rule number 2 (page 1170) states "compatibility with model output". Based on this rule, the authors try to reconstruct the most basic climate variables: temperatures and precipitation. However, their model is more sensitive to positive-degree-days (PDD) and precipitation. I think that in addition to temperature and precipitation, they should also give the most sensitive parameters in their model, in particular the PDD. Indeed, as they honestly write later in the manuscript, they make the assumption, to convert their reconstructed PDD to temperatures, that the seasonal cycle has not changed. This type of relationship can be analysed from climate models. In fact, PDD can be easily computed from model output. So the database would be even more valuable if it contained primary reconstructed variables such as the PDD. This is equivalent to the "bioclimatic" parameters for the pollen-based reconstructions. There is no shame in providing such type of variables, on the contrary, it is very informative and makes model-data comparisons much richer for both sides.

2- The database is based on glacier distribution of the LGM. How well dated are the glacier advances? Could the reconstructions be related to a local glacial maximum rather than to the Last Global Glacial Maximum, at 21 ky BP?

3- I find figures 3, 7 and 8, showing the possible temperature/precipitation distribution, very interesting. This is exactly what can be checked from model output, rather than the basic temperature and precipitation taken separately. So the authors should make advantage of this and suggest, in their discussion, these relationships to be examined in model output.

4- page 1174: should isostatic effects be taken into account in the vicinity of the ice-sheets?

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## Minor comments/typos

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Page 1168, line 2: remove "to" in front of "data"

Page 1168: the last sentence of the abstract is misleading since at this stage, the reader thinks that the author reconstruct climate variables from temperatures and not the contrary (this part is clear in the text, but misleading here)

Introduction: please update references on pollen-based reconstructions: Jost et al (2005) and Wu et al (Climate Dynamics, 2007). The authors could be more precise in the values they cite: are they mean annual temperatures? Temperatures of the coldest month? Of the warmest month?

Page 1169: the reference to the PMIP2 project is now Braconnot et al, Climate of the Past 2007, part 1

Page 1170: in Jost et al (2005) the model resolution is actually ~50 km in some GCMs...

Page 1179: the authors state that a large cooling is needed to achieve a realistic glacier distribution over the Puterana plateau, while this threshold is estimated to  $-0.5^{\circ}\text{C}$  on page 1178

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