

As editor at C. Past, I am succeeding Nathalie Combourieu-Nebout to finalize the revision process of the paper entitled “The climate and vegetation of Europe, North Africa and the Middle East during the Last Glacial Maximum (21,000 years BP) based on pollen data.”

First, many thanks to thanks B. Davis and co-authors for proposing a new version of his paper that takes into account the previous comments of the reviewers and the editor. I find the new version much improved. Therefore I decide to definitively accept it after a few minor corrections listed as follows :

Abstract, line 28 “The reconstructions are based on the modern analogue technique (MAT) with a modern calibration pollen dataset taken from the latest Eurasian Modern Pollen Database (~8000 samples).” **You don’t use the standard MAT (Guiot et al papers) as the MAT is based on pollen counts; if you calculate a dissimilarity index not on raw counts but on PFTs scores as you did in Davis et al 2003, you need to clarify it. I suggest “ The reconstructions are based on the modern analogue technique (MAT) adapted with PFT scores...”**.

- Abstract, lines 36-37 “Differences between our latest MAT reconstruction and those in earlier studies can be largely attributed to bias in the small modern calibration dataset previously used” . **I agree but differences can also been explained by the method itself (see Brewer et al 2008 or Salonen et al 2019 for multi-method approaches). I suggest “... to bias in the small modern calibration dataset previously used and also to the method itself (Brewer et al 2008, Salonen et al 2019)”**.

- Introduction, line 70, **a key reference is missing, please add it. Braconnot, P., Harrison, S.P., Kageyama, M., Bartlein, P.J., Masson-Delmotte, V., Abe-Ouchi, A., Otto-Bliesner, B., and Zhao, Y.: Evaluation of climate models using palaeoclimatic data, Nat. Clim. Change, 2, 417–424, <https://doi.org/10.1038/nclimate1456>, 2012.**

- Introduction, line 88 “through the use of a correction algorithm (Prentice et al. 2017)” **Here, the recent papers by Cleator et al 2020 is missing, please add it.**

- Introduction, line 91 “Pollen-climate reconstructions based on inverse modelling that account for these low CO2 effects show less cooling and drying and consequently greater agreement with climate models (Ramstein et al., 2007; Wu et al., 2007).” **Key recent papers using the INV for the LGM are missing, please add it.**

- **Izumi and Bartlein, 2016: North American paleoclimate reconstructions for the Last Glacial Maximum using an inverse modeling through iterative forward modeling approach applied to pollen data, <https://doi.org/10.1002/2016GL070152>**

- **Wu et al 2019. Quantitative climatic reconstruction of the Last Glacial Maximum in China. Sci. China Earth Sci. 62, 1269–1278 (2019). <https://doi.org/10.1007/s11430-018-9338-3>**

- Introduction, line 161 “In addition, ... using the Modern Analogue Technique (MAT)...” and Methods lines 277-279 “We reconstructed climate from pollen data based on a standard Modern Analogue Technique (MAT) that used PFT scores to match fossil samples with modern pollen samples (as used by Davis et al., 2003).” **same as in the abstract: you don’t use the standard version of the MAT, so avoid the term standard and replace it by “a modified version of the standard MAT (Guiot et al 1989)...**

- Methods 2.6 Marine pollen records: **thanks so much for this new part! You provide very interesting new results which have never been discussed before. I just suggest to put it in 2.4 before the part on the vegetation cover**

- Results line 576 *Pinus* in italic

- Results line 607-610 “comparisons between studies can only be made with caution because results are often heavily dependent on the nature of the modern pollen dataset used as the training set, which is not the same in all studies (Juggins, 2013).” **I agree with you; the choice of the method is also very important, so I suggest to add “and results also largely depend on the method used (Salonen et al., 2019; Brewer et al., 2008; Peyron et al., 2013)”**
- Discussion line 690 : **tundra not Tundra** , and line 821 **boreal not Boreal**
- Discussion line 835: (see figure 6 in Velasquez et al., 2021); **just cite the ref Velasquez et al., 2021**);
- Discussion line 848: (Kageyama et al., 2021, Bartlein et al., 2011; Harrison et al., 2015; Kageyama et al., 2006). **References are missing : Braconnot et al 2007 ; Braconnot et al 2012, Cleator et al 2020**
- Discussion line 855: « but instead uses a process-based vegetation model run in inverse mode.” **The ref Guiot et al 2000 is missing, please add it**
- Discussion line 857 : « but in inverse mode the model is reconfigured to generate climate as an output given a particular vegetation (pollen) assemblage as an input.” **not true: in the inverse modelling developed by Guiot and updated by Wu et al, 2007, 2019 input data are climate data (and CO2) and output data are PFTs scores simulated by the vegetation model; these PFTs scores are compared to the pollen-inferred PFT scores following an iterative process: the climate value is selected as the most probable (when the error between the simulated and pollen-based PFTs score is the lowest). Please correct**
- Discussion line 981 : **Lago della Costa just after in the text, please check**
- Discussion line 1011 : “A number of additional proxies have also been used to reconstruct LGM mean annual temperature”. **a recent ref is missing for your comparison: Last glacial maximum cooling of 9 °C in continental Europe from a 40 kyr-long noble gas paleothermometry record Bekaert, D.V .et al 2023 Quaternary Science Reviews, 310, 108123**
- Discussion line 1014 : **correct to the Vosges Mountains**
- Discussion line 1027 : “This compares with -7.2 C for our 63 pollen 1028 sites.”: **not sure to understand which is compared**
- Discussion line 1046: “Further south and west...” **A reference is missing for your comparison : Rodrigo-Gamiz et al 2022 : Padul new record, lipids biomarkers, temperature close to the current ones.**
- Discussion line 1085: “Few proxies apart from pollen provide quantitative reconstructions of precipitation during the LGM.” **A comparison with the paper by García-Alix et al 2021 is missing García-Alix et al 2021. Paleohydrological dynamics in the Western Mediterranean during the last glacial cycle, Global and Planetary Change, 202, 2021,103527, <https://doi.org/10.1016/j.gloplacha.2021.103527>.**
- Conclusion lines 1196 and 1200: **boreal not Boreal**; line 1221: **comparison not comparsons**
- Figure3: **in the figure correct arboreal pollen**
- Figure 5 and 7, **the name of the sites is too small, the title of each curve also, please correct it**
- figure A3: **this figure`s panels are included separately with their own captions. This will be unacceptable in the final paper**

**Odile Peyron, for Climate of the Past**