

Dear Authors,

I would like to thank Dr. Liu and co-authors for submitting this new version of their manuscript “*A global analysis of reconstructed land climate changes during Dansgaard-Oeschger events.*” The comments from the 3 reviewers have been addressed and this version is better.

As a specialist in climate reconstructions based on pollen data, I have reviewed this latest version myself to help speed up the process and avoid sending the manuscript back out for another full round of review. I would therefore kindly ask you to take my comments into account in the next revised version.

The main issue with the manuscript at this stage is the Discussion section, which is currently too short, overly descriptive, and needs to be significantly expanded in order for the manuscript to be suitable for publication in *Climate of the Past*.

- Some points need to be discussed in more depth than in the current version, particularly:
 - (1) the effect of CO₂ on the reconstructed parameters (alpha);
 - (2) the comparison with model results, especially with the iLOVECLIM simulations. Figure S9, which presents the comparison with iLOVECLIM, should be moved into the main text and properly discussed.

- Some important discussion points are missing and should be added:
 - (1) the variability between individual D/O events — Figure S7 should be moved into the main text and discussed. It is not necessary to include all individual D/O event figures currently shown in Figure S5, but 1 or 2 key events (e.g., D/O 5 or 8) should be selected, integrated into the main text, and the corresponding results thoroughly discussed;
 - (2) the atmospheric and oceanic mechanisms that could explain the obtained results, particularly the observed winter/summer decoupling, are currently lacking in the manuscript;
 - (3) a comparison with the study by Zumaque et al. (2025), “*Decoupled winter and summer climate changes in southern Europe during the Dansgaard-Oeschger cycles*” published in *Quaternary Science Reviews* (<https://doi.org/10.1016/j.quascirev.2025.109273>), is missing. This study is based on the same European and Mediterranean sites and addresses very similar questions. Your results should be discussed in light of theirs, and the added value of your manuscript (e.g., global reconstruction...) should be clearly highlighted.

A restructuring of the discussion is necessary.

Minor Comments:

Introduction:

- **Line 44:** Please provide more detail about D/O cycles, including how many occurred during MIS 4 and 3, their typical duration, and specific features of the key D/O events. It would also be helpful to briefly summarize what is currently known about their variability.

- Lines 52–59:** Please add references to Zumaque et al. (2025) and Lappelgerie et al. (2024) (DOI: 10.1016/j.quascirev.2024.109016), which present a chironomid-inferred July temperature reconstruction for the last glacial period from Lake Bergsee.

- Line 57:** Please correct the citation year for Zander et al. to 2024 (not 2023).

Methods:

-Line 75: The sentence "*Modern pollen data were obtained from version 3 of the SPECIAL Modern Pollen Dataset (SMPDSv3)*" requires a reference. Please also clarify how this version differs from the modern pollen dataset by Davis et al. What type of samples does SMPDSv3 include (e.g., surface soils, top-core sediments)? Additionally, please provide details on how climate parameters were derived—were they based on WorldClim or another dataset?

-Line 150: The correction for the effect of atmospheric CO₂ on plant water-use efficiency (Figure S2), following Prentice et al. (2022), needs to be described in more detail. Also, I would suggest addressing this point in the Discussion, as it has implications for the interpretation of the results.

Discussion:

-The following sentence requires further development regarding its causes and mechanisms:

"These analyses show that there is an anti-phasing between changes in the northern extratropics and the southern extratropics, with warming in the north and cooling in the south. The largest and most consistent warming during D-O events occurs in Eurasia. There is a significant difference in the warming during winter and summer in the northern extratropics, resulting in an overall reduction in seasonality, but no significant difference in the southern extratropics."
Please discuss the possible climatic drivers behind these patterns.

-The statement "*Site-based reconstructions (e.g. Denton et al., 2022; Zander et al., 2024) suggest much larger cooling in...*" would benefit from clarification: which specific sites and proxies are referred to here?

-"*We have used a global pollen data set for calibration of the pollen–climate relationships...*": Recent studies (e.g., Dugerdil et al., 2021, 2025) have emphasized the advantages of using local datasets and region-specific calibrations. It would be helpful to nuance this point and discuss the potential limitations of global-scale calibration in this context.

-"*Several new high-resolution records covering MIS 3 have become available since the compilation of the ACER database (e.g., Bird et al., 2024; Wei et al., 2021; ...)*": Please also consider citing Duprat-Oualid et al. (2017), "*Vegetation response to abrupt climate changes in Western Europe from 45 to 14.7 ka cal BP: the Bergsee lacustrine record (Black Forest, Germany)*", which provides a relevant high-resolution record for this time period.

Supplementary Information: I would appreciate the inclusion of a table listing all the pollen taxa used here in your datasets.

Once all revisions have been made, I believe the paper will be ready for final acceptance and can be published shortly thereafter.

Best regards,

Odile Peyron, Editor for *Climate of the Past*