

Interactive comment on “Patterns in recent and Holocene pollen influxes across Europe; the Pollen Monitoring Programme Database as a tool for vegetation reconstruction” by Vojtěch Abraham et al.

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We are pleased that both reviewers see the value of the database that we aim to make publically available with this publication. We also appreciate the comments on the manuscript that will certainly help to improve it. We like to take this opportunity to respond to some of the comments, each response is introduced by ### and finished by \$\$\$

Anonymous Referee #2 I feel that if the first two are clearly and separately addressed,

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it would be easier for the authors to address the third point coherently. At the moment, the results broadly follow this structure, but the Introduction and Discussion do not, I suspect if they did, the paper would flow better.

We are grateful for this suggestion and will work to implement it in a revised manuscript. \$\$\$

Specific points by section Introduction I was a little surprised that so much of the introduction dealt with history. Although I think this would merit its own sub-section, I think it would be better to focus on scientific questions addressed in the manuscript. Why pollen traps are an appropriate analogue for fossil records should be introduced. It would be nice to see some mention of species ranges and their possible fluctuation over time, and whether present day species distributions can be considered to be in equilibrium with climate. Another factor that could be addressed in the introduction is pollen dispersal and deposition; how far does pollen usually travel? This would set up the argument for your chosen LDT threshold.

We appreciate this suggestion to improve the organisation of the manuscript and will move the historical aspects of the development of the network (see response to rev1) to a subsection. \$\$\$

2 Methods General comment: all botanical names including species epithets need to be written with their authorities the first time they are mentioned in the manuscript. Up to date authorities can be found here <http://www.worldfloraonline.org/>. Upon first use, a species must be written out in full even if its genus has been mentioned by name previously. This is to avoid confusion between genera that start with the same letter. So for in-stance, *Pinus sylvestris* L. could be shortened to *P. sylvestris*, but then *Pinus mugo* Turra needs to be written as such before it can be abbreviated to *P. mugo*

We can add authorities to the botanical names, however Biogeosciences is not taxonomical journal and many papers state species without authorities. \$\$\$

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Figure 1: As there is so much overlap on the map between modern and fossil sites, I think separating this out into two side by side maps with one showing fossil and one modern samples would make it clearer, and would also make it easier to go back and check locations of fossil sites as I was trying to do so later in the manuscript. ### Thank you for this comment. We already separated a map of only fossil sites and it is better readable. \$\$\$

On page 7, 2742 samples were mentioned as being in the database (Section 3.1) but on line 8 only 271 are mentioned- which number was in the analysis?

We added to Section 3.1: “Considering the trap record with 3 years and more we obtained 271 mean trap assemblages.” \$\$\$

2.2 Data Collection It would be interesting to see a plot of surface area of trap against PAR to test for a relationship there and potentially be able to correct if one exists.

This is an interesting point and the reviewer is invited to try this out as all this information will be available. Do you have any idea which mechanism can stay beyond? \$\$\$

2.3 Investigated taxa and Environmental parameter Why was 200km chosen as the threshold for LDT?

Regional pollen is assumed to correspond to the vegetation cover in 100 by 100 km (Hellmann et al 2008) so doubling that distance represents a good rationale. Additionally, we considered the uncertainty of the maps. \$\$\$

2.4 Comparison Page 12: Figure 5 is a bit tricky to interpret, however, once I had realised what it was supposed to be showing I saw its value. I particularly like the LDT cut-off, which will be potentially very useful in interpreting fossil records. I was surprised, however, that LDTs did not receive further attention in the discussion section as it seems that they are a tangible, useful output from the work.

We are happy to develop the topic in the discussion. \$\$\$

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3.2 Recent and fossil PAR Figures 6 onwards: In caption, specify that distribution of taxon is in grey. These taxon-specific figures are in general, I think, quite useful. I hope they are reproduced a little bigger (at least a page each) so that the details on the maps are easily readable. If this is not possible, maps should perhaps be split into separate figures to improve legibility. I am not sure the multi-coloured coding for the PAR values adds much to the figure- you could probably do away with (b) and still retain the meaning of the figures. I am also not clear on why, in the fossil graphs, only certain colours are included - why is only the highest PAR of interest?

Added: "... distribution of the species (gray, Caudullo et al., 2018 ...)".

Unfortunately, one page per figure would surpass our APC budget.

We will improve legibility by abbreviating names of fossil sites, so we make use of blank space and the map is larger now.

Multi-coloured coding helps to link the fossil and trap PAR values of the same height/class. In the fossil stratigraphic plot we point out the class of interest, coloured squares in 6b) illustrate the variability of traps within one trap area.

Boxplot would be one option as proposed by reviewer 1 (see response there), black and white bar-plots for the fossil and trap record without any colours would not visualize the analysis we did.

Only certain classes appeared in the fossil record. We picked the highest PAR class from the fossil record, because it represents also the densest population of the source plants. \$\$\$

3.4 Taxa specific results How were the 'main taxa' to be presented chosen for this section? It seems odd that some are arbitrarily in the SM, particularly arboreal pollen which was presented in Figure 2. Figures need to be referred to consistently in this section.

We do not want to flood reader by all species. Fossil-trap links of species selected

for the main text show nicely changes of distribution patterns, whereas species in the SM can suffer from certain biases and limitations (See Cyperaceae and Poaceae in section 4.2) \$\$\$

3.4.2 Betula Why are traps from the Caucasus and Turkey ignored?

Reworded to “Letting aside traps from the Caucasus and Turkey...(), because those two areas have different species Betula than rest of the trap areas)” \$\$\$

4.1 Discussion The first sentence of the discussion doesn't seem to tally with the results- it looks, from your data, like the relationship between modern and fossil PAR is actually quite complex and variable. I don't necessarily think this is a bad thing, however; the paper presents a quantitative dataset that could potentially be used to help researchers quantify what their PARs from fossil data actually mean.

We included mention about complexity of the relationship to the first sentence. \$\$\$

I would be interested to see some consideration of how these results might be useful in feeding into quantitative reconstructions of vegetation. Although PDD models tend to deal in percentages, surely this approach (on cores with appropriate chronologies) could open the door to future models being calibrated using PARs, an interesting prospect for vegetation reconstructions, particularly given your LTD estimates.

We included in the discussion possibilities of PAR vs. PDD and wider use of LTD estimates in quantitative reconstruction. \$\$\$

4.2 Limitations Line 21: Why are only 3 fossil sites listed here? Are the others not likely to show any bias?

The fossil PAR values at the 3 sites are rather high so we suspect that lake internal processes may explain these values. In general the reviewer is right these biases may also occur at other sites and we will add this to the discussion in this section. \$\$\$

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