

Petra Marešová: Human impact as reflected in the pollen record, with a focus on the Middle Ages

The thesis consists of five published papers and the general introductory part.

The first two papers deal with lake Komořany focusing on nutrient availability inferred from diatoms on the Late Glacial/Holocene transition (paper I) and on the climatic reconstruction from pollen record during the Holocene (paper II). The last three papers show Medieval human impact in altitudinal gradient, starting with the vegetation from the early medieval fishpond in Prague (paper III), continuing with dating of landscape pattern from middle altitudes in South bohemia (paper IV) and finishes with High medieval short-lived village in Krušné Mts (paper V). The last three papers are strongly connected through the period and thus perfectly fit in the title of the thesis despite the fourth one lacking a pollen record. The first and second papers deal with quite different topics, they lack human impact and Middle Ages, and moreover the contribution of Petra Marešová in the first one amounts only to 16%. In my opinion, the thesis would be much better if those two papers were excluded, their inclusion was not necessary. The last three papers would be more than sufficient for a PhD thesis, even though the fourth is rather short and in the third one Petra Marešová was not the leading author.

Joining different topics in one thesis usually requires a broad introduction, however, here is probably too broad, written for somebody who has never heard about palaeoecology and pollen analysis (sect. 1). Had she included just the three papers about Middle Ages, the introduction could have started by chapter 1.5. The general introductory part also contains the results (sect. 2), where findings of each paper are contrasted with other papers in the thesis and the synthesizing conclusions (sect. 3). Specification of the human impact on the vegetation is deeper than in the published paper II. Amalgamative effort goes even further and new result, e.g., about *Secale* pollen, is mentioned here, but it is completely missing in the published paper IV. Apart from this misleading detail, both sections 2 and 3 interconnect the five papers quite nicely, better than in section 1.

Apart from this drawback in the overall structure, the thesis is an excellent collection of multiproxy research including biological proxies (pollen (4 papers), macro-remains (3 papers), diatoms (4 papers) and chironomids (2 papers)) in combination with geochemistry (2 papers) and geoarchaeology (2 papers). The PhD candidate showed that she can lead palaeoecological investigations, even if her field (pollen analysis) is not included (paper IV). The paper II also demonstrates a good command in numerical analyses. The present PhD thesis shows that she has acquired broad and in-depth knowledge and training in pollen analysis and paleoecology. Based on this overall evaluation, I recommend this thesis for defence.

Questions and comments

1. Your climatic reconstruction does not reflect 8.2-event, but it shows strong change at 6.5 ky BP, which fits with the rise of *Fagus* at PAZ 3b and PAZ 4 boundary. You discuss MCM model, but since your paper was published other climatic models (Divíšek, 2021; Karger et al., 2021) and model data-comparisons appeared. They show evidence of 8.2 event even in the western Carpathians (Horsák et al., 2020). How can you explain this contrasting evidence? What are the biases of climatic reconstructions from pollen record?

2. In paper V you assume fluctuating sedimentation rate; however, your depth-age model is linear. Why? Fluctuating concentration of pollen (Fig. 4) could help you distinguish local and regional presence of species.
3. Your sentences on the top of page 16 could be understood to mean that new anthropogenic habitats in the Neolithic were colonized by plants brought by humans - crops and archaeophytes. Although Pokorná et al (2018) listed only species whose macro-remains were found in an archaeological context, are they all archaeophytes? What is the name of the ecological mechanism accompanying human activity in the environment?
4. Regarding p. 25, which bias corrected by LRA is missing in the list? How does LRA work? The sentence on „LRA combines LOVE estimates and REVELAS models...” is not correct.

Technical comments (not for discussion at the defence):

- p. 24 for pollen-floristic relationship you picked Goring et al 2013, whose study was the only one which showed a negative relationship. Pollen is not so bad indicator of plant diversity, I hope.
- p. 28 top: You mean “Quantification of human impact”?
- p. 28 centre: The sentence “REVEALS identified...” is hard to understand.

References:

- Divíšek, J., 2021. High-resolution BIOCLIM and ENVIREM grids for Europe in consecutive 100-year bins spanning the last 21,000 years. <https://doi.org/10.5281/zenodo.5119958>
- Horsák, M., Limondin-Lozouet, N., Granai, S., Dabkowski, J., Divíšek, J., Hájková, P., 2020. Colonisation dynamic and diversity patterns of Holocene forest snail fauna across temperate Europe: The imprint of palaeoclimate changes. *Quaternary Science Reviews* 240, 106367. <https://doi.org/10.1016/j.quascirev.2020.106367>
- Karger, D.N., Wilson, A.M., Mahony, C., Zimmermann, N.E., Jetz, W., 2021. Global daily 1 km land surface precipitation based on cloud cover-informed downscaling. *Sci Data* 8, 307. <https://doi.org/10.1038/s41597-021-01084-6>

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Vojtěch Abraham