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Climate of the Past Discussions

Interactive comment on "Periodic input of dust over the Eastern Carpathians during the Holocene linked with Saharan desertification and human impact" *by* Jack Longman et al.

Anonymous Referee #1

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The manuscript presents profiles of major elements and paleoecological indicators from an ombrotrophic peat bog in Romania. The paleoclimate records are associated to mineral dust and the discussion is focused around possible interpretations that try to disentangle local from distal signals. The authors interpret the history of the site in function of a superposition of changes on diverse spatial scales, from that of local hydrology to the large scale / hemispheric patterns derived from Greenland ice cores or North Atlantic marine sediment records. The topic is of interest to the paleoclimate community. The work appears well structured and its presentation in the manuscript is generally clear. I think that a better discussion of uncertainties would improve the manuscript.

General comment

My comment about improving the discussion of uncertainties is articulated in two parts, that have to do with (1) the quantification of the dust flux and (2) the attribution of potential sources.

(1) For the purpose of estimating the dust flux, only the concentrations of Ti from ICP-OES are used, although a semi-quantitative comparison is carried out against three major elements counts from XRF. Other studies trying to estimate dust from peat bog records discussed the uncertainties related to this issue (e.g. Marx et al., 2009; Kylander et al., 2016). Please discuss more in detail these aspects, and if possible provide some estimates of the uncertainties.

(2) The attribution of potential sources is based on a simple analysis of correlations between major elements counts, as discussed by the authors, and is also supported by the interpretation of the evidence from indicators such as testate amoeba and pollen. Nonetheless, it would only be by looking at dust size distributions at the same time, that one could derive more firm conclusions about distal versus local contributions to the dust budget (e.g. Mahowald et al., 2014). If possible, include this kind of data, otherwise please discuss this aspect in the text.

Specific comments

p. 3, 103-106. Please describe how the cores were packed and stored in the phase between recovery and analyses.

p. 4, 120-121. Later in the text (line 179) you also mention different detection limits for the different elements. Please provide all this kind of information in the same place in the text, and try to mark it visually in the plots.

Figures 3 & 4. I think a slight confusion can arise because of the way some of the records are organized between these two figures. For instance, it would be useful to see in Figure 3 the Ti concentration profile from ICP-OES along with the major ele-

ments counts from XRF, rather than directly the dust flux which weights in the sedimentation rate and bulk density profiles. On the other hand it would be nice to have all the factors defining the dust profile in the same figure, i.e. Ti concentration profile from ICP-OES, sedimentation rate and bulk density profiles.

p. 4, 126. What is the depth span of each sample? i.e. was the full core analyzes, or just portions of it?

p. 5, 160. Harmonize with what you say at line 118.

p. 5, 175. What do you mean by significant? Did you apply some statistical test? Otherwise perhaps change with “visible”.

p. 6, 190. Please discuss the uncertainties in estimating the dust flux.

p. 6, 208-211. It is not clear at this point what is the contribution of this kind of analysis to the work.

p. 7, 238. The dust “Dn” events are selected based on the occurrences of at least one of the elements form the XRF scan, so it is a bit weird to go through the text until this point with some apparent inconsistency between the discussion of peaks D0 to D3, which are not evident and sometimes in anti-phase the what you call dust record. Please either change your definition of dust event (D) or harmonize the text.

p. 7, 244-245. As you discuss below, there is not a correlation, so please rephrase with something like “we compare the timing of the identified dust prepositional events with periods ...”

p. 7, 260. “Appear to indicate”: maybe it would be better “are consistent with”, in relation to my comment about the missing information on dust particle size distributions. Please include this kind of data if possible, otherwise add a discussion paragraph about this issue.

Figure 5. Check the units of the upper curves (the two cores from McGee et al., 2013):

I think you reported the values with the wrong units, which I think are g/cm2/kyr in the original publication, so there is a factor ten difference. In fact, on this scale you have the same dust flux, if not lower, in the North African plume and Belgium or Romania, which would be weird.

p. 8, 266-268. It is not very clear what is the relation between these two studies, please rephrase.

p. 8, 279-289. Again, particle size distributions would help clarify these issues.

p. 8, 291-298. Earlier in the text you mentioned the different mobility of these major elements, and how the similarity of their profiles supports the ombrotrophic nature of the peat bog. Please clarify how this is coherent with your analysis here, which is instead based on the difference between the same elements.

p. 9, 310-313. It would be interesting to compare Type 2 events with the background signature of non-D periods.

p. 9, 314. “Fig. 8” should probably be “Fig. 6”, please check.

p. 12, 429. Was the data interpolated somehow before performing wavelet analysis? What is the pace / temporal resolution of the time series fed to the wavelet analysis software?

References

S.K. Marx, H.A. McGowan, B.S. Kamber, Long-range dust transport from eastern Australia: a proxy for Holocene aridity and ENSO-type climate variability, Earth Planet. Sci. Lett., 282 (2009), pp. 167–177.

Malin E. Kylander, Antonio Martínez-Cortizas, Richard Bindler, Sarah L. Greenwood, Carl-Magnus Mörth, Sebastien Rauch, Potentials and problems of building detailed dust records using peat archives: An example from Store Mosse (the “Great Bog”), Sweden, Geochimica et Cosmochimica Acta, Volume 190, 1 October 2016, Pages

156-174, ISSN 0016-7037, http://dx.doi.org/10.1016/j.gca.2016.06.028.

Mahowald, N., S. Albani, J. F. Kok, S. Engelstaedter, R. Scanza, D. S. Ward, and M. G. Flanner (2014). The size distribution of desert dust aerosols and its impact on the Earth system. Aeolian Research, 15, 53-71, doi: 10.1016/j.aeolia.2013.09.002.

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