

Interactive
Comment

Interactive comment on “Climate-driven enrichment of pollutants in peatlands” by A. Martínez Cortizas et al.

Anonymous Referee #2

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General comments

No doubt peat deposits represent one of the best and most useful archive from which information about past environmental conditions can be obtained. A huge number of studies based on peat cores have also been presented, e.g., on past climatic conditions and on deposition of atmospheric pollutants. However, the interpretation, e.g., of chemical analyses of the peat is far from straightforward and the quality of the published studies varies, too. Particularly, many authors assume a constant peat accumulation rate and sometimes even try to fit available ^{14}C -datings to such an assumption. The authors of present paper point to this often-neglected problem, namely the effects of a variable peat accumulation rate on the element concentrations in the peat. In my opinion this paper represent an important contribution to demonstrate such effects and,

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particularly, to clarify the effects in relation to climatic changes both during past periods and in the future.

Having said that I have also to point to some problems in the study that in my opinion in one way or another ought to be considered by the authors. Firstly, the studied site is hardly representative for the bulk of ombrotrophic mires in the world situated as it is at the fringe of the distribution of boreal and temperate peatlands. No information is given in the paper about the surface vegetation or the macrofossils forming the peat. However, my general impression is that the site might not be ombrotrophic to the same “degree” as the raised and blanket bogs in, e.g., NW Europe.

Secondly, the authors assume that the peat accumulation rate was lower during dry than wet periods. Although the assumption most probably is valid, it ought to be better underpinned. There could, e.g., be changes in the plant productivity, too. Moreover, are the dry and wet periods contemporary with the hydrological variations in the region or otherwise in southern Europe as demonstrated, e.g., by Magny et al. in several papers?

Thirdly, the authors argue for a “preferential mineralization of N relative to C” (p. 2099, line 16) as a reason for the variation in the C/N-ratio. However, there are many studies that in different ways demonstrate that the mineralization of N in the litter and peat is negligible in ombrotrophic bogs in N. Europe and N. America. Therefore, at least in these northern types of ombrotrophic peat the determinant of the C/N-ratio is loss of C and not of N. However, in peat deposited at minerotrophic sites the decay conditions are more complicated and a mineralization of N may sometimes take place, particularly if the pH on the site is relatively high. The decrease by time in $\delta^{15}\text{N}$ may well be explained by a change in the “degree” of minerotrophy for the plant community forming the peat. All the N concentrations in the present core are also above what is usual for ombrotrophic peat in northern Europe.

Fourthly, Oldfield et al. (Quarter. Res. 12:326-332) have demonstrated that the ele-

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ment deposition rates vary with the plant cover. A cover of dwarf shrubs, e.g., increases the deposition rate compared to microtops with only mosses. Although I don't think that might be a main reason for the observed variation in accumulation rates it ought at least to be considered as a possibility.

Specific and technical comments

p. 2097, lines 1-10. In minerotrophic peatlands as much as 80% of the plant litter is lost before the deposition as peat but only rarely as much as that in most types of ombrotrophic bogs. Further, I think that Clymo 1984 (Phil. Trans. R. Soc. B 303: 605-654) ought to be added to the references. See also Belyea & Malmer 2004 (Global Change Biology 10: 1043-1052) for an interpretation of variable peat accumulation rates.

p. 2099. In the first paragraph the first sentence could be omitted. Further, there are in this paragraph no references to what is meant with NPPs or to the method for the dating of the horizons. At least references to the relevant publications have to be included but, preferably, the text also ought to be written much more informative to the reader.

p. 2103, paragraph. The first paragraph presents the most important result in the article, but the statement "changes in concentrations . . . depend . . . on internal transformations of the peat matrix . . ." I think that the discussion of the "related mass loss" should be expanded to include also the effects of the two types of mass loss mentioned in the Introduction, namely decomposition and run off. Decomposition increases element concentrations in the peat while organic bound elements are lost from the matrix in the drainage water.

p. 2104. The first reference misplaced and should be moved.

p. 2109. Figure 1. Explanations incomplete. The scale to the right? The Br and I?

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