

## ***Interactive comment on “Comparison of different methods to determine the degree of peat decomposition in peat bogs” by H. Biester et al.***

**Anonymous Referee #2**

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**General Comments** This manuscript has interest because it makes comparison between several techniques that might be used to investigate past changes in peat decomposition. It is based on studies on two peat cores from one locality – Harz Mountains – and the authors’ general conclusions are drawn inductively from this particular location. However, whether it is possible to extrapolate from these specific findings to wider general application elsewhere is not known (and to an extent, this is acknowledged in the Conclusions). Indeed, because of the constituents of the peat from this location, the choice of mires for making these comparisons between techniques may limit applicability of the findings.

For example, it is somewhat unfortunate that the authors chose mires in which *Eriophorum* remains are present in the peat, because this taxon is known to produce erratic

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and potentially erroneous values using one of the techniques reviewed (the colorimetric method), owing to the strong contrast in relative decay between unhumified *Eriophorum* fibres and the more humified peat matrix. Markedly different results can be obtained from the same analysed horizon in the peat, depending upon which of these fractions happens to predominate in any 0.2 g sub-sample (Chambers et al., 2011). So, it is perhaps not surprising that the UV-ABS method used on these Harz Mountain peats produced results that are different from some of the other techniques applied (this is partly admitted on p. 17377, lines 16–19, but the specific problem of *Eriophorum* is not mentioned).

**Specific Comments** The review of the literature is not complete. In places, these omissions have led inadvertently to inaccuracies. For example, on p. 17355 the authors state that

“Blackford and Chambers (1993) introduced an alkaline extraction (NaOH) procedure combined with UV absorption measurements to determine differences in the degree of peat humification based on the leachate’s color intensity.”

It would be more complete to say that

“Aaby and Tauber (1975) used Bahnson’s (1968) alkaline extraction (NaOH) procedure combined with UV absorption measurements to determine differences in the degree of peat humification based on the leachate’s color intensity, and related this to bog surface wetness at the time of peat formation. Blackford and Chambers (1993) compared this colorimetric ‘determination of peat humification’ for reconstructing past bog surface wetness with various other simple methods (such as fibre content; von Post visual humification scale, etc.), and considered fibre content and the colorimetric technique to be superior. However, because ‘percentage peat humification’ is a dubious concept, they recommended that results from colorimetry should instead be reported using percentage light transmission values. A revised protocol for this colorimetric method was published recently by Chambers et al. (2011).”

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Aaby, B. & Tauber, H. (1975) Rates of peat formation in relation to degree of humification and local environment, as shown by studies of a raised bog in Denmark. *Boreas*, 4, 1–14.

Bahnson, H. (1968) Kolorimetriske bestemmelser af humificeringstal i højmosetørv fra Fuglsø mose på Djursland (Colorimetric determination of humification for bog peat from Fuglsø Mire in Jutland). *Meddelelser fra Dansk Geologisk Førelse*, 18, 55–63.

Chambers, F.M., Beilman, D.W. & Yu, Z. (2011) Methods for determining peat humification and for quantifying peat bulk density, organic matter and carbon content for palaeostudies of climate and peatland carbon dynamics. *Mires and Peat*, 7, Article 07, 1–10.

p. 17377, lines 22–55. There is no mention here of the work of Morgan et al. (2005), who used size-exclusion chromatography and showed, inter alia, that humic and fulvic acid compounds were being extracted from peats through alkali digestion; there were implications about their structures and molecular masses. Morgan, T.J., Herod, A.A., Brain, S.A., Chambers, F.M. and Kandiyoti, R. (2005) Examination of soil contaminated by coal-liquids by size-exclusion chromatography in 1-methyl-2-pyrrolidinone solution to evaluate interference from humic and fulvic acids and extracts from peat. *Journal of Chromatography*, 1095, 81–88

Nowhere in the manuscript are there cited any of the several relevant papers on proxy-climate methods from peats that were published in *Mires and Peat*, vol 7: <http://www.mires-and-peat.net/mpj3.html#Vol7> It is important to cite some of these because they represent state-of-the-art laboratory protocols for various proxy-climate methods from peats, including those of testate amoebae, peat geochemistry, pollen and non-pollen microfossils, peat humification, etc., and they are more up-to-date than other papers regarding specific techniques (e.g. analysis of testate amoebae) that are cited by the authors. Some of the papers (in that volume of *Mires and Peat*) were published in 2010; others in 2011. It is unclear also whether the field-sampling protocol of

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De Vleeschouwer et al. (2010; in that same volume) was followed by the authors when they sampled the Harz mires.

p.17367 The comment that “Changes in humic acids may thus reflect more a signal of vegetation changes than of changes in humification or decomposition alone” is not a new finding. That there is a ‘species’ signal in peat humification records using the NaOH colorimetric technique was recognised by Chambers et al. (1995). This finding was also mentioned by Yelloff & Mauquoy, but the first recognition was in the following: Chambers, F.M., Barber, K.E., Maddy, D. and Brew, J. (1997) A 5500-year proxy-climate and vegetational record from blanket mire at Talla Moss, Peebleshire, Scotland. *The Holocene*, 7, 391–399.

Technical (text-drafting) corrections Several times, sentences begin ‘Due to’. In all these instances, what was meant was ‘Owing to’. There might also be occasions when ‘due to’ (= caused by) was used within sentences when ‘owing to’ (= because) might be better. See advice in Booth, V. *Communication in Science: Writing and Speaking*, CUP, Cambridge.

p. 17352, line 20, p. 17353, line 10, 17357, line 16 and p. 17368, line 3: change ‘extend’ to ‘extent’

p. 17358, line 8: change ‘present day’ to ‘present-day’

p. 17371, line 6: change ‘dryer’ to ‘drier’

p. 17361 lines 17-18 I wonder whether ‘was adopted by Blackford and Chambers (1993)’ should instead be ‘of Blackford and Chambers (1993) was adopted’ [Note also that this paper has been superseded by Chambers et al. (2011).]

p. 17362, line 15: hyphenate ‘peat forming’: ‘peat-forming’

p. 17374, line 9. Write ‘FTIR data, however, confirm’ [not ‘confirms’]

p. 17375, line 14. Re-word the end of this sentence: ‘discussed controversial’ does not

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read well.

p. 17376, lines 17-18 'present day increase in grasses on the bogs surface' There are two things to change here: (i) hyphenate 'present day' (to 'present-day'); (ii) do something about the missing apostrophe in 'bogs surface'. It is not clear whether this sentence refers to one or to two bogs. If two, then place an apostrophe after the s in bogs. Or, can avoid an apostrophe altogether by writing as follows: 'present-day increase in grasses on the bog surface'

p. 17377, lines 16-17. Change 'due to the fact that' to 'because'

p. 17379. Change 'Moreover, the amount of UV-absorbing aromatic compounds which are e.g. abundant in lignin also depend on changes in vegetation, which does not necessarily correlates with' to 'Moreover, the amount of UV-absorbing aromatic compounds that are abundant in lignin, for example, also depend on changes in vegetation, which do not necessarily correlate with'

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Interactive comment on Biogeosciences Discuss., 10, 17351, 2013.