

Interactive
Comment

Interactive comment on “Mobility of black carbon in drained peatland soils” by J. Leifeld et al.

Anonymous Referee #3

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There is still little information on the mobility or longevity of BC, and in the absence of long-term experiments, studies like this can provide useful surrogate information. However, the information that can be extracted is limited by the nature of the sites available, and especially, by lack of detailed information on initial conditions or rates of BC inputs. In this case, comparison of a site unaffected by disposal of ashes and charcoal and with essentially no detectable BC provides one component of quality control. The authors have assembled information as far as possible on site history and former BC disposal. However, this paper has two serious limitations. First, despite the quality of the sampling and analysis, the final result on rate of movement of BC can only be a reasonable estimate bounded by the limitations of the experimental design and assumptions. The rate has not been quantified, but a reasonable estimate deduced. Considering the paucity of data on BC movement, this is a useful result, but has to be presented as such. Terms such as “support, suggest, infer, and estimate” are more

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Discussion Paper

appropriate throughout the ms than the definitive terms used, such as “quantify”. The results need to be cast in appropriately cautious terms.

Second and more substantial, considering the limitations of the available peat sites to address the research goals, the paper is very underwritten. It is so compressed that it gives the impression of trying to “sell” a very compelling story while hardly allowing access to supporting data. The Results section is very short, and every opportunity is taken not to present details or explanations. First, there is inadequate description of the peat profiles. The profiles were sampled by horizon, and a table should be given with the expected information on depth intervals, horizon descriptive characteristics, total C, and bulk density, for which no data are given. This table should include both W and S profiles. There is great variation in the peat profiles, including one which is very shallow (W4), and one with mineral interlayers (W2). Detailed supporting information allows the reader to make an informed judgement as to the validity of the results. The data in Fig. 4 should go into Table 1. Also, it is essential to present the area-based data on BC in a table or figure, by horizon, for the full depth of each profile. Finally, the correlations in table 1 seem a very cursory and inadequate treatment of the results.

On balance, the research presented here could be publishable as a contribution to understanding the behaviour of BC in the environment. However, the MS lacks sufficient detail to assess the results, and the overall conclusion needs to be presented in terms that recognize, rather than minimize its limitations.

p. 872, l. 14. The data suggest or support.

p. 873, l. 15. that is duplicated

p. 873, l. 24. data are lacking.

p. 873, l. 27 were inferred or estimated

p. 874, l. 14 twentieth century

p. 875, l. 3. The meaning of dipper (a small container with a handle) does not seem

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correct here. Was it a small mechanical digger with a large scoop?

p. 875, l. 8. varies considerably

p. 875, l. 12. presumably three sites, S1-S3.

p. 875, l. 17. were determined. Also, as no N data are given, there is no point in reporting that it was measured. However, it might be useful to have the N data, as part of the overall characterization of the contrasting peatlands.

p. 875, l. 25 mW - I presume this is milli Watt, but readers may not realize this immediately.

p. 875, l. 27. CPMAS NMR needs to be defined. Also, there is no information on the determination of pore volume or bulk density.

p. 876, section 3.1. There is no reference for the single sentence on NMR results. There is later in the discussion, but some minimal explanation is required here.

p. 876, l. 16. had only a weak signal

p. 876, section 3.2. No bulk density data are given; they should be included in a table of peat properties.

p. 877, section 3.3, Table. 1. These correlations with depth do not adequately describe the data. W4 is so shallow that the trends hold. However, especially when plotted as BC/OC (Fig. 6) data for W1 to W3 show a similar trend of decrease then increase with depth. A more considered analysis of the data would be more enlightening.

p. 878, l. 3-4. Area-based data on BC by horizon for the full profiles need to be presented in a table or figure. This information is key to the conclusions, and yet we get only an inadequate summary.

p. 879, l. 13, etc. The discussion on stocks and production is confusing. Most results are given in kg/m² or kg/ha, but then results from the two references are given in t/ha.

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This may be to show fewer significant figures, but to avoid confusing the reader, the units should be kept consistent. Also, there is confusion in this section between inputs and stocks. Line 23 talks about BC input rates in the referenced studies, but what they reported was char or BC production after single fires. Rate refers to a time-based unit, such as per year, based on fire frequency. In fact, the BC/OC ratios found in the ms are within the range reported for a wide range of soils using different techniques. In general, the discussion of inputs and stocks is inadequate, and needs to be expanded with better reference to reported stocks and production, with consistent units, and with provision of the supporting area-based stocks of BC determined by DSC.

p. 881, l. 11. Specify profiles W1 and W3.

Fig. 1 caption. Inconsistent use of percent in one line and % in the next.

Fig. 3 caption should note that BC/OC ratios are from DSC. Someone not reading the whole text carefully might associate these values with the NMR spectra. Also, since BC/OC values are given as ratios elsewhere, why use percent here?

Figures 3-7 are very difficult to follow. Why not use colour as in Fig. 1? It does not cost anything in Biogeosciences, and would greatly improve the clarity and impact of data.

Figure 7. The caption should note that the two points that do not fit the general trends are the mineral interlayers.

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