**Biogeosciences
Discussions**

Interactive comment on "Thermal stability of soil organic matter responds to long-term fertilization practices" *by* J. Leifeld et al.

Anonymous Referee #1

Received and published: 28 April 2006

General comments: The paper presents a relatively novel method to easily (rapid, with little sample preparation) explore soil organic matter complexities using their thermal properties. The paper is well written, it is short and concise and to the point. However, the title does not read so well. I would rewrite it as follows "Thermal stability responses of soil organic matter to long-term fertilization practices". Writing the title in this way better explains that the soil organic matter is subjected to a thermal treatment, and responds according to the fertilization practice applied to the material. There are some other language and grammar mistakes but these can be easily corrected.

Specific comments:

1. Page 311, line 2: What is the significance of measuring the thermal stability of bulk soils compared to only clay fractions? I am not sure if it is enough reason only because it has not been done before. Do the other soil particles (size-defined) also play a role,

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or are there other advantages of measuring bulk soil, e.g. that sample preparation is limited? This should not be confused with the sample preparation for the thermal measurements.

2. It would be easier for the reader to follow if the treatment abbreviations (N, M, NM, MN) were a bit more explanatory e.g. N = Null, M = Fertilized, NM = Converted-Fertilized and MN = Converted-Fallow, or something like that. The "OC of N and the SOM of MN" really doesn't read fluently.

3. Page 311, line 12: Since wood is a biogenic material, would this include wood char? How different would that look from coals and soot?

4. Page 311, line 16: The sampling technique is not clear. What was different for each of the seven days picked to sample on? Later on, in the results section you state that you found no systematic pattern for the seven days comparison. I agree, SOM would not change much in the space of a year. But what changes did you expect to find when you thought of this sampling procedure? I can also imagine that a sampling depth of 20 cm dilutes any microbial effect (SOM breakdown) or manual effect (mixing or ploughing) among treatments, that would be better expressed when sampling only the top 5 cm or 10 cm.

5. Page 313, line 24-28: The term "thermal properties" is a bit abstract for me. Should you not rather write "... a higher sensitivity of SOM quality ... to fertilization."? These thermal properties are operationally defined, and I would rather think that you mean to say that the labile and stable SOM fractions are influenced by fertilization.

6. Page 314, line 12-16: Rewrite this sentence. Suggestion: "Chemical quantification methods (Schmidt et al., 1996) and 14C dating (Rethemeyer et al., 2005), suggest that some soils near the city of Halle ... and lignite power plants."

Technical corrections: 1. According to the National Institute of Standards and Technology, numbers should be separated from the unit by a space. Correct that for % and $^\circ$C

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throughout the manuscript.

2. Page 310, line 8, Page 312, line 18, Page 313, line 9: enter $^\circ$C after each temperature mentioned.

3. Page 310, line 19: remove the comma after the word "suggested".

4. Page 311, line 21: rewrite "long term" as "long-term".

5. Page 312, line 5,6,10: chemical compound names are written with small letters in English as opposed to German. Rewrite Sapphire as sapphire, Indium as indium and Aluminium as aluminium (the symbols are obviously spelled with capital letters). Just for interest sake - aluminium is the British spelling and aluminum is the American spelling.

6. Page 312, line 21: explain the meaning of IR.

7. Page 312, line 24: add an "s" to the word "correlation" - should read "correlations.", unless there was only one correlation sought.

8. Page 313, line 2: add a comma after the word "input".

9. Page 313, line 4: add an "s" to the word "sample", unless only one sample is in question (state then which sample).

10. Page 313, line 12 to 13: A suggestion would be to state only ranges of peak temperatures for the four peaks, e.g. "(first peak range 345.1 +- 0.3 - 355.4 +- 0.7, second peak range ...)". This would make reading a bit easier, unless the individual numbers are really important.

11. Page 313, line 14: add the word "were" between the words "and compared".

12. Page 313, line 16: remove the comma after the word "both".

13. Page 313, line 24: add an "s" to the word "content" and replace the word "was" with the word "were".

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14. Page 313, line 27: remove the words "of the" in front of "OC contents ..." from the sentence.

15. Page 314, line 22: insert the word "a" in front of the word "possible".

16. Page 314, line 29: insert the word "thermal" in front of the word "stability".

17. Page 315, line 8: insert a full stop after "2005".

18. Page 317, Figure 1: add °C to each temperature mentioned. Rewrite Quartz as quartz.

19. Page 318, Figure 2: All figures should be self-explanatory - include explanations for N, NM, MN and M. Do the same for Figure 3 and Figure 4.

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