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

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GENERAL COMMENTS The impact of land management base on the thermal properties of the soil samples could be estimated by DSC. The present work is original and complements other thermal analysis techniques use to characterise soil organic matter. Several studies have looked at the use of thermal stability as an indicator of the distribution of labile and recalcitrant SOM. Thermogravimetry (TG) is often used in combination with Differential scanning calorimetry (DSC), rather than DSC on its own. Nevertheless, complementary analysis of these well characterised samples, such as OC measurements have been used to normalise the data. However, caution should be taken in interpretation of peaks associated with stable SOM due to mineral dilution (especially clays). They must provide independent evidence of the presence of coals. They have ignored the literature that discusses char formation.

SPECIFIC COMMENTS

Abstract: It describes the findings of this research clearly and the value of the method

Title: The title is clear and appropriate.

Introduction: Page 311 line 2. Bulk soils have been characterised before (refer to literature, e.g. Lopez-Capel et al 2005 SSSAJ, Siewert 2004 SSSAJ, Satoh 1984 Soil Sci. Plant Nutr.), although may have not been under different fertilization regime. It may be worth mentioning. Page 311 line 8. Thermal stability is a good indicator, but caution should be taken when dealing with bulk soils as the stable fraction may be diluted by the mineral fraction (see Siewert 2004).

Material and methods: Page 312 line 7. What was the dependence between DSC peak height and C content (r2)? Was there much dependence variation between the three exothermic peaks? From previous thermal characterisation literature, I would assume that the highest dependence in bulk soils would be with the 1st peak Ĕ Page 312 line 15. Although peak height may be mainly attributed to C (as samples have high C content 2

Results and discussion: Page 313 line 5. I agree with the statement regarding the total heat evolved. However, this is mainly due to the labile contribution (maybe even higher r2?) Peak attributions in the labile fraction can be justified, as they are dominated by plant materials. Several studies can verify it. However, attributions in the stable SOM fraction should be taken with caution. Peak intensities in the stable fraction would be affected by the mineral content of the soil. Clays usually present in soils, such as kaolinite and illite will decompose at around 450-550C (Smykatz-Kloss et al 2003) giving an endothermic reaction. This limitation has been overcome by other authors by isolation SOM from the mineral fraction, or by focusing on the labile fraction and taking into account the clay and carbon content of the sample in weight loss after 400C (Siewert, 2004). Page 313 line 26. I agree with ratio between 1st and 2nd peak. Good statistics. It is understood that it is a rough measurement. Work from other authors supporting the use of ratios between the labile and stable fractions could be

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considered. Maybe work on TG in similar samples. Page 314 line 16. It is possible that lignite derived products contribute to the 3rd peak. Artificial char from the combustion of labile materials may also contribute (Kaloustian 2001) if there is high content of plant derived material in the soil.

Conclusion: The conclusion is in agreement with the results.

TECHNICAL CORRECTIONS Page 312 line 1. Manure application is mention but what about the mineral fertilization? How often was that applied? Page 312 line 12. Good analytical conditions for SOM characterisation. However, for distinction of coals, a higher temperature may be required. Some coals decompose at 700-800 C. Page 316 line 9. Reference (Shafizadek et al 1984) wrong spelling either here or in the text.

Interactive comment on Biogeosciences Discussions, 3, 309, 2006.