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Biogeosciences Discussions

Interactive comment on "Which are important soil parameters influencing the spatial heterogeneity of ^{14}C in soil organic matter?" *by* S. John et al.

Anonymous Referee #2

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The authors studied the spatial distribution of 14C with depth as well as with distance to a beech tree, and discussed possible factors influencing this distribution, including biological, physical and chemical soil properties.

Although this is an interesting study, I suggest major revision for the following reasons.

- I was wondering why the authors did not include the topsoil. This is surprising as it was said at several passages in the Introduction and Discussion chapters that for topsoil, aboveground litter plays an important role for SOM. Similarly, a negative point is that several parameters were obtained solely down to a depth of 110 cm.

- PCA as the only statistical tool is not sufficient for a comprehensive and sound interpretation, especially when taking into account that some of the studied soil properties may correlate with each other. Here, PCA did not yield unambiguous results, so it is

not safe to declare roots as the main factor, especially as dissolved organic carbon was not investigated.

- It is nowhere explained, why it is desirable to improve understanding of SOM cycling and turnover. One or two sentences would be enough to show the reasons for such research like in the current study.

Detailed remarks:

TITLE

- I miss the information, that the soil under a tree, thus likely forest soil was investigated. This information does not appear before the middle of the Abstract, and towards the end of the Introduction.

ABSTRACT

- Lines 28f: This is a rather sudden transition from general points to the current study.

- Lines 32f: It was not mentioned here that only fine roots were analysed.

- Line 45: ". . . to determine SOM" sounds strange. Please rephrase.

INTRODUCTION

- I missed some references like Marschner et al. (2008) when talking about different turnover times of SOM compounds (lines 54ff), or Kautz et al. (2013). Although the latter review deals with nutrient uptake from arable and not forest subsoils, it could be included in the current study, as the Introduction is partially written very general.

MATERIAL AND METHODS

- Lines 120ff: If profile A was sampled directly beneath the tree, I am sure that there were also coarse roots present.

- Lines 129f: Please give the temperature used for combustion of the samples.

- Lines 161f: The authors treated the sampes with acid to remove inorganic carbon. This contradicts the statement made in lines 129f.

- Lines 180f: Why were some analyses like particle size not measured on the complete sample set?

RESULTS

- Lines 273ff: In my opinion, it is not necessary to give decimals for the pMC values.

- Lines 312ff: The phrasing with the "<“ signs is not easy to read.

DISCUSSION

- Chapter 4.1 has the heading "Influence of root-derived OC on 14C distribution“. However, first it begins with repetition from the Introduction as well as citing references rather than discussing the own data, which I find inappropriate. Second, the complete second paragraph discusses the root depth distribution rather than its influence. The actual statement made about root influence on 14C distribution is restricted to the end of the chapter and is written rather vague.

- At the end of chapter 4.3 (lines 433f.), it sounds like grain size would have a stronger effect on 14C distribution than roots, which contradicts the overall statement of the study. Please rephrase.

Further notes:

- Language is partially bad and has to be considerably improved, also to avoid missunderstandings in case of ambiguous statements (e.g. lines 140ff, lines 190ff.).

- Throughout the manuscript, SI units should be used, also for C contents.

- From Fig. 1, I can not clearly see if the horizon boundaries were even or undulating, and if they occurred at identical depth throughout the transect. Maybe a picture would be good.

- I also noticed that the horizon terms refer to the German soil classification system, whereas the soil classification itself refers to WRB. Please use a uniform system.

- The supplement shows the same data like Figure 2. One of the two might be skipped to avoid repetition of the same data.

LITERATURE

Marschner B., Brodowski S., Dreves A., Gleixner G., Gude A., Grootes P.M., Hamer U., Heim A., Jandl G., Ji R., Kaiser K., Kalbitz K., Kramer C., Leinweber P., Rethemeyer J., Schäffer A., Schmidt M.W.I., Schwark L., Wiesenberg G.L.B. (2008) How relevant is recalcitrance for the stabilization of organic matter in soils? J. Plant Nutr. Soil Sci. 171, 91–110.

Kautz T., Amelung W., Ewert F., Gaiser T., Horn R., Jahn R., Javaux M., Kemna A., Kuzyakov Y., Munch J.-C., Pätzold S., Peth S., Scherer H. W., Schloter M., Schneider H., Vanderborght J., Vetterlein D., Walter A., Wiesenberg G. L. B., Köpke U. (2013) Nutrient acquisition from arable subsoils in temperate climates: A review. Soil Biol. Biochem. 57, 1003–1022.

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