

Interactive comment on “Relevance of aboveground litter for soil organic matter formation – a soil profile perspective” by Patrick Liebmann et al.

Anonymous Referee #5

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The article deals with a significant question that is the redistribution of fresh litter carbon into different soil C pools and the processes involved in the transfer and turnover of carbon in the whole soil profile. The use of stable isotope labeling in a field study seems really adapted. However some information is missing, sometimes with significant importance for interpretation. Main concerns:

- o What is the percentage of remaining litter (in mass and labelling) after 22 months? This data is important to assess the percentage of litter lost by mineralization compared to the part that did not enter the soil, and to know if the incorporation of litter fits well with natural conditions (11% seems low).
- o What are the properties of labeled and unlabeled litter? Was the labeling realized through continuous or pulse technique? In relation to this question, what is the $\delta^{13}\text{C}$ of

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the remaining litter after 22 months (is it consistent with the $\delta^{13}\text{C}$ measured for initial litter or may have the incorporation process been discriminant?). The interpretation of the labeling calculation could be different if the labeling is not homogenous.

- o All the data that would allow comparing the properties of the different plots, especially labeled/unlabeled plots. For example, authors always averaged the control and the labeled plots for soil properties: the C contents and stocks (figure 1), the distribution in density fractions (in figures 2 and 6, the variability is high as mentioned in the caption: is it distributed randomly between labeled and unlabeled plots or is there significant differences?), the C/N (figure 3), WEOC (figure 4). If significant differences exist between the labeled/unlabeled plots, the interpretation of the low difference in isotopic signature (figure 5) could be limited.
- o Table S1: add the value of the reference (C, N or $\delta^{13}\text{C}$). Moreover, was a labeled standard (in-house) used since the initial enrichment applied was high (1241-1880 permil)? What is the maximum $\delta^{13}\text{C}$ measured in the soil fractions and used for calculation?

Minor concerns:

- A 2-mm mesh was used to prevent new litter input during first 22 months: what about a potential leaching of additional unlabeled litter? As mentioned lines 366-368: WEOC release is possible.
- Was the WEOC extracted on frozen samples (line 115) or on field-moist samples (line 129)?
- Line 322-325: the sentence is not clear for me. Which recalculation was done? Is it to correct the input of litter to the soil of the experiment that was not representative of typical “annual” litter input? If it is the case: what about this difference (line 98-99, authors mentioned a “equivalent amount of litter” added to the plots)?
- The XPS part does not seem to be related to the study. Is it necessary? Additional Table S3, Figure S1, figure S3 and figure S6 are not cited in the text for example. At least Table S3 and Figure S5 seem redundant. I would delete the Table S3 (or simplify it? The replicates should be averaged).
- Line 131: Were the filters pre-rinsed? Was the effect of cellulose pollution on $\delta^{13}\text{C}$ of WEOC assessed? Is it negligible (depending on the DOC content of the WEOC extract)? If this pollution is equivalent for the labeled/unlabeled WEOC (and if WEOC is equivalent for labeled/unlabeled plots), it may not impact the isotopic calculation but should be mentioned.
- The WEOC extraction and the density

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fractionation were done in parallel (not sequential). So is there a relation between the DOC collected in SPT fraction and the WEOC? Line 227, authors mentioned that the “no consistent trend” was observed for DOC of SPT. What about the $\delta^{13}\text{C}$ of SPT? - Line 169-174: Measurement of nitrate and ammonium, for calculation of organic nitrogen were mentioned, but never used in result. Delete? - Line 174-175: Is the XPS really useful for this study? - Line 228: cite Figure 2 - Line 248: cite Figure 5c - Line 258: cite Figure 6b - Line 267: Sentence is not clear: what means “similar loss for recovered material”, is it 77% of mass or of carbon? - Table 3: add the % of initial litter that was lost by mineralization compared to the material remaining after 22 months. Express the values in % of C “entering” the soil. - Figure 1, 3, 4: show the mean and SD of labeled and unlabeled plot, of 22 and 40 months.

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