

Interactive comment on “Density fractions versus size separates: does physical fractionation isolate functional soil compartments?” by C. Moni et al.

Anonymous Referee #1

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The present paper presents the results of two different physical fractionation techniques (particle size fractionation and aggregate density fractionation) which were applied to a field incubation experiment with N 15 labelled litter in forest soil. The authors generate from their data some recommendations with regards to the use of physical fractionation procedures and suggest an improved procedure, which is supposed to isolate organic matter of progressing decomposition from soil in different physical fractions. Although, there might be some valuable information included these are diluted in a conceptual framework, which is in my opinion too complicated and not really necessary. The authors aim to derive functional soil compartment by physical fractionation. However, physical fractionation procedures will always be biased by their operational nature when choosing the density or particle size limits. Therefore, in my opinion, the authors should more focus on the actual information on N cycling they could derive

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from the two fractionation procedures they applied. Moreover, the following queries should be addressed:

- 1) English of the whole manuscript should be improved; in particular, the abstract is very badly written and can hardly be understood. (exp the sentence: however, scientists investigating specific aspects of OM are pointed towards ADF when adsorption and aggregation processes are of interest whereas PSDF is the superior tool to research the fate of particulate OM) The aim of the study should be stated in the abstract. After the first sentence, the authors could begin with: The aim of the study was to determine whether physical fractionation. In particular we investigated if.
- 2) The authors are presenting some kind of literature review on physical fractionation methods in the introduction. This is not necessary, because only two fractionation methods are studied. Thus it is more useful to introduce those two in more detail instead of elaborating some kind of classification of all physical fractionation methods. Therefore the introduction need to be re-written and more focused on the objectives to be addressed in this study.
- 3) The observation that OM of litter becomes increasingly decomposed and associated with the mineral phase is nothing new and was reported many times. The new information that could be added by this study is about decadal timescale and different sites.
- 4) The authors try to draw some conclusions on the possibility to derive functional soil compartments among physical fractions (discussion 4.3). However, they cannot conclude on function related to the carbon cycle or total organic matter as they only used a 15N label designed to follow the N cycle. This should in particular be mentioned in the discussion points 4.4, where recommendations are given. During decomposition there might be a decoupling of C and N. By the way: did the authors check that all the label was incorporated into the mineral soil? The humus form of the experimental sites should be stated – and the organic layer, if there is any, should have been analysed for

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15N.

5) The authors do not discuss the bias, which may be introduced by the use of SPT as a density fractionation agent. SPT as a salt may also be a dispersion agent and may therefore in addition to leading to carbon loss lead to aggregate dispersal.

6) P. 21: the conclusion that SOM dynamics cannot be fully understood when using a single step fractionation procedure was known before, as fractionation procedures were developed to address different questions with regards to SOM stabilisation mechanisms, e.g. the importance of aggregation for ADF procedures.

7) Material and methods: the authors state that the A horizon was collected – however, only 2,5 cm of the A horizon were analysed – how is this possible after sieving?

8) Results 3.3 and 3.4 should be combined.

9) P.15 discussion what is 'step fashion'? P. 18 'absence of contrast of tracer enrichment. . .' ?

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