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Interactive comment on "Recycling vs. stabilisation of soil sugars - a long-term laboratory incubation experiment" *by* A. Basler et al.

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We would like to thank the reviewers for their helpful comments and suggestions, which have greatly improved our manuscript. We hope that our response answers all their concerns. Anonymous Referee #1

Received and published: 8 July 2015 The paper by Basler et al. investigates on the relative prominence of recycling versus stabilization processes of soil sugars, a relevant component soil organic matter (SOM). The authors have addressed the problem by performing a three year incubation of a silty loam soil, under different types of land use (i.e. respectively: arable land, grassland and forest) and by adding 13C-labelled glucose in order to track the possible incorporation patterns. Their main observations are that two main tracer dynamics take place for different sugars and these are all

dominated by a pool which persists (i.e. high mean residence time, MRT), independently of soil C content. Higher labelled C incorporation is measured in the microbial biomass than in the CO2 produced. The authors consequently suggest that all together these things point at the predominance of recycling over stabilization as main sugar dynamic occurring into soils. Understanding the fate of carbon in soils is of great relevance for the consequences it implies for soil management and more in general for the global carbon cycle. This study gives insights on the possible degradation patterns of soil sugars, which are important contributors in these dynamics. However, as a general comment I would have expected that the authors had put more emphasis on the relevance and the contribution that this study may represent for the soil (and global) carbon cycle understanding. A statement or even a paragraph in the Abstract and/or in the Introduction sections which highlight these aspects would be beneficial for the paper.

Answer: A sentence to highlight this aspect was included in the abstract.

I also have some specific request for revisions that may improve the paper. However, I recommend publication in Biogeosciences after the authors consider them.

1. Introduction: 1) page 3, lines 2 to 3: Please add references to this sentence. 2) page 3, line 3: Please define the acronym SOM before you start using it in the text. 3) page 3, line 6: Although you introduce the concept of "mean residence times" already in the Abstract, I would suggest you to re-define it here and add again its acronym, i.e. MRT, because you are using it later in the text. 4) page 3, line 14: There is a typo after the colon, the sentence "their high degradability. . ." starts with an uppercase instead than with a lowercase letter.

Answer: Thank you for your comments, we have implemented all these recommendations.

5) page 3, lines 23 to 24: Please add references to this sentence. Besides, I would develop a bit this sentence by explaining which kind of effects you intend here. An-

swer: We rephrased this sentence because we did not intend to relate to the effects of recycling and stabilization but their importance for C turnover 6) page 4, lines 2 to 4: Please refer to the Figure/Table which show the experimental set-up reported here.

Answer: We improved section 2.2 (Soil incubation) to clarify that soil samples were incubated individually We therefore believe that a diagram of the experimental setup is now not necessary.

2. Material/Methods: 2.1 Study Site: It might be helpful to clarify the set-up of the experiment if you could draw a diagram showing the vertical section of the different soils and horizons employed in the experiment.

Answer: We improved section 2.2 (Soil incubation) clarify that soil samples were incubated individually We therefore believe that a diagram of the experimental setup is now not necessary.

2.2 Soil incubation: 1) page 4, line 27: Please define “Corg”, before using this abbreviation in the text. 2.4 13C analysis of individual sugars: 1) page 5, line 19: Please correct the typo “13C” to “13C”. 2.4.1 Extraction procedure: 1) page 5, line 23: Please define TFA before using the acronym in the text.

Answer: We have revised the text as suggested.

2.4.2 Analysis: 1) page 6, line 7: I believe the title of this section is too generic. Please rename it as “Isotopic Analysis” for instance.

Answer: We renamed this section to “sugar analysis” as this section now comprises both the isotopic analysis and the determination of sugar amounts.

2.6 Calculation and statistics: 1) page 8, line 7: The number assigned to the equation should be (5), instead of (6) and consequently the numbers assigned to the following formulas need to be corrected as well.

Answer: The section 2.6 was restructured. However, we took this point into considera-

tion in the final version.

3. Results: 3.1 Carbon concentrations and incorporation of the labelled C into soil organic matter fractions and the respired CO2: 1) page 9, lines 4 to 5: Please add the corresponding acronym after “microbial biomass” and re-define “ex-C” before using this abbreviation in the text.

Answer: exC stands for extractable carbon and was first mentioned and explained in the method part/chloroform fumigation (2.5). Microbial biomass was removed and replaced by the acronym Cmic, which was also introduced in the method section.

3.3 Dynamics of label-derived C of the individual sugars: 1) page 11, line 1: I am not sure I understand what the letter “a” stands for, when you report the MRT for gal (5957a) and for rha (1-365a), calculated from the nonlinear regression analysis: it is not reported either in the text or in Table 3. Is it referring to Figure 3, panel a? Also please correct the extra space after 1-365.

Answer: The “a” referred to years. To avoid misunderstanding we replaced a by yr.

4. Discussion: My main suggestion here is to add the references to Tables and Figures in the text while you discuss them in this section; it would make easier to follow your argumentation. Figure 1. and 2. 1) page 27, lines 6 to 7 and page 28, lines 5 to 6: I am not sure I understand the different letters notation you use in this figures and how you explain it in the captions. Please rephrase this. Figure 3. 1) page 29. Please correct the typo in panel c): the x axis label says [month] instead of [months] as for the other panels.

Answer: Thank you for these comments; we have changed the points as suggested.

Interactive comment on Biogeosciences Discuss., 12, 8819, 2015.