Biogeosciences Discuss., 12, C6483–C6486, 2015
www.biogeosciences-discuss.net/12/C6483/2015/

Biogeosciences
Discussions
Open Access

Interactive comment on "Microbial carbon recycling: an underestimated process controlling soil carbon dynamics" *by* A. Basler et al.

A. Basler et al.

abasler@gwdg.de

Received and published: 14 October 2015

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.

Interactive comment on "Microbial carbon recycling: an underestimated process controlling soil carbon dynamics" by A. Basler et al.

Anonymous Referee #3

Received and published: 21 August 2015

The submitted manuscript addresses the age of C in sugar, and discuss it as a con-

sequence of microbial recycling and stabilisation, depending on sugar nature. This topic is very interesting and within the scope of the Journal. The authors benefit from a nice experimental device to address their question and realised a lot of demanding analyses. But at this stage, I consider that the MS is not acceptable for publication.

The first major issue is to clarify what is the MRT of sugar. A mean residence time is the average time during which something resides in a pool. The authors indicate they want to assess the MRT of sugar (presumably in soil or soil fraction). However, this is cannot be achieved based on a C3C4 device!

The obtained data can only help to assess the MRT of C in a given pool, not the MRT of individual molecule in any pool. In addition, the choice of a single pool model only allows estimating the MRT of C in bulk soil, or in plant fraction (fPOM). To assess MRT in aggregate fraction, it is necessary to take into account the delay prior to incorporation C in the fraction, when it resides in another fraction. I recommend that the authors rework their rational and focus on the proportion of new C instead of making an attempt to provide non-rigorous and incorrect MRT values. A study inspecting new C incorporation in so many fractions would provide great results to the community!

Answer: We agree with this comment. We have to apologize that we were not explicit enough to stress that we always refer (and discuss) the MRT of sugar C, not the MRT of the sugar molecules. This was clarified throughout the text and explicitly in the M&M section 2.6

The second major issue is to related to the lack of methodological details and to the fact that raw results of C isotope composition in individual molecule are not provided. Answer: The mean isotope values of all sugar measurement are given in the supplement.

Sugar 13C analysis in a soil matrix by HPLC-IRMS is very challenging, results are generally associated with a 1 permil uncertainty. I recommend the authors to prepare a table with the bulk data set, including uncertainty.

Answer: In Basler and Dyckmans (2013), we could show that the HPLC -IRMS method yields more accurate results than the GC-C-IRMS methods. The uncertainty are <0.66‰ if the amounts are >2.5nM. Due to their small occurrence in soil especially fuc and rha show higher uncertainties. The mean isotopic values and uncertainties are given in the supplement Table1.

In the M&M section, they should write the equation of errors propagation in the calculation of maize derived C.

Answer: We added information on the magnitude of the error for maize contribution but we do not think that the equation to compute these is of interest, as it can easily be derived.

The data from the control treatment that are used to compute the proportion of new C should also be provided, and possibly discussed as interesting findings may arise from them.(values of individual sugar in individual fractions for the C3 control plot).

Answer: We agree that the data of the control treatment might be interesting and worth a discussion. However, this is not the scope of this manuscript and would probably make the story unfocussed and lengthy.

The third major issue is related to the discussion on sugar recycling or stabilisation. It cannot be done without considering the plant input: the study should provide the wheat and maize molecular composition.

Answer: The requested data is given in Table 1.

Especially, mannose could be important in mannan hemicellulose. The authors could also again discuss what they expect as cellulosic glucose contribution and how its C may be stabilised in the different fractions.

Answer: We used the method of Amelung et al. (1996) for sugar extraction which is most suitable for non-cellulosic sugars. Cellulose, in contrast is more efficiently extracted by the H2SO4-method. As our focus were the non-cellulosic sugars, we

refrain from discussing amounts of glucose in any pool.

Minor comments Indicate in the M&M section that you sample two horizons.

Answer: In the section 2.1 study site we mentioned that we sample the Ap and E-horizon.

Explain the colours in Fig1

Answer: Thank you, we have corrected the figure.

In Tab1, the amount of total C in the first column should be given in the same unit than sugar C (per g of fraction)

Answer: We believe that the data given (although different units are used in the Table) are the most suitable to enable the reader to gain an overview on carbon distribution in the soil and soil fractions. We therefore prefer to leave the table unchanged.

References

Amelung, W., Cheshire, M. V., and Guggenberger, G.: Determination of neutral and acidic sugars in soil by capillary gas-liquid chromatography after trifluoroacetic acid hydrolysis, Soil Biol. Biochem., 28, 1631–1639, 1996.

Basler, A. and Dyckmans, J.: Compound-specific delta C-13 analysis of monosaccharides from soil extracts by high-performance liquid chromatography/isotope ratio mass spectrometry, Rapid Commun. Mass Spectrom., 27, 2546–2550, doi:10.1002/rcm.6717, 2013.

Interactive comment on Biogeosciences Discuss., 12, 9729, 2015.