

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

Anonymous Referee #3

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

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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!

The second major issue is related to the lack of methodological details and to the fact that raw results of C isotope composition in individual molecule are not provided. Sugar ^{13}C 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. In the M&M section, they should write the equation of errors propagation in the calculation of maize derived C. 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).

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. 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.

Minor comments Indicate in the M&M section that you sample two horizons. Explain the colours in Fig1 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)

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