



8, C379-C381, 2011

Interactive Comment

Interactive comment on "How to link soil C pools with CO₂ fluxes?" *by* Y. Kuzyakov

Y. Kuzyakov

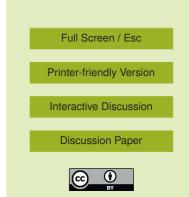
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Response to the comments of Y.-D. Wang

> I am confused with the line of C4/C3 in CO2 in Fig. 3 (bottom). In my opinion this line should be similar to the line of C4/C3 in SOM in the same figure.

This is the important issue that because the availability of new C (here C4) in SOM is much higher that that of the old C (here C3) their contributions to the CO2 fluxes do not correspond to the ratio C4/C3 in SOM. During the time course after C3-C4 changes the remaining C3-C is getting every year less available. The decrease of availability of C3 is stronger than the decrease of its contribution to the SOM. Therefore, both lines presenting the ratios of C4/C3 in SOM and in CO2 are different: the C4/C3 in SOM is a saturation curve, and in contrast the C4/C3 in CO2 is an nearly exponentially growing line.



> Furthermore in contrast with dry soil, the soil carbon cycle and 13C signature of fluxes (CO2 and CH4) are different in wetland. Could you give some comments on how to link soil C pools with CO2 and CH4 fuxes in wetland? Thank you very much!

CO2: The differences between isotopic signature of CO2 under oxic and anoxic conditions are connected with isotopic fractionation, which depends beside other factors on 1) completeness and 2) the rate of C oxidation. As the completeness and the rate of C oxidation decrease under anoxic conditions compared to the oxic conditions, the isotopic fractionation increase, and is much higher compared to isotopic fractionation under oxic conditions. Surely it is possible to consider isotopic fractionation, but separate experiments are necessary. Another frequently unaccounted source of apparent isotopic fractionation is preferential utilization of substrates with different δ 13C. There are some approaches to evaluate isotopic fractionation and preferential utilization (see Hobbie and Werner 2004; Werth and Kuzyakov, 2010; Blagodatskaya et al., 2011).

CH4: Isotopic fractionation by CH4 production is much higher than that by CO2 production and is much more variable depending on environmental conditions (including the redox potential). Additionally, the source of C is especially important for CH4. Commonly, easily available substrates will be converted to CH4 and therefore, their isotopic signature should be measured. So, I fully agree that it is much more difficult to link CH4 flux with its sources. However, the addition of various 13C or 14C labelled (strongly enriched) substrates to soil help to solve this problem.

References

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