Biogeosciences Discuss.,
doi:10.5194/bg-2015-399-RC2, 2016

Biogeosciences Discussions

Interactive comment on "Soil carbon dioxide emissions controlled by an extracellular oxidative metabolism identifiable by its isotope signature" *by* B. Kéraval et al.

Anonymous Referee #2

Received and published: 17 May 2016

This excellent study shows the occurence of extracellular respiration in soils and discusses the involved pathways. Even if addressed in earlier works, the question of extracellular or abiotic production of CO2 is of broad interest for the conceptual representation of soil organic carbon mineralization. The study is one of the best conducted on this subject. Even if research has to be continued on this question, these are new concepts and ideas in this study, which are worth being published yet. The initial manuscript has been clearly improved in this new version. I therefore consider the manuscript as acceptable for publication.

Concerning section "4.4. Towards a quantification of EXOMET and cellular respiration in living soils". Results of figure 3e and corresponding equation page 16 that relates

d13C of CO2 to DOC could be explained through two processes of CO2 release by exomet: one involving (almost) no frationation and the other highly fractionating, and probably from carbon derived from extracted/heated organic matter. The linear relationship between d13C and DOC concentration might be as well explained by a proportion of the second process in the CO2 efflux, which is itself correlated with the extraction level of carbon by treatment, as by a reservoir size dependent kinetic expression of the 13C fractionation factor. The proposed method to quantify exomet through 13C signature thus makes sense, but the equation that relates the isotope fractionation to DOC concentration should not be considered as generic.

According to the data, labelled glucose is a source of exomet CO2, but is not the dominant source. The conclusion that exomet can achieve a respiratory-like metabolism doesn't exclude the occurrence in parallel of more partial mineralization processes, e.g. involving methoxy or carboxyls etc. Complete mineralization of complex molecules such as glucose would furthermore lead to smaller isotope fractionation than observed.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2015-399, 2016.