

Interactive comment on “Distinct patterns in the diurnal and seasonal variability in four components of soil respiration in a temperate forest under free-air CO₂ enrichment” by L. Taneva and M. A. Gonzalez-Meler

Anonymous Referee #1

Received and published: 6 May 2011

To make the type of separation that is made in this paper is difficult but the use of stable isotopes may be of help. By the use of one isotope it is possible to separate the contribution to respiration from two sources by a mass balance approach, e.g. root respiration and heterotrophic respiration when C₃-plants are grown in a C₄-soil or vice versa. A prerequisite for such a partitioning is that the isotopic difference between end-members is relatively large. However, in the present paper differences in ¹³C signatures is applied to separate soil respiration into four different sources, root/rhizosphere respiration (RR), litter decomposition (RL), and decomposition of two pools of root-free

C846

SOM (RSOM-young & RSOM-old). A litter exclusion treatment enabled the estimation of RL to RS. However, how the contribution from the remaining three sources is possible to separate with only one isotope is not clear to me. A root trenching treatment would have been one solution to that problem. However, the isotopic difference between some of the end-members is small compared to errors in the estimated values for these. To use a 1‰ difference in a sensitivity analysis, when a 95% confidence interval for the end-members is up to 4‰ (RR in the elevated plot), is not appropriate.

I suggest the authors to make a complete rethinking of the model, the data treatment and the whole manuscript. Estimate the contribution from RL simply by calculating the difference in respiration rates between plots with and without litter. The respiration from old and young C can also be estimated from these two plots. Unfortunately, a further separation of the C sources is not possible with the data available.

However, there might be some problems with this approach also. The assumption that there is no effect on stomatal conductance of the CO₂-treatment is possibly wrong. The general view is that the effect of [CO₂] is smaller in conifers than in some broadleaved (see Medlyn et al., 2001 New Phytologist 149: 247–264). But the effect on conifers is not always zero. In addition, there is a rather substantial understorey of broad leaved trees in the FACE plots at Duke, and the contribution to soil respiration from these may be of significance.

Interactive comment on Biogeosciences Discuss., 8, 2875, 2011.

C847