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Biogeosciences Discussions

Interactive comment on "Summer drought reduces total and litter-derived soil CO_2 effluxes in temperate grassland – clues from a ^{13}C litter addition experiment" *by* O. Joos et al.

Anonymous Referee #1

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Temperature and moisture are key drivers of biological activity in soil. Hence, changes in these parameters affect CO2 flux. This study intended to (a) quantify the effect of a prolonged drought on CO2 flux from a temperate grassland. To this end rain shelters were installed on a larger grassland to prevent rain from falling onto small plots for a period of 69 days. By application of 13C labelled litter to these plots, and plots outside the shelters, it was possible to (b) distinguish CO2 flux components from soil and litter under natural and artificially dry conditions.

Unfortunately, a 'small gap' in the soil moisture data set covers the entire drought treatment period plus the about 10 preceding and 10 succeeding days. As I understand,

only the sensors at 5 cm depth failed during that period and the ones at 15 cm depth provided data. Values for 5 cm depth were then estimated with an empirical function (R2 = 0.54). This is at best only a rough estimate of the key variable associated with point (a). Consequently, results and conclusions derived in this respect can also at best be rough estimates. However, there is an even more problematic issue in the drought experiment. I doubt that a drought can be simulated with rain shelters the size of 3.0 m x 3.5 m. The shelters will in their centre definitely keep the soil surface dry but with increasing soil depth soil moisture will approach similar levels to those outside the shelter. I am not familiar with the situation at the experimental site. Yet, I assume rooting depth of at least 1 m for most species. So plants underneath the shelter will have benefited during the drought treatment from precipitation that has fallen outside the shelter and that has moved by gravity flow and/or capillary rise into their rooting zone. The same applies to the soil microbial community, especially in the deeper soil layers. For reasons of the half-way nature of the induced drought and missing soil moisture data during the course of the treatment, I would remove this part entirely from the manuscript. Also the finding that applied litter is decomposed much more slowly when kept in a dry place underneath a plastic shelter, compared to when it is exposed to rain, is trivial. In fact keeping things dry is one way to conserve them (we all have read sentences like this on boxes of tea, coffee, biscuits...: 'store in a cool and dry place').

The part to save from this manuscript is the labelled litter experiment in the control plots only. I think this is a neat and interesting study, which is scientifically sound. The authors may consider re-submitting a short communication on this part of their experiment.

Interactive comment on Biogeosciences Discuss., 6, 11005, 2009.