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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 #2

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The manuscript presented by Joos et al. describes a drought experiment to assess the temperature and moisture sensitivity of managed grassland. The experiment aims to quantify the contribution of litter and below ground decomposition to total soil CO2 efflux using 13C labelled litter. Key findings are that grasslands are sensitive to reduced moisture regimes and the need to quantify the contributions of different organic matter pools to total soil CO2 efflux and to understand their different sensitivities to environmental drivers. Overall, the manuscript is well written, aims clearly defined and the experimental approach well presented. I think, the idea to use labelled 13C material to study the contribution of different organic matter pools to total soil CO2 effluxes is a sound approach. However, whereas the first aim is clearly achieved, it is com-

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mon knowledge and ecosystem models do generally include moisture sensitivity as it is one of the main drivers of environmental processes. The results and discussion of the second aim are weak. It does not become clear to me, if Flitter and FBG are more sensitive under drought conditions than in the control plot. Of course do they both decrease under drought compared to the control plot and Flitter responds stronger than FBG in the drought plot due to higher moisture limitations than the bulk soil, but, are Flitter and FBG under drought differently sensitive to environmental drivers than in the control plot?

Points that need clarification: Labelled litter is placed directly onto the soil surface. Was the remaining grass from the previous growing season cut before that? For CO2 flux measurements, standing plant biomass was cut down to 3 cm height. How was it possible to separate the standing grass biomass from the added litter?

I am doubtful about the gap filling of the soil moisture values for the 5 cm layer in the drought plot. Were the 97 days a continuous gap or on and off days? It is not visually distinguishable in Fig. 1c. In either case it needs to be explained, how representative the values available for the regression are of the drought period. The relatively low R2 already indicates that the regression does not hold especially since the soil moisture values of 5 cm depth are one of the main parameters in the sensitivity analysis.

Measurements of 15 and 30 cm depth need to be shown and interpreted since the status of the soil in these layers greatly contributes to the observed FBG fluxes. It needs to be explained, why only the measurements of the 5 cm layer were taken into account for the interpretation of the results.

Discussion – Soil CO2 efflux: Please explain, why a peak shortly after the addition of litter is observed and state, that it is derived from litter decomposition. Please explain here, why soil moisture has no significant effect. It is explained later on but misses the arguments, that a) total CO2 efflux is determined also from lower layers, not only from the first 5 cm and b) that the soil moisture status is probably within an optimum range

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for respiration processes so that little variations are not significant.

In general, the discussion would benefit from further interpretation of the results like on pg. 11019, lines 22-26, and stating and explaining differences compared to other works, rather than only listing similarities.

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