Biogeosciences Discuss., 6, C3357–C3360, 2009
www.biogeosciences-discuss.net/6/C3357/2009/

Biogeosciences Discussions

Interactive comment on "Greenhouse gas fluxes in a drained peatland forest during spring frost-thaw event" *by* M. K. Pihlatie et al.

Anonymous Referee #1

Received and published: 2 December 2009

The manuscript presents an interesting, solid and comprehensive study of GHG fluxes. The authors focus on the spring frost-thaw season, although the measurements have started a bit late, which may arise a concern that some freeze-thaw peak(s) were missed. The chosen object, drained peatland forest, is indeed very interesting in terms of GHG exchange; measured fluxes (above- and sub-canopy CO2, CH4 and N2O), complemented by soil concentration profiles give a good approach to understanding GHG balance. Using three different methods of flux measurements (EC, automatic and manual chambers) is also a big benefit. The whole study makes impression of well-planned, well-organized and well-performed work. However the text and especially the figures may be recommended for a number of corrections.

Specific questions and notes:

In the introduction the authors declare their measurements aim "...to estimate the net GHG exchange and the importance of different C and N flux components on the total GHG balance..." (6114:15); the terms "GHG balance" and "radiative forcing" can be found all over the manuscript. Unfortunately the estimation for the total GHG balance in any form (CO2 equivalents, radiative forcing, whatever else) is given neither in the text nor in the table. Certainly, any form of GHG balance estimation can be discussible, but it may be recommended to choose one and use it as a numerical prove of the conclusions (i.e "Fluxes of CH4 and N2O contributed only insignificantly to the GHG balance" – 6132:25, for the moment this sentence is baseless). Table 1 may be a good place for these numbers.

Chamber measurements. What was the reason for not measuring CO2 by manual chambers? Or may be this data is available but chosen to be excluded from this publication? Manual chamber CO2 fluxes might be interesting not only per se, but also as a quality indicator for CH4 and N2O data. The authors state "The development of gas concentrations inside the chamber during an enclosure period was linear" (6119:15) – was it always the case? Which criteria (R2?) was used to check the concentration data quality? Was any low-quality data filtered out? Was there any prove that the linear regression is the best to be used for the flux calculations?

EC measurements. What software was used for EC calculations?

Soil measurements. The gas sample cups seem to be very big. When sampling 105-110 ml of gas phase from the cup, the same amount of gas from surrounding soil should replace it. If the porosity is, say, 10% it means degassing of about one liter of soil (a sphere with diameter >12 cm). The cups are placed at 5, 22 and 45 cm (6118:5), so in theory may affect each other. Were the cups sampled always in the same order? The same time between? Is there any evidence that 1-2 weeks of exposition is enough to restore the natural concentration profile after so massive disturbance? Why soil CO2 concentrations were not analyzed? Or may be this data exists but chosen to be not reported?

BGD

6, C3357–C3360, 2009

Text corrections:

6124:25 - Figs. 5b and 6b were probably meant instead of 4b and 5b

6125:5 - Fig. 6b was probably meant instead of 4b

Figures. In contradistinction to the text, which is written in general very well, the figures seem to be prepared in a rush. The authors would be suggested to:

1) Carefully analyze what is the aim of every single figure, and what data is necessary and sufficient to achieve it. For example, why the plot of soil temperature is linked to plots of CO2 fluxes (Fig.3), water table – to CH4 (Fig.5), and soil and air temperature – to N2O (Fig.6), while Fig.2 contains all the same environmental data at one graph?

2) Find a single style across the figures, making easier to perceive them one after another. For example, automatic chambers and their data are abbreviated as AC at Fig.1, but AutoChamb at Fig.3 and Fig.6; the same thing is called “tall eddy covariance mast” (Fig.1), “eddy covariance above the forest canopy” (Fig.3) and “above canopy eddy covariance” (Fig.4). The water table data is represented by dots at Fig.2, but by a line at Fig.5. The same symbols and colors are used for different things at 3 parts of Fig.6.

3) Tune the graphs to the best possible emphasis for black-&-white figures, if b&w is chosen. The circles of the same size, filled by different levels of grey, are hard to distinguish (Fig. 3-6). The perception can be much clearer if different shape symbols are used; in many cases the size of symbols can be increased as well.

Fig.1 - would be good to mark Ac and Mc by different symbols, or sign all 4 Mc circles – othervice three unsigned Mc may be taken as Ac or whatever else. This figure can be also used to mark the towers footprint and the location of soil measurements.

Fig.2a (and 6d) – the temperature lines are really hardly readable! Some other representation may be better, for example daily min-max filled areas.

BGD

6, C3357–C3360, 2009

Fig.3 – is it really informative to show both a) and b) graphs? May be only one of them is sufficient?

Fig.4 – the legend is missing, is it the same as for Fig.3? Why error bars at Fig.4 show standard deviations, and at Fig.5,6 – standard errors? What do they show at Fig.3?

Interactive comment on Biogeosciences Discuss., 6, 6111, 2009.