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Biogeosciences Discussions

Interactive comment on "Contribution of recent plant photosynthates of *Eriophorum vaginatum* and *Scheuchzeria palustris* to methanogenesis and CH_4 transport at a boreal mire: a ^{14}C pulse-labeling study" *by* M. Dorodnikov et al.

Anonymous Referee #1

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Review of the manuscript "Contribution of recent photosynthates of Eriophorum vaginatum and Scheucheria palustris to methanogenesis and CH4 transport at a boreal mire: a 14C pulse-labeling study" by M. Dorodnikov et al. (bg-2011-119)

General comments:

Methane production in wetlands is largely associated to plant derived carbon compounds. Furthermore, vascular aerenchymatous plants efficiently transport methane from water-logged soil to the atmosphere thus enhancing methane emissions. In peat-

lands hydrological and associated botanical conditions have high spatial variation, a key reason for the spatial variation in methane emissions. This spatial variation is well-known but the possible differences in the function of vascular plants of the microhabitats (hummocks, lawns, hollows) behind methane production and transport are poorly known. In this work these questions have been studied by a mesocosm system and applying radioisotope approach which allowed to gain knowledge on the fate of carbon dioxide fixed by the vascular plants typical at the microhabitats. The experimental layout and the radiocarbon method used are appropriate for the research questions. Some methodological aspects which could have had some impact on the results will be commented. The manuscript is generally well-written, some minor revisions are needed.

Specific comments:

1. Both the CH4 and CO2 fluxes were measured by transparent chamber. Therefore, do not use for the CO2 flux the term "respiration" as has been done e.g. on page 4373/line23. The measurement method shows NEE, i.e. sum of photosynthesis and respiration.

2. A potential reason for the carbon loss not detected is the release of methane in bubbling. The incubation temperature of the mesocosms was 22/27 oC, i.e. higher than the highest in peat during summer (some 14 oC in the uppermost peat). High temperature likely enhanced bubble formation in the experiments. It could well be that the measuring system did not cover the irregular bubble release events (on average 20 % of the incorporated label was not recovered). The relative low amount of added 14C found in emitted methane could be a result of the missed methane released in bubbles. A second points would be that the photosynthesis (transparent chambers) caused reassimilation of released 14CO2 which decreased the recovery?

3. For the CO2 fluxes following aspects should be considered and discussed. The isolated mesocosms showed only the carbon balance of the above-ground vegetation

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whereas the control mesocosms included also CO2 released from the soil (root respiration, heterotrophic respiration) . Therefore, if we assume similar photosynthesis in the controls and isolated mesocosms, the isolated mesocosms should show generally lower CO2 uptake or lower CO2 net release. There is some evidence on that when looking the data shown in the Figures.

4. Was the light intensity of 800 μ mol m-2 s-1 used also in the gas flux measurements not only in maintaining the mesocosms (see the previous comment on the CO2 uptake/release in the various mesocosms during the measurements).

Interactive comment on Biogeosciences Discuss., 8, 4359, 2011.