Response to the comments of the Reviewer 2

MS: bg-2011-119

Dorodnikov et al.

General comments:

We are thankful to the Reviewer for his/her valuable recommendations and we improved all points mentioned by the Reviewer as outlined below.

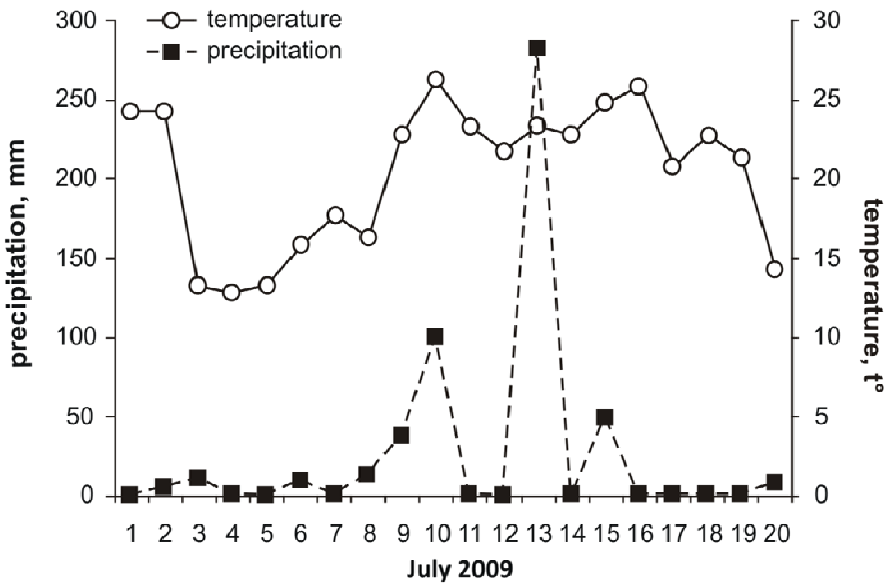
"…When several variables, e.g. vascular plant density and water-table depth, vary it is hard to distinguish the specific effects of different vascular plants and such conclusions should be drawn with some care."

- We agree with the Reviewer that a number of environmental parameters are responsible for the processes observed during the experiment. In the current study our goal was to consider a combination between plant species and their attribution to microforms distinguishing by water table level, hence by the portion of roots located under anoxic conditions. Therefore, in our experiment we consider plant species and microforms as coupled ecological units, which are relevant to the natural environment of boreal peatlands.

Specific comments:

1. **page 4364, line 11-13 awkward sentence**
   - The awkward sentence was deleted.

2. **A high temperature (22/27oC) was used in the experiment, ca 10oC higher than the temperature reported by Saarnio 1997 for the warmest month. The very high temperature is most likely responsible for the 2-9 folds higher CH4 fluxes (se page 4374). Were there any noticeable damages on the vegetation as a result of these high temperatures and more specifically any different temperature effects on Eriophorum versus Scheucheria? Irrespectively, the higher fluxes could be a result of decaying roots etc. if vegetation was damaged.**
   - We appreciate the Reviewer for such an important comment. Indeed, the temperatures were on average higher than those reported by Saarnio et al. (1997) and responsible for higher fluxes. However, temperatures we used in the experiment corresponded to the highest (27^{o}C) and were close to average (22^{o}C) temperatures observed on the site (Salmisuo, 62°47'N, 30°56'E) during the time of sampling (see Figure below).



Concerning the decrease of plants functionality, we stopped the experiment immediately as we detected first noticeable changes in semblance of plants. These changes were observed in *Eriophorum vaginatum* first. Thus, the reported time interval corresponded to the period of proper functionality of two vascular plant species.

3. **How was the fluxes calculated, i.e., was any filtering applied? Include discussion of how bubbles were treated. It is likely that more of the emission from mesocosms without plants was in bubbles..**
   - During flux calculations all obtained data points were thoroughly checked for goodness (slope with an r^2 of >0.9 was used) and outliers were removed. There was no abrupt increase in CH_4 concentration (indicator of a bubbling event) observed during flux measurements in control mesocosms without vascular plants. The respective text was added into the discussion ((L 24-26, page 4376, improved version).

4. **Flux units. I would prefer mg/m2 h since I doubt that the authors have accomplished a three decimal accuracy on their CH4 flux measurements.**
   - Corrected (Figures 2, 3 and in the text).

5. **page 4374 end paragraph. The conclusion regarding species specific plant-mediated CH4 transport should be drawn with some care. As stated by the authors CH4 emission is influenced by water-table depth, methanogenic substrate and rhizospheric oxidation. I don't think the authors can safely conclude that Scheucheria has a higher methane transport capacity than Eriophorum and dismiss the importance of rhizospheric oxidation in Eriophorum. The most evident result seems to me the very high allocation of 14C below ground in Scheucheria possibly indicating a higher supply of methanogenic substrate in this**

species (although this as stated by the authors can not be entirely proven without a chemical analysis of rhizodeposits).

- We totally agree with the Reviewer that without information about rhizospheric oxidation of CH_4 it is difficult to draw conclusions about differences in CH_4 transport between two plant species. Although we did not estimate rhizospheric oxidation in our experiment, we referred to earlier findings of Frenzel and Rudolph (1998) who could not identify significant CH_4 oxidation under *E. vaginatum*, despite the highly aerenchymatic root tissues. Considering the latter and our own results (plant-mediated CH_4 transport was 10–20% more intensive from *Scheuchzeria* mesocosms and 4.5 folds larger on the dry weight basis as compared to mesocosms of *Eriophorum* (Fig. 3)) we, therefore, assumed the efficiency of *S. palustris* vs. *E. vaginatum* in transmission of CH_4 from the anoxic zone to the atmosphere under conditions of the experiment. Changes of oxic/anoxic conditions of microsites with respective plant communities due to drought or flood events should affect the efficiency of CH_4 transport of both species. However, this was not the aim of the current experiment and has to be tested separately.

6. **Fig 3. Ad legend and remove the strange text format of the right axis in the diagram.**
   - Corrected.

Maxim Dorodnikov and co-authors