

Interactive comment on “Contribution of recent plant photosynthates of *Eriophorum vaginatum* and *Scheuchzeria palustris* to methanogenesis and CH₄ transport at a boreal mire: a ¹⁴C pulse-labeling study” by M. Dorodnikov et al.

Anonymous Referee #3

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General Comments

The study aimed to determine the contribution of plant photosynthates to the total CH₄ efflux from soil considering an interactive effect of micro-landscape and plant species on methane production and transport. An application of ¹⁴CO₂-C pulse labeling to the mesocosm study can give a new knowledge at the level of inter-specific plant – microbial interactions elucidating the mechanisms of greenhouse gases production by microbial transformation of root exudates. The MS is written for audience of wide scientific community who are familiar with microbial ecology, development of land use

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technologies and GHG mitigation strategies.

The study is relevant and is in the scope of BG. Despite the relatively complicated experimental design it is clearly described in the MS and the data presented are convincing. The interpretation of the results is correct and realistic.

Certain improvements are necessary, however, to make the presented material more clear and understandable for the readers. The title is tedious, looks like an Abstract and should be simplified. It is not clear what is the difference between recent and old plant photosynthates, this should be defined somewhere in the text. The list of plant species is not necessary in the title. ¹⁴C pulse-labeling - is it necessary to outline it in the title? E.g. “Contribution of plant photosynthates to methanogenesis and CH₄ transport at boreal mire”.

The research questions should be better formulated (see also my specific comments). The hypotheses look artificial and formulated basing on the results. Is there any reason to assume the opposite: that contribution of recent plant photosynthates to methanogenesis occurs SLOW and does NOT depend on the amount of plant biomass? The sufficient background for the second hypothesis is lacking in the Introduction.

I partially disagree with the conclusion that “Contribution of recent plant photosynthates to methanogenesis was not depended on the amount of plant biomass”. The study clearly revealed the positive intra-specific (within the same plant species) relationship between CH₄ and root mass.

I recommend the MS for publication after moderate revision.

Specific comments:

P4361.Line 8. “The obtained results” – omit “obtained”

P4361.Line 9. Abbreviations for E and S should be presented above. Or generally accepted terms as *E. vaginatum* should be used.

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P4361.Line 17. "was not depended" or "was negatively related"?

P4362.Line 12. "(boreal)" – omit brackets

Lines 88-89. P4363.Line 17. it is not clear – was the *Scheuchzeria palustris* never studied as it is not important at the ecosystem level...I suggest to add, e.g.: despite this species dominates in hollows microform of boreal peatlands.

Lines 107-109. According to this statement the sites with the same microforms but with different plant species are missing in your experimental design.

Line 128. Second research question partly repeats the first one.

Line 264. "(4 points, see above)" – I suggest to omit the repetition

Line 264. "mg m⁻² min⁻¹" – not clear mg CO₂ /CH₄ or mg C?.

Line 311. "g dry weight" – of soil or of plant?

Line 326. "11% of the total 14C activity" – not clear, what activity do you mean – added or evolved?

Lines 329-330. "The total amount of 14C-CH₄ emission did not exceed 0.03-0.13% of 14C activity" – what does it mean considering 20% losses in recovery? Could be the real contribution of 14C-CH₄ up to 20% greater?

Fig 1 Lines 643-648. I think it would be more logical to trade the places of item 2 and item 3.

Fig 2. It is not clear, what is the control here: 2 cores with moss with the shift in time? Why did they show the different patterns for CO₂ then?

According to the Fig. 3. the plant species was more responsible for the differences in CH₄ efflux than microforms.

Table 1. What is presented the vegetation type or plant species?

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