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Biogeosciences Discussions

Interactive comment on "Methanotrophy potential versus methane supply by pore water diffusion in peatlands" *by* E. R. C. Hornibrook et al.

Anonymous Referee #2

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The manuscript describes interesting data on the importance of diffusion and methane oxidation in methane emissions from peatlands. The theoretical methane diffusion rates based on methane concentration gradient in peat profile and peat properties did not exceed 10-20 mg m-2 d-1. However, the diffusion was highly limited because methane oxidation capacity in peat was greater than the diffusion rate. Therefore, most of the methane released had to be transported by vascular plants or released in bubbles. The observations explain why methane released from peatlands is highly 13C-depleted; it should be enriched if processed by methanoptrophs. The finding on the effect of precipitation on methane profile is also important. Enclosed some suggestions and comments.

Page 2609, lines 5-7, 16-27: In acidic peat there also are methane oxidizers others

than Types I and II (they do not have soluble methane monooxygenase, e.g. AEM 64: 922-929, 1998). However, here the text on the diversity could be shortened because methane oxidation is not linked to the diversity of methane oxidizers.

There are rather many figures in the manuscript, some could be excluded. These include Fig. 1. There are several figures (Figs 3, 4, 5 and 6) for dissolved methane in pore water profiles. Only one typical profile would be shown , and the rest can be excluded.

The information in the Table 4 can be shown in the legend of the Fig. 7.

Page 2628, lines 24-26: In a short-term this conclusion would be true but if methane oxidation is totally lacking the methane concentration in the peat profile increases causing higher methane release via vascular plants and bubbling. This text should be revised by considering this comment.

Some comments could be added why the kinetic parameters were larger in the ombrotrophic than minerotrophic peatlands although methane production is expected to be higher in the later peatland types? Is the reason lack of methane and oxygen transport by vascular plants in the ombrotrophic peat? Was the methane concentration higher in the ombroptrophic peat profiles?

It would be interested if the coverage of various vascular plant species are correlated with the surface methane fluxes. Then their importance in the methane transport is shown here, and some other explanations for the high emissions (like bubbling) can be excluded.

Is there evidence that methane released from ombrotrophic peatlands is more 13C-enriched that methane from minerotrophic peatlands?

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