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Discussions

Interactive comment on "Zero to moderate methane emissions in a densely rooted, pristine Patagonian bog - biogeochemical controls as revealed from isotopic evidence" *by* Wiebke Münchberger et al.

Anonymous Referee #1

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This is a carefully done study about the production, oxidation and emission of CH4 in Patagonian bog, the results are of considerable interest and the paper is well written. However, some points need clarifying and certain statements require further justification. 1. the authors should not ignore that acetogenesis might be important in anaerobic environments when H2 partial pressures are high and temperatures are low. Acetogens can outcompete methanogens at low temperature, as many acetogens seem to have a higher growth rate at low temperature than most methanogens (Kotsyurbenko et al., 1996, 2001). If acetogenesis process is active in the bog, the δ13C value of

actetate in the porewater will be largely decreased because of the substantial fractionation during acetate production from CO2 and H2. And resultantly, the 13C value of CH4 will also be lower and resulted in larger apparent isotopic fractionation factor (ac) between CO2 and CH4. Therefore, it's difficult to determine the relative importance of acetoclastic versus hydrogenotrophic methanogenesis pathway without the 13C value of acetate in this study. 2. In the first page, line 26-28, it's stated that: "Below the rhizosphere. . .. . .CH4 was predominantly produced by hydrogenotrophic methanogenesis". In fact, data in Figure 4def showed that the hydrogenotrophic pathway had higher contribution to CH4 in the pool, while the acetoclastic pathway must play relatively more important role for the CH4 production below the rhizosphere of Astelia Lawn. This is consistent with the supply of labile organic carbon from the root exudates of Astelia. To sum up, I think it's difficult to conclude that CH4 is mainly produced from the hydrogenotrophic pathway below the rhizosphere of Astelia. 3. It's stated that mean root lifetimes of A. pumila has been estimated to be $\sim$3-4 years. So, whether the production and oxidation of CH4 will be strongly affected in case of the turnover of large amounts of roots? 4. Please check Table 3, the data in the last three columns are in wrong places.

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