Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-456-RC2, 2018

Biogeosciences Discussions
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Interactive comment on "Multi-year effect of wetting on CH_4 flux at taiga-tundra boundary in northeastern Siberia deduced from stable isotope ratios of CH_4" *by* Ryo Shingubara et al.

Anonymous Referee #2

Received and published: 15 November 2018

Shingubara and coworkers present the multi-year effect of wet summer on CH4 emissions from riverine lowland in northeastern Siberia, which has potential to emit substantial amount of CH4. The data shown in this paper, especially carbon and hydrogen isotopic composition of CH4, contribute better understand the mechanisms of temporal variation of CH4 emission in this important region. Although I appreciate to the authors' effort to collect CH4 flux and their isotopic data in Siberia and found this is an important and worthwhile study to be done, I think the authors do not exhaust the potential of their data. Therefore, I encourage the authors to revise the manuscript. I suggest revisions on three major points as outlined below (as well as corrections of several minor points listed in the following).

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Major points

1. If the authors want to prove that the increase of CH4 emission in 2012 and 2013 was due to reduced condition after high precipitation in 2011, the authors should show the precipitation data in the preceding years before 2009 (e.g. 2007 and 2008, if possible) to prove that low CH4 emission in 2009 and 2010 was observed under long lasting oxic condition (although there is no GWL data). By showing it, readers can convince more easily the authors' hypothesis.

2. In Figure 4 and 5, isotopic data of CH4 are shown in different colors for different year (not for each sampling site). Therefore, readers cannot see the spatial difference of these isotopic values. Please revise the figures (in the same manner as Figure S1). By doing so, the reader can judge if the difference in dD is due to spatial difference or not. In addition, are there any temporal changes in dD values at 10 cm in 2011? If there is any relationships between higher dD values and environmental factors (i.e. drop with GWL or precipitation in summer), this can be important information to understand the effect of CH4 oxidation or diffusion on variation in dD.

3. Results of phylogenic composition should be presented in the main text and as a main figure.

Minor points

Abstract

P1, L23 "soil" incubation "emitted" CH4

P1, L25 & L26 CH4 "emission"

P1, L28 "in 2011" see Major point 2

Introduction

P2, L5, Rewrite the sentence.

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P2, L9-14 Referencing in the manuscript is incomplete.

P3, L8 “soil” incubation

Methods

P4, L25 When was GWL measurement conducted in each year? After every sampling? Or just one time?

P5, L3 How many soil incubation samples are prepared for each sampling point and for each initial and final measurement? Please clarify.

P5, L9-L12 If the analysis method of phylogenic composition is shown in Methods section, data (figure) should be shown as main figure (not as supplement)

P5, L15 Were the samples prepared in quadruplicate for each day of sampling? Or one sample was measured for each location and each sampling day? Please clarify.

Results

See the Major point 3.

P6, L21, Please clarify the definition of “wet area” in this manuscript.

P6, L25, Please show the thaw depth of each observation year, in addition to the averaged value.

P6, L26- See Major comment 2, please show the environmental data of several years prior to flux measurement in 2009 and 2010.

P7, L2, Again, when was GWL measurement conducted in each year? After every sampling? Or just one time? If the authors measured GWL after every sampling, it can be useful information to understand the CH4 production and oxidation processes. It may be especially true for summer 2011 when the dynamic GWL change must occur with precipitation.

P7, L11 Take out “active”

P7, L13 Take out “Interestingly”

Section 3.3 See the Major comment 2. Please show the spatial (and temporal) variations of isotopic values.

P7, L25 Please show the ranges of concentrations and dD and d13C values of CH4 in ambient air using for “in situ” dilution.

P7, L26 similarly “to what?”

P8, L9, L10, Please show statistics.

P8, L20- Please add figures showing change of d13C and dD in Figure S2.

Discussion

P8, L30, L31 Please show the ranges of CH4 flux both in this site and in the some literature.

Section 4.2 Need more reference.

P9, L15, If the authors do not show the ORP data, take out “remarkably”.

P9, L26, Again, please check if these higher dD values are not associated with sampling point and sampling time.

P9, L32, Here, I recommend showing the equilibrium concentration of dissolved CH4 with atmospheric CH4, to exclude the possibility that CH4 exchange can effect on isotopic values.

P10, L1 In addition, heavy precipitation may supply O2 to surface layer of wet area.

Section 4.3 See the Major point 3. I think that the results of microbial analysis agree well with isotopic variation and, therefore, are should be shown in main text.

Concluding remarks

P11, L18-19 Add reference.

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Figure 2 Please show the precipitation and temperature data in the preceding years before 2009. GWL data of sphagnum moss in 2013 seems missing.

Figure 3, Add statistical information (yearly difference) in the figure.

Figure 7, Please represent the symbols for different sampling site by different colors.

Figure 8, Are the d13C & dD data averaged value? Please clarify.

P25, L5 “in the bottom left corner”? Please rewrite.

Figure S2, Please add figures showing change in d13C and dD.

Table S2, Please show isotopic values and number of samples.

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