

## **Responses to comments raised by Professor Dong.**

We are grateful for the constructive comments and suggestions for improving the manuscript. We try our best to address the issues raised and to revise the manuscript. In the following we go through the comments by the reviewer point by point.

### ***Comments***

*This MS contains some important valuable information for in site measurements that deserves to be published as it will provide new idea of the influence of natural boreal peatland with different community on CH<sub>4</sub> biogeochemistry process. As noted by the authors, relatively little data is available from choose ecosystems. This study therefore makes a valuable contribution to our understanding of natural boreal peatland CH<sub>4</sub> emission and carbon sequestration variations at a regional scale. But to my knowledge, some more background information, such as what is the climate situation during the study period comparing with long-term patterns, soil nutrient (particularly available nutrient), et al., are not clean explained in the text. These should be making more attentions for the revision.*

**Response:** Thanks for reviewer's comments. According to the reviewer's suggestion, we will add necessary background information and try our best to make explicit interpretations in the coming revised manuscript.

### ***Comments:***

*However, the value of the data, in the regard, the MS will be much enhanced if there is some modification in the presentation.*

**Response:** Thanks for reviewer's suggestions. We will enhance this aspect in the coming revised manuscript.

### ***Comments:***

*I would suggest demonstrating and discussing in materials and methods section what are the*

*mean ecological different on two measured site, such as biomass weight, plant height, leaf area, root/shoot ratio, et al. This information will strongly support some differences of ecosystem CH<sub>4</sub> effluxes.*

**Response:** Thanks for reviewer's suggestions. As described in response to reviewer 1, we measured gas fluxes from two types of vegetation communities in the peatland site. We randomly set up 8 plots (4 replicate for each community) for methane observation in the peatland site. We will add some plant properties of these two vegetation communities in the "Materials and methods" section in the coming revised manuscript.

**Comments:**

*It is should be much better if MS can statistic and calculate the exact differences of climate factors between measurement period and long-term annual mean data, particularly, precipitation and temperature. It is also so important to compare the plant growth data different during the measurement period with long-term mean value if the date is available. Most of time, the plant growth situation is more correlation with CH<sub>4</sub> productions and emissions.*

**Response:** Thanks for reviewer's suggestion. However, we have made a comparison of climate conditions such as temperature and precipitation between measurement period and long-term annual mean data in the section "3.1 Environment variables, CH<sub>4</sub> concentration in porewater and CH<sub>4</sub> fluxes" on page 8, lines 4-7 and 9-11 in the previous manuscript. We agreed on the reviewer's viewpoint that plant growth data during the measurement period were important to interpret the difference of CH<sub>4</sub> production and emissions between vegetation communities. However, to obtain some plant growth data such as above- and below- ground biomass (shrubs and herbs) dynamics, we had to conduct destructively sampling. In order to minimize the disturbance in the research site, we did biomass measurement only once a year during the peak growth. In the revised manuscript, we will provide basic plant growth data such as maximum above-ground biomass of two vegetation communities.

**Comments:**

*It is necessary to show and discussion the variations of soil nutrient data (DOC, Nitric-N, Ammonia-N) of CH<sub>4</sub> active layer, maybe with the microbes and relative soil characteristics. This is basically proving the results of CH<sub>4</sub> emissions from two measured ecosystems.*

**Response:** Thanks for reviewer's suggestion. We agreed on the reviewer's viewpoint that the seasonal variations of soil nutrient data, microbes and other soil characteristics in active layer were possible to interpret and prove the results of CH<sub>4</sub> emissions from two vegetation communities. Due to limitation of our experimental conditions, we could not provide soil Nitric-N and ammonia-N and the microbes in the active layer. We will provide some other soil characteristics such as soil carbon and nitrogen in the coming revised manuscript.

**Comments:**

*Lastly, I suggest to make some comparing of CH<sub>4</sub> emissions with others ecosystems in the measured area.*

**Response:** Thanks for reviewer's suggestion. Little research on methane fluxes from wetlands or other ecosystems was conducted in the permafrost zone of Northeast China. To my knowledge, Sun et al. (2011) measured one-year methane fluxes from various wetlands in Xiaoxing'an Mountain of Northeast China. We will add this information in the revised manuscript. In addition, we have compared our results with BOREAS peatlands and arctic/subarctic fens on page 6760, lines 4-9 in the previous manuscript.

Reference:

Sun, X., Mu, C., Song, C.: Seasonal and spatial variations of methane emissions from montane wetlands in Northeast China, *Atmos Environ*, 45, 1809-1816, 2011.