Biogeosciences Discuss.,
doi:10.5194/bg-2016-286-RC3, 2016

Biogeosciences Discussions

Interactive comment on "Timescale dependence of environmental controls on methane efflux in Poyang Lake, China" *by* Lixiang Liu et al.

Anonymous Referee #3

Received and published: 20 October 2016

Review: Timescale dependence of environmental controls on methane efflux in Poyang Lake, China.

Authors: Liu et al.

The present manuscript centers on relating methane efflux in Poyang Lake, China to the timescale dependence of environmental parameters. The study uses statistic methods to correlate methane efflux measured by floating chambers with other environmental factors under shorter and longer timescales. The results of measurements throughout the 4 years showed that temperature is an important factor controlling seasonal changes of methane efflux. Wind speed has negligible effects on methane efflux on daily and seasonal scales. The objectives fall well to the goal of Biogeosciences. However, the results and discussions did not show strong relevance to the Biogeosciences

so that I can't recommend publication of this manuscript in Biogeosciences.

Specific Comments:

1. Most of the results and discussions were built on the environmental variables and methane flux data. However, there are no data of biogeochemical related environmental variables shown in the figures and tables except Table 2. I would suggest to present the raw data of measured environmental variables in the supplementary material.

2. Substrate availability (Line, 432), biological (e.g., microbial activities) and biochemical (e.g., sediment carbon and nitrogen contents processes) (Lines 454-455) are very important factors to link methane efflux to the biogeochemical cycles and understand methane source and sink. Unfortunately, no comprehensive data or evidence to support the role of substrates and microbial activities on methane efflux in this manuscript which could be an important contribution to this journal.

3. It might be a risk to use the data from three sampling sites measured from one day (1 hr? Line 148) to represent methane efflux in that month. For example, it appears a contradiction between high methane efflux measured in July 2011 in Figure 3 and low methane efflux measured in July 2011 in Figure 4a.

4. How long and what time did the authors deploy the floating chambers in the three sampling sites within a day for the study at the large temporal scales (Fig. 3)? I feel 4-year measurements are not a very large temporal scale especially there are no continues measurements/monitering such as deploying floating chamber within a short interval (every week or every two to three days). Since high methane efflux was shown in the early mornings in Fig. 4a, b and d, were the floating chambers deployed at the same time at three different sites for the data shown in Fig. 3?

5. The area and water table of Poyang Lake fluctuate dramatically between the wet and dry seasons. The authors only have short but not clear descriptions of the effect of water level on methane efflux, e.g., in Lines 404-405 and Line 432. Methane efflux

might be high in dry seasons instead of summer, since methane efflux is expected to be high under lower water level due to decreasing of the hydrostatic pressure (e.g. Chanton et al. 1989). Are there any difference in water level between three sampling sites in different seasons (The mean water depth at three sites should not be always 3m through the whole year; Line 186)? The authors might consider a simple calculation of methane solubility changes due to water level fluctuations to strength the role of water level on methane efflux, e.g., Line 432.

6. As the authors stated in the introduction that methane is driven by three major mechanisms such as molecular diffusion, bubble ebullition and plant-mediated transportation, bubble ebullition is not the only pathway for methane to transport from water to the air. However, data for dissolved methane concentrations in lake water and sediments are lack in this study. No bubble ebullition doesn't mean no methane efflux. I would suggest to include diffusive methane flux to the air for comparison in the future by analyzing surface water methane concentrations and using the equation from the gas-transfer model e.g., Wanninkhof (1992).

7. Since many environmental factors and methane fluxes collected in October 2010 in Poyang Lake have been shown in Liu et al., (2013) for spatial studies, the authors may include Liu et al. (2013) in the introduction and discussions to emphasize why the three sampling sites were chosen in this timescale study and the relations between different environmental factors and methane effluxes in Autumn (October).

Minor Comments:

1. Lines 57-59: Please add references for the studies in high-latitude, tropical and subtropical lakes.

2. Line 129: What fluxes did the floating chamber measured while inserting 20 cm above the water surface?

3. Line 150: the air samples ==> the gas samples

4. Line 159-160; Fig. 4: Since methane efflux was calculated by using a linear regression model to the methane concentration data, should the minimum value be zero instead of a negative value? There should be no negative methane value detected by GC.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-286, 2016.