Biogeosciences

Discussions

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

Anonymous Referee #2

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This manuscript presents 4 years of CH4 flux patterns in the largest lake in China and environmental factors that influence CH4 flux rates. It falls well within the scope of Biogeosciences, but several aspects need to be improved for publication.

Some suggestions: 1) How do you define "long-term"? To me, 4-year observations can be short-term. Also, all the statements related to seasonal or interannual variability need to be justified because CH4 flux rates measured on one day may not represent flux rates of one month. Furthermore, daily CH4 flux rates could have been overestimated, considering that CH4 flux rates are measured during the day each month, when CH4 flux rates were higher than those at night according to diel cycle measurements.

2) All the assumptions are met for regression models? Did you consider any interactions among variables? In addition, did you also carry out the analysis before averaging

C1

the flux rates, with replicates as random effects? If so, how did the results differ from those after averaging?

3) In the discussion section some results were described, which did not appear in the result section. Results and discussion need to be better separated. In addition, the interpretation of the results needs to be better supported in the discussion section, focusing clearly on the core messages, i.e., what the results mean and what we can learn from this study.

Line#47-51, there are too few references to represent the minimum and maximum flux rates in lakes, especially given that those references are from lakes in China and Norway only. Also, if such values can be presented with more studies, how would seasonal variations look like in comparison to diurnal ones?

Line#75-78, can you add references for each variable? Line#64-72 well covered the references for each variable, but this section lacks it.

Line#78-82, it sounds like investigating in large lakes is not important. Please rephrase or add some more sentences to justify the importance of this research.

Line#86-87, I suggest adding references that describe the previous studies, e.g. Liu et al. (2013).

Line#109, what are the species names of Carex?

Line#128-146, this section can be written more concisely.

Line#166, can decreases in CH4 concentrations right after ebullition events be solely explained by diffusion back to lake water? If CH4 molecules were diffused back to the lake water, partial pressure of CH4 inside the chamber should be very high, inhibiting further emission from lake water to chamber. Can they be partially from irregular air mixing inside the chamber, which results in errors in CH4 concentrations? Then, the current method for calculating flux rates needs to be reconsidered.

C2

Line#167-182, this section is confusing. It can be written clearly and concisely.

Line#200, were water and sediment samples collected at three sampling points for flux measurements?

The paragraph from line#229 can be given in a Table.

Line#241, T test → t-test

Line#242, flux rates are measured three times per season and they may not well represent flux rates of one season of the year. Then, can deviation of these three values be used to quantify interannual variability?

Line#247, please write what b represents in the equation.

Line#278, what do you mean by "inconsistent and obvious"?

Line#309-331, this part can be written more concisely.

Line#331-332, sentences of this paragraph do not support this conclusion.

Line#335, here again, can the absolute values be compared with a few references, which are probably based on different observation periods?

Line#338-342, a larger number of data points can produce wider range of values.

Line#345-356, possible explanations can be added, such as potential drivers that can affect diel CH4 flux patterns and their variations (if measured).

4.2 CH4 effluxes in summer, this section contains a lot of new results, which were not presented in the result section. Also, some sentences describe very detailed information from other studies, which hinders the main focus of the paragraph.

4.3 Timescale dependence of wind, substrate availability, and temperature effects on CH4 effluxes, here again, a lot of new results are reported, such as line#410-414, line#436-451, line#457-461 (repetition from result section), and line#462-468.

C3

Line#473-475, considering uncertainties related to infrequent measurements (CH4 efflux rates measured on one day may not represent the mean rates of that month), this kind of statement needs to be corrected.

Table 3, can you add the observation period of each study for better comparison? Also, sorting the rows by lake size and climate would make this Table easier to read.

Figure 3 and 4, can you add error bars from spatial variability?