

Interactive comment on “Organic matter and sediment properties determine in-lake variability of sediment CO₂ and CH₄ production and emissions of a small and shallow lake” by Leandra Stephanie Emilia Praetzel et al.

Anonymous Referee #2

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Review of the manuscript, “Organic matter and sediment properties determine in-lake variability of sediment CO₂ and CH₄ production and emissions of a small and shallow lake’ by L.S.E. Praetzel et al.

This manuscript highlights large variations in production and fluxes of two of the most important greenhouse gases (CO₂ and CH₄) in a small and shallow lake located in Southwest Germany. The authors present a large data set and their interpretations are by and large sound and interesting. The manuscript certainly deserve publication, but with substantial modifications. I got involved with the review process quite late and

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therefore had the benefit of going through the other review, which is available online. I fully agree with the other referee’s evaluation and only add here a few more comments that hopefully will be helpful in improving the presentation.

General

The manuscript needs careful line editing to take care of non-idiomatic English. An example is the frequent usage of wrong tenses (e.g. in line 60: "is mainly depending on" rather than "mainly depends on"). The authors may seek help from a native English speaker for this purpose. I have pointed out a few instances below, but these are by no means exhaustive. I must also concede that I am not a native English speaker!

Specific

Lines 14-15: Change "... to the atmosphere, following recent studies this is particularly the case for small and shallow lakes." to "... to the atmosphere; recent studies have shown that this is particularly the case for small and shallow lakes."

Line 16: Delete "yet" and "thus".

Lines 21-22: Change "... were significantly negative ($p < 0.05$, $\rho < -0.6$) correlated" to "... exhibited significant negative correlation ($p < 0.05$, $\rho < -0.6$)". Please make similar changes elsewhere.

Lines 32-34: The last sentence states the obvious. Who has suggested such a "replacement"?

Line 52: Change "has been" to "have been" (here majority is plural), and remove "is".

Line 56: Remove hyphen between "in" and "lake".

Lines 58-59: Why is it crucial? Your results show that it is not.

Line 64: Also its origin (e.g. lignin).

Line 74: Remove "being".

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Line 82: As also pointed out by the other referee a more negative deltaG change would make R2 thermodynamically more favourable.

Lines 86-87: Change "are attributed to" to "may arise from".

Line 90: Change "remain" to "remains".

Lines 92-93 and elsewhere: As also pointed out by the other referee please define each abbreviation when you use it the first time and maintain consistency.

Line 96: Why "to a small extent"? In such shallow systems wind-driven turbulence could disturb the sediments.

Lines 97-98: Add "penetration" after "oxygen" and remove "in our case". What do you mean by "perennial circulation".

Line 99: Please use present indefinite tense, not present continuous.

Line 103: "other" sediment properties?

Line 108: Change "is accountable" by "accounts".

Lines 110-114: Please rephrase this sentence.

Line 119: Did you actually investigate "connected productions patterns to OM"?

Line 121 and elsewhere: I am not sure if these experiments can be termed as "mesocosm". These were incubations of cores in the lab. Line 125: Change "hypothesize" to "hypothesized". Line 137: Change "blast" to "blasted". Line 138: Change "arose" to "formed". Figure 1 captions: Technically the depth categories are wrong. For example by <150 cm, you imply depths between 125 and 150 cm, but 20 cm is also <150 cm. This should be clarified (e.g. 125 indicates $100\text{cm} < \text{depth} \leq 125\text{ cm}$).

Table 1, caption: Analytical procedued do not have to be mentioned here; they should be described in methodology section.

Line 167: Change "at three occasions" to "on three occasions".

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Line 169: Why randomly? It should be selectively based on a reason.

Line 172: Add "respectively" at the end of the sentence.

Line 176: Change "added with" to "containing".

Line 180: Change "stored" to "maintained".

Line 192: Referring to a comment by the other reviewer, I note that some isotope data are presented in Table 2 (not for sulphur though), although not at all discussed in the text. It is not clear whether the sample was decalcified. Also what was the reproducibility of measurements? In fact the precision of analysis is not given for any parameter.

Line 201: Change "Therefore" to "For this purpose".

Line 253: Something missing in the sentence.

Line 267: Change "analyzed for" to "measured".

Lines 274, 291: Change "measured" to "analyzed". (Note samples are analyzed, parameters are measured).

Line 301: Change "Therefore" to "For this purpose".

Line 313: These are lab experiments, NOT mesocosms!

Line 331: Change "conducted" to "made".

Line 361: There is no other way to quantify inputs is ebullition?

Line 408: Change "nor" to "or".

Fig. 2: Figure difficult to digest. I could not follow "Different letters indicate significant differences between these sites." What do letters "a"- "d" mean? Am I missing anything?

Line 483: Change "by averagely" to "on a average by".

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Lines 490, 493, 499: See earlier comments on Lines 21-22.

Line 508 and elsewhere: I believe sediment ebullition is inferred from $k > 0$. I am not sure. Was there any bioturbation that could increase the emission?

Table 4: "n.s." presumably means not significant ($p < 0.05$). Is it mentioned somewhere? Significance also depends on the number of values that are not given.

Lines 528: Change "concentration" to "concentrations" and "was" to "were".

Line 536: Change "were significantly negative correlated" to "showed significant negative correlation"

Line 542: What do you mean by "narrower"? lower?

Lines 545-556: Authors have emphasized on C/N ratio. They have observed increase in C/N with depth in the inner part of the lake. C/N ratio may not be a very efficient parameter to characterize organic source owing to rapid remobilization of nitrogen as well as reabsorption of ammonium on particulates. The paragraph 405 "The C content in the samples was between 2.15 and 33.16% with lowest values at site 3.50 and highest at site 1.50. C/N ratios ranged from 10.97 at site 1.150 to 19.06 at site 3.100. Neither C content nor C/N ratio showed significant changes with sediment nor lake depth, but C/N ratio was significantly higher in samples taken close to the shore (50) than in samples from the lake center (150) ($p < 0.01$)." is very confusing. A graph showing distribution of C/N ratio across the horizontal length of the lake would be suitable to comprehend the results better.

Line 551-552: I do not believe in shallow depths it matters.

Line 559: Change "buried" to "getting buried"

Line 571: Change "role for" to "role in"

Line 578: Change "e.g." to "among other things"

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Line 587: Change "in the following" to "below"

Line 591: Remove "the" before "in other studies"

Lines 612-614: Laborious sentence. All you are saying is that such shallow depths do not get thermally stratified in summer.

Lines 619-620: Change the tense to present indefinite.

Line 627-630: What do you mean by "wider" and "narrower"? I do not follow this sentence.

Line 637: Change the tense to present indefinite.

Line 654: But the acetate concentration increased!

Line 655: Remove "of" before "importance"

Line 671: OM quality is not quantified so instead of low you should perhaps use poor.

Line 673: Change "of energy" to "in energy"

Line 675: Change "... acetate, but rather is fermentation" to "... acetate. Instead fermentation may be rate limiting"

Line 677: Bring "Further" before "it".

Line 678: Change "finding emphasizes" to "supports"

Line 692: If the relationship was insignificant the trend cannot be "clear".

Line 693: Not at all clear, and so is the following conclusion. I find this whole paragraph speculative.

Line 702: Change "something" to "somewhat"

Line 706: Change "approaches" to "factors"

Line 730: Authors attempt to correlate ebullition with grain size. They believe that

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higher sand content leads to lesser ebullition. Which is highly unlikely since ebullition depends on permeability of sediments and not porosity. Sand always has higher permeability than silt and clay although lesser porosity. You need to elaborate your concept with more clarity

Line 747: Change "experiment" to "results"

Line 749: Remove "especially"

Line 753: Change "vulnerable" to "sensitive"

Line 754: Change "unroll" to "expect"

Line 755: Change "lower water columns" to "shallow depths"

Line 761: Change "refer" to "attribute"

Lines 764-765: Then why do you not find strong relationship between methane production and (EACorg)?

Line 770: Measuring "production rate" does not neglect water column processes, interpretation of these data alone would.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-284>, 2019.