

Interactive comment on “Methane and carbon dioxide emissions from 40 lakes along a north–south latitudinal transect in Alaska” by A. Sepulveda-Jauregui et al.

Anonymous Referee #2

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The study describes methane and carbon dioxide emissions from lakes in Alaska having differences in their latitudinal location and physical/chemical characteristics. An interesting aspect is that the transect studied allows comparison of yedoma and non-yedoma related lakes. Some comments and suggestions below.

Abstract

In the abstract the relationships between methane emissions and lake characteristics are considered but carbon dioxide is neglected. Carbon dioxide should be included here because this gas is included to the study, and mentioned also in the title.

Introduction/Discussion

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When discussing/comparing the atmospheric impact of methane and carbon dioxide emissions, the limitations of the emission measurements could be commented, this is relevant especially for carbon dioxide. The lakes receive organic matter from their catchments and part of that is finally accumulated into the sediments. The C emitted/C accumulated ratio varies a lot (from 4 to 86) between various northern lakes (Global Biogeochemical Cycles 27: 363-374, 2013) and this could be considered when evaluating the real climatic meaning when analyzing only the emissions. In the present study there are great differences between the nutrient status of various lakes and this can have an important effect on their ability to retain carbon. For example, increasing nitrogen availability increases the C emission/C accumulation ratio meaning that nitrogen rich lakes have lower capacity to sequester carbon at landscape level than nitrogen poor lakes (Global Biogeochemical Cycles 27: 363-374, 2013). So, some discussion between lakes (e.g. yedoma and non-yedoma lakes) could be given by considering the real C balance at landscape level.

Discussion

P. 13278

Lines 6-10: There are also earlier observations that area of northern lakes correlates negatively with their methane emissions (Biogeosciences 6: 209-223, 2009).

Lines 12-23: Yedoma-lakes had higher DOC content which would favour carbon dioxide production as stated. Some comments on the effects of quality of DOC could be given because there are observations that not only the quantity but also quality of DOC is important for the carbon dioxide emissions from northern lakes (Global Change Biology 12: 1554-1567). Would yedoma derived DOC be more easily decomposable?

Conclusions

The first sentence concluding that the study shows northern lakes to be net source of methane and carbon dioxide is not very novel, it is generally known, and could be

C6443

excluded.

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