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Interactive comment on "Seasonal methane dynamics in three different Siberian water bodies" *by* Ingeborg Bussmann et al.

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This is a very interesting study and it is also practically difficult to conduct field research in waterbodies of Arctic regions. It is thus a timely contribution of methane cycles. The manuscript is well organized, and the writing appears to be somehow redundant.

The major concerns are the following. (1) Title. Is the term seasonal dynamic appropriate? There are only two sampling period for some rivers. A better title might be formulated such methane dynamics under contrasting ***? We would prefer to keep the "seasonal dynamics", as we have been sampling the river twice in summer and winter (2016, 2017, 2018), the lake once in winter and summer 2017, and Tiksi Bay

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once in winter and summer 2017/2018.

(2) Conclusion. The rationale behind the higher methane concentrations in winter than that in summer is not very clear for Tiksi bay and Lake Golzovoye. Please make a brief and focused discussion about the possible mechanisms.

A new part of the discussion has been added, to explain in more detail the different sinks and sources of methane in a water body. (in the last part of the discussion)

(3) Methane production potential. If these data are not available, the authors may discuss methanogenesis a little bit more. Or methane simply stored in waterbodies due to physiochemical mechanisms?

Colleagues have determined the methane production rate in Lake G. and a marine setting, with 0.5 - 0.2 nmolg/g/d at surface sediment. However, active AOM and SRR reduce methane concentrations at the sediment surface to about 2 mM in freshwater sediment and to < 0.1 mM in marine sediments (unpublished data from S. Liebner and C. Knoblauch). Added in Line 398 and L 412

(4) Oxygen concentrations. Please provide these data as much as possible if available. Unfortunately, there are no data on the oxygen concentrations at any of the locations.

Minor concerns (1) L20. How to define “the most rapid climate warming on Earth”? Changed to “affected by a rapidly warming climate”

(2) L22. Maybe the authors can briefly introduce the proportion of these poorly unexplored water bodies. More details on the different water bodies are given in the introduction, . L 107 ff and L 135 ff. To elaborate this in the abstract would be too long

(2) L35. It is somehow abrupt to compare with temperate environments. This is more appropriate in the review paper The relation to temperate environments has been removed.

(4) L45. Please give concluding remarks as a summary of the key findings. We have

no added our concluding remarks to the abstract.

(5) L55. Pls describe the range of variability This variability is mentioned in the abstract of the reference, but not further elucidated in the text. Therefore we changed our statement to "...and the sea-air flux of methane is mainly affected by increasing water temperatures (Wåhlström et al., 2016)"

(6) L65-67. This sentence seems irrelevant to the previous one. The ebullition mode and transportation from Arctic rivers to the shelf seems to be different. In the sentences above we describe the role of lakes for the methane flux. In the lines 65 ff we wanted to elucidate the role of rivers as methane source to the atmosphere, not the shelf. ....

(7) L108. Pls write the conclusions in the abstract in line with the hypothesis. We have now added our concluding remarks to the abstract.

(8) L111. Why not measure the potential of methanogenesis, and how to integrate these potentials in situ sink with the budget estimate of methane emission? We were not able to measure methanogenesis in the field, however there are unpublished data on methane production and anaerobic oxidation in the sediment of Lake Golzovoye. We mention now these unpublished data in L 436.

(9) L125. The freeze-up and ice-off days can be specified for each waterbody We have now added additional information, for lakes in L 97ff and L 142, for rivers in L 104 and for Tiksi Bay in L 149.

(10) L168. How low it is below the ice? Just at the interface between ice and water, changed to "In winter, water samples at the ice – water interface were taken. ..."

(11) L174. Is the sampling procedure the same for different rivers? No, the river water has been processed in the same way.

(12) L195. Please describe the procedures for methane concentration measurement. For example, is there any vigorous shakingïij§Yes, samples were shaken for 2 min, to assure equilibrium between water and gas phase. This has been added to the Result

section(3.4 Methane analysis).

(13) L305. Figure 3 and Figure 4 can be merged. Ok, the figures have been merged

(14) L340. Figure 5 and Figure 6 can be merged No, Figure 5 shows the methane oxidation rate at the different locations, while figure 6 shows the influence of temperature on the methane oxidation rate.

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