

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2022-135

Anonymous Referee #1

Referee comment on "Highest methane concentrations in an Arctic river linked to local terrestrial inputs" by Karel Castro-Morales et al., Biogeosciences Discuss.,
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The article considers an extremely important phenomenon – the entry of methane into the water mass of the Arctic river from its catchment area. It is shown that methane is distributed inhomogeneously in the transverse direction, its highest content is characteristic of coastal areas. This work opens up the direction of research necessary to assess the flow of methane into the coastal zone of water bodies during the melting of permafrost. A large number of studied indicators gives grounds to confirm the results obtained. The conclusion seems to be important that a considered fraction of CH₄ is already oxidized within the recently thawed active layer.

From the comments on the work, the following should be mentioned. Dissolved organic carbon is among the studied indicators. Why do the authors use this indicator, and not the total organic carbon, which seems more correct, since organic suspension can be a carbon source for methanogens? The second remark concerns the authors' conclusion that the upstream river sections are not a source of CH₄ entering the Arctic Ocean by transferring downstream with river runoff. It is possible that this is the case in low-water phases, and during the period of maximum flood flow, the time of water reaching can be significantly reduced. The study of the length of the river section from which methane enters the mouth in various phases of the water regime was not included in the list of research tasks, but this idea seems very relevant for further work. Another remark concerns the reference to Figure 7. The authors write: statistically significant correlation between methanogen abundance and methane concentration (Fig. 7). Figure 7 in the appendix shows other data.

Despite the above comments, the work seems to be very important and should certainly be published.