

Interactive comment on “Methane distribution and oxidation around the Lena Delta in summer 2013” by Ingeborg Bussmann et al.

Anonymous Referee #1

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In this study, Bussmann et al. examine the distribution and microbial oxidation of methane in the estuarine and coastal waters of the Lena River Delta and Laptev Sea. Here, the authors quantified methane concentrations in different water masses and tested for significant associations with environmental parameters, such as temperature, salinity, DOC, and TDN. Further, they examined methanotrophic populations of bacteria by applying quantitative PCR and intergenic spacer analysis of the particulate methane monooxygenase gene. The authors have developed a hypothesis that separate groups of methanotrophs are differentially specialized in riverine versus polar waters, perhaps in response to temperature, or concentrations of methane and nitrogen. An important finding from this study of a shallow coastal environment is that methanotrophs in this polar environment may consume a small percentage of dissolved methane in the water column.

C1

This study highlights the minimal consumption of methane as a fraction of the dissolved gas, which is in flux to the atmosphere. Moreover, the authors demonstrated that in riverine, mixed, and polar water masses, MOX is significantly tied to methane concentration. The focus here is on the diffusive flux to the atmosphere, but we have no sense of how this diffusive flux compares with ebullition of methane from seeps in the study region. Since this study examined shallow water masses, discussion of any active seep/vent locations in the study area would be helpful, as ebullition is likely to play a major role in methane flux to the atmosphere, and, in turn what fraction of total methane release is available for consumption by MOB.

I am generally supportive of the publication of this study, although mention of marginally significant statistical findings or insignificant results and speculation leading from these should be addressed. In a few cases, grammatical errors and vague language should be rephrased, but addressing these items shouldn't be difficult.

Specific Comments:

L15 – here “methane distribution” refers in parentheses to “headspace”, but this isn't a method and it is unclear what is meant. Suggest rewording.

L44 – should read “The source(s) of methane...”

L55 – suggest rewording “water column MOX” to be consistent with first reference to an abbreviation (i.e. “water column methane oxidation (MOX)”).

L59 – this sentence seems vague and perhaps unnecessary. Suggest beginning with the following sentence and changing “for some authors” to “In certain studies”

L120 & L132 – change to methane [mono]oxygenase

L133 – were the same primers used here as above?

L224-225 – “This was most pronounced...” the sentence is oddly phrased; suggest rewording.

C2

L230 – 236 “significant” should have a p-value given

L286 – remove mention of OTU “preference” for different water masses, especially where you didn’t find a significant trend. Perhaps use phrasing “association” or “link” instead of “preference” throughout.

L379-381 Perhaps MOB with divergent pmoA sequences were not detected with these specific primers? This possibility isn’t discussed, but instead speculation was raised that MOB might exist that lack pmoA genes.

L395-396 The statement that “OTUs identified in this study cannot be related to known MOB” appears to contradict the taxonomic affiliations offered on Line 288. Do you mean that a subset of the OTUs identified in this study cannot be linked to known MOB?

L415-416 This part is a reiteration of the results on L295. What is the importance of measuring a higher windspeed in comparison to Thornton et al.?

L443 Define (spell out) ESAS; not mentioned elsewhere.

Figure 3. I recommend changing the color for highest methane concentration from pale orange to something that isn’t already on your color scale for lower concentrations (e.g., grey or black)

Figure 5. The omission of two data points is mentioned in the main text, but this should also be clearly stated within the figure caption.

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