Biogeosciences Discuss.,
doi:10.5194/bg-2017-22-RC3, 2017

Biogeosciences Discussions

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

Anonymous Referee #3

Received and published: 26 April 2017

GENERAL COMMENTS

Bussmann and colleagues report a valuable data-set of dissolved CH4 concentration in the Lena Delta.

It could be useful if authors compare in much more detail their new data-set with older data-sets obtained in the area (Bussmann et al. 2013). As it stands it's unclear what's the added value and novelty of the present ms compared to what was previously published by the authors on the same topic.

The CH4 concentrations in the study area are extremely low compared to other estuarine environments (at lower latitudes), and the spatial gradients are also extremely low given the large salinity gradients. This fundamental difference contains some potentially important information on the functioning of estuaries in high latitudes and de-

serves to be discussed in light of published CH4 data in other estuaries. Is this due to a low CH4 concentrations in the Lena inner river itself? Any data on the CH4 concentration in the river itself ? If so does it differ from other rivers worldwide (e.g. Stanley et al. 2016) ? Or are these patterns related to removal of CH4 from river water by emission to the atmosphere and by MOX within the delta, since the measurements were made quite away from the coast ?

I suggest that the authors make their data-set publically available, either as a supplement of the paper, or in an international data-base (PANGEA, MEMENTO, . . .).

SPECIFIC COMMENTS

All of the abbreviations need to be defined, e.g. qPCR (L13), MISA (L14), OTUs (L21), etc. . .

L24-26: In estuaries there are typically differences in residence time in different regions (e.g. salinity ranges). Residence time will strongly affect the distribution of microbes that for some groups can have relatively long growth times.

L33: Please add a reference to back this statement on latitudinal variations of CH4 source-sinks.

L50: Conversely, the authors should also describe what goes on at depths <200 m since this corresponds to the regions covered by the paper.

L91: how was equilibration achieved ? Shaking ?

L101: Please add the reproducibility of peak areas of the standards, and the reproducibility of sample duplicates.

L 178: this equation was not given by Wanninkhof et 2009, it goes back at least to Liss & Slater (1974)

L226: Please add all of the station numbers to figure 1.

L232: I suggest that authors show the figures of the correlations as supplemental figures, in addition to the statistics in the Tables. The visual inspection of correlations can also be informative and useful.

L243: Please use nmol L-1 instead of nM throughout the text

L294: does the difference of 0.05 ppm in air CH4 have a significant incidence of the air-sea CH4 flux computation, given that the analytical uncertainty on the dissolved CH4 concentration is typically of +/- 3% ?

L 311: Can you provide a statistical test ?

L311: “a bit more north”, can you quantify this in km ?

L318: I suggest to remove “unfortunately” this is a self-evaluation, let the reader decide what’s unfortunate or not.

L335: “In contrast to sea-ice, the freezing and melting of freshwater-ice does not alter the salinity pattern”: Please develop and clarify this statement, as I do not understand it. Melting of fresh-water ice and mixing with sea-water leads to a decrease of the initial salinity.

L340: then

L344: same as L318

Figure 2: please add a legend for the variable (and units) in the plot.

Figure 3: please add a legend for the variable (and units) in the plot. Add units in the text of the legend of the figure. It could be useful to add a plot with the horizontal distribution of salinity.

Figure 4: please add a legend for the variable (and units) in the plot. Add units in the text of the legend of the figure. This figure could be merged with Figure 2. It could also be useful to add the O2 vertical distribution along this transect.

Figure 5: legend of the figure is incomplete. Add the spatial (where) and temporal (when) info. The sediment data should also be in nmol/L. Add statistics of the regression. Please specify that the two crossed dots were excluded (I assume). Do you have an explanation why those two points are outliers ?

Figure 6: please add a legend for the variable (and units) in the plot. Add units in the text of the legend of the figure

Figure 7: please add a legend for the variable (and units) in the plot. Add units in the text of the legend of the figure

Table 2: How can r2 be negative ? Is this r ?

Table 2: what do the empty cases in the Table mean ? statistics not significant ? Please provide all of the stats and put in bold those that are significant.

Table 5: Specify this is for high latitude shelf seas.

REFERENCES

Fenwick, L., D. Capelle, E. Damm, S. Zimmermann, W. J. Williams, S. Vagle, and P. D. Tortell (2017), Methane and nitrous oxide distributions across the North American Arctic Ocean during summer, 2015, J. Geophys. Res. Oceans, 122, doi:10.1002/2016JC012493.

Liss, P. S. & Slater, P. G. Flux of gases across the air-sea interface. Nature 247, 181-184 (1974).

Stanley EH, Casson NJ, Christel ST, Crawford JT, Loken LC, Oliver SK. 2016. The ecology of methane in streams and rivers: Patterns, controls, and global significance. Ecological Monographs 86: 146–171.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2017-22, 2017.