EGU21-12685, updated on 16 Sep 2021
https://doi.org/10.5194/egusphere-egu21-12685
EGU General Assembly 2021

Features of the diffusive methane emission measurements on lakes by chamber method

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Methane is one of the main greenhouse gases in the atmosphere. Lakes are the third-largest natural source of methane on a global scale [Kirschke et al., 2013]. Currently, the chamber method is quite often applied in the measurements of diffusive GHG emissions from natural ecosystems, especially in remote areas, due to low cost and mobility. In lakes, methane can be transported to the atmosphere not only by diffusion but also by bubbling, so during measurements, it is important to divide these two pathways. We have complemented customary floating chambers with plastic shields located underside not blocking diffusive transfer but preventing gas bubbles from entering into the chamber.

The study was conducted on August 19–20, 2019 in the vicinity of Vaskiny Dachi field station (68.8663° N, 70.3040° E, Central Yamal, Western Siberia, Russia). Measurements were carried out in the central part of the thermokarst lake with a depth of 1.6 m. To compare results of customary and modified chambers, samples were taken in parallel from chambers with and without shields (two chambers of each type) every two hours during the day. Sampling and flux calculations were conducted according to [Bastviken et al., 2010]. The methane concentrations in samples were determined in the laboratory by a Crystal 5000.2 gas chromatograph with a flame ionization detector.

According to the sign test for the 0.05 p-level, methane fluxes measured using chambers with and without shields differ statistically significant considering their diurnal dynamics. At the same time, within the group of fluxes measured by the same type of chambers, no statistically significant differences were found, and mean and median flux values are higher for chambers without shields. It appears that observed differences are not due to natural variability, but due to the contribution of bubble component to the fluxes measured by chambers without shields.

References

Bastviken D., Santoro A.L., Marotta H. et al. 2010. Methane emissions from Pantanal, South America, during the low water season: toward more comprehensive sampling. – Environmental Science & Technology, vol. 44, No. 14, pp. 5450–5455.

Kirschke S., Bousquet P., Ciais P. et al. 2013. Three decades of global methane sources and sinks. – Nature Geoscience, vol. 6, No. 10, pp. 813–823.