



High rates of methane emissions from south taiga wetland ponds.

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Since wetland ponds are often assumed to be insignificant sources of methane, there is a limited data about its fluxes. In this study, we found surprisingly high rates of methane emission at several shallow ponds in the south taiga zone of West Siberia. Wetland ponds within the Great Vasyugan Mire ridge-hollow-pool patterned bog system were investigated. 22 and 24 flux measurements from ponds and surrounded mires, respectively, were simultaneously made by a static chamber method in July, 2011. In contrast to previous measurements, fluxes were measured using the small boat with floated chamber to avoid disturbance to the water volume. Since the ebullition is most important emission pathway, minimization of physical disturbance provoking gas bubbling significantly increases the data accuracy. Air temperature varied from 15 to 22°C during the measurements, and pH at different pond depths – from 4.4 to 5.

As it was found, background emission from surrounding ridges and hollows was $1.7/2.6/3.3 \text{ mgC}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ ($1^{\text{st}}/2^{\text{nd}}/3^{\text{rd}}$ quartiles). These rates are in a perfect correspondence with the typical methane emission fluxes from other south taiga bogs. Methane emission from wetland ponds turned out to be by order of magnitude higher ($9.3/11.3/15.6 \text{ mgC}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$). Comparing to other measurements in West Siberia, many times higher emissions ($70.9/111.6/152.3 \text{ mgC}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$) were found in forest-steppe and subtaiga fen ponds. On the contrary, West Siberian tundra lakes emit methane insignificantly, with the flux rate close to surrounding wetlands (about $0.2\text{--}0.3 \text{ mgC}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$). Apparently, there is a naturally determined distribution of ponds with different flux rates over different West Siberia climate-vegetation zones. Further investigations aiming at revelation of the zones with different fluxes would be helpful for total flux revision purposes.

With respect to other studies, high emission rates were already detected, for instance, in Baltic ponds (Dzyuban, 2002) and U.K. lakes (Casper et al., 2000). Annual CH_4 emission from West Siberia south taiga ponds with area of $0.6\cdot10^6 \text{ Mha}$ was estimated to be $0.26 \text{ MtCH}_4\cdot\text{yr}^{-1}$.

References:

Dzyuban A N 2002 Intensity of the microbiological processes of the methane cycle in different types of Baltic Lakes, *Microbiology* 71(1) 98-104

Casper, P, Maberly S C, Hall G H, Finlay B J 2000 Fluxes of methane and carbon dioxide from a small productive lake to the atmosphere, *Biogeochemistry* 49 1–19 doi: 10.1023/A:1006269900174