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Methane emissions from lakes in West Siberian wetlands

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Wetland lakes are less studied component in the methane emission inventories. We investigated methane fluxes in lakes situated in wetlands in most eco-regions of West Siberia including taiga (16 sites overall in sub-taiga, southern taiga, middle taiga, northern taiga), forest-steppe (1 site), forested tundra (1 site) and tundra (5 sites). Flux measurements were made during summer and autumn of 2007 and summer of 2008 and 2009. We used static chambers with base size of 40x40 cm and height of 30 cm and 40 cm floated on water surface. Each observation included collecting 4 samples in a 7-10 minute time step. Methane concentrations in samples were determined with the GC-FID. Concentration trend during exposure and fluxes were calculated with linear regression of concentration versus time. Environmental factors (pH, EC and temperature profile) were measured at each site. Mean fluxes by eco-region and corresponding statistics were obtained. In the following list, numbers in parenthesis are in the given order: 1st quartile/median/3rd quartile: forest-steppe – 98.0/125.6/146.0; sub-taiga – 62.0/84.6/170.3; southern taiga – 2.4/3.8/12.5; middle taiga – 0.1/0.4/1.4; northern taiga – 0.01/0.1/1.2; forested tundra – 0.3/0.6/1.4; tundra – 0.3/0.6/1.1 mgC-$CH_4 m^{-2} h^{-1}$. Interestingly, tundra fluxes are same as in the forested tundra to the south, and forest-steppe fluxes are much higher than on the other areas. Observed emission rates vary along with a combination of two factors: eco-region and pH. Probably, eco-region type connects with temperature, and pH connects with conditions of mineral supply. Emission rate dependence on pH has maximum around with pH = 5.2-5.4. Fluxes of CH_4 from the lakes in the forest-steppe and sub-taiga are higher than in surrounding wetlands, while lake fluxes in other climate regions of West Siberia are comparable with those from the corresponding wetlands. Our data concur with previous report by (Repo et al, 2007), who observed fluxes at two sites in middle taiga and forested tundra.

References:

Repo M.E., et al, Release of CO_2 and CH_4 from small wetland lakes in western Siberia, Tellus, DOI: 10.1111/j.1600-0889.2007.00301, 2007.