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Floodplain hydrology and spatial / temporal variation of methane fluxes in arctic tundra, Northeastern Siberia.

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Methane flux measurements at an arctic tundra site in northeastern Siberia demonstrate large differences between floodplain and tundra bog ecosystems, and a strong dependence on temporal variations in river discharge.

We measured methane fluxes from tundra soils on a river terrace and floodplain of a tributary of the Indygyrka river in Northeastern Siberia. The river terrace is part of the bottom of a drained thaw lake. It is underlain by a thin (20-40 cm) active layer and shows a pattern of ice wedge polygons and a varied vegetation with dominance of *Sphagnum*. The adjacent floodplain is characterized by a thicker ($>$ 40 cm) active layer, active sedimentation of silt and organic material, and a denser and more uniform vegetation of sedges and grasses.

In 2004, the methane fluxes measured on the river terrace averaged 4.3 $mg.m^{-2}.hr^{-1}$, on wet sites 7.2 $mg.m^{-2}.hr^{-1}$ and on dry sites 0.18 $mg.m^{-2}.hr^{-1}$. The fluxes from floodplain sites are considerably higher, on average 12.5 $mg.m^{-2}.hr^{-1}$, for dry sites 1.6 $mg.m^{-2}.hr^{-1}$ and for wet sites 23.4 $mg.m^{-2}.hr^{-1}$. In particular dense sedge vegetations on both floodplain and river terrace show high fluxes. The large flux differences between river terrace and floodplain sites are related to 1) the thicker active layer on the floodplain and 2) probably by a higher primary production of the floodplain vegetation, stimulated by nutrient and organic matter addition during flooding. This is suggested by a positive correlation between soil water electrical conductivity and

methane flux.

In 2005, a dry winter resulted in a considerable drop of the river water level, affecting also the groundwater table in the floodplain and river terrace soils. This resulted in lower fluxes in all wet sites on the river terrace (3.1 $mg.m^{-2}.hr^{-1}$), and in particular on the floodplain (5.1 $mg.m^{-2}.hr^{-1}$).

Our results indicate that changes in fluvial discharge variations of arctic rivers may have a considerable effect on arctic methane fluxes.