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# Modelling methane emissions from arctic wetlands: A comparison between two sites

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This study focuses on a comparison between two arctic wetland sites and their $CH_4$ fluxes during 3 years: 2003 to 2005. The PEATLAND Model was used to simulate the emissions; the $CH_4$ module of PEATLAND is based on the Walter-Heimann (2000) model. The first site is located in Siberia, near Chokurdagh ($70^o$N, $147^o$E) in a continuous permafrost region. The other site was part of the Swedish IBP tundra biome project site, Stordalen mire in the eastern part of lake Torneträsk ($68^o$N, $19^o$E) ten kilometers east of Abisko. It is located in a discontinuous permafrost region. Chokurdagh has a pronounced high arctic climate with mean annual temperatures of -14.3C degrees, while Stordalen has a sub arctic climate with a mean annual temperature of -0.7C degrees.

Model input consisted of observed temperature, precipitation and snow cover data. Although the wetland ground water table strongly influences the methane emissions, groundwater table data were incomplete. Therefore the model was run with two different approaches for the water dynamics: observed water table and simulated water table based on equations from MMWH Model of Granberg et al., 1999.

In all cases, the modelled methane emissions were higher than the observed ones, but show a direct correlation between the variations in water table and the soil temperature variations. The differences between the two sites are caused by different climate, hydrology, soil physical properties, vegetation type and NPP.

For Chokurdagh the measured and simulated methane fluxes show similar trends during the growing season, having average values for 2003 to 2005 of 2.49 $CH_4$ mg $m^{-2}$

$hr^{-1}$, while for Stordalen the simulated fluxes show higher average values for the same years (3.78 mg $CH_4$ $m^{-2}$ $hr^{-1}$) than the observed ones (2.26 mg $CH_4$ $m^{-2}$ $hr^{-1}$). The effect of the longer growing season at Stordalen is simulated correctly.

This study furthers the understanding of the relationship between methane fluxes from tundra wetlands and water table variation. We conclude that methane fluxes at these sites are less sensitive to temperature variation than to water table variations. Furthermore, parameter uncertainty at site level in wetland $CH_4$ process models is an important factor in large scale modelling of methane fluxes.