Geophysical Research Abstracts, Vol. 9, 03472, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03472

1 Below ground carbon turnover and greenhouse gas exchanges in a sub-arctic wetland subject to permafrost degradation

2

2.1 L. Ström and T. R. Christensen

2.2

GeoBiosphere Science Centre, Department of Physical Geography and Ecosystems Analysis, Lund University, Sweden (lena.strom@nateko.lu.se / Fax: +46 46-2224011 / Phone +46 46-2223746)

Here we present results from a field experiment in a sub-arctic wetland near Abisko, northern Sweden, where the permafrost is currently disintegrating with significant vegetation changes as a result. During one growing season we investigated the fluxes of CO_2 and CH_4 and how they were affected by ecosystem properties, i.e., composition of species that are currently expanding in the area (*Carex rotundata*, *Eriophorum vaginatum* and *Eriophorum angustifolium*), dissolved CH_4 in the pore water, substrate availability for methane producing bacteria, water table depth, active layer, temperature etc. We found that the measured gas fluxes over the season ranged between: CH_4 0.2 and 36.1 mg CH_4 m^{-2} h^{-1}, Net Ecosystem Exchange (NEE) -1000 and 1250 mg CO_2 m^{-2} h^{-1} (negative values meaning a sink of atmospheric CO_2) and dark respi-

ration 110 and 1700 mg CO_2 m^{-2} h^{-1}. We found that NEE, photosynthetic rate and CH_4 emission were affected by the species composition. Multiple stepwise regressions indicated that the primary explanatory variables for NEE was photosynthetic rate and for respiration and photosynthesis biomass of green leaves. The primary explanatory variables for CH_4 emissions were depth of the water table, concentration of organic acid carbon and biomass of green leaves. The negative correlations between pore water concentration and emission of CH_4 and the concentrations of organic acid, amino acid and carbohydrate carbon indicated that these compounds or their fermentation by-products were substrates for CH_4 formation. Furthermore, calculation of the radiative forcing of the species expanding in the area as a direct result of permafrost degradation and a change in hydrology indicate that the studied mire may act as an increasing source of radiative forcing in future.