Geophysical Research Abstracts,
Vol. 11, EGU2009-11182, 2009
EGU General Assembly 2009

Impact of long-term drainage on hydrogeological and biogeochemical processes near a drainage ditch in a Canadian peatland

B. Kopp (1), J. Fleckenstein (2), and C. Blodau (1)

(1) Limnologische Station und Lehrstuhl für Hydrologie, Uni Bayreuth, Germany, (2) Lehrstuhl für Hydrologie, Uni Bayreuth, Germany

Little is known about long-term effects of climate change on hydrogeological and biogeochemical processes in northern peatlands. A drainage ditch in the Mer Bleue Bog, Canada which has been established around 100 years ago, was investigated as natural analogue for long-term drying due to climate change. To examine the effects of the hydrological manipulation, several piezometer nests were installed across a transect from an open bog, across the drainage ditch into a now forested bog. Forest growth likely started after lowering of the groundwater table.
Piezometer nests were installed in 200, 60, 30, 15 m distance from the drainage ditch on each side; three nests were installed across the drainage ditch. Piezometers were inserted into 0.25, 0.75, 1.0, 2.0 and 3.0 m depth. Pore water samples were taken on three occasions during the study period in summer 2008 and contents of carbondioxide (CO2), methane (CH4), dissolved organic carbon (DOC), main anions and DOC quality were analysed. Water levels in each piezometer were measured every two to nine days and logger were inserted in two piezometer (depth 0.75m and 2.0m) at the 200 m sites which allowed continuous monitoring of hydraulic potentials. By ground water modelling (using the MODFLOW pre- and post-processor Groundwater Vistas) differences in ground water patterns will be elucidated.
First results show higher concentrations of CO2, alongside with high concentrations of DOC and low concentrations of CH4 in the forested area, especially in the upper most 0.75 m, compared to the open bog. Together with low hydraulic conductivities (Kf) and a lower water table in the forested area, this indicates higher mineralization rates and higher decomposed peat. High chloride (Cl-) concentrations, stemming from under-lying marine clay, in the forested area suggest that lower water tables together with greater evapotranspiration (ET) result in an increased upwelling of ground water. Highest concentrations of CO2 and CH4 were determined in the ditch, alongside with medium DOC concentrations. Cl- concentrations were highest in the ditch where upwelling groundwater flow patterns occurred and important effects of the hyporheic zone are likely to take place.
These first results document the importance of changes in groundwater flow patterns and drainage for hydrogeological, biogeochemical and ecological processes in northern peatlands.