Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05517, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05517
EGU General Assembly 2008

Link between carbon and sulphur cycling during simulated drought cycles in six UK ombrotrophic peats

J.M. Clark (1), A. Heinemeyer (2), P. Martin (3), S. Bottrell (4)

(1) Earth and Biosphere Institute, School of Geography, University of Leeds, Leeds, LS2 9JT, UK, (2) Stockholm Environment Institute and Centre for Terrestrial Carbon Dynamics (York-centre), University of York, Heslington, York, YO10 5DD, UK, (3) National Oceanography Centre, Southampton, European Way, Southampton, SO14 37H, UK, (4) Earth and Biosphere Institute, School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK (j.m.clark@leeds.ac.uk/Fax: +44 113 3433308/Phone: +44 1133433300)

Dissolved organic carbon (DOC) is released during the decomposition of organic material and is responsible for considerable carbon export, notably in peatlands which account for around one third of the global terrestrial carbon store. Water table draw-down enhances DOC production, and in high-latitude organic soils draw-down is predicted to intensify over the coming decades as temperatures and evapotranspiration rates increase and summer rainfall declines. Although DOC release should increase in response to drier conditions, several studies have shown a reduction relative to 'normal' wet periods, when water tables are at or close to the peat surface. Possible explanations for reduced DOC during dry periods include either: (i) increases in biological activity and microbial consumption of DOC; or (ii) a decline in organic carbon dissociation due to episodic acidification driven by sulphur redox reactions. To determine which of these biological or chemical mechanisms is the key driver of reduced DOC concentrations in peat soil water, we carried out controlled incubation experiments at 10 $^{\circ}$C on 10x10 cm peat soil cores collected from six sites across a sulphur deposition gradient in the UK. Stochiometric comparisons between DOC and sulphate (SO_4) changes in peat soil water and measured trace gas fluxes (CO_2, CH_4 and N_2O) allowed us to make an estimate of the mass balance for DOC changes during a simulated drying and rewetting cycle. During dry periods, all sites showed a concurrent increase in SO_4 and microbial activity and a decline in DOC, although the

magnitude of change in both DOC and SO_4 varied considerably between sites with respect to historical sulphur deposition loads. The experimental data suggest that suppression of DOC by drought-induced acidification occurs in peat soils across the UK. However, as sulphur deposition is declining due to pollution control measures, it is likely that microbial mineralization will play a more important role in reducing DOC concentrations during dry periods as future sulphur pools in peat soil waters decline.