Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05487, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05487
EGU General Assembly 2008

Can increased DOC in streams and lakes be explained by changes in acid sulphate and seasalt deposition in catchment soils?

J.M. Clark (1), C.D. Evans (2), S. Bottrell (3), D.T. Monteith (4), M. Ratcliffe (1), P.J. Chapman (1)

(1) Earth and Biosphere Institute, School of Geography, University of Leeds, Leeds, LS2 9JT, UK, (2) Centre for Ecology and Hydrology, Environment Centre Wales, Bangor, LL57 2UW, UK, (3) Earth and Biosphere Institute, School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK, (4) Centre for Ecology and Hydrology, Lancaster Environment Centre, Lancaster, LA1 4AP, UK. (j.m.clark@leeds.ac.uk/Fax: +44 113 3433308/Phone: +44 1133433300)

Concentrations of dissolved organic carbon (DOC) have increased in freshwaters draining areas of peat and organo-mineral soils across parts of Europe and North America over the last two decades. Recent analysis of regional lake and stream data has shown a link between this increase in DOC concentrations and the decline in freshwater sulphate and chloride concentrations that have been driven by the decline in acid sulphate and seasalt deposition over the same period (Monteith et al., 2007). The assumption made in the interpretation of these data is that stream water data are a proxy for chemical and biological processes operating in catchment soils that control the supply of DOC. However, DOC concentrations in freshwaters are also influenced by a number of other processes, including temperature and catchment hydrology. Variations in both of these factors have been proposed as alternate explanations for increased DOC concentrations in freshwaters. Spatial variations in catchment hydrology linked to soil type and geology may also act to obscure relationships between deposition and DOC in soils, particularly in catchments where hydrology has a major influence on DOC concentrations in stream water (e.g. in catchments draining organo-mineral soils). To remove the effect of catchment hydrology and other factors on DOC,

and so verify the hypothesis that deposition changes have been a significant driver of DOC, direct experimentation on catchment soils was carried out. Soil cores were collected from the top 10 cm of peat and organo-mineral soils in six of the UK catchments studied by Monteith et al. (2007). Temperature was controlled (8 ^{o}C) and vegetation removed to reduce biological effects on DOC release so that geochemical changes in solubility could be examined. Deposition loading of acid sulphate and seasalt was varied within the range observed at these sites between 1988 and 2005. Preliminary data showed that solute loading from seasalt was more significant than acid loading from sulphuric acid in reducing DOC concentrations. However, as seasalt loading caused a greater increase in soil water acidity due to ion exchange processes it was difficult to determine whether coagulation with marine cations or increased acidity caused a reduction in DOC solubility. The study highlights that responses seen at a catchment and regional scale can be explained by processes that operate at a micro scale seen in small soil cores. However, the degree to which changes in soil water and changes in stream water can be quantitatively linked will depend on catchment scale and hydrology, and also how well all these processes are integrated within catchment hydrological and biogeochemical models.

Monteith DT, Stoddard JL, Evans CD, de Wit HA, Forsius M, Høgåsen T, Wilander A, Skjelkvåle BL, Jeffries DS, Vuorenmaa J, Keller B, Kopácek J, Vesely J (2007). Nature, 450: 537-541.