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DOC export from an upland peat catchment in the Flow Country, northern Scotland

Shailaja Vinjili (1), Ruth Robinson Robinson (1), Yit Arn Teh (1), Susan Waldron (2), and Michael Singer (1)

(1) School of Geography and Geosciences, University of St Andrews, KY16 9AL, UK. Email: sv79@st-andrews.ac.uk, (2) Department of Geographical and Earthsciences, University of Glasgow, Glasgow, G12 8QQ , UK.

ABSTRACT

Flow Country blanket bogs in northern Scotland are the most expansive in Europe covering an area of ∼4000 km^2, and they significantly impact the global carbon cycle because of their high rates of carbon production and storage, as well as their role in the transfer of carbon to oceans through rivers or greenhouse gas exchange (*Moore et al.*, 1998). These upland areas are highly susceptible to climatic and landuse changes, and currently, large areas of previously drained and forested peatlands are being felled and blocked to increase the water table level and rejuvenate the peatlands (LIFE Peatlands Project 2001-2006; Holden *et al.*, 2004). This study is examining the event-based export of dissolved and particulate organic carbon (DOC and POC) from one of the main upland Flow Country catchments that drains into the north-draining Halladale River. For a time-series of summer rainfall events, we have focussed particularly on a comparison of DOC/POC exports from three different land use areas in the catchment: forested plots, felled to waste (restoration) plots (felled between 2005-2007), and near-pristine bog sites. DOC concentrations have been measured using a combination of methods including TOC and EA analyses, and *in situ* absorbance measurements using a spectrophotometer (Thurman, 1985; Worrall *et al.*, 2002). Our results show that the stream water draining the felled to waste site records the highest levels of DOC concentration (and DOC variability), and the near-pristine site has the lowest export rate of DOC (and lowest variability). All sites exhibit positive DOC responses to the flood hydrograph, and the near-pristine and forested sites have a similar maximum concentrations of DOC. The felled site concentrations are about 2times greater than the near-pristine and forested sites, and the non-linear response to flow reflects the hydrophobic nature of peats after a period of drought, and the lag time required for them to saturate. The integrated downstream DOC concentrations on forested land and on the main stem of the Halladale River have "forest-like" values reflecting a dilution in DOC concentrations from the felled site, and mixing of stream water from other sources. The initial results from this study imply that i) the felled to waste site (after 2-3 years) releases the highest (up to x2) DOC into stream waters that drain them, ii) DOC concentrations are more sensitive to hydrological variation in sites felled to waste but not yet fully restored, and iii) saturation-excess overland flow is the predominant response of near-pristine site to the rainfall events.

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