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Insights from 14C into C loss pathways in degraded peatlands

Martin Evans (1), Chris Evans (2), Tim Allott (1), Andrew Stimson (1), and Claire Goulsbra ()

(1) University of Manchester, School of Environment. Education and Development, Geography, Manchester, United Kingdom (martin.evans@manchester.ac.uk), (2) Centre for Ecology & Hydrology, Bangor, UK

Peatlands are important global stores of terrestrial carbon. Lowered water tables due to changing climate and direct or indirect human intervention produce a deeper aerobic zone and have the potential to enhance loss of stored carbon from the peat profile. The quasi continuous accumulation of organic matter in active peatlands means that the age of fluvial dissolved organic carbon exported from peatland systems is related to the source depth in the peat profile. Consequently 14C analysis of DOC in waters draining peatlands has the potential not only to tell us about the source of fluvial carbon and the stability of the peatland but also about the dominant hydrological pathways in the peatland system.

This paper will present new radiocarbon determinations from peatland streams draining the heavily eroded peatlands of the southern Pennine uplands in the UK. These blanket peatland systems are highly degraded, with extensive bare peat and gully erosion resulting from air pollution during the industrial revolution, overgrazing, wildfire and climatic changes. Deep and extensive gullying has significantly modified the hydrology of these systems leading to local and more widespread drawdown of water table. 14C data from DOC in drainage waters are presented from two catchments; one with extensive gully erosion and the other with a combination of gully erosion and sheet erosion of the peat. At the gully eroded site DOC in drainage waters is as old as 160 BP but at the site with extensive sheet erosion dates of up to 1069 BP are amongst the oldest recorded from blanket peatland globally These data indicate significant degradation of stored carbon from the eroding peatlands. Initial comparisons of the 14C data with modelled water table for the catchments and depth-age curves for catchment peats suggests that erosion of the peat surface, allowing decomposition of exposed older organic material is a potential mechanism producing aged carbon from the eroded catchment. This mechanism may be as important as changes in hydrological flow pathways within the peat in mobilising aged carbon from the systems.