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How does hillslope position control carbon fluxes from peat soils?

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Peatlands represent a significant terrestrial carbon stock, with an estimated 445.69 Gtonnes of carbon stored globally (Joosten 2009). In the UK, peatlands are estimated to store 1.75 Gtonnes of carbon (Joosten 2009), yet most of the upland blanket bogs that dominate peatland forms in the UK are in a damaged condition from erosion or land management practices. As such they could be releasing carbon and their restoration could be of benefit to the UK government in terms of climate change mitigation targets through the benefits of avoided carbon losses. In order to realise any possible benefit of management intervention upon peatlands accurate carbon budget models are required to assess the carbon balance of peatlands. To reduce uncertainty in model output a greater understanding of peatland function is required (Ostle et al., 2009). As part of this, topographical and hydrological controls need to be characterised in more detail. Landscape scale features such as gullies (McNamara et al., 2008) and drainage ditches (Wallage et al., 2006; Gibson et al., 2009) have been shown to affect carbon fluxes from peatlands, but slope position and its role on carbon fluxes has not yet been considered.

A 12 month field study was carried out from June 2010 – June 2011 in the Peak District, UK, to assess the role that hillslope position has upon carbon flux from peat soils. Changes in hydrology, carbon dioxide flux and dissolved organic carbon (DOC) concentration across four hillslope positions: topslope, upper midslope, lower midslope and bottomslope were observed. Results showed that there was a significant slope effect for both DOC and CO_2 effluxes but that the effect upon CO_2 was explained by changes in the depth to the water table across the slope.