



The role of particulate organic carbon (POC) in the carbon cycle of degrading upland peat systems

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The impacts of particulate organic carbon (POC) fluxes from the peatland carbon store are poorly understood compared to the dissolved fluvial load (DOC) and with respect to the fate of POC. In light of future environmental changes to potentially more erosive climates, upland peat systems are expected to face increased erosion, raising POC fluxes. As such, better understanding is required of the processes acting on POC following its erosion from the peat profile to determine the fate of this organic carbon source.

This paper reports on laboratory and field experiments designed to investigate transformation of POC in two key environments, namely in-stream and floodplain deposits. Initially a mixing experiment was undertaken using varied sediment-water mixes in controlled laboratory conditions to simulate the turbulent transport of POC. Results show a clear relation between POC concentration and increasing DOC concentration in the water. Most rapid POC dissolution occurs in waters with lower initial DOC concentration, where increases of > 7 mg/l were observed within 4 hours of mixing. The second experiment assessed oxidation losses from peat exposed on the land surface in aerobic conditions. Maximum loss of peat mass of over 30 % in 12 months was observed.

These results imply that significant transformation of POC occurs within the fluvial environment. Carbon lost as POC is not inert but readily transformed into atmospheric carbon either directly or via DOC as an intermediate step. An understanding of peatland erosion and appropriate erosion management should therefore be central to consideration of peatland carbon balance.