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The fate of carbon in floodplain sediments: A biogeochemical approach

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Inland waters including fluvial systems and their associated sediments have been predominantly overlooked as part of global carbon budgets until recently. In the UK, peatlands are dynamically eroding, with the eventual result being 'off-site' greenhouse gas emissions, which must be incorporated into carbon budgets for management strategies. Evans et al. (2013) concluded fluvial systems are active cyclers of carbon, with 50-90% of particulate organic carbon (POC) exported from peatlands eventually emitted as CO_2. Floodplains, although commonly regarded as zones of carbon storage, have been identified as potential hotspots of carbon cycling in the fluvial system with a key process being decomposition of POC. Decomposition is known to involve mass loss with selective transformation of labile compounds such as polysaccharides, and preferential preservation of more resistant compounds (refractory aromatics or aliphatics). Several decomposition proxies including FTIR band intensities, hydrogen indices and C/N ratios, correlated with molecular structure determinations using pyrolysis GC-MS, have been used successfully in peat cores (Biester et al., 2013), to disentangle changes due to decomposition and those that are related to vegetation variation. The aim of this research is to determine whether similar techniques can be applied to arguably more complex systems such as floodplains, to examine stratigraphic records of carbon cycling. Initial results from sediment cores taken within a floodplain environment downstream of the Bleaklow Plateau in the Peak District, UK will be presented. An initial OSL date of 640$\pm$90 years BP together with assessment of the valley morphology using high resolution LiDAR DEM's indicate potential interaction of post glacial landslide features with the onset of substantial peat erosion, conditioning the landscape to interrupt the transport of carbon down the fluvial network. The floodplain under investigation is a potential hotspot for carbon processing, thus representing an ideal study area for testing some of these ideas.