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Controls on suspended sediment, particulate and dissolved organic carbon export from two adjacent catchments with contrasting land-uses, Exmoor UK.

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The fluvial export of total organic carbon (particulate and dissolved) plays an important role in the transportation of organic carbon from terrestrial to aquatic ecosystems, with implications for the understanding of the global carbon cycle and calculations of regional carbon budgets.

The terrestrial biosphere contains large amounts of stored carbon in the soil and vegetation, thus a small change in the terrestrial carbon pool may have significant implications for atmospheric CO_2 concentrations. Since the onset of agriculture, human activities have accelerated soil erosion rates 10- to 100- fold above all estimated natural background levels, especially in the uplands and at lower latitudes, whilst increasing DOC concentrations over the past decades have been reported in rivers across Western Europe and North America, raising concerns about potential destabilisation of the terrestrial soil carbon pool. The increased input of fine sediment and organic carbon into aquatic environments is also an important factor in stream water quality, being responsible for direct ecological effects as well as transport of a range of contaminants.

Many factors, such as topography, hydrological regime and vegetation are known to influence the fluvial export of carbon from catchments. However, most work to date has focused on DOC losses from either forested or peaty catchments, with only limited studies examining the controls and rates of TOC (dissolved and particulate) fluxes from agricultural catchments, particularly during flood events.

This research aims to:

• Quantify the fluxes of total suspended sediment, total dissolved and total particulate carbon in two adjacent catchments with contrasting land-uses and

• Examine the controlling factors of total fluvial carbon fluxes in a semi-natural and agricultural catchment in order to assess the impact of agricultural land-use on fluvial carbon export.

The two contrasting study catchments (the Aller and Horner), in south-west England, cover 50km2 and comprise a lower lying agricultural sub-catchment and an upland sub-catchment with extensive native woodland and heather moorland. 24 months of monitoring characterised the water quality status in both catchments, including TSS, POC and DOC in both baseflow and stormflow conditions. Results indicate that the agricultural catchment exports higher TSS and TOC concentrations, instantaneous loads and total loads on a storm-by-storm basis, though these exports are short-lived as the catchment is hydrologically very responsive. The upland/woodland catchment displays more attenuated behaviour, with longer response times and longer duration events. In addition to flux data, geospatial sampling at >200 locations across each catchment characterised the carbon and nitrogen content and bulk density of the soils across four land-use categories. Analysis of these data suggests a strong relationship between TSS and TOC loads during stormflow and the spatial distribution of contributing source areas of soil with high carbon content, erodibility and land-use controls such as soil compaction within the two study catchments.