



Inferring rates of in-river POC-DOC transformation using radio carbon dating

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There is indirect evidence that particulate organic carbon (POC) is transformed to dissolved organic carbon (DOC) during transport through headwater stream networks, suggesting that high POC fluxes from eroding catchments do not simply represent passive carbon transport.

One way to test this hypothesis is to examine the radiocarbon signature of POC and DOC samples along a reach, as POC and DOC have very different radiocarbon signature. As POC is derived from the full depth of the gully wall, which spans a 7000 year peat profile, the mean ^{14}C age of POC is characteristically old. In contrast, peat-derived DOC is largely produced from recently photosynthesised organic matter and is therefore enriched with 'bomb' carbon produced in the last 50 years.

This study presents the results of a sampling campaign along a downstream transect in the River Ashop in the south Pennines, UK. POC and DOC are measured at 6 sites over a 10 km reach of the river during a high flow event and analysed for carbon isotopes. Changes in the apparent age of DOC downstream will allow the rate of down-river POC-DOC transformation to be inferred.

If the hypothesised downstream increase in the age of DOC is observed, this will provide strong evidence that POC is contributing to the pool of actively cycling organic carbon within the river system, with the potential to be converted to CO_2 , and that they should therefore be fully integrated into catchment carbon budgets.