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Sediment origins across the terrestrial-aquatic continuum: climate threat mitigation and promotion of water quality

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Although fine-grained sediment (FGS) is a natural component of river systems, increased fluxes can impact FGS levels to such an extent they cause detrimental, irreversible changes in the way rivers function intensifying flood risk and negatively affecting water quality.

Previous catchment scale studies indicate there is no simple link between areas of sediment loss and the organic carbon (OC) load in waterways; areas with a high soil loss rate may not contribute most sediment to the rivers and areas that contribute the most sediment may not contribute the most OC. Anthropogenic and climate changes can accelerate soil erosion and the role of soil OC transported by erosional processes in the fluxes of C between land, water and atmosphere is still debated. Tracing sediment pathways, likely depositional areas and connections to streams leads to better assumptions about control processes and better estimation of OC fluxes.

In this innovative study OC fingerprinting of sediment reaching a catchment's waterbodies is combined with OC stock and erosion modelling of the terrestrial catchment. Initial results show disconnect between catchment OC loss erosion modelling and fingerprinting results, which could be due to failure to model connectivity between the land and river channel. The current soil erosion model RUSLE (Revised Universal Soil Loss Equation) calculates only the spatial pattern of mean annual soil erosion rates. Using the WaTEM SEDEM model, which in includes routing (and possible en route deposition) of eroded sediments to river channels, we aim to determine the dominant source of OC within catchment streams by identification of both the land-use specific areas with the highest OC loss and the transport pathways between the sources and river channel.