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A neglected riverine carbon transfer: The importance of coarse particulate organic matter for carbon export from a headwater catchment

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Erosion in mountain uplands can mobilize particulate organic matter (POM) from vegetation and soil and input carbon to headwater streams and rivers. The resulting lateral flux of atmospheric CO_2 is thought to be of global importance. While sampling of mountain rivers has provided improved constraint on the transport of POM in fine grained suspended load (typically <500 μm) and the dissolved load, we lack information on the erosion and riverine transport of coarse POM (CPOM), particles with a diameter larger than 1 mm up to meter-sized logs and whole trees, which escape most sampling protocols. Carbon budgets of headwater streams are thus incomplete and we cannot fully assess how the fate of CPOM impacts net carbon transfers from the atmosphere. . Here we have calculated a decadal organic carbon budget for the Erlenbach, a pre-Alpine headwater stream, using a novel sampling protocol that recovers transported CPOM. We find that the rate of CPOM transport increases in a strongly non-linear manner with water discharge, meaning that flood events dominate the CPOM transport. Rating curves for CPOM, suspended load POM and dissolved organic carbon show that in the Erlenbach, CPOM carbon may contribute up to 90% of the total organic carbon export from the headwater catchment We also find that much of the CPOM load is water-logged and therefore supplied to larger fluvial networks as bedload. Subsequent grinding by clastic material may result in important contributions of CPOM to the finer grained sediment export in these systems, an important in-stream source of POM that has so far been overlooked.