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Abstract
Water erosion affects the redistribution of soil organic carbon (SOC) in many ways. However much remains unclear in the complex processes that take place during erosion, transport and deposition with regard the interaction between SOC and the soil. The main objective of this study was to determine the complete carbon (C) budget of a loess soil affected by water erosion in an experimental setting. In a unique 3-replicated rainfall-simulation experiment we quantified fluxes of sediment, SOC, dissolved organic carbon (DOC) and CO_2. The experiment took 120 days in which four representative rainstorms were generated. For the solid phase we characterized carbon pools of the eroding, transported and deposited material using density fractionation and by determining C enrichment (ERc) in the sediments. The gas phase (CO_2 emissions) was measured semi-continuously over the whole experimental period. The water phase was studied with respect to DOC in both overland flow and through flow. Significantly higher ERc of the sediments exported were measured, ranging between 1.3 and 4.0. In the sediments the C contents of the free light fraction and mineral-associated OC were both significantly higher than those of control soils. Material transported over the surface did not show a significant change in loss of C and particulate OC flux was about 10 times more important than the DOC fluxes. Mineralization of C as shown by the emission of CO_2 was slightly lower at the erosion site and was clearly higher on the deposition site in comparison to the control soil. The role of CO_2 in the carbon budget of this experiment was found to be most important as it counted for 98% of total C loss. The C fluxes found in this experiment also showed that they are in the same magnitude as found under reported natural conditions which shows that laboratory studies are useful to zoom in on the complex processes of C dynamics during erosion, transport and deposition.

Notes