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Modelling Carbon Cycling on Eroding Arable Land

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The influence of erosion and redistribution of soil within the landscape on the global terrestrial C budget is poorly understood. At present, there exist two opposing hypothesis concerning the role of soil erosion on carbon dynamics. (i) Soil erosion creates an atmospheric sink for CO2. This is based on the assumption that carbon in eroded sediment will decay more rapidly than in undisturbed soil as a large part of the eroded carbon is decompsed. (ii) Soil erosion and deposition may create an atmospheric sink for CO2 if considerable storage of sediment takes place between the site of erosion and the fluvial system. This redistribution leads to burial of carbon and such storage zones may reduce decay. In this paper, we address this issue in a quantification of the dynamic variations in carbon fluxes induced by soil erosion on arable land. This has been accomplished by incorporating carbon dynamics in a soil erosion model that accounts for both water and tillage erosion to undertake a spatial analysis of sediment and carbon fate during erosion, transport and deposition. We conclude that in contrast to earlier estimates, soil erosion under mechanized agriculture may constitute a net carbon sink.