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Stability of organic matter in soils of the Belgium Loess Belt upon erosion and deposition

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Soil erosion has significant impacts on terrestrial C dynamics, which removes C from topsoil and continually exposes subsoil that has lower C content. However limited studies have paid attention to the mechanisms of stabilization of the eroded and deposited carbon against microbial decay. We analyzed factors governing organic C mineralization in topsoil (from depths of 5–10 cm) and subsoil (from depths of 75–100 cm and 160-200 cm) from depositional and eroding sites of Belgian Loess Belt. In 28-days incubations we studied the effects of oxygen concentrations (0%, 5%, and 20%), soil microbial biomass, substrate (glucose) availability and the amount and chemical features of soil organic carbon (SOC) on C mineralization. Soil erosion and deposition significantly affected SOC concentrations in 0-200 cm profiles and microbial biomass C, N in the topsoil. Carbon enrichment at the depositional site could be related to smaller mineralization. Concentrations of water-extractable C were larger in the soils of the eroding sites. Glucose addition stimulated microbial growth, enhanced soil respiration in all soils, particularly in the topsoil. Carbon mineralization per unit organic carbon was larger in topsoils than in subsoils at both depositional and eroding sites. Oxygen availability showed the expected positive relationship to C mineralization in topsoils. However, small O2 concentrations did not result in decreased C mineralization in subsoils indicating that the controls on C dynamics might be different in different soil layers. The experimental results suggest that the observed C accumulation at depositional sites are also the result of smaller C mineralization. However, we are just at the beginning of understanding the reasons of this decreased mineralization.