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Estimation on soil erosion dynamics using stable isotope ratios of soil organic matter

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Stable isotopes are a powerful and widely used tool for tracing biogeochemical processes across the ecosystem. Measuring the stable carbon, oxygen and hydrogen isotope composition of CO_2 and H_2O compounds and organic matter is useful for examining the soil, plant and atmospheric carbon and water pools as they isotopic composition is altered during vegetation–soil–atmosphere exchange processes (e.g., evapotranspiration, carbon assimilation and respiration). Stable carbon and nitrogen isotopes can serve as a tracer for C and N input by plants into the soil, C turnover and soil organic matter studies. In addition, coupling of isotopic tracers with molecular biology approaches and biomarkers can lead to a better understanding of the soil ecosystem processes. This study aims to estimate soil erosion deposition and redistribution processes at catena scale on the basis of stable isotope results. Soil samples were taken from the total depth of the solum along two catenas on an intensively tilled arable Cambisol. Highest δC13 values were found on the most eroded spots, while on the deposition areas significant differences were measured among the sedimented layers. The lowest δC13 value was in the buried horizon at around 120 cm depth. From this horizon δC13 values slightly increased in both upward and downward directions. However the total organic carbon concentration was highly fluctuated in the deposited profiles and have not reached its maximum in this horizon isotope results suggest that this horizon could have been the original soil surface prior to the main erosion events. In this way the use of stable isotope changes in space can provide additional information on soil redistribution due to tillage erosion. National Hungarian Research Found K100180, G. Jakab was supported by the János Bolyai fellowship of the HAS.