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Interactive effects of land use and soil erosion on soil organic carbon in the dry-hot valley region of southern China

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Changes in land use can result in soil erosion and the loss of soil organic carbon (SOC). However, the individual contribution of different land use types on SOC variability as well as the combined impacts of land use and soil erosion are still unclear. The aims of the present study were to: (1) evaluate soil erosion and SOC contents under different land use types, (2) identify the influences of soil depth and land use on SOC content, and (3) determine the contribution of land use and soil erosion on SOC variability. We assessed the SOC and total soil nitrogen (TSN) contents under three types of land use in the dry-hot valley in southern China. Caesium-137 (¹³⁷Cs) and excess lead-210 (²¹⁰Pb_{ex}) contents were also measured to determine soil-erosion rates. Land use was found to significantly affect soil erosion, and erosion rates were higher in orchard land (OL) relative to farmland (FL), which is in contrast with previous study results. SOC and TSN contents varied significantly between the three land use types, with highest values in forest land (FRL) and lowest values in OL. SOC was found to decrease with decreasing soil depth; the highest rate of reduction occurred in the reference site (RS), followed by FRL and FL. The interaction between soil erosion and land use significantly impacted SOC in the soil surface layer (0–12 cm); the direct impact of soil erosion accounted for 1.5% of the SOC variability, and the direct or indirect effects of land use accounted for the remainder of the variability. SOC content in deep soil was mainly affected by factors related to land uses (89.0%). This quantitative study furthers our understanding on the interactive mechanisms of land use and soil erosion on changes in soil organic carbon.