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Turnover times of soil organic matter in aggregates based on radiocarbon measurements

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Radiocarbon (C-14) is a useful tool for studying carbon dynamics in soil aggregates. We hypothesized that (1) turnover time of soil organic carbon (SOC) in microaggregates is higher than that of macroaggregates (2) agricultural land use, such as cropping, preferentially removes younger carbon from soil aggregates. Contrasting land uses investigated at Dermosol (equivalent to Alfisol in the US Soil Taxonomy) sites were native pasture, crop-pasture rotation and woodland, whereas at Ferrosol (equivalent to Oxisol in the US Soil Taxonomy) sites land uses were improved pasture, cropping and forest. Soil aggregates were separated into macro- (>250 μm) and microaggregates (<250 μm) by wet sieving. Signatures of C-14 in macro and microaggregates were determined by Accelerator Mass Spectrometry (AMS). Radiocarbon contents in both macro and microaggregates were >100 percent modern carbon which indicated presence of post-bomb carbon in soil. Turnover time of SOC in macro- and microaggregate was >50 years higher in Ferrosol as compared with Dermosol. SOC in microaggregates had higher turnover time than that of macroaggregates in Dermosol. Microaggregates-SOC in native pasture and cropping had 40 and 19 years higher turnover time, respectively, than that of other land uses. Higher SOC turnover time in cropping indicated removal of younger SOC during cultivation.