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Potential sink of soil organic carbon in a Japanese cool-temperate forest based on bomb radiocarbon based residence time

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Functional roles of SOC pool for carbon dynamic remains almost unknown. In this study, residence time (RT) based on carbon and radiocarbon (14C) inventories, was f investigated in a Japanese temperate forest (Takayama) under Asian Monsoon climate, and the potential of soil carbon sequestration were also investigated. Soil organic matter was divided to two fractions as low density humified material (LOM) and high density mineral-associated material (HOM). Our results were thoroughly compared with those in a temperate forest (Harvard forest) conducted using a similar approach [Gaudinski et al., 2002]. The LOM was the major part of the SOC (76%) and its contribution was higher even in the deep layer. 14C contents of LOM in surface layer were similar to those of atmospheric CO2 and roots, whereas those in deep layer are significantly low (?14C <-200 per mil) as well as HOM fractions, although LOM fraction seems to consist of labile carbon. RTs for low density fractions as derived from their radiocarbon content are 53 ?330 yrs BP in surface layer and 1760 ?2780 years BP. Storage of SOC in our site was larger, irrespective of depths and differed considerably from that in Harvard forest. We also measured soil 14CO2 profile to determine the rate of CO2 production from heterotrophic respiration of two SOM fractions. The ?14C values of soil CO2 profile was constant down to 75 cm depth, which were close to those of atmospheric CO2 and fine roots, suggesting that most of soil CO2 is derived from recent photosynthetic fixed C. These results indicate that this forest might be higher sequestrating soil carbon as low density fractions semi-permanently, which is also concerned about instability of near future climate change.