

放射性炭素同位体を用いた冷温帯落葉広葉樹林における土壌有機炭素蓄積能の評価 Potential sink of soil organic carbon in a Japanese cool-temperate forest based on bomb radiocarbon based residence time

近藤 美由紀^{1*}; 内田 昌男¹; 大塚 俊之²; 村山 昌平⁴; 白戸 康人³; 柴田 康行¹
KONDO, Miyuki^{1*}; UCHIDA, Masao¹; OHTSUKA, Toshiyuki²; MURAYAMA, Shohei⁴; SHIRATO, Yasuhito³; SHIBATA,
Yasuyuki¹

¹ 国立環境研究所, ² 岐阜大学, ³ 農業環境技術研究所, ⁴ 産業技術総合研究所

¹National Institute for Environmental Studies, ²Gifu University, ³National Institute for Agro-Environmental Studies, ⁴Environmental Management Technology

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 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 sequestering soil carbon as low density fractions semi-permanently, which is also concerned about instability of near future climate change.