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Stable carbon and radiocarbon isotopic signatures of plant derived biomarkers in forest fine aerosol

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Significantly more carbon is stored in the soils than in present in the atmosphere. Although the potential for C storage rates may change in the future as climate change progresses, the dynamics of soil carbon is unknown enough. We separated two density fractions on the soil down to 75 cm depth and estimated turnover time of these SOC fractions for volcanic ash soils in a cool-temperate deciduous forest in Japan, at one of AsiaFlux monitoring sites. According to the eddy-covariance based and biometric based carbon flux measurements over 10 years long in this site, this ecosystem is storing C (net ecosystem exchange (NEE): -2.4 tC ha-1 year-1). However, the partitioning of C storage among vegetation and soils at this site is unknown. Measurements of carbon and radiocarbon (14C) inventory were used to determine the turnover time of two fractions of SOM: humified low density material $<$ 2 g/cc and high density or mineral-associated organic matter $>$ 2 g/cc. Total SOC stocks down to the depth of 75 cm were 26.2 kg C m-2, with the majority of SOC (52%) in the AB horizon (20 - 50 cm). Storage of SOC in our site was larger and differed considerably from that in other temperate forests in North America and Europe. The major part of the SOC (74%) was carbon in low density fraction. In the AB horizon, carbon in low density fraction accounted for 75% of the total SOC. The age of this fraction in lower AB horizon (35 - 50 cm) was significantly old (2490 years) as well as high density fraction (2930 years), although this fraction seems to consist of labile carbon. urnover times in all fractions are investigated for some layers in the soil depth of 75cm, as well as fine

roots, low density humified material and carbon associated with minerals. Turnover times in both fractions increased with soil depth and 11-2780 year for low density fractions and 610- 3740 year for high density fractions. The turnover times of SOC were relatively long (1760 – 3740 years) in lower AB and B horizons as compared with other temperate forests. The results show that this forest is capable of accumulating large amount of carbon in the belowground and might be sequestrating carbon as low density fractions semi-permanently.

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