Geophysical Research Abstracts
Vol. 20, EGU2018-18642, 2018
EGU General Assembly 2018

Isotopic enrichment of C-13 and N-15 with older radiocarbon age for the organo-mineral aggregates from low- to higher-density soil particles: evidence of mineral protection?

Rota Wagai (1), Masako Kajiura (1), Maki Asano (2), and Yuzuru Inoue (3)

(1) National Agriculture & Food Research Organization, Institute for Agro-Environmental Sciences, Ibaraki, Japan (rota@affrc.go.jp), (2) Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan, (3) Kanagawa Agricultural Technology Center, Kanagawa, Japan

Distinctive difference is well-recognized between low-density fraction (LF, consisting largely of plant litter) and high-density fractions (HF – amorphous organic compounds associated with mineral matrix) with regard to soil C turnover rate. On the other hand, the transition from LF to HF and the transformation of organic matter (OM) within HF are much less clear. More recently, with sequential density separation technique, progressive increase in C-13 and N-15 as well as the decline in D14C from LF towards higher-density fractions have been reported from a wide range of soils. While these changes are often used as indirect evidence of mineral protection and contribute to the development of conceptual models of SOM stabilization, specific mechanisms behind are poorly understood. We thus examined the inter-relationship between the isotopic compositions (C-13, C-14, and N-15) and mineralogical characteristics (surface area and elemental composition, pedogenic metal oxides) as well as OM distribution among density fractions using a range of surface soils of contrasting mineralogy including volcanic soils rich in short-range-order minerals and much more weathered soils from both agricultural and natural systems. Each soil was separated into 4-7 density fractions after mechanical shaking with sodium polytungstate. From LF to higher-density fractions, SEM qualitatively confirmed that intermediate-density fractions where major portions of soil OM are present consisted largely of organo-mineral aggregates rather than pure particles. We will assess if and to what extent the mineralogical factors account for the OM distribution and the isotopic variation and attempt to elucidate specific mechanisms of organo-mineral associations (e.g., sorptive interaction vs. aggregation).