Heterogeneity of organo-mineral particles within submicron aggregate among contrasting soil types

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Soil organic matter (SOM) accounts for a major portion of terrestrial C and is considered to be stabilized against microbial degradation due partly to its interaction with soil minerals. These organo-mineral interactions contribute to the formation of heterogeneous organo-mineral aggregate at various space scales down to submicron level. Many early studies showed hierarchical structure of organo-mineral aggregates that are bound together by various binding agents. Yet how organic compounds of microbial and plant origins interact with mineral phases within soil aggregate structure at the spatial scale relevant to microbial extracellular enzymes (tens of nanometers) remain unclear.
Here we focused on the sonication-resistant organo-mineral aggregates that are enriched in organic matter (OM) collected by particle size fractionation from four soil types of contrasting minerology. We hypothesize that spatial variation of C, Fe and Al and it’ s chemical composition differ among the soil types due to the differences in the mode of organo-mineral associations.
We compare top soils (A horizon) from four soil types: allophanic Andisol, non-allophanic Andisol, Mollisol, Ultisol. The recovered particle size fractions are observed by scanning transmission X-ray microscopy (STXM) and near-edge X-ray absorption fine structure (NEXAFS). We will discuss common patterns and differences based on the mapping of these elements as well as that of carbon chemical composition among the four soils.

Keywords: soil aggregate, soil organic matter, organo-mineral associate, STXM, carbon stabilization

