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Nitrogen stabilization in organo-mineral fractions from soils with different land uses

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Understanding the processes that control quantity and quality of soil organic matter (SOM) interacting with mineral surfaces is of paramount importance. Although several physical fractionation methods have been proposed to date to obtain fractions that mirror SOM degree of stability and protection, a detailed quantification of stabilisation modes through which SOM bounds to the mineral matrix is still lacking.
In this research we determined C and N distribution in several soils including coniferous and broadleaved forest soils, grassland soils, technosols and an agricultural soil amended with biochar at rates of 0 and 20 t/ha in a factorial combination with two types of organic amendment (municipal solid waste compost and sewage sludge).
We performed a physical size fractionation by ultrasonic dispersion and wet sieving, splitting particles into four different size fractions: coarse sand (2000-200 μm diameter), fine sand (200-50 μm), coarse silt (50-20 μm) and fine silt plus clay (<20 μm).
The fraction <20 μm, that includes organo-mineral complexes, was then subjected to the organo-mineral fractionation method (SOF) proposed by Lopez-Sangil and Rovira (2013), in order to define the importance of different stabilization modes. This method, in fact, allows resolving the nature of different bonds between mineral and organic components by the use of sequential extractions with chemical reagents (potassium sulphate, sodium tetraborate, sodium pyrophosphate, sodium hydroxide, sodium hydroxide after weak acid attack, sodium hydroxide after sodium dithionite pretreatment, and sodium hydroxide after hydrofluoric acid pretreatments). Elemental analysis (CHN) was then carried out on SOM pools isolated from different fractions.
Preliminary data show that, for all land uses in general, and for grassland soils in particular, most of the total N is found in organo-mineral complexes (fraction <20 μm). The total N content of the size fractions, especially of the <20um fraction, was highly correlated with whole soil N content. Although a small N loss was observed during the fractionation procedure, especially in N-rich samples, and data analysis is still ongoing, these preliminary results could already represent a valuable insight into organic N stabilization by mineral matrix.