Geophysical Research Abstracts
Vol. 20, EGU2018-18521, 2018
EGU General Assembly 2018

Soil organic matter composition explained by the availability of coordination sites for associations with polyvalent cations

Ruth Ellerbrock and Horst H. Gerke
ZALF, Hydropedology Group, Müncheberg, Germany (rellerbrock@zalf.de)

The soil organic matter (SOM) includes a variety of functional groups, from which the carboxylic and carbonylic groups (C=O) preferably interact with polyvalent cations from soil minerals. While the basic processes of interactions between cations and organic substances are known, interactions be OM and cations have not systematically been utilized for a site-specific characterization of the organic matter (OM) composition of soils.
The objective of this study was to test a simplified or "effective" model to describe interactions between OM and polyvalent cations for explaining site- and management- specific differences in SOM composition. Soil data from differently-managed plots of long term field experiments (Halle, Bad Lauchstädt, and Rotthalmünster) were used in this analysis. Three types of association (OM-cation, OM-cation-mineral, and OM-mineral) and type-specific availabilities of cation coordination sites for interaction with OM were considered. Data of clay, soil organic carbon, and of exchangeable, oxalate soluble, and dithionite soluble cations was used as site-specific soil properties. The compositions of SOM and a pyrophosphate soluble OM fraction (OM-PY) were characterized with Fourier transform infrared spectroscopy.
The proposed effective model described the SOM composition in terms of the C=O functional groups mainly by oxalate (OM-mineral associations) and exchangeable cation contents (OM-cation-mineral associations). For the soils from plots with long-term farmyard manure application, however, the OM-PY composition tended to be site-independent. The results suggest that the consideration of the number of coordination sites per cation according to the type of association can improve explanations of differences in the SOM composition of arable soils that result from site-specific conditions and crop and soil management practices.