Geophysical Research Abstracts
Vol. 21, EGU2019-10250-1, 2019
EGU General Assembly 2019

NIRS as a fingerprinting technique for SOM quality in a tropical savanna soil

Laura Schnee (1), Albert Ngakou (2), and Juliane Filser (1)

(1) Universität Bremen, Bremen, Germany (laura.schnee@yahoo.de; filser@uni-bremen.de), (2) University of Ngaoundéré, Ngaoundéré, Cameroon (alngakou@yahoo.fr)

Soils represent the largest terrestrial carbon (C) pool on the planet, whilst providing numerous ecosystem services that are often are dependent on the availability of soil organic matter (SOM). The latter, however is lost at an alarming speed worldwide. Organic amendments like compost and biochar (BC) are promising for rehabilitating degraded soils. Particularly in countries of the global South, these low-tech approaches are applied with increasing trend for the amelioration of agricultural soils. However, up to now, remarkable knowledge gaps exist concerning the mechanisms of SOM stabilisation in tropical soils. It is known that tropical soils often display irregularities in SOM:C conversion factors depending on clay content and structural water presence.

Near Infrared-Spectroscopy (NIRS) is increasingly applied as a non-invasive technique for the characterisation of SOM, both quantitatively and qualitatively. However, the successful application of this technology requires "libraries" to accurately predict SOM quality and quantity which are not yet publicly available for most soils.

We used NIRS as a fingerprinting technique for SOM quality in a tropical soil amended with BC, compost and a mineral fertiliser. Additionally, we used H_2O_2 wet digestion to determine soil structural water content and the SOM:C conversion factor.

In a field experiment at the University of Ngaoundéré, Cameroon, we amended a clay-rich, acidic savanna soil with biochar, compost, and a mineral fertiliser; sorghum was sown to obtain a homogeneous vegetation. Soil samples were taken before amendment, immediately after amendment and after the first vegetation period, i. e. in December 2017 and in June and December 2018. The soil was sieved into four aggregate size classes and pH and C and N content were determined. Additionally, part of the samples was digested by H_2O_2 to remove SOM. Samples were ground and subjected to NIR scans.

A high content (10 % mineral dw) of structural water and an SOM:C conversion factor of 1:1.4 were found. Up to 30 % of all C was not digested by H_2O_2 and must thus be occluded in aggregates.

We hypothesise (I) that compost and BC applications lead to increased SOM content; (II) that NIRS fingerprints of different aggregate size classes render distinct patterns; and (III) that changes in SOM quality and quantity upon amendment are more pronounced in larger aggregate size classes.

We expect that the results of this study help us understand how fresh OM is incorporated into aggregates of tropical soils and how these processes can be observed and displayed by implementing NIRS as a fingerprinting technique for SOM quality.