P400-TH

EVALUATION OF THE CARBON STORAGE CAPACITY FOR A GRASSLAND

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Soil organic matter (SOM) is actually of great environmental interest as the amount of organic matter stored in soils represents one of the largest reservoirs of organic carbon on the global scale (Schlesinger, 1995). As a matter of consequence, any change in soil carbon quantity may affect atmospheric CO_2 concentration. Therefore carbon dioxide sequestration in plant and carbon storage in soil and biomass could be considered as a complementary solution against the increase in concentration of gases responsible for climate change. The mean residence time of SOM was observed to increase with soil depth (Rumpel et al., 2002), but limited information exists about the composition of stabilized OM. However in order to understand the mechanisms of OM stabilization in soils with depth it is necessary to characterize its structure and origin.

Four horizons from the same profile of a soil located in the vicinity of Poitiers in France (INRA Lusignan, ORE Prairie) were studied. Global characterizations were realized using IR spectroscopy (Figure 1), elemental analysis and ATD/ATG. OM amount decreases slightly with depth (1,8 % at 0-30 cm and 1,1% at 80-120 cm) but stays relatively high. The granulometric fractionation indicates a silty soil in which clays accumulate with depth.

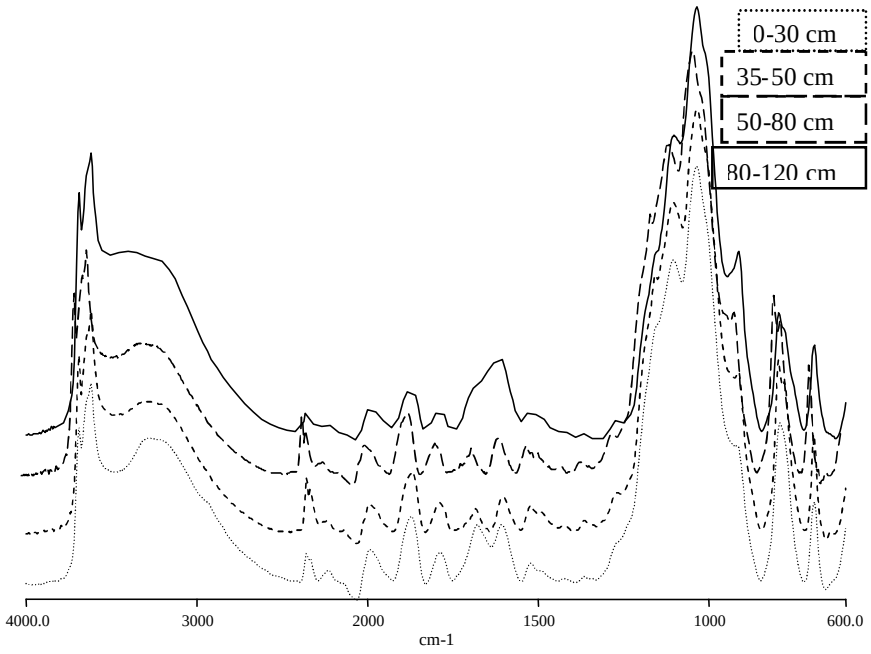

Figure 1. IRFT spectra of the soil samples from the four horizons.

The total organic matter was fractionated according to IHSS (International Humic Substances Society) protocol. Lipids were extracted with CH_2Cl_2 / MeOH using accelerated solvent extraction (ASE). The total fraction was then derivatised (methylation and acetylation) prior to GC-MS analysis. Humic substances were characterized by thermochemolysis using TMAH as alkylating agent.

Lipids are concentrated into 0-30 cm indicating a low mobilisation. They are mainly of plant origin from surface to 50 cm horizons (long odd chained hydrocarbons, long even chained alcohols and fatty acids). Lipids of bacterial origin become major between 50 to 80cm whereas they clearly have a different origin in the deepest horizons.

Humin which represents the less soluble, the more complex and the more resistant form of organic matter to biodegradation increases with depth whereas fulvic acids drastically decrease at 50 cm. An increase of humic acids is effective at 50-80 cm. Humic acids and humin were characterised by thermochemolysis using tetramethyl ammonium hydroxide (TMAH). The major products are short fatty acids which were bound to the macromolecular network via ester linkages and were liberated as methyl esters. The bacterial input (iso, anteiso) is more important in the two surface horizons than in depth.

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