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Mid-infrared spectroscopy as a tool to identify and quantify soil organic carbon fractions

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Models, as CENTURY or RothC, developed to analyze the dynamic of soil organic carbon require introduction of initial conditions such as the amount of organic matter present in different pools. Each is characterized by a specific turnover rate that is linked to particular stabilization mechanism of organic matter. Four mechanisms of stabilization exist: unprotected, physical protection, chemical and biochemical stabilization. Respectively, these mechanisms correspond to the following soil fractions: > 2 mm, 2000-250 μm, 250-53 μm and <53 μm.
This study aims to develop a tool for identifying and quantifying the main soil organic matter fractions directly from a bulk soil without any traditional fractionation process which are really time consuming. Samples come from four experimental fields localized in different states of USA. Through these 4 fields, to calibrate our model, 70 samples have been selected and treated to extract four physical fractions: > 2 mm, 2000-200 μm, 200-53 μm and <53μm. A total of 350 samples (4 fractions plus bulk soil) were spectrally measured in mid-infrared in laboratory with a FT-IR spectrometer. Based on the spectral characteristics observed for each fraction, we are able to identify and quantify those fractions directly from the bulk soil spectra.
Key words: MIR spectroscopy, fractionation, dynamic of soil organic carbon.