



Structural properties of dissolved organic carbon in deep horizons of an arable soil.

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The objective of this work is to quantify the DOC that percolates in deep horizons of an arable soil, and to characterize the structural properties of the main fractions. The study was conducted on the long term observatory for environmental research- biogeochemical cycles and biodiversity Lusignan site-France. DOC collected using lysimeter plates inserted to a depth of 105 cm was fractionated into 3 fractions using the two column array of XAD-8 and XAD-4 resins. The HPO (hydrophobic) fraction (i.e. humic substances) isolated from the XAD-8 resin, the TPH (Transphilic) fraction from the XAD-4 resin and the HPI (hydrophilic) fraction which corresponds to the DOC that does not adsorbed onto the two resins under the acid condition used (pH 2). DOM adsorbed onto the resins is recovered with a 75%/25% acetonitrile/water mixture and lyophilized. The hydrophilic fraction is purified according the protocol proposed by Aiken and Leenheer (1993). The isolated fractions were subjected to several characterization tools: UV/Vis, fluorescence EEM, HPSEC/UV/DOC, ¹³C NMR, ¹⁴C dating, FT-IR, pyrolysis, thermochemolysis and MSSV GC/MS.

The DOC content ranged from 1 to 2.5 mg / L between winter and the middle of spring and then to 4-5 mg / L in summer time. For all isolated fractions HPSEC analyses indicated the predominance of low molecular structures with a low aromatic character. Fluorescence EEM confirmed the non-humic character of the DOM. ¹³C-NMR spectra showed that the aromatic character decreased from HPO to TPH, and HPI character. Molecular size follows the same trend. HPI DOM was found to be strongly enriched in carboxyl groups. The ¹⁴C concentration of the HPO fraction corresponds to an apparent calibrated age around AD 1500. For the same fraction isolated from the 0 - 30 cm horizon, the measured ¹⁴C concentration 131.9 pMC corresponds to that in the atmosphere around AD 1978. Significant input of terpenoid derived organic matter was confirmed in the HPO fraction of DOC, results supported by the data of ¹³C NMR, FT-IR and Micro Scale Sealed Vessel / pyrolysis GC / MS. Flash pyrolysis GC / MS chromatogram highlight the presence of phenol and alkyl phenols, generally attributed to structures polyhydroxyaromatic structures. Acetamide, a pyrolysis product of amino sugars constituents of microbial cell wall is also significantly present. The thermochemolysis (TMAH)/GC/ MS confirmed the presence of hydroxy aromatic structures in the extracts; however, their precise origin (lignin, tannins ...) remains uncertain.