Influence of depth on soil organic matter characteristics: An ultrahigh resolution mass spectrometry study

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The characterization of soil dissolved organic matter (DOM) is a fundamental challenge given its diversity, chemical complexity, and importance in many vital ecosystem processes. We analyzed podzolic B horizon soil collected at multiple depths from the Bear Brook Watershed in Maine (U.S.A.) to study changes in soil DOM chemical properties with depth using ultrahigh resolution mass spectrometry.

The results show that for the B horizon-derived DOM, the Aromaticity Index (A.I.) decreases with depth, indicating that the more aromatic components of DOM are preferentially being removed either through sorption with surface functional groups and/or microbial processes. Also with increasing B horizon depth, the van Krevelen diagram classified protein- and lipid-like DOM components (those that are aliphatic) increase in relative content. Increases in these chemical classifications have been linked to microbial processes.

Soil Horizon	A.I. > 0.5	A.I. > 0.67	VKD % Proteins	VKD % Lipids
B 0-5 cm	19.5	5.3	24.0	0.2
B 5-10 cm	14.3	2.5	26.0	0.4
B 10-15 cm	11.2	1.2	26.9	0.7
B 15-20 cm	11.2	1.8	29.0	0.6
B 20-25 cm	9.1	0.6	30.9	0.8
B 25-50 cm	9.2	0.7	31.8	1.2

Table 1: Influence of soil depth on DOM chemical properties of soils from a reference hardwood stand.

The results are consistent with the hypothesis of Kaiser and Kalbitz [1], who suggested that near-surface DOM is more related to plant-derived molecules, while DOM at depth has a greater content of microbially-derived molecules.

[1] Kaiser & Kalbitz (2012) *Soil Bio. Biochem.* **52**, 29-32.

Autoradiography analysis on local area distribution of radiocesium in trees from FDNPP

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The nuclear accident at the Fukushima Daiichi Nuclear Power Plant (FDNPP) occurred as a consequence of the massive earthquake and associated tsunami that struck the Tohoku and north Kanto regions of Japan on 11 March 2011. A series of hydrogen explosion was occurred from 13 March to 15 March at the units 1, 2, and 3. The release rate of ^{137}Cs on 15 March is estimated between 10^{12} and 10^{15} Bq/h [1]. This fallout radioactive Cs were dispersed from FDNPP to ocean [1,2] and land [1]. Some of the released radiocesium was deposited on the area located north-west direction from FDNPP. We should elucidate the migration behavior of radiocesium in environments.

Local area distribution and relocation of radiocesium in trees has been studied by measuring its spatial distribution on/in trees using autoradiography analysis. The samples of trees were collected on the places located between 4 and 55 km from FDNPP at approximately 2, 8, 20, and 22 months after the accident. The autoradiography analyses of *Cryptomeria japonica*, *Torreya nucifera*, and *Thujopsis dolabrata* var. *hondae* collected on approximately 2 and 8 months after the accident showed that radiocesium was mainly distributed as like spots on the branches and leaves of the trees emerged before the accident, and was little detected in new branch and leaves emerged after the accident. On the contrary, radiocesium was detected at the outermost tip of branches in the trees collected after 20 months of the accident. *Morus alba* collected after 22 months contained radiocesium in and outside of the stem, even though no radiocesium was detected in the root, strongly suggesting that some radioacesium was translocated from the outside stem to inside. These results indicate that distribution of radiocesium deposited on/in the trees has been gradually changed with time in the scale of the year.

[1] M. Chino, *et al.*, *J. Nucl. Sci. Technol.,* 48, (2011) 1129-1134. [2] H. Kawamura *et al.*, *J. Nucl. Sci. Technol.,* 48, (2011) 1349-1356.

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