Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

MIS21-P06 Room:Poster Time:April 28 18:15-19:30

Microbial contributions to biochemical commonalities of decaying organic matter

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Natural organic matters including dead organisms are decayed (decomposed) under various environmental conditions, but some parts of them, residues, remain for long time. Organic matter residues are major components of organic matter in soil and marine ecosystems, and play important functions and roles. The residues are originated from various organisms, organs, and cellular components, and in various stages of organic matter decay. Recently, it has been suggested that organic matter produced by microorganisms increase its percentage in residues during decay process. However, researches are limited especially on the quality of the produced organic matter and its producing processes. In this research, we investigate biochemical differences between original organic matters and organic residues and biochemical changes of organic matter during decaying process to clarify microbial contributions to the organic matter residues. Biochemical molecular compositions of original organic matters was more variable than those of organic residues in soil and water: for example, glycine:lysine (Gly/Lys) ratio and glucosamine:galactosamine (GlcN/GalN) ratio of original organic matters varies widely with origins, while those of decayed residues indicates considerably narrower ranges for both ratios. An incubation test, litterbag experiment, in a terrestrial ecosystem showed a clear trend that Gly/Lys ratio increased and GlcN/GalN ratio decreased during decay for all three species litter. These changes were also observed for litterbag experiments conducted in water, suggesting that it might be uniformly-observed biochemical directivity for decaying organic matter. In addition, amino acids and amino sugars are biomoleculars, which increase during decaying processes, suggesting that this directivity results from microbial products. Another biochemical directivity was observed for molecular weight distribution of decaying organic matters, suggesting that organic residues derived from microbial products contribute to biochemical directivities and commonalities of decaying organic matter in various environmental conditions.

Keywords: Organic matter decay, Soil, Ocean, Amino acids, Amino sugars, Molecular weight distribution