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

MIS21-P08 Room:Poster Time:April 28 18:15-19:30

Spatial variability of mineralization and nitrification in soil nitrogen along the hillslope in Japanese cedar forest

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introduction Precise understandings of mechanism of nitrogen (N) cycle is one of the most important subjects for ecosystem conservation in forests and rivers. Especially, the responses of N mineralization and nitrification to environmental changes are especially important due to their role in entire N cycling. Previous studies suggest that nitrification and mineralization have spatial variation in forest, which are controlled by the geophysical condition such as topography and water condition. The aim of this study is to clarify the mechanisms behind the spatial variety of nitrification and mineralization rate in soil along the hillslope.

Methods The field observations and soil samplings were conducted at Fukuroyamasawa Experimental Watershed (Catchment Area 0.8ha) which belongs to the University of Tokyo, Chiba forest. Dominant vegetation on the slope consisted of Cryptomeria japonica plantation. Along the hillslope (entire length: 110m), soil samples were collected at organic layer (O-layer) and mineral layer (0-10cm) at 10m intervals. After measuring water content and pH, the NO_3^- and NH_4^+ concentration of soil extract (by 2M KCl solution) were measured. The net mineralization and nitrification. Rate were measured by laboratory incubations (28 days). Then, the gross mineralization and nitrification rate were determined using the ^{15}N pool-dilution method.

Results Soil moisture content was higher at the down slope part. Similarly, the pH value was higher at down slope part. The pool size of NO_3^- was significantly low at the up slope part, and gradually increased along the slope toward the lower portion. On the other hand, the pool size of NH_4^+ did not have visible pattern along the slope. Moreover, there was not significant spatial variations in net and gross mineralization rate over the hillslope while net and gross nitrification had significant spatial pattern with higher rate at the down slope part.

Discussion Difference in the spatial patterns of mineralization and nitrification suggested that nitrification is more sensitive to the geophysical conditions such as the soil moisture content. We are attempting to explain the mechanisms of these spatial patterns from the spatial distributions of related microbial communities in the next step of this study