Long-term nitrogen dynamics in pine forest using ¹⁵N tracer

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We investigated the retention of applied nitrogen(N) to vegetation and soil after application of 15N tracer to determine the effects of atmospheric N deposition on the N dynamics in forest ecosystem. Most of previous studies using ¹⁵N focused on relatively short duration effect, and it has been reported that microbes in organic layer is the major sink of the ¹⁵N. However, it is not clear the long-term effects on N dynamics. This study clarified the ¹⁵N retention to vegetation and soil ten years after the ¹⁵N application.

We conducted survey in pine (*Pinus* densiflora) forest in Akagi field of Central Research Institute of Erectric Power Industry (CRIEPI) in Gunma prefecture, Japan. We established the six plots (4x5m) surrounding each mature pine tree, and applied NH₄Cl solution (50mgN m⁻²) in added plots (three plots) in 2002. Other three plots were control plots to compare with added plots. We collected boles, branches, leaves, roots 0 layer and soils (0-10, 10-20, 20-40 cm depth) in January 2013. Disks of boles were sampled at a height of 7-15 m and three radical replications were set. Furthermore, we sampled latest 15 years part and divided every five years. We determined delta-15N by using mass spectrometer.

Delta-15N of the bole were from -2.0 to -3.3% and from -4.7 to -5.3% in added and control plots, respectively. Delta-15N values of the branches, leaves, and roots were also high in added plots. Especially, in roots, delta-15N value was high (from 9.7 to 10.0%) compared with from -5.7 to -5.1% in control. In the soil, the difference was large in organic layer and surface 10 cm layer. These results suggest applied N was retained in forest ecosystem even ten years after application. We will also discuss the changes of 15N distribution and 15N recovery during ten years.

Keywords: 15N tracer, pine forest, nitrogen deposition