

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

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

We conducted survey in pine (*Pinus densiflora*) forest in Akagi field of Central Research Institute of Electric Power Industry (CRIEPI) in Gunma prefecture, Japan. We established the six plots (4x5m) surrounding each mature pine tree, and applied NH_4Cl 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- ^{15}N by using mass spectrometer.

Delta- ^{15}N of the bole were from -2.0 to -3.3‰ and from -4.7 to -5.3‰ in added and control plots, respectively. Delta- ^{15}N values of the branches, leaves, and roots were also high in added plots. Especially, in roots, delta- ^{15}N 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 ^{15}N distribution and ^{15}N recovery during ten years.

Keywords: ^{15}N tracer, pine forest, nitrogen deposition