Partitiong of atmospherically deposited radiocesium by forest canopies following the Fukushima Dai-ichi NPP accident

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The forest canopy is an important interface between atmosphere and soil horizon and act as an effective receptor of atmospheric fallout. The atmospheric fallout will be partitioned into two fractions, namely interception by forest canopies and that directly reaches forest floor through the canopy. Thus, interception processes significantly affect initial distribution and subsequent redistribution of atmospheric fallout under forest canopies.

Radioncesium deposited on forested areas by either wet or dry processes encounter the canopy. Most radiocesium (> 90%) deposited onto the coniferous forest canopy is intercepted and retained by tree leaves and branches and subsequently transferred to the forest floor as a result of weathering processes in association with rain and wind. Radiocesium leaching by rainwater seems to be huge source of secondary contamination of forest floor during initial phase of accidents, however effects of canopy interception and subsequent transfer of atmospherically deposited radiocesium have not been linked with spatial variability of radiocesium and its temporal evolution at the forest floor.

The purpose of this study is to investigate spatial pattern of atmospherically deposited radiocesium at forest floor and its temporal evolution in evergreen cedar and mixed broad-leaved forest affected by the Fukushima reactor accident. We monitored the cesium-137 (Cs-137) contents in throughfall, stemflow, and litterfall in two coniferous stands (plantation of Japanese cedar) and a mixed deciduous broad-leaved forest stand (Japanese oak with red pine). In addition to that, the repeated in-situ measurement of radiocesium was conducted in order to determine radiocesium distribution at forest floor.

We discussed the effect of initial canopy interception and subsequent redistribution of canopy-radiocesium on its spatial patterns at the forest floor. The results of this study give a better understanding of the fate of atmospheric fallout in Japanese forest environment.