

Estimation of radioactive cesium translocation by litterfall, stemflow and throughfall in the forest of Fukushima

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The accident of Fukushima Daiichi nuclear power plant after the earthquake and Tsunami in March 11th 2011 caused large amount of radioactive cesium (Cs) deposition onto the forest in surrounding areas. Deposited radioactive Cs that were caught by the tree canopy, reaches to the forest floor via various several pathways. To estimate the annual flux of radioactive Cs translocate to forest floor, we investigated the component and amount of those which move from tree canopy based on the measurements of litterfall, stemflow and throughfall.

Field study was conducted in a forest at the upstream part of the Kami-Oguni River catchment, northern part of Fukushima Prefecture. Three plots (2 deciduous-pine (*Pinus densiflora*) mixed stands and 1 Japanese cedar (*Cryptomeria japonica*) plantation) were set in the forest. Five litter traps were set in each plot and collected every month from October 2012 to September 2013. Litter samples were sorted among tree species and also branches, seeds and barks. Throughfall and stemflow were collected every 1 or 2 months. Water samples were filtered and particulate matters were collected for radioactive Cs measurement. Radioactive Cs concentration of all samples were measured by germanium semiconductor detector and NaI(Tl) scintillation counter. Both concentrations of ¹³⁷Cs and ¹³⁴Cs were measured but only data for ¹³⁷Cs were discussed in this report.

The concentration of ¹³⁷Cs in leaf litter samples varied from non-detected level to above 30 kBq/kg. The ¹³⁷Cs concentration was highest in pine needles and followed by cedar. Leaf litters of deciduous tree species showed significantly lower concentration compared to those of evergreen trees. This was because deciduous trees were before leafing stage at the time of the accident. However, significant levels of ¹³⁷Cs in the leaves even of deciduous trees suggest that ¹³⁷Cs have been translocated from some part of tree body. On the other hand, deposited ¹³⁷Cs at the time of the accident still remains on the leaves of evergreen tree. Amount of ¹³⁷Cs translocated from canopy to forest floor in cedar plantation was about 3 times higher than that of deciduous-pine mixed forest. This was due to higher ¹³⁷Cs concentration and larger litter biomass of cedar.

¹³⁷Cs concentration of throughfall and stemflow were comparable. Since the amount of throughfall was larger than that of stemflow, significant amount of ¹³⁷Cs moved to the forest floor by throughfall. Higher ¹³⁷Cs translocation occurred according to the high precipitation. ¹³⁷Cs concentration fluctuated depending on the season, but there was no apparent tendency to decrease between 2013 and 2012. Since the concentration of ¹³⁷Cs in open rainwater was below the detection limit, it is suggested that ¹³⁷Cs is still supplied constantly from the tree canopy and source limitation is not occurring from leaves and trunks, despite the fact that it has past more than one and half year from the fallout.