Investigation on distribution of radioactive substances in Fukushima (14) Seasonal variation in radiocesium deposition through stemflow following the Fukushima Dai-ichi Nuclear Power Plant accident

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Abstract

This study seeks to better understand the seasonal variation in the transport and deposition of radiocesium through the tree canopy via branchflow and stemflow of the cedar and oak stands following the Fukushima Dai-ichi Nuclear Power Plant accident.

Keywords: Radiocesium deposition, forest hydrology, branchflow, stemflow, cedar stand, oak stand

1. Introduction~Objective

Stemflow is one of self-decontamination pathways of radiocesium in the forested ecosystem following the Chernobyl and Fukushima nuclear power accidents (IAEA, 2002; Kato et al., 2019). Through stemflow, intercepted rainfall was transported from the canopy to the trunk together with concentrated input of particulates and leachable radiocesium before deposited to the forest floor. Understanding the dynamic of stemflow per rainfall amount and tree physiology attributed by the seasonal variation could give an insight into the mechanism that governs radiocesium cycling and deposition in the forest stand. Therefore, we investigated the seasonal variation and distribution of radiocesium depositional flux by branchflow and stemflow in each tree sections of canopy and trunk compartments of the cedar and oak stands.

2. Methodology

Stemflow were partitioned into canopy and trunk compartment for both a coniferous forest (*Cryptomeria japonica* (L. f) D. Don, young Japanese cedar stands, mean height is 10.9 m, mean DBH is 0.560 m) and a mixed deciduous broadleaved forest (*Quercus serrata* Murray, Japanese oak stands, mean height is 14.3 m, mean DBH is 0.789 m).

3. Results and Discussion

The results showed that the canopy of cedar stand has contributed to a more ^{137}Cs depositional flux than the trunk during higher stemflow-rainfall flux in the spring and summer seasons due to highest canopy interception. In the winter, a higher ^{137}Cs depositional flux was detected in the oak stand due to winter leaching (snow melting and bark surface residence time) although with a lesser stemflow depth.

4. Conclusion

The seasonal pattern of ^{137}Cs that deposited through stemflow in a tree stand can be distinguished by partitioning through canopy and trunk compartments, and it differs among the tree sections and between cedar and oak stands.

References

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