Spatial variability of radiocesium deposition through the tree canopy via branchflow and stemflow

*Zul Hilmi Saidin[1], Yuichi Onda[2], Hiroaki Kato[2], Momo Kurihara[2], Kazuki Nanko[3], Delphis F. Levia[4]

1. Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan, 2. Center for Research in Isotopes and Environmental Dynamics, University of Tsukuba, Tsukuba, Ibaraki, Japan, 3. Department of Disaster Prevention, Meteorology and Hydrology, Forestry and Forest Products Research Institute, Tsukuba, Ibaraki, Japan, 4. Departments of Geography, University of Delaware, Newark, Delaware, USA

This study aims to clarify the spatial variability radiocesium deposition through the tree canopy via branchflow and stemflow in the aftermath of the Fukushima Dai-ichi Nuclear Power Plant accident. Working in both a coniferous forest (*Cryptomeria japonica*, young Japanese cedar stands, mean height is 10.9 m, mean DBH is 0.560 m) and a mixed deciduous broadleaved forest (*Quercus serrata*, Japanese oak stands, mean height is 14.3 m, mean DBH is 0.789 m), we investigated the fate of radiocesium transported by branchflow from upper and lower portions of canopy and deposited by stemflow at trunk-based. Particular attention was paid to the leachable radiocesium at the tree canopy and the mechanism of radiocesium transport via stemflow and branchflow. In addition, we used isotopes to clarify the signature of evaporation loss via branchflow and stemflow on its routing through the canopy. Significant variability of ^{137}Cs concentration was detected among the sampling periods and differed between the two forests, with the oak stand generally exhibiting higher a ^{137}Cs concentration than the cedar stand. The preliminary results further revealed that the ^{137}Cs concentration was larger from dead foliage as compared to mixed and young foliage at the branchflow of cedar stand. Radiocesium leached more in lower stemflow of the trunk compared to upper trunk stemflow, possibly due to the increased residence time of stemflow on the lower reaches of the trunk. We also found that the isotopic composition of branchflow was generally enriched in δ^{18}O and δD compared to open rainfall and throughfall. However, the differences in enrichment between branchflow and stemflow remain unclear. Canopy architecture and canopy cover affected the cycling of radiocesium in stemflow and branchflow by foliage storage and washout capacity.

Keywords: Radiocesium leaching, Isotopic composition, Stemflow and branchflow, Coniferous and broadleaved forests, Canopy architecture, Canopy cover