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Vertical variation in the transport and fate of radiocesium through the canopy via branchflow and stemflow

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This study seeks to better understand the vertical variation in the transport and fate of radiocesium via branchflow and stemflow in the aftermath of the Fukushima nuclear power plant accident. Working in both a coniferous forest (Cryptomeria japonica, young Japanese cedar stands, average height is 14.0 m) and a mixed deciduous broadleaved forest (Quercus serrata, Japanese oak stands, average height is 13.3 m), we employed isotopic tracers to help determine the fate of radiocesium transported by branchflow and stemflow from the upper and lower portions of the canopy. Branchflow was harvested and examined from the upper canopy layers (including younger foliage, dead foliage, and live branches), whereas stemflow was collected in both the upper and lower portions of the canopy (with varying portions of live and dead branches). Particular attention was paid to the washoff, leaching, adsorption, transport, and storage (stem and bark) of radiocesium. The preliminary results showed radiocesium leaching (Cs-137 concentration) was greater for branchflow that received washoff and leachate from the dead foliage than the branchflow receiving radiocesium inputs from mixed and young foliage. For the tree trunk, radiocesium leached more in stemflow from the lower part of the canopy as compared to the upper canopy. We also found that the isotopic composition of branchflow was generally enriched in δ18O and δD compared to open rainfall and throughfall, however, the differences in enrichment between branchflow and stemflow remains unclear. Further work should examine the effect of tree architecture on the cycling of radiocesium both stemflow and branchflow.