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Seven-year monitoring study of radiocesium transfer in forest environments following the Fukushima Nuclear Power Plant accident

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Approximately 70% of the total land area affected by the fallout of the Fukushima nuclear power plant accident was forest area; therefore, monitoring of atmospherically deposited radionuclides such as radiocesium (137Cs) in forest environments is essential for diagnosis and early convergence of the environmental impact of radioactive contamination. This study investigated temporal changes in 137Cs concentrations in environmental samples collected from various forests over 6 years following the accident. 137Cs was detected in all forest environmental samples; however, the concentration in most samples decreased exponentially with time. The decreasing trend of 137Cs concentrations varied between needles/leaves and the outer bark of Japanese cedar and konara oak trees, suggesting that self-decontamination processes and internal recycling of 137Cs varied among tree species and different tree parts. 137Cs concentrations in throughfall, stemflow, and litterfall exhibited an exponentially decreasing trend with time. 137Cs concentrations in throughfall decreased with the concentrations in leaves/needles, whereas 137Cs concentrations in stemflow were independent of the concentrations in the outer bark. These results suggest that leaching of 137Cs in throughfall in Japanese cedar depended on 137Cs concentration in needles; however, the origin of 137Cs concentrations in stemflow was more complex. Further investigation is required to clarify temporal changes in the leachable 137Cs stock in the tree canopy and the mechanisms of 137Cs entrainment to rainwater from different tree parts.