

Three-year monitoring study of radiocesium transfer and dose rate in forest environments after the FDNPP accident

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We investigated the transfer of canopy-intercepted radiocesium to the forest floor during 3 years following the Fukushima Daiichi nuclear power plant (NPP) accident. The cesium-137 (Cs-137) contents of throughfall, stemflow, and litterfall were monitored in two coniferous stands (plantation of Japanese cedar) and a deciduous broad-leaved forest stand (Japanese oak with red pine). We also measured an ambient dose rate at different height in the forest by using a survey meter (TCS-172B, Hitachi-Aloka Medical, LTD.) and a portable Ge gamma-ray detector (Detective-DX-100T, Ortec, Ametek, Inc.).

Total Cs-137 deposition flux from the canopy to forest floor for the mature cedar, young cedar, and the mixed broad-leaved stands were 157 kBq/m², 167 kBq/m², and 54 kBq/m², respectively. These values correspond to 36%, 39% and 12% of total atmospheric input after the accident. The ambient dose rate in forest exhibited height dependency and its vertical distribution varied by forest type and stand age. The ambient dose rate showed an exponential decrease with time for all the forest sites, however the decreasing trend slightly differed among three forest sites. In order to clarify the difference of decreasing trend of ambient dose rate, we investigated the relationship between radiocesium transfer flux from the canopy to forest floor and reduction of ambient dose rate at 1-m height above forest floor. We also evaluated effects of forest decontamination on ambient dose rate in coniferous stands.

Keywords: Fukushima Dai-ichi Nuclear Power Plant, Radiocesium, Forest environments, Transfer, Ambient dose rate