

Migration dynamics of ^{137}Cs deposited on the forested ecosystem in Fukushima after the nuclear power plant accident

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A massive amount of radioactive substances, including cesium-137 (^{137}Cs), emitted from the disabled nuclear power plant, has been deposited on the forested areas in the northeastern region of Honshu Island, Japan after the Fukushima Daiichi nuclear power plant accident. Forest ecosystems in these regions are particularly important, not only for the forest products industry but also for source areas of drinking water and for residential environments. To clarify the migrating mechanisms of ^{137}Cs deposited on the forested ecosystem, we initiated intensive field observations in a small catchment that included forest headwaters and farmlands in the northern part of Fukushima Prefecture. The following expected major pathways of ^{137}Cs export and diffusion were investigated: 1) transportation of dissolved and particulate or colloidal forms via hydrological processes within a forested catchment and export dynamics through the stream, and 2) diffusion through the food web in terrestrial and aquatic organisms of forests. Preliminary findings indicated the following: 1) Most of the ^{137}Cs was discharged as suspended matter. High water flow generated by storm acted to accelerate the transportation of ^{137}Cs from the forested catchments. Thus, the estimation of ^{137}Cs export requires precise evaluation of the high flow acceleration during storm events; 2) Because litter and its detritus may form the biggest pool of ^{137}Cs in the forested ecosystem, ^{137}Cs diffusion occurs more rapidly through the detritus food chain than the grazing food chain. Most predators have already ingested ^{137}Cs , particularly in aquatic environments. An urgent question that needs to be addressed is when and how ^{137}Cs diffuses through grazing food chains and how rapidly this process occurs. To elucidate or to be able to predict these phenomena, the mechanisms of ^{137}Cs release from litter and soil organic matter need to be clarified.

Keywords: ^{137}Cs deposition, forested ecosystem, hydrological process, food web