

Translocation of Fukushima driven ^{137}Cs and ^{134}Cs in forest organic soil layer

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After the Fukushima power plant accident (11 March 2011) a huge amount of radionuclide materials were released. Its distribution and deposition pattern varies depending on the distance from the power plant, weather condition following the accident, topographic features, land cover types and the like. Forest land cover plays a great role on the distribution and deposition pattern of the radionuclide materials mainly by trapping and holding in canopy. Litter, wet and dry fall forms are the major transfer pathways that canopy trapped-radionuclide to reach forest floor. Studies have been carried out on the migration and related behavior of ^{134}Cs and ^{137}Cs in forest soil layers following the Chernobyl accident. However, a litter-fed continuum was not included in the process while it is known as major provider of radionuclide to forest floor. Therefore for better understanding of the movement of these radionuclides at least a part from the entire journey, litter-fed continuum has to be enclosed as radioactive recharger to forest organic soil layer. Hence, soil and litter samples are being sampled in Karassawa forest mountain chain, located ca.160 km away from the crippled power plant in Tochigi prefecture. The O-horizon is divided in to three major sub-layers (O1, O2 and O3) according to their status of decomposition. Radionuclide activities in both soil and litter samples were quantified by using gamma ray spectrometry. All the values of the radionuclides were corrected for decay back to 20 May 2011 to analyze only the dynamic of time-dependent down ward velocities at different soil organic layers. Results revealed that the ratio of ^{134}Cs to ^{137}Cs in litter was 1.00 and in the absence of soil erosion scenario, litter has contributed 71% of ^{137}Cs and 97.8% of ^{134}Cs to their respective total soil inventories. This makes litter the main conveyor of atmospheric radionuclides to forest soil. Since ^{137}Cs has Chernobyl remnant in the soil, it has been detected up to 30 cm soil depth and has shown relatively faster downward velocity as determined based on its relaxation depth. Whereas ^{134}Cs is totally originated from Fukushima accident and its depth is limited to upper 10 cm soil layer with 1.6 cm y⁻¹ downward velocity. A continuum translocation of the radionuclides in different parts of O-horizons that includes litter as year-round sources of radioactivity is under investigation.

Keywords: Cs-137, Cs-134, radionuclide, litter-fed, organic soil horizon