Investigation on distribution of radioactive substances in Fukushima
(12) Evaluating the radiocesium fallout in Fukushima's contaminated forests

*Donovan Anderson[1], Hiroaki Kato[1] and Yuichi Onda[1]
[1]Univ. of Tsukuba

Abstract

Anthropogenic stressors have influenced ecosystems and, in some cases, caused long lasting perturbations including fallout radioactive material that has gained substantial interest in understanding radionuclide behavior in the environment. However, accessible data from radiation releases is often restricted to a few study sites. Here, we investigated radiocesium distribution dynamics in 390 forested areas contaminated by the radioactive fallout from the 2011 Fukushima Dai-ichi Nuclear Power Plant accident.

Keywords: radiocesium fallout, forests, deposition, Fukushima

1. Introduction

In 2011, the fallout radiation from Fukushima Dai-ichi Nuclear Power Plant events caused widespread contamination across Fukushima Prefecture and heavily contaminated forested areas in northwest Japan [1]. Forested areas received the greatest portion of the radiocesium fallout deposited in the terrestrial environment and the radiocesium deposited was expected to recycle in the forest ecosystems for long periods [2]. However, recent studies demonstrated that distribution of radiocesium, particularly ^{137}Cs, within forests changed significantly through time and mobility was dependent on the forest's tree species composition [2]. Retained radiocesium in upper centimetres of forest soil owing to leaching and from the gradual movement of heavily contaminated surface organic material to soil could continue as a source of radioactive contamination into nearby bodies of water or biota. Elucidating the initial radiocesium concentrations distributed in organic material and in forest soils at several sites of varying tree species could provide information to track and forecast the behavior of radiocesium in forested terrestrial environments. Here, we investigated the distribution of radiocesium in 390 forested areas throughout Fukushima Prefecture. Specifically, we looked at changes of radiation dose rates and radiocesium concentrations in litter and soil layers depending on if the initial fallout was wet or dry deposition. We also compared these measurements to forest stand densities and tree species composition.

3. Conclusion

Preliminary results show that the radiation dose rates changed as forest stands' tree densities (trees per hector) varied. However, radiation dose rates tended to decrease with tree density in wet deposition contaminated areas, while radiation dose rates gradually increased with tree density in dry deposition. We also observed that the fraction of total activity concentration (Bq/kg) in forest soil retained in soil surface organic layer in forests drastically decreased from 2011 to 2016.

References

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