Estimation of spatiotemporal distribution of ^{137}Cs activity concentration in the litter layer of forest ecosystem in Fukushima using FoRothCs model

*Kazuya Nishina[1], Seiji Hayashi[1]

1. NIES National Institute of Environmental Studies

As a result of the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident, radioactive fallout had spread on land, which 70% of the contaminated area is forest ecosystems. It is known that most of the deposited ^{137}Cs in forest ecosystems are adsorbed by soil and steadily persisted in soil for a long time. On the other hand, some of the ^{137}Cs is cycled in the forest ecosystem and show high bioavailability. The litter layer (organic matter layer) on the forest floor is known to be a secondary source of contamination for organisms in the forest ecosystem and in the downstream river ecosystem of the contaminated forest. Therefore, it is important to predict the concentration of ^{137}Cs in the litter layer over a long time in order to understand the dynamics and environmental impacts of 137Cs in the ecosystem. In this study, we tried to estimate the Spatio-temporal ^{137}Cs concentration in the litter layer in the contaminated area in Fukushima Prefecture using the radioactive ecology model FoRothCs. The model couples biomass/carbon dynamics with 137Cs dynamics, which enables us to estimate the concentration in the litter layer. In this study, the spatial input datasets were ^{137}Cs deposition data from MEXT (modified by Kato & Onda (2018)), monthly meteorological data (temperature, precipitation), and vegetation type distribution data (evergreen coniferous trees/deciduous broad-leave trees). For the planted forests, the maximum tree height was estimated using the site index according to geographical variables, and the age of the forest was assumed to be 50 years uniformly at the time of the accident. The initial litter layer and soil carbon were estimated by the spin-up procedure. The estimated ^{137}Cs activity concentrations were generally agreed with the observed values in the database provided by Hashimoto et al. (2020) due to the strong correlation with the amount of deposition. Our simulation results show that the deposition standardized ^{137}Cs activity concentrations were correlated with mean annual temperature, but, a positive correlation in the early stages and a negative correlation in the later stages (2016~). Thus, we found that environmental factors have a strong influence on the persistence of ^{137}Cs in the litter layer.

Keywords: 137Cs, Litter

©2022. Japan Geoscience Union. All Right Reserved.