



Radiocesium inventory and distribution patterns in forest soils in Fukushima - seven years after the nuclear accident

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Since the Fukushima Nuclear Plant Accident occurred in 2011, local residents and environmental scientists have been concerned about the radioactivity levels in the mountain areas because the vast majority of the forests in the region have remained without decontamination. Seven years has passed since the accident and this study attempts to find the current radionuclide concentration levels as well as the distribution patterns of radionuclides, specifically Cs (cesium)-137, in a small watershed in a Fukushima forest. Not only do those forests provide water resources for lowland farming but also they provide residents with valuable space for logging, farming/ranching, and leisure. It is important to know how radionuclides have accumulated, moved, and dispersed in the environment over the past seven years and to devise future planning to contain the contamination in the forests and remediate that contamination if necessary. During the summers of 2016, 2017 and 2018, soil samples were collected in a village in Fukushima, about 32 km northwest of the nuclear plant. Those samples were collected in lowland rice paddies and on the hillslopes surrounding the paddies. The results from the longest slope – which is approximately 630 m - show that currently, the soil samples collected at higher elevations contain higher Cs-137 inventories, although there are variabilities in these inventories among samples. This finding was contrary to our hypothesis that contaminated soils must have moved downhill by now. At the same time, the samples collected at lower elevations show deeper Cs-137 migration in soils. There is an indication that Cs-137 has migrated downwards beyond the length of our soil sampling liner (30 cm) since most of the samples contain a larger inventory of Cs-137 in the deepest layers than the background Cs-137 inventory before the accident. These findings might explain why the results were contrary to our hypothesis. The other possibility is that wet locations on the slope have functioned as sinks or traps for Cs-137 in the past years. With these findings from the soil samples and with the help of spatial inference, this paper builds a hypothesis of Cs-137 distribution on the study site in both horizontal and vertical directions. The hypothesis presented will be a reference for ongoing research on the radioactive contamination in Fukushima. It will also help us gain insight into how radionuclide movements differ between the Fukushima and Chernobyl regions.