

Increase of radioactive cesium resuspension to the atmosphere with bioaerosols in a polluted area in Fukushima

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Radionuclides emitted in the Fukushima dai-ichi nuclear power plant (FNDPP) accident in March 2011 have been deposited on the soil, ocean and vegetation. Re-suspension of radioactive cesium (Cs) from the soil and vegetation to the atmosphere may be one of significant path in the diffusion of radionuclides after the accident. We have measured the concentration of atmospheric Cs-134/137 radioactivity at a mountainous region in Fukushima, where deposition density of Cs-134/137 is relatively high. Atmospheric suspended particles have been collected on a sheet of quartz fiber filter with high-volume air samplers mounted at a playground site and forest site, and gamma-ray emission from them were measured with Ge detector to obtain the atmospheric activity concentration of Cs-134/137. A small part of each filter was used to measure chemical composition and microscope particle observation. This observation showed that major part of the sampled coarse particles were carbonaceous, probably biogenic particles, such as spores and bacteria in summer and autumn, between June and October, indicating that a large amount of bioaerosol could be emitted from forest around Fukushima. The atmospheric Cs radioactivity concentration significantly increased in this period. It was higher in the forest than that at the playground in these seasons. The measured concentration of atmospheric Cs-134/137 was positively correlated with amount of carbonaceous particles in these seasons. Bioaerosol sampling and genome analyses showed that major coarse particles in these seasons were probably spores of fungi and stain. We counted the spores collected on the sample filters to evaluate their number density, and found the number density was positively correlated with the atmospheric Cs radioactivity concentration. We collected fungi at Namie to sample its spores. About half of Cs-137 in the spores was removed by pure water, being consistent with similar experiment for the atmospheric particle samples. These results indicated that spore emission from fungi significantly contributes to the resuspension of radioactive Cs to the atmosphere in summer and autumn. Water solubility of atmospheric

Cs-137 in these seasons suggests possibility of its circulation between the atmosphere and biosphere.

Keywords: FDNPP accident, radiocesium, bioaerosol