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Temporal change in the size distribution of airborne Radiocesium derived from the Fukushima accident

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The accident of Fukushima Dai-ichi nuclear power plant discharged a large amount of radioactive materials into the environment. After 40 days of the accident, we started to collect the size-segregated aerosol at Tsukuba City, Japan, located 170 km south of the plant, by use of a low-pressure cascade impactor. The sampling continued from April 28, through October 26, 2011. The number of sample sets collected in total was 8. The radioactivity of ^{134}Cs and ^{137}Cs in aerosols collected at each stage were determined by gamma-ray with a high sensitivity Germanic detector. After the gamma-ray spectrometry analysis, the chemical species in the aerosols were analyzed.

The analyses of first (April 28-May 12) and second (May 12-26) samples showed that the activity size distributions of ^{134}Cs and ^{137}Cs in aerosols reside mostly in the accumulation mode size range. These activity size distributions almost overlapped with the mass size distribution of non-sea-salt sulfate aerosol. From the results, we regarded that sulfate is the main transport medium of these radionuclides, and re-suspended soil particles that attached radionuclides were not the major airborne radioactive substances by the end of May, 2011 (Kaneyasu *et al*., 2012).

We further conducted the successive extraction experiment of radiocesium from the aerosol deposits on the aluminum sheet substrate (8th stage of the first aerosol sample, 0.5-0.7 μm in aerodynamic diameter) with water and 0.1M HCl. In contrast to the relatively insoluble property of Chernobyl radionuclides, those in aerosols collected at Tsukuba in fine mode are completely water-soluble (100%).

From the third aerosol sample, the activity size distributions started to change, $i.e.$, the major peak in the accumulation mode size range seen in the first and second aerosol samples became smaller and an additional peak appeared in the coarse mode size range. The comparison of the activity size distributions of radiocesium and the mass size distributions of major aerosol components collected by the end of August, 2011, ($i.e.$, sample No.5) and its implication will be discussed in the presentation.

Reference Kaneyasu et al., *Environ. Sci. Technol*. **46**, 5720-5726 (2012).