



Contribution ID: 209

Type: Poster

Airborne radionuclides measured in Wako, Japan, after the Fukushima Dai-ichi nuclear power plant accident in 2011

Wednesday 19 September 2012 18:00 (1h 50m)

On March 11, 2011, an earthquake of magnitude 9.0 occurred near the east coast of Honshu, Japan, and was followed by a large tsunami. The disasters caused damage to the Fukushima Dai-ichi nuclear power plant (FDNPP), resulting in the release of radionuclides into the environment. Hence, we initiated an urgent measurement of the radioactivity concentrations of airborne radionuclides at the RIKEN Wako Institute (35°46'44" N, 139°36'54" E), Wako, Japan, located about 220 km to the southwest of FDNPP.

Air dust was collected using a commercially available air dust sampler (M&F Enterprise SP-30). Dust was collected for 30 min for the first two samples F01 and F02 in the period March 15 11:15–11:45 (Japan Standard Time, JST) and March 16 13:15–13:45, respectively. After the third sample from March 16 18:32 to March 17 9:00, dust was continuously collected for about one year using a total of 84 filters (F03–F86). The filter samples were subjected to γ -ray spectrometry using a Ge detector.

In this work, radioactivity concentrations were determined for Ba-140, Cs-137, Cs-136g, Cs-134g, I-133g, Te-132, I-131, Te-129m, Ag-110m, Mo-99, and Nb-95g. The highest radioactivity concentrations for typical radionuclides in unit Bq/m³ were 8.8 ± 0.2 for Cs-137, 1.2 ± 0.2 for Cs-136g, 8.5 ± 0.2 for Cs-134g, 4.7 ± 0.3 for I-133g, 58 ± 2 for Te-132, 8.0 ± 1.2 for Te-129m, and 35 ± 1 for I-131 in the F01 sample. The time variations of the radioactivity concentrations and their ratios in Wako are discussed by referring to those of the ambient effective dose rate as well as the amount of rainfall.

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Session Classification: Poster Session

Track Classification: Radioactive elements in the environment, radiation archeometry and Health Physics