



Comprehensive Retrieval of Spatio-temporal Variations in Atmospheric Radionuclides just after the Fukushima Accident by Analyzing Filter-tapes of Operational Air Pollution Monitoring Stations in Eastern Japan

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After the Fukushima Daiichi Nuclear Power Station (FD1NPS) accident on March 11, 2011, many datasets have been available of deposition density of radionuclides in soils in eastern Japan. By contrast, no time-series data of atmospheric radionuclides has been measured in the Fukushima prefecture (FP), although very limited data is available in the Tokyo metropolitan area (TMA) located more than 170 km southwest of the FD1NPS. As a result, atmospheric transport models simulating the atmospheric concentrations and surface deposition of radionuclides have large uncertainty, as well as the estimate of release rate of source terms and of internal exposure from inhalation. One year after the accident, we collected the used filter-tapes installed in Suspended Particulate Matter (SPM) monitors with beta-ray attenuation method operated by local governments in the air pollution monitoring network of eastern Japan. The SPM monitoring stations are mostly located in the urban and/or industrial area to measure the hourly mass concentration of SPM less than 10 μm in diameter for health effect due to atmospheric aerosols. By measuring radionuclides in SPM on the filter-tapes, we retrieved hourly atmospheric Cs-134 and Cs-137 concentrations during March 12-23, 2011, when atmospheric, aquatic, and terrestrial environments were seriously suffered in most of eastern Japan. Until now, we measured hourly radiocesium at around 100 SPM sites in the southern Tohoku region (ST) including the FP and in the TMA. By analysing the dataset, about 10 plumes/polluted air masses with Cs-137 concentrations higher than 10 Bq m⁻³ were found, and some plumes were newly detected in this study. And the spatio-temporal distributions of atmospheric Cs-137 were clearly shown for all the plumes. The east coast area of the FP where the FD1NPS was located in the centre was attacked several times by the plumes, and suffered the highest time-integrated Cs-137 concentration during the period among the ST and TMA. Local meteorological conditions of land and sea breezes, and temperature inversion layers near the surface coupled with topography could greatly affect the transport pathways of radioactive materials and their deposition to the land surface.