

Comprehensive Study on Atmospheric Radionuclides just after the Fukushima Accident by Analyzing used Filter-tapes of Air Monitoring Sites

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The first retrieval of hourly atmospheric radiocesium concentrations during March 12-23, 2011 just after the Fukushima Daiichi Nuclear Power Station (FD1NPS) accident was already published by measuring radionuclides in Suspended Particulate Matter (SPM) on the filter-tapes installed in SPM monitors with beta-ray attenuation method at 40 sites operated by local governments in the air pollution monitoring network of eastern Japan (Scientific Reports, 2014). Since then, hourly atmospheric radionuclides in SPM have been measured at around 100 SPM monitoring stations, and the dataset has been also published on a website (Journal of Nuclear and Radiochemical Sciences, 2015). In this paper, we will introduce new findings by the synthetic analysis of not only those data but also radiation dose rates at many monitoring sites, atmospheric radionuclides independently measured at several sites, and meteorological data by Japan Meteorological Agency. From the FD1NPS, 7 and 6 plumes/polluted air masses with high radionuclides were found to be transported to southern Tohoku region including the Fukushima prefecture, and to the central Kanto region including Tokyo Metropolitan Area located more than 170 km southwest of the FD1NPS, respectively. Many peaks of radiation dose rate were already observed at many monitoring stations, and a one-to-one correspondence could be identified between a peak of radiation dose and a plume/polluted air mass of radionuclides. Many case studies on the transport of plume/polluted air masses have been also made, and which clearly demonstrates that local meteorological conditions such as land and sea breezes, precipitation, and temperature inversion layers near the surface coupled with topography could greatly affect the transport pathways of radioactive materials, their maximum concentrations, and their deposition to the land surface.

Keywords: Atmospheric Cs-137, Suspended Particulate Matter, Fukushima Daiichi Nuclear Power Station, plume, Spatio-temporal variation