

Transport of the Radioactive Materials to Fukushima City in the Fukushima Nuclear Accident

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In Fukushima Daiichi nuclear power plant located in the Pacific coast of Fukushima Prefecture, the earthquake and the resulting tsunami on March 11, 2011 caused radiation accident that made a lot of outflow for the surrounding environment. In this study, we investigated how radioactive materials are transported to the inland from the nuclear power plant by simulating the atmospheric dispersion of radioactive materials. In particular, consider where the radioactive materials which bring the high radiation doses were maintained for a long period in Fukushima city come from.

In computing the spreading of radioactive materials, we used the Weather Research & Forecast (WRF) model to reconstruct the atmospheric field at the accident, and then the particles assumed as the radioactive materials were flowing the calculated field. This Lagrangian advection-diffusion calculating is composed three parts, the advection part, diffusion part, and dry deposition part. The advection calculation use the wind speed calculated by WRF model to move the particles. The vertical diffusion calculation is described by the random-walk model. And, the dry deposition calculation is realized by dropping the particles near the surface on the ground at random.

Result of this advection-diffusion simulation, it is confirmed that the radioactive materials released from the nuclear power plant is progressing inland at about 14 and 19 JST on March 15, and after that the particles flowed into Fukushima city. In addition, when great amount of radioactive materials reached into Fukushima city in this study, it was the same time that radiation doses which were observed increased rapidly. Moreover, according to the observation of the Japan Meteorological Agency (JMA), it started to rain at this time. Therefore, it is thought that the high radiation doses at Fukushima city was caused by the large amount of radioactive materials dropped by rain.

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