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Atmospheric-Terrestrial Interactions in Radioactive Pollution by the Fukushima Accident

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Our Grants-in-aids Scientific Research Group have been established to elucidate the physico-chemical state of the radioactive aerosols that were released into the atmosphere by the Fukushima accident (primary emission), improve transport model by which better emission inventory is made, and understand better the atmospheric-terrestrial interactions in the radioactive pollution. While aiming at providing basic data on the estimation of the inhalation exposure, as well as the establishment of simulation model for radionuclides transfer among atmosphere-terrestrial-hydrosphere, the final goal in the project is to contribute and ensure the safety as well as security of the people by providing relevant information on the internal exposure due to atmospheric radioactivity. This project promotes the state-of-the art methodologies from various research fields to be integrated with the comprehensive research methods/frameworks, and has specific sets of topics as listed below.

1) Monitor continuously radioactive aerosols and gases in the atmosphere around the Fukushima Daiichi Nuclear Power Plant, particularly at the greatly contaminated regions with higher radiation dose rate, to examine temporal change in concentration.

2) Analyze samples that have been collected soon after the accident in order to understand the physico-chemical properties of the radioactive aerosols, detailed radionuclide composition, particle chemical composition and particle size distribution, as well as correlation with specific stable isotopes.

3) Observe the atmospheric radioactivity concentration under various conditions, as well as the suspension of soil particles and the aerosol particles along with meteorological elements such as soil water content, by making an observation field in the polluted area mentioned above. Furthermore, perform a necessary controlled experiment and better understand the re-suspension process (secondary emission) of the radioactive material from the soil. Apply the up-to-date mass spectrometry on this occasion, with measuring directly radionuclides and elements in atmospheric aerosols to clarify their relations with meteorological parameters.

4) Quantify the emission flux of radionuclides, which is supplied by eco-processes such as the suspension of Japanese cedar pollen and wax-like substance on the plant surface (secondary emission).

5) Verify the present assumption of the simulation model concerning wet deposition process of radionuclide by comparing observation results of the radioactivity in air and in the precipitation.

6) Validate the simulation results by comparison with those of each observation activity as well as improve the quantification in transport, diffusion and deposition in the atmospheric models, finally to develop resuspension model to quantify the atmosphere-terrestrial interactions.

In this presentation, the briefing of the project is given with expecting active discussion among attendees; what kind of atmospheric science should be indispensable.

Keywords: the Fukushima Accident, Radioactive aerosol, Primary emission, Secondary emission, Resuspension