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Estimation of released radioactive materials from Fukushima power plant by inverse model

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Huge amount of radioactive materials were emitted in the accident of the Fukushima nuclear power plant which occurred in March, 2011. Although various organizations released the prediction result using their transport models about this event, the most predictions assumed fixed emission amount and the results are not robust. We combined inverse technique (Maki et al., 2011), transport model results with tag-tracer and dose-of-radiation observation data to estimate more precise emission amount in this event.

We used regional chemical transport model named MRI-PM/r (Kajino et al., 2011). The horizontal resolution is 5km and spatial resolution of tag-tracer is 6 hours. We also used 3 tags in vertical (0-100m, 100-200m, 200- 400m). The observation data are obtained from Ministry of Education, Culture, Sports, Science and Technology and the number of observation site is 49. The prior information about the emission is obtained by Chino et al., 2011. Now we are trying to use our global aerosol transport model named MASINGAR (Tanaka et al., 2003) to use globally distributed observation data (CTBT and so on).

We could obtain analysis results which are not largely different from observation and prior information by using inverse analysis. We find that the precision and resolution of the analysis depends on quality and quantity of the observation data. We also obtained higher maximum emission value than prior information.

By developing this system, it is expectable for construction of the near real-time forecasting system and the precise analysis system of the total emission amount at the time of the occurrence of an accident of a nuclear power plant etc. To achieve such objectives, it is important to develop more precise transport model including transport and deposition process, to collect as many observation data as possible and to obtain more robust prior information as possible.

Keywords: Inverse model, Fukushima Dai-ichi nuclear power plant, radioactive materials