Aerial radiological monitoring of East Japan after the Fukushima Daiichi NPP accident

Yukiha SANADA a, Takeshi SUGITA a, Aatsuya KONDO a and Tatsuo TORII a

* Headquarters of Fukushima Partnership Operations
Center of Fukushima Partnership Environmental Safety Research and Development, Japan Atomic Energy Agency, 2-2-2 Uchisaiwai-cho, Chiyoda, Tokyo,100-8577, JAPAN
E-mail: sanada.yukiha@jaea.go.jp

Introduction

We measured the ambient dose-rate and the deposition amount of radioactive cesium by using four helicopters in the whole area of East Japan to investigate the influence of the radioactivity that released in the atmosphere due to the disaster of the Fukushima Daiichi NPP (Nuclear Power Plant), Tokyo Electric Power Company (TEPCO), occurred by the East Japan earthquake and tsunami on March 11, 2011.

Mission Goals are to create the radiation map of East Japan for
- to grasp on the influence of radiocesium.
- to establish the method of aerial radiological monitoring
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- to establish the method of aerial radiological monitoring

Achievement of aerial radiation monitoring

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<th>Date</th>
<th>Mission</th>
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<td>25 Mar. 2011</td>
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<td>MEXT Press release of plan for aerial radiation monitoring</td>
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<td>5 Apr. 2011</td>
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<td>third monitoring</td>
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<td>17 May 2011</td>
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<td>second monitoring</td>
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<td>21 Jun. 2011</td>
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<td>first monitoring</td>
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Aerial monitoring system

- Count rate was obtained by helicopter with large detector
- Height above the ground: 30m
- Acquisition rate: 1 second interval

Methods

I. Procedure of data analysis

II. Correction factor

IV. Discrimination between radiocesium and natural radionuclides

Spectrum index (SI) method was applied for discrimination between radiocesium and natural radionuclides.

\[ SI = \frac{C_{\text{Cs134/C137}=0.9}}{C_{\text{background}}} \]

Results

I. Map of dose rate and the deposition

AMS data was compared to ground survey data (NaI survey meter).
- On the whole, it was well in agreement.
- In the following cases, the data of AMS may not match ground survey data.
  (1) Area of a fold of hills
  (2) Cosmic ray time, season and weather

II. 3D map of the deposition

Radiocesium that emitted into the atmosphere was deposited along Oi Mountains, lide Mountains, Echigo Mountains, Shinm憋uke Mountains and Kanto Mountains.

II. Prediction of dose rate

Based on the created map, the prediction map was made in consideration of half-life.
- Area of above 0.23 uSv/h(=1.9 mSv/y) was limited to Fukushima, Tochigi* and Gunma* after 5 years. (* mountainous region)

Comparison with the ground survey

AMS data was compared to ground survey data (NaI survey meter).
- On the whole, it was well in agreement.
- In the following cases, the data of AMS may not match ground survey data.
  (1) Area of a fold of hills
  (2) Cosmic ray time, season and weather

Summary

- The radiation map which can be used for the plan of decontamination or the determination of a refuge zone was able to be made.
- The method of aerial radiological monitoring was established.
  * the conversion method to a dose rate
  * discrimination between radiocesium and natural radionuclides

It has been understood for the region where the dose-rate is high to extend from the NPP for northwestward, and wide to Gunma Prefecture from the vicinity of Fukushima City in the direction of the southwest. This map is utilized to determine the decontamination area and estimate the variation of contamination areas.