Results of Airborne Monitoring Survey by MEXT in the Chugoku Region

The results of the airborne monitoring survey by MEXT in the Chugoku region ("Airborne Monitoring survey by MEXT in the Western Part of Japan, etc.": announced on January 27, 2011) were summarized today, so they are provided here.

1. Objective of this monitoring in the Chugoku region

MEXT conducted airborne monitoring* over the eastern part of Japan (Tokyo and 21 other prefectures) and has confirmed air dose rates and the distribution of the deposition of radioactive cesium in respective areas. Furthermore, through this monitoring, we were able to confirm the influence of natural radionuclides in East Japan, for which detailed measurement results had not been available.

In the meantime, the results of the monthly measurements of fallout conducted so far by MEXT have revealed that radioactive cesium has also been deposited in the western part of Japan and Hokkaido, although in small amounts.

Therefore, in order to confirm that deposition amounts of radioactive cesium are surely small, MEXT conducted airborne monitoring in the Chugoku region, as monitoring in the western part of Japan, where airborne monitoring had never been conducted.

This monitoring was conducted in respective target areas under the following systems.
(i) Airborne monitoring in Shimane, Tottori, Hiroshima, and Yamaguchi prefectures was conducted using a private helicopter equipped with MEXT’s airborne monitoring system, and the measurement was carried out by the Japan Atomic Energy Agency.
(ii) The airborne monitoring survey in Okayama prefecture was conducted by the OYO Corporation using a dedicated private helicopter that can be equipped with an airborne monitoring system of the OYO Corporation. These measurement results were analyzed by the Japan Atomic Energy Agency.

* Airborne monitoring: A technique in which highly sensitive, large radiation detectors are installed in an aircraft, and gamma rays from radioactive substances accumulated in the ground are quickly measured over a large area, in order to check the surface deposition.
2. Details of this monitoring

○ Monitoring dates:
  (i) Hiroshima, Yamaguchi: February 12 to 27 (14 flights in total) Shimane, Tottori: April 10 to 24 (15 flights in total)
  (ii) Okayama: March 7 to 14 (5 flights in total)

○ Aircraft:
  (i) Shimane, Tottori, Hiroshima, Yamaguchi: a private helicopter (BELL412SP, BELL412EP)
  (ii) Okayama: a private helicopter (AS350B3)

○ Items covered: Air dose rate at 1 m height above the ground surface and deposition of radioactive cesium on the ground surface in the Chugoku region

3. Results of this monitoring

Attachments 1 to 4 are maps showing the distribution of air dose rates at 1m height above the ground surface and maps showing the deposition of radioactive substances on the soil surface in the Chugoku region. Maps were prepared under the following conditions.

○ The flight altitudes were from around 300m above the ground and the values for this monitoring survey are the averages of the measured values in circles with a diameter of around 600m (varies by flight altitude) below the aircraft.

○ The width of the track is around 5km in this monitoring survey.

○ In order to prepare distribution maps of air dose rates, we first obtained the relation between counting rates (cps) measured in the air above the test line established at each of the monitoring areas and air dose rates (μSv/h) at the height of 1m above the ground measured around the test line using NaI scintillators, and then calculated air dose rates at the height of 1m above the ground using counting rates measured in the air above respective measuring points.

○ Maps showing deposition amounts of radioactive cesium were prepared by first assessing the characteristics of energy spectra of gamma rays measured in the air by type of helicopter and measuring equipment used, and then sorting out areas where the energy spectra of radioactive cesium (Cs-134 and Cs-137) were detected significantly and those were they were not. The details are as follows.

(i) Areas where the energy spectra of radioactive cesium were detected significantly
  • Compared with the eastern part of Japan, the western part is further from Fukushima Dai-ichi NPP, and therefore deposition amounts of radioactive cesium are considered to be smaller. In addition, monitoring results prior to the occurrence of the accident at Fukushima Dai-ichi NPP have revealed that air dose rates due to natural radionuclides are higher in the western part of Japan.
Therefore, in order to calculate detailed deposition amounts of radioactive cesium in the western part of Japan, the method newly adopted in the recent airborne monitoring in the Kyushu region and Okinawa prefecture to assess influences of natural radionuclides in detail based on information on the energy spectra of gamma rays measured in the air was also adopted in this monitoring survey (See Attachment 9 of the “Results of Airborne Monitoring Survey by MEXT in the Kyushu Region and Okinawa Prefecture” (published on May 11, 2012) for details).

Based on this method, deposition amounts of radioactive cesium were calculated by deducting the contribution by natural radionuclides from measurement results of air dose rates at respective measuring points, and also based on the correlation between air dose rates and the results of the in-situ measurement* using germanium semiconductor detectors, which was conducted by the Japan Chemical Analysis Center in the course of the project, the 2011 Strategic Funds for the Promotion of Science and Technology, entitled “Establishment of the Base for Taking Measures for Environmental Impact of Radioactive Substances — Study on Distribution of Radioactive Substances.”

* In-situ measurement using germanium semiconductor detectors: Means to analyze the concentration of radionuclides accumulated in soil by setting up transportable germanium semiconductor detectors in the environment and detecting gamma rays that are emitted from radiation sources distributed in soil.

(ii) Areas where the energy spectra of radioactive cesium were not detected significantly

- In the same manner as before, they were indicated on maps as areas showing the minimum range of radioactive cesium (≤10kBq/m²) for the sake of simplicity.

The energy spectra of radioactive cesium were not detected significantly at any measuring points within the areas targeted in this monitoring.

○ Decay compensation of air dose rates and radioactive cesium were calculated as follows:
  - After deducting air dose rates due to natural radionuclides from measurement results of air dose rates at respective measuring points, air dose rate were conducted by taking into account the physical attenuation of Cs-134 and Cs-137 from the measurement date to the final measurement date.
  - Regarding deposition amounts of Cs-134 and Cs-137, physical attenuation from the measurement date up to the final measurement date was taken into account.
Readings of the Airborne Monitoring Survey by MEXT in the Chugoku Region
(Air dose rates at the height of 1m above the ground surface in the Chugoku Region)

Legend
Air dose rate over 1 meter above ground level (Sv/h)
[Compensated value as of April 25, 2012]

19.0 <
9.5 - 19.0
3.8 - 9.5
1.9 - 3.8
1.0 - 1.9
0.6 - 1.0
0.2 - 0.5
0.1 - 0.2
≤ 0.1

*This map contains air dose rates by natural radionuclides.
Readings of the Airborne Monitoring Survey by MEXT in the Chugoku Region
(Total deposition of Cs-134 and Cs-137 on the ground surface in Chugoku region)

Legend
Total deposition of Cs-134 and Cs-137 (Bq/m²)
[Compensated value as of April 25, 2012]

- 300k <
- 100k - 300k
- 60k - 100k
- 30k - 60k
- 10k - 30k
- ≤ 10k
Readings of the Airborne Monitoring Survey by MEXT in the Chugoku Region
(Deposition of Cs-134 on the ground surface in Chugoku region)

Legend
Deposition of Cs-134 (Bq/m²)
[Compensated value as of April 25, 2012]
Readings of the Airborne Monitoring Survey by MEXT in the Chugoku Region
(Deposition of Cs-137 on the ground surface in Chugoku region)

Legend
Deposition of Cs-137 (Bq/m²)
[Compensated value as of April 25, 2012]