Topics Fukushima 20 August 2013 No.26

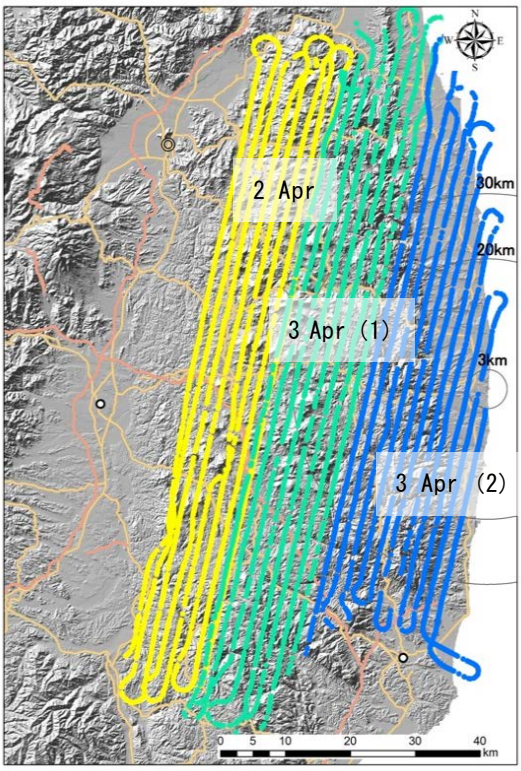
Creation of Map Indicating Iodine Dispersal Immediately After the Accident

Analysis Based on Aerial Monitoring Data

Due to iodine-131's short half-life of 8 days, there had been poor understanding of the detailed dispersal situation after the accident at the Fukushima Daiichi Nuclear Power Station of the Tokyo Electric Power Company (TEPCO). The contamination map was released for the first time by the Japan Atomic Energy Agency (JAEA) as a result of joint research with the U.S. Department of Energy (DOE). Analysis was conducted based on measurement data obtained through aerialmonitoring by the DOE immediately after the accident, and it was found that soil deposition of iodine was high in the northwest direction from the nuclear power station, and that part of the iodine also flowed to the south in the vicinity of the power station.

The DOE aircraft which monitored the dose rate at ground level from the air over Fukushima Prefecture immediately after the accident (above) and its path (lower right)

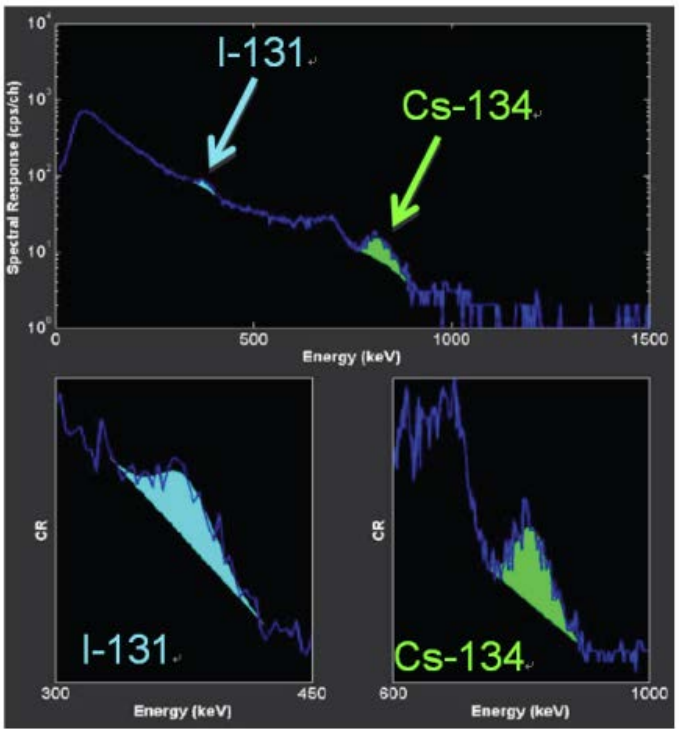
At the request of the Emergency Operations Center of the Ministry of Education, Culture, Sports, Science and Technology (name at the time, referred to below as the "MEXT EOC"), the JAEA obtained measurement results from aerial monitoring conducted by the DOE immediately after the accident, and analyzed the spectrum of the obtained data. Among these results, the energy peak indicating iodine-131 (365 keV) was detected in the results of measurement conducted on April 2 and 3 of 2011, three weeks after the accident, and thus an attempt was made to map the deposition amounts indicating the dispersal situation of iodine-131.The count rate was extracted for radiation at the peak attributed to the detected iodine-131, and a new technique was developed for correcting the count rate attributable to iodine-131 based on the altitude of the aircraft which conducted the



measurements. Based on these corrections, an estimate was made of the iodine deposited on the earth's surface immediately after the accident.

To verify the validity of this method, the analysis results were compared, with half-life correction, against soil data gathered by the MEXT EOC from June to July 2011 (evaluated on June 14). The same procedure was also carried out for cesium-134. As a result, it was confirmed that deposition of iodine-131 and cesium-134, measured on the ground, almost matched the estimated values.

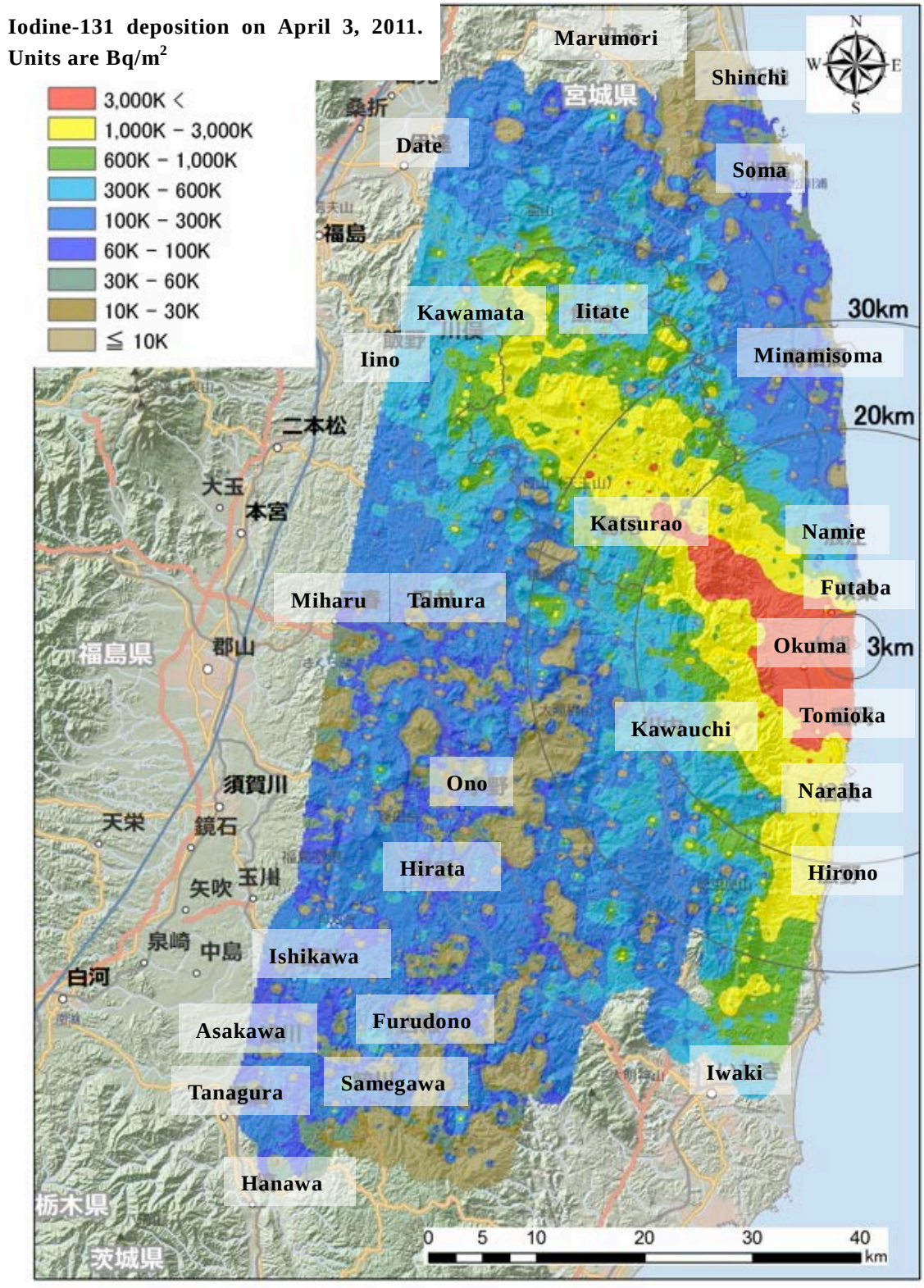
The distribution map summarizing the estimation results shows that areas where deposition was at least 3 million Becquerel per square meter on April 3 extended in the northwest direction, and at some parts in the southern direction.



The spectrum of the monitoring data

Tatsuo Torii of the JAEA, who is in charge of this research, said, "Spectrum analysis was conducted in order to extract the iodine-derived signal from the data obtained via aerial monitoring measurement, but measurements were conducted every second at altitudes ranging from 100 to 460 meters, and thus various techniques were needed to remove noise. In addition, there was no data to clarify issues such as the degree to which the signal from iodine-131 on the earth's surface attenuated at the altitude where aerial monitoring was conducted, and therefore an attenuation coefficient was found by developing techniques, using a Monte Carlo calculation method for simulating gamma-ray behavior. The data obtained here almost matches the values actually measured on the ground, and thus the method enables evaluation of the concentration of iodine-131 deposited on earth's surface." Furthermore, Mr. Torii said, "These analysis results clarify the two-dimensional dispersion of iodine-131, about which there was little previous information, and thus we expect the result will be useful for evaluating the accident." He also said, "This technique enables evaluation of the concentration of radioactive materials on the earth's surface without using any ground measurements at all, and thus a new technique has been introduced for monitoring from the air in the event of a nuclear emergency, even though it should never happen."

The results obtained in this analysis were published in the August issue of the U.S. journal Health Physics, and in the journal's online version (http://journals.lww.com/health-physics/pages/currenttoc.aspx).There are also plans to release an iPad version.



The image shows iodine-131 deposition on the earth's surface on April 3, 2011.