

Three different structures of radionuclide ratios on the surface soil in the northwestern area from the FDNPP

SATOU, Yukihiko^{1*}; SUEKI, Keisuke¹; SASA, Kimikazu¹; MATSUNAKA, Tetsuya¹; SHIBAYAMA, Nao¹; TAKAHASHI, Tsutomu¹; KINOSHITA, Norikazu²

¹AMS Group, University of Tsukuba, ²Institute of Technology, Shimizu Corporation

The Fukushima Dai-ichi Nuclear power plant (FDNPP) accident caused radioactive contamination on the surface soil at Fukushima and its adjacent prefectures. Substantial contamination has been found in the northwestern area from the FDNPP, according to the airborne monitoring survey and the ground base survey by MEXT, Japan. Radionuclide ratios would have characteristic information on emission source because each nuclear reactor at the FDNPP had different amount of radionuclide and different activity ratio. The activity ratios can be used to make emission source and transport process in the contamination more obvious. We address the issue of radioactive contaminated process, we have measured radionuclides on the surface soil at the town of Namie in the northwestern region from the FDNPP, in the viewpoint of activity ratio.

This study focused on the gamma-ray emitting radionuclides of ¹³⁴Cs, ¹³⁷Cs, and ^{110m}Ag. The activities were decay-corrected as of 11 March 2011 when all nuclear reactors scrammed. Data of activity ratios by our results and the Japanese official report classified the investigated northwestern region into 3 groups. Ratios of 0.02 for ^{110m}Ag/¹³⁷Cs and 0.90 for ¹³⁴Cs/¹³⁷Cs were observed northern area of inside 15 km from the FDNPP. On the other hand, two kinds of ^{110m}Ag/¹³⁷Cs ratios of 0.005 and 0.002 were distributed broadly in the area 60 km away from the plant. The ¹³⁴Cs/¹³⁷Cs ratio was 0.98 there.

The activity ratio in the northern area from the FDNPP corresponds to those of nuclear fuel in Unit 1 according to estimation using the ORIGEN code. The ¹³⁴Cs/¹³⁷Cs in the northwestern area from the FDNPP agrees with that of Unit 2 and 3. The ^{110m}Ag/¹³⁷Cs ratios of 0.005 and 0.002 are 1/5 ? 1/10 of the Unit 2 and 3. Official report has announced that discharges of radionuclides from Unit 2 and 3 occurred on 14th March. It is known that contamination in the northwestern area from the FDNPP took place on 15th March. Ag has higher boiling point than Cs. Reactor core would be cooled down to lower temperature below the boiling point of Ag at the timing when contamination occurred. Thus, Ag with higher boiling point was not much released than Cs with lower boiling point. The ^{110m}Ag/¹³⁷Cs ratio has served to identify the specific sources of contamination in the northwestern area from the FDNPP.

Keywords: Fukushima Nuclear Power plant Accident, 110mAg/137Cs ratio, Surface soil