Dynamics of atmospheric ^{131}I just after the Fukushima accident related to ^{137}Cs by analysis of published data

*Haruo Tsuruta[1], Yuichi Moriguchi[2], Teruyuki Nakajima[3]

1. Remote Sensing Technology Center of Japan, 2. The University of Tokyo, 3. Japan Aerospace Exploration Agency

The spatio-temporal distribution of atmospheric ^{131}I just after the Fukushima Daiichi Nuclear Power Plant (FD1NPP) accident has not been understood due to the very limited measurements, compared to those of atmospheric ^{137}Cs and to many datasets of ^{131}I deposition density measured in east Japan. Accordingly, current estimates of internal exposure from inhalation have large uncertainty. The purpose of this study is to clarify the behavior of atmospheric ^{131}I in east Japan just after the accident, analyzing all the published data in the east Fukushima and Kantou areas. In the Kantou area, we mainly analyzed the data measured at JAEA-Nuclear Science Research Institute (NSRI) in Tokai (Ohkura et al., 2012). In the east Fukushima area, we used the data measured by Ministry of Education, Culture, Sports, Science and Technology (MEXT, 2012), by US Department of Energy (DOE)/National Nuclear Safety Administration (DOE/NNSA, 2011), and by Tokyo Electric Power Company (TEPCO, 2011) who measured on the sites of FD1NPP and Fukushima Daini Nuclear Power Plant (FD2NPP). The particulate/aerosol ^{131}I(g) and volatile/gaseous ^{131}(a) concentrations were decay-corrected to March 11, 2011 to normalize all the data due to the short half-life time of 8 days (the symbol of * is used). The major results are as follows. (1) For most of the dataset, particulate radionuclides were collected on the first filter (HE-40T or HE-40TA), and gaseous radionuclides were collected on the second filter cartridge (CHC-50 impregnated with 10% of TEDA) to increase in the collection efficiency of gaseous ^{131}I. The ^{137}Cs concentrations were detected on not only the first filter but also the second filter. After checking the data at NSRI in detail, we used the ^{137}Cs data only on the first filter mainly due to any contamination of measurement/sampling system (Ohkura et al., 2013; Tsuruta et al., to be submitted), while we used the ^{131}I data collected on both of the first and second filters. (2) The ratios of ^{131}(a+g)*/^{137}Cs in radioactive plumes were divided to three groups of A (10), B (75), and C (360). In addition, the ratios of ^{131}I(a)*/^{131}I(a+g)* were also divided to the same three groups. (3) These differences were caused by each plume, regardless of the measurement sites located in east Fukushima or Kantou area. Radionuclides in the A group were estimated to be emitted from Unit 2 and/or Unit 3, because the ratio of 10 was nearly equal to the inventory data of 9.7 (Unit 2) and 9.2 (Unit 3) by Nishihara et al.(2012). In contrast, the ratios in groups B and C were much higher than in group A. (4) The extremely high ratios of ^{131}(a+g)* /^{137}Cs in Group C measured from the afternoon of March 21 to March 25 were possibly caused by a new emission event after water supply to FD1NPP, such as the one proposed by Hidaka and Ishikawa (2014). This new event should be studied in future, although Group C has not been focused until now.

Keywords: Fukushima Daiichi Nuclear Power Plant, Atmospheric 131I, Ratios of 131I/137Cs, Effect of water supply

