

Revisiting research on the vertical transport of radioactive nuclide from Fukushima Nuclear Accident

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We observed spectrum of gamma rays at the summit of Mt. Fuji by means of germanium (Ge) detector (Micro-Trans-SPEC, ORTEC Ltd. Co.) from July to August of 2014. The detector was installed on the second floor of the first building of Mt. Fuji Weather Station. The second floor is made of the plywood covered with a vinyl and carpet over the H-steel. The roof and wall are made of the H-steel covered with the plywood. The weight of the detector equipped with data logging and battery is 6.8 kg. The Ge crystal which is cylindrical with a length of 40 mm and a diameter of 50 mm is electrically cooled. The detection efficiency is 13 %. Measurable energy of gamma rays ranges from 0 to 3 MeV for 8192 channels. Fig. 10 shows energy spectrum from 0 to 3 MeV versus the number of accumulated counts for one month. All of line spectrum in Figure 1 originated from natural radionuclide, while a continuous spectrum, namely a background, originated from cosmic rays and Compton scattering of measured gamma rays. Fig. 11 shows total counts from July to August of 2014, just one month, and total counts for one day on August 1, 2014. The counts of Cs134 with 605 keV are below the background for one day data, while the counts of the Cs134 are extremely slightly beyond the background for one month data. Magnified spectrum from 600 to 800 keV is shown in Fig. 12. A half-life and main photon energies of Cs137 and Cs134 are 30.2 and 2.06 years and 662 and 605 keV (Emission rate: 85.1 and 97.6 %), respectively. In this study, we investigate these line spectra to identify Cs137 and Cs134. The counts of Cs134 with 605 keV is almost equal to those of the background, whereas line spectra of Cs137 with 662 keV are clearly found. From the spectrum analysis by means of MAESTRO-32, the net counts of Cs137 and Cs134 are 20425 ± 443 and 434 ± 457 , respectively. Therefore, extremely small amount of Cs134 originating from Fukushima Nuclear Accident was transported into the summit of Mt. Fuji. On the other hand, the most of Cs137 originates from nuclear tests in the 1950s to 1960s, because the ratio of Cs134 to Cs137 60 years later is $3.0 \times 10^{-9} : 1$, assuming all counts of Cs137 spectra originates from nuclear tests.

Keywords: Fukushima Daiichi nuclear disaster, Radioactive material, Germanium detector