

Measurement of vertical distribution of environmental radiation using a drone at Choshi

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Increases of radon density in atmosphere [1] and in groundwater [2] at the southern part of Hyogo Prefecture Earthquake in 1995 were reported, respectively. In the case of Tohoku Region Pacific Coast Earthquake, the data obtained the exhaust air monitor that peak duration was long and the peak decreased rapidly before earthquake has been reported at the radiation facility of Fukushima Medical College in Fukushima [3]. An anomalous increase in radon concentration was measured at the Nakaizu observatory on the Izu Peninsula prior to the 2011 Tohoku earthquake [4].

We have reported continuous measurements of atmospheric radon density on the ground at Okayama for three years, Kochi, Choshi and Kiyosumi for two years, to predict earthquakes. In these measurements, we usually measured daily variations of the radon density. A model of the daily variations was proposed by Yoshioka [5].

This time, we tried to measure the vertical distribution of environmental radiation in atmosphere by using a drone (DJI MAVIC2 PRO) with a gamma ray detector, Radi (PA-1100, HORIBA). Preliminary measurement was done at Choshi (N35.71°, E140.84°), inside Chiba Institute of Science (CIS) from 12:06 to 12:17 on Feb. 15, 2020. We observed radiations of 0.056 micro-Sv/h (43m of altitude), 0.05 (56.6m), 0.054 (60.5m), 0.043 (79.5m), 0.036 (101.5m), 0.032 (112.5m), 0.033 (124m), 0.034 (141m) and 0.022 (151.2m). Environmental radiation dose trended to decrease in increase of altitude. Further measurements of vertical distribution of environmental radiation around CIS will be presented.

[1] Igarashi G., Saeki S., Takahata N., Sumikawa K., Tasaka S., Sasaki Y., Takahashi M. and Sano Y. : Ground-water radon anomaly before the Kobe earthquake in Japan, Science, 269, 60-61, 1995.

[2] Yasuoka, Y. and Shinogi, M.: Anomaly in atmospheric radon concentration: a possible precursor of the 1995 Kobe, Japan, earthquake. Health Physics, 72, 759-761, 1997.

[3] Nagahama H., Yasuoka Y., Suzuki T., and Homma Y.: Radon Variation in the Air before the 2011 Tohoku Earthquake (Mw =9.0), Programme and Abstracts, A32-09, The Seismological Society of Japan. 2011, Fall Meeting. (Japanese)

[4] Tsunomori F. and Tanaka H.: Anomalous change of groundwater radon concentration monitored at Nakaizu well in 2011. Radiation Measurements, 60, 35-41, 2014.

[5] Yoshioka K.: Atmospheric Diffusion Process Based on Time Change of ²²²Rn vertical Profile, Journal of aerosol research, 17 (4), 267-275, 2002. (Japanese)

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