C204-P002 **Room: Poster Session Hall** **Time: May 27**

Correlation between radionuclide concentrations in the top soils of active faults and earthquake activity

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Uranium (^{238}U) and Thorium (^{232}Th) are the important source of radionuclides in the decay series. Radionuclides emit one of alpha, beta, and gamma particles with their decays, and finally become lead. In this process, Radon isotopes (^{222}Rn and ^{220}Rn), the only radionuclide in the gas form, are generated. Radon diffuses in rock fractures and in groundwater, and is adsorbed in the surface of minerals. Because Radon can move during crustal movements, Radon measurement is useful for detecting crustal movements in the deep depths and for estimating fault continuities on the ground surface.

The half-lives of ^{222}Rn and ^{220}Rn are 3.8 days and 54 seconds, respectively. Using this big differentiation and Exponential decay, a calculation method of radon concentration by considering the radioactive equilibrium condition was proposed (Koike et al., 2000), which was demonstrated to be useful for characterizing a part of active faults. This study improves the method by applying an alpha scintillation counter method using Pylon AB-5 and a gamma ray spectrum analysis using ORTEC germanium semiconductor detector, which is aimed at clarifying spatial distribution of radionuclide concentrations in the top soils around active faults and detecting its relationship with earthquake activity. For this purpose, three active faults under different geological environments were selected; the Futagawa-Hinagu, Atera, and Nojima faults. The field measurements were carried out from Apr. 2004 to Dec. 2007.

The 111 measurement points in total were set on and around the three faults with 65-cm depth. The radon detector counts alpha particle per one minute successively during 20 minutes. Using the temporal change pattern of the counts, the numbers of radon and polonium atoms were calculated. At the next step, the soils at the hole bottom were gathered, dried, and screened for the gamma ray samples with the same weights and smaller than 0.25-mm diameter particles. By the gamma ray detector, the uranium, thorium, radium, polonium, bismuth, and lead concentrations were quantified.

It was found that the three areas have a common characteristic in the temporal change pattern of the alpha counts: the first minute count is higher than the usual soils, but the second minute count decreases to a half of it and keeps almost the same counts after that. Many micro-earthquakes have been observed in the Futagawa-Hinagu fault area after the main shock during Jun. 2000. The measurement results at the 33 points in this area clarified that the magnitudes of the micro-earthquakes have a spatial correlation with the gamma ray intensities and the radon concentrations. In the Atera fault, high radionuclide concentrations were measured in the fault gouges. In spite of the remarkable distribution of gouges, the radon concentrations and the gamma ray intensities were the smallest in the Nojima fault area among the three areas. This result may be caused by the attributes of constitutive minerals and the shallow level of groundwater.

The Futagawa-Hinagu fault area has the largest number of the micro-earthquakes during the last ten years among the three areas. From our researches, the concentrations of the radionuclides in the top soils around the active faults did not show clear correlation with the fault activities in the late Quaternary, but seem to be affected by the latest seismic activity. To check this assumption, we are analyzing the measurement results in detail furthermore.

Koike, K., Tomita, S., Sakamoto, Y., Yoshinaga, T. and Ohmi, M., 2000. Estimation of active-fault shape using radon concentration in soil gas and numerical simulation. Geophysical Exploratroion (Butsuri-Tansa) , v.53, no.1, pp29-42.