

## Measuring Method of Atmospheric Radon-Thoron Short-Lived Daughter Nuclide and Application for Short-term Earthquake Prediction

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Igneous rocks distributed over the Japanese islands contain many radioactive elements of uranium (U-238) and thorium (Th-232). These elements continue a radiation disintegration and generate the radioactive nuclide of an uranium series and a thorium series. In this series, radon Rn-222 and thoron Rn-220 are the only radioactive rare gas, and all other radioactive metallic elements have a great difference of physical properties. This rare gas does not react at all with other elements, but moves about freely in a base rock or groundwater, and gets scattered and lost easily in the atmosphere especially at the time before an earthquake, and it has the purpose utilized for realization of the short-term earthquake prediction.

This research takes an attention to the short-lived daughter nuclide that renew every day by about 10 hours. The dust samples are used to collect by 4 times per day from the atmosphere with the filter method. Continuous measurement of the dose of radiation is carried out by the Geiger-Muller counter using the sample just behind this collection. It measures at intervals of 1 second for 360 minutes. This continuous intensity change spectrum is analyzed and a nuclide is identified in quest of two kinds of half-life, U series and Th series. Moreover, it asks for the radiation intensity of each short life nuclide (Fig. 1). It measured also by the gamma ray spectrum method, germanium-LEPS simultaneously, correlation analysis with the GM method was performed, and mutual evaluation of the analysis accuracy between both-hands methods was carried out (Table 1).

Continuous observation of the field environmental atmosphere was carried out by the simple simultaneous measuring method by this Geiger-Muller counter. As a result, the regular diurnal variation of the short-lived daughter nuclide of Radon and Thoron was clarified. While following the rhythm of this diurnal variation continuously, a diurnal variation rhythm may change suddenly at unspecified time. The scale, the time, and the position of the earthquake which occurred near the observing point at the time of this sudden change was examined. From a measurement start (2002. 4) to present, the earthquake more than M5 of the conspicuous scale has not occurred in the Chugoku and Kinki districts of the south-west Japan.

From now on, verification of this technique needs to build and maintain the observation organization of prolonged continuation by multi-point observation and continuation of 24 hours. Therefore, it is difficult and it is necessary to build the broader-based measurement network system of full automation instead of the present measurement system depending on man.

Table 1. 短寿命放射性核種の半減期

短寿命娘核種半減期	ウラン系列		トリウム系列	
	$^{214}\text{Pb}$	$^{214}\text{Bi}$	$^{212}\text{Pb}$	$^{212}\text{Bi}$
基準データ	26.8min	19.7min	10.6h	1.01h
$\gamma$ 線スペクトル	23min	25min	8.9h	0.68h
GM測定値	29.9min		7.7h	

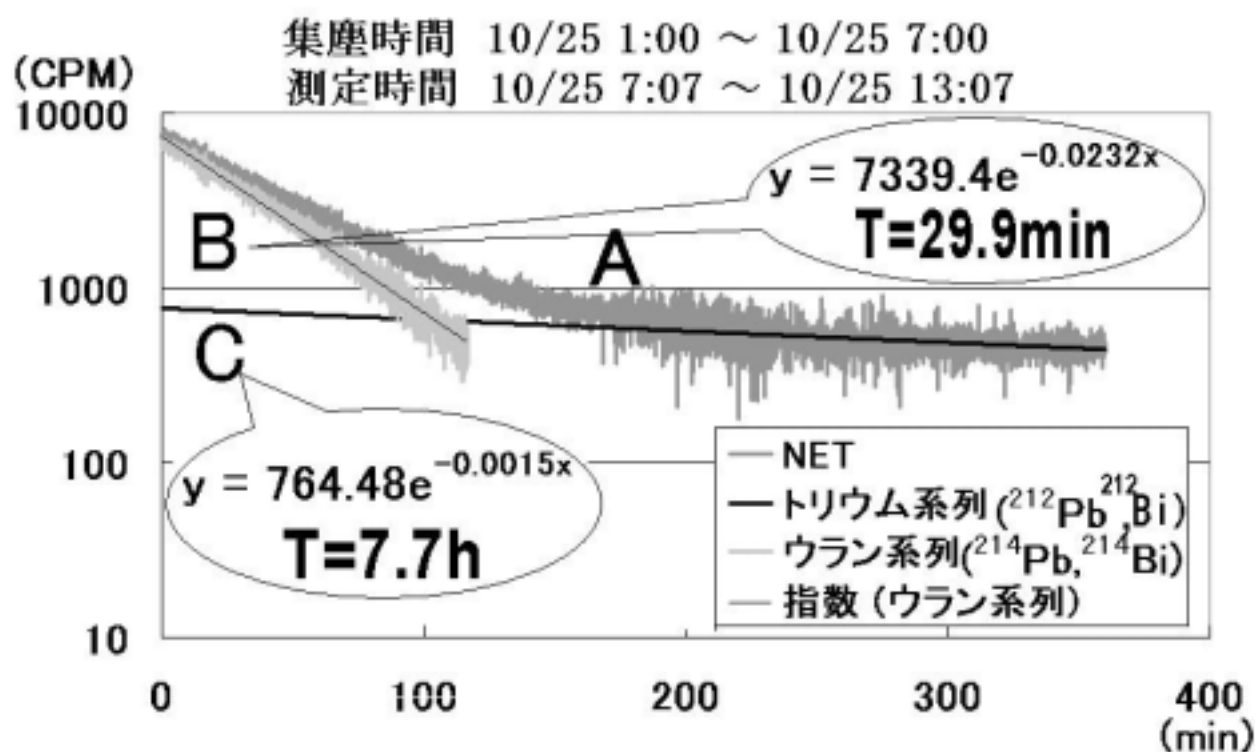


fig. 1. Rn・Tn娘核種放射線強度変化