Short-Term Earthquake Prediction: What could be found by Physical Measurements of Atmospheric Ions and of Radioactive Aerosols?

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It has investigated using various physical measurement equipments to make clear the real image of the atmospheric ions and the radioactive aerosols. Atmospheric ion concentration carried out continuous measurement for five years, released data on Web, and clarified the earthquake sign of change pattern. In April 2002 and afterwards, radioactive aerosols were collected by the filter method and continuous measurement of the sample was carried out by the Geiger-Muller counter immediately after collection being 1-second interval for 360 minutes. In addition, the measurement techniques such as a gamma ray spectrum measurement (Ge-LEPS), a fluorescence X-rays analysis, an electronic probe micro analyzer, and a high sensitivity radiation picture sensor (IP: Imaging Plate) were utilized. It has solved that atmospheric ions and radioactive aerosols has a remarkable close relation as a result.

(1) Continuous measurement of atmospheric ions is carried out for judgment of a positive/negative electric charge, and for the particle size classification of large, intermediate, and small, based on the degree of movement by impressed electromotive force, and the ion concentration (particle counts/cc) for every particle size is carried out for five years with the Gerdien condenser. The special unusual rise of atmospheric-ion concentration took place 3 times in this period, and the possibility of earthquake was forecast on the Web. The earthquake happened twice inside, the Tottori western earthquake (M7.3) after 90 days and the Geiyo earthquake (M6.7) after 7 days, and unlike anticipation of size M6 of Bungo Channel was M4, it failed once remainder.

(2) Gamma ray spectrum measurement equipment (Ge-LEPS) at the laboratory of Prof. Ninagawa have been used for the measuring a series of radioactive daughter nuclides of the uranium and the thorium series. The interior of this Ge-LEPS is covered with an old lead and non-oxygen copper, and its accuracy is very high as its background is very low.

(3) Geiger-Muller counter measurement continues at intervals of 1-second for 360 minutes in Geiger-Muller counter under PC control, the fixed quantity is carried out paying attention to the Radon-Thoron short-lived daughter nuclides of half-life. This technique needs to perform filter exchange four times every 6 hours. Since it is a limit with a human help, a full automation measurement system is under development now.

(4) Fluorescence X-rays analysis equipment of Prof. Seki's laboratory irradiate X-rays at a sample and carry out the quality of a spectroscopic analysis and an element, or a quantitative analysis for the fluorescence X-rays generated from a sample.

(5) Electronic probe micro analyzer equipment of the synthesis apparatus center irradiate an electronic line in a vacuum at a sample, and measure the wavelength and intensity of characteristic X-rays which are generated from a sample.

(6) High sensitivity Imaging Plate (IP) at the gene experiment institution of Okayama University moves a sample stepping at the fixed timing in a plate top, and investigates the radiation intensity and their half-life.

As the results of the measurement operations, the diurnal variation and seasonal variation of atmospheric ion concentration for five years have been checked from the concentration data. Moreover, it is also understood the diurnal variation of the short-lived daughter nuclide concentration of Radon-Thoron. In the early morning, small ions increase and large ions decrease conversely. The small ions consist of water molecular ions by radiation with the free atoms which was newly born from Radon-Thoron rare gas. On the other hand, large ions increase in the afternoon. The aerosol particles in the atmosphere adhere and large radioactive aerosols are made to the surroundings of radioactive free atoms. The radioactive core of the central part continues emitting a beta ray (electron), and maintains the electric charge of positive and causes earth current.