

Correlation between Radon Concentration and Electric Conductivity of Groundwater

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Radon is a radioactive noble gas that is steadily generated from 226-radium contained in rocks. Taking advantages of that radon is radioactive gas and its half-life is 3.8 day short, radon is used as a tracer element for surveying faults, monitoring atmospheric transport and so on. In addition, though a mechanism is not known yet, radon is expected to be an earthquake predictor. In fact, many earthquake precursors in groundwater radon are reported still now.

Groundwater radon concentration depends on both surface area of cracks and permeability of an aquifer, excluding groundwater channeling from another aquifer and disturbance of temperature change. It is however difficult to measure the surface area of the aquifer directly, electric conductivity of groundwater is an alternative parameter indicating a crack density in the aquifer.

The KSM observation well is located at east edge of Futaba fault zone. A screen is placed from 124 m to 129 m in a 200-m-depth borehole. The screen is in a pebble conglomerate layer.

Before continuous monitoring, a drawdown test and a groundwater analysis were carried out. Groundwater radon concentration was measured by a NW-101 (Aloka), an AB-5 with an 300A (Pylon) and a RTM1688 (Sarad). Electric conductivity of groundwater was measured by a S47 with an InLab Redox (Mettler). Groundwater was pumped up in 20 mL/min with a peristaltic pump, and after electric conductivity measurement, it was injected into a gas-water separator. Extracted gas was introduced into radon detectors after removing moisture with an electric dryer. Meteorological parameters (ex. air temperature, barometric pressure, humidity and rainfall), pumping rate, groundwater table level, and groundwater temperature were simultaneously recorded.

Approximate extraction efficiency was 10 %. The aquifer was an aquiclude because the permeability was about 4.1×10^{-6} cm/s. The temperature gradient was 1.3×10^{-2} degC/m, and the discharging rate was about 2 mL/min. The groundwater hardness was about 53 mg/L, and the average electric conductivity was about 2.3×10^{-4} S/cm.

Correlation between radon concentration and electronic conductivity variations of groundwater will be discussed.