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ミュオンを用いた地下水状態把握のテスト計測の紹介(いくつかの観測結果を含めて)
Introduction about test measurement of the muon detection system for monitoring a groundwater (With some observations)

三宮 明[1*] ; 田中 宏幸[2] ; 末永 弘[3] ; 鈴木 浩一[3]
SANNOMIYA, Akira[1*] ; TANAKA, Hiroyuki[2] ; SUENAGA, Hiroshi[3] ; SUZUKI, Kouichi[3]

[1] 電源開発株式会社, [2] 東京大学地震研究所, [3] 電力中央研究所
[1]Electric Power Development Co., Ltd, [2]Earthquake Research Institute,U of Tokyo, [3]Central Research Institute of EPI

The technique to radiographically image the internal structure of gigantic objects by utilizing muon's significant penetration power (muography) enabled us to investigate the internal structure of volcanoes and the city foundation with higher spatial resolution than possible with the conventional techniques.

This observation technique is applicable to exploring a large-scale civil engineering structure, the internal state of a base rock, etc. However, feasibility of muographic application to monitoring inside the large-scale civil engineering structure has not confirmed yet. Therefore, we decided to carry out test measurements in order to explore the possibility of muography for monitoring groundwater levels.

We are currently investigating the response of the groundwater levels to major rainfall events in the landslide area. We selected this area as an observation area. The measurement was carried out from the inside of a scupper tunnel in the base rock. Our muon detection system consists of plastic scintillator, photomultipliers (PMTs), and a high voltage (HV) power supply.

The muography detector was installed to the observation site in August, 2012 and measurement was started on the same date.

The result will be compared with the independent measurement results of groundwater levels and soil resistivity in order to quantitatively assess the technological limit of muography.

So far, we obtained the preliminary result that showed variations in the penetrating muon intensity; hence the density as a response of major rain fall events by plotting a moving average of the 48-hour observation time at different time intervals of one hour, two hours, three hours, and six hours. It showed a clear rainfall effect when the time interval is 6 hours. The future prospect includes further case studies for different rainfall-underground water coupling scenarios.

キーワード: ミュオグラフィー, ミュオン観測装置, 地下水位, テスト計測, 地すべり
Keywords: muography, muon detection system, groundwater, test measurement, landslide