

Operation of a muon detection system under extremely high humidity environment for monitoring underground water table

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Introduction

The technology that enables us to observe the internal structure of a volcano and the city foundation is being developed by utilizing the muon's significant penetration power. From the possibility to use this technology for monitoring underground table, we conducted a test measurement in a scupper tunnel in the base rock.

General Instruction

Our conventional muon detection system consists of plastic scintillator, photomultipliers (PMTs), and a high voltage (HV) power supply. The HV power supply and long HV cable requirement is specific to our choice of PMT (Hamamatsu R7724). Under extremely high humidity environment (constantly 100

In this work, a Cockcroft-Walton (CW) high-voltage PMT socket was designed for use in a scupper tunnel where humidity is constantly 100

The test measurement was carried out from the inside of a scupper tunnel in the base rock. The equipment was installed and the measurement was started in August, 2012. During the observation period between August 9 and 17, the data which suggests the density change in the stratum accompanying a rise of groundwater was obtained. The result will be compared with the independent groundwater level measurement and the resistivity measurements in order to perform quantitative evaluation of muon radiography. The observation will be continued until December, 2013. We anticipate that the measurement technique to observe the density change of the rock overburden from inside of the horizontal tunnel will be useful for the future volcanological measurement.