Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SVC54-P17 Room:Convention Hall Time:May 20 15:30-17:00

Development of low noise calorimeter type cosmic ray muon detector to image internal structure of Usu volcano

KUSAGAYA, Taro[1*], TANAKA, Hiroyuki[1], TAKETA, Akimichi[1], OSHIMA, hiromitsu[2], Tokumitsu Maekawa[2]

[1]ERI, University of Tokyo, [2]Usu Volcano Observatory, Hokkaido University

We are now developing a low noise calorimeter type cosmic ray muon detector to image internal structure of Usu volcano with cosmic ray muon radiography. Usu volcano has often erupted and formed upheavals such as Oo-usu, Ko-usu, Ogari-yama, and Usu-shinzan. But the conduits of these are unspecified. Thus, we intend to find out the internal structure of Usu volcano with cosmic ray muon radiography.

Cosmic ray muon radiography of volcano has been performed several times: Mt. Asama (Tanaka et al., 2007, NI&M A; Tanaka et al., 2007, EPSL; Tanaka et al., 2009, GRL; Tanaka et al., 2010, JGR), Showa-Shinzan (Tanaka et al., 2007, GRL), and Satsuma-Iwojima (Tanaka et al., 2009, GRL). These cosmic ray muon radiographies had been performed between only a few hundred meters to one kilometer of muon penetrating length of volcanoes. Because the cosmic ray muon flux penetrating through a few kilometers of rock is two or more order of magnitude less than that through a few meters of rock, signal-to-noise ratio becomes worse and therefore we cannot properly determine the density structure.

In order to investigate Usu volcano conduits, we need a better signal-to-noise ratio detector for accurate measurement of cosmic ray muon flux penetrating through a few kilometers of rock. So we are now developing a calorimeter type muon detector that is thought effective for reducing noise. The calorimeter type muon detector consists of several position-sensitive detectors. A position-sensitive detector consists of sets of plastic scintillator strips and photomultipliers, and they make matrix-like segments so that we can detect where muon passes through. Utilizing the muon characteristic of straight passing through detector, we count as muon when we can connect pass points of each position-sensitive detector by a straight line.

We focus on 'fake track' as a noise source: electromagnetic particles such as gamma rays and electrons generated above the muon detector can simultaneously pass through each position-sensitive detector and make a track as if muon comes from a target. This noise would be reduced with use of more position-sensitive detectors.

We will report simulation result how fake tracks are reduced as number of position-sensitive detector changes by combining cosmic ray simulation and reconstruction of muon detector on computer.