Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

U02-P01 会場:3 階ポスター会場 時間:4 月 28 日 18:15-19:30

Review of the recent muon radiography observations by using nuclear emulsion detector

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宮本 成悟 [1*]
MIYAMOTO, Seigo[1*]

[1] 東京大学
[1]The University of Tokyo

Nuclear emulsion is one of three dimensional particle tracker which have micron position resolution and the feature that no electricity so we can put this detector everywhere easily and also this is suitable for non-fixed point observation.

Several observations for volcanoes were done and will be done from 2011 to 2014. The imaging the of Unzen lava dome, which was formed from 1991 to 1995, was done by Miyamoto et al and they found the detector got many back ground particles and the amount is more than several times than expected muon signal. this implies that we are on the stage of background particle study.

The emulsion cloud chamber (ECC) is a modular structure made of a sandwich of passive material plates such as lead interleaved with emulsion film layers. Nishiyama et al studied the source of background noise in cosmic-ray muon radiography using ECC. They found that the origin of background is expected to be electromagnetic components of air-showers or cosmic-ray muons scattered in topographic material whith momentums is less than 2GeV/c.

The shallow conduit shape of Stromboli will provide the important information for eruption dynamics modeling by Tioukov et al. Hernandez et al put the emulsion detector near the top of summit of Teide volcano to investigate the past eruption histroy of Teide. Teide volcano is located in Teferife, Canary Islands, Spain. They are also under observation of the fault appeared in La Palma, Canary Island, in 1949, which is the sign of huge land collapse or not. The width of the fault is expected to be 1 meter or less, so high position resolution of emulsion detector is suitable for this observation. They will measure the width, delth and the porosity of this fault.