

A pilot muon radiography to image the shallow conduit of the Stromboli volcano: results and future prospects

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The test result of imaging the shallow part of the Stromboli crater zone by using cosmic-ray muons in 2012 and possible performance of the future muon observation will be presented. It is well known that the behavior of volcanic eruptions strongly depends on the shape of the conduit. Stromboli is one of the most known and studied active volcanoes in the world, nevertheless the details of its internal structure are not well defined yet. Geophysical exploration method which use high energy cosmic-ray muons and makes the density image of the object like X-ray radiography for the human body is called "muon radiography" or "muography". A pilot muography was done for the shallow part of Stromboli in 2012. We succeeded to clarify that there is a less density part at the North-East cone in the crater zone. It is considered that the stack of volcanic ashes. On the other hand, we also confirmed that the contamination of the physical background particles and they makes the noisy density image especially about 50 meter below from the top of the crater. In another observation, Nishiyama et al (2014) revealed the contents of background particles and the way to remove them were presented. They showed that the main contents of the background particles is low kinetic energy charged particles and also showed that it is possible to remove them by using multi-layered muon film detector. We can plan the future muography observation to see the deeper part of the conduit(at least until 100 meter from the top of crater) by their backgroundless method. Therefore we estimated possible performance of the future observation by multi-layer muon films. The result suggests that we might get the image of shallow conduit from the surface to the depth of e.g. 55 meter with 20 meter spatial resolution or 100 meter with 27 meter resolution in case the density in the conduit is 0.0 g/cm³ and with 71 percent statistical confidence level.