

Muon radiography at Teide and Cumbre Vieja volcanoes, Canary Islands, Spain

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The aim of volcano monitoring is to assess the current state of the volcano in its eruptive cycle, estimating its evolution in the near future, and quantifying its associated risk. To quantify the hazard level of an eruption it should be ideal to access to the internal structure of a volcano and estimate the source parameters (changes in volume, density, pressure) associated with the transport of fluids (magma, gas water), or physical-chemical evolution of volcanic materials (eg hydrothermal alteration). Because of the social impact that represent active volcanoes such as Mount Teide and Cumbre Vieja in the Canary Islands, these volcanoes are currently subject to careful monitoring based primarily on a network of geophysical, geodetical and geochemical monitoring stations. In addition to volcano monitoring by classical techniques, these volcanoes also provide unique and privileged place for the installation of new surveillance methods as cosmic-ray muons. This novel technique has recently been used successfully in Japanese volcanoes allowing a visually access to the internal distribution of densities on the volcano, and therefore its internal structure. This technique is based on measuring the flux of muons of cosmic origin and its attenuation in passing through the rock. Consequently, muon radiography is an ideal technique to obtain direct information on the density distribution of geological bodies in Canary volcanoes. For these reasons, we propose in the context of a new research project a study of cosmic-ray muons radiography in two Canary active volcanoes such as Mount Teide in Tenerife and Cumbre Vieja on La Palma, Spain. This will be the first time you study the internal structure of these volcanoes with a spatial resolution unattainable with conventional geophysical methods. In this project we intend to apply this technique together with a geochemical study of volatile gases in the atmosphere and surface of the volcanoes selected to assess the state of volcanic activity.