

Ngauruhoe volcano as a target for muon tomography

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Abstract

Ngauruhoe (2287 m high) was New Zealand's most active volcano for over a century until 1975, when after a series of Vulcanian eruptions, it became quiescent. It is a steep conical volcano, which had an open vent about 200 metres deep in late 1973, which has since filled up. It is important in considering the hazard of future eruptions to know whether its former vent is blocked by solid lava or just rubble.

Muon tomography offers a method to measure the density within the upper part of the volcano, and can potentially answer this question. Based on measurements of the deep open vent that existed in late 1973, and using the current topography, we have calculated the effect on the muon attenuation profile of a density anomaly in the old vent region. This shows that an indication of any different density region within the upper cone can be obtained with a muon recording site at about 700 metres below the summit. A 50% change in density of the old vent region would produce up to 10% change in the total attenuation length for muons on paths through this region.