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Application of muon radiography to Mt. Etna volcano

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During the summer of 2010, we installed a muon telescope on the summit zone of Etna, to perform a muon radiography of the volcano's Southeast Crater (SEC). Unfortunately, due to some technical issues, the acquisition time was limited to only one month. Following the results of a feasibility study we performed before deploying the telescope, the 1-month acquisition time is not enough to reach the required signal-to-noise ratio, under the conditions of the experiment.
Even though a clear picture of the internal density structure of the SEC cannot be assessed using the available dataset, the experiment we performed gave precious hints on (i) the average bulk density of the target structure and (ii) the standards needed to withstand the harsh environment in the summit zone of an active large-sized volcano, like Etna. Both pieces of information will be used to inform future experiments of muon imaging at Mt. Etna.
The average bulk density of the target, derived from the observed attenuation of the muon flux, is lower than expected. This result could in part depend on background noise from false muon tracks. However, precise gravity/GPS measurements, performed in the SEC area during the summer of 2010, also points to an average density of the cone lower than expected.