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Muography for the Colombian Volcanoes

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We describe the Muography Program to study the Colombian volcanoes. Mainly, we discuss the adopted criteria for designing, building, and commissioning *MuTe*: a hybrid Muon Telescope. *MuTe* implements a composite detection technique combining a hodoscope for particle tracking and a water Cherenkov detector for enhancing the muon-to-background-signal separation due to the high energy component of extended air showers. We discuss the detailed *MuTe* digital twin employed to estimate the instrument's response to the muon flux and its impact on its design and performance. The impinging muon flux calculation and its corresponding signals in the detector considers three critical factors with different spatial and time scales: the geomagnetic effects, the development of extensive air showers in the atmosphere, and the detector response at a particular geographic point. Next, we examine the structural –mechanical and thermal– behaviour of *MuTe*, its first calibration measurements and identify the possible volcano candidate with the best observation points. *MuTe* incorporates particle-identification techniques for reducing the background noise sources and discrimination of fake events by a picosecond *Time-of-Flight* system. Finally, we also discuss some optimization algorithm to improve the volcano internal density distribution measured by our instrument.

Keywords

Muography, Muon tomography, Muon radiography, Volcanoes
Cosmic ray techniques

Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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