EGU22-9746, updated on 10 Aug 2022
https://doi.org/10.5194/egusphere-egu22-9746
EGU General Assembly 2022

Initial results of the MURAVES muon telescope at Mt. Vesuvius

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The MURAVES (Muon Radiography of VESuvius) muon telescope was conceived to study the internal structure of Mt. Vesuvius, an active volcano near Naples, Italy, using the absorption of muons generated by cosmic-ray showers in the upper atmosphere (a technique also known as "muography"). Even though the volcano is currently quiescent, this system presents a potential hazard for its highly populated surroundings. Muographical imaging data of the summit cone combined with gravimetric and seismic measurements may help the modeling of possible eruptive dynamics.

The MURAVES telescope currently consists of three identical, independent muon hodoscopes, each of them made of four 1m^2 active area XY tracking stations and a 60cm thick lead wall placed in between the two downstream stations to passively reduce the background from low energy muons. The tracking stations are constructed using scintillator bars that are coupled via wave-length shifting fibers to silicon photomultipliers. The apparatus has been installed on Mt. Vesuvius and is currently acquiring data. Next to a description of the telescope setup, initial, preliminary results from the analysis of first data samples will be presented.

In addition, we will report on a number of simulation studies that allow us to investigate the effects of the experimental constraints and to compare our simulated data with the actual observations. The simulation chain is based on Geant4, and for the generation of cosmic showers a comparative study of particle generators, including CORSIKA and CRY, has been done to identify the most suitable one for our simulation framework. Muon transport through the mountain is being addressed using PUMAS and Geant4. We will present ongoing work on e.g. the detector digitization in the simulation, the muon track reconstruction and tracking inefficiencies, the effects of the lead wall, dark noise and other nuisances, and the simulation to measured data comparison.

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