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Seasonal variation of atmospheric muons

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Competition between decay and re-interaction of charged pions and kaons depends on the temperature/density profile of the upper atmosphere. The amplitude and phase of the variations depend on the minimum muon energy required to reach the detector and on muon multiplicity in the detector. Here we compare different methods for characterizing the muon production profile and the corresponding effective temperature, with application to measurements of single and multiple muons by MINOS and NOvA in mind. A muon production profile based on a parameterization of simulations of muons as a function of primary energy is compared with approximate analytic solutions of the cascade equation integrated over primary energy. One goal is to determine the extent to which the geometrical effect of muon production at higher altitude when the temperature is higher can explain the anti-correlation with effective temperature observed for multiple muon events. Another is to compare different methods in the literature for defining effective temperature.

Keywords

muons; multiplicity, variation, underground

Collaboration

other Collaboration

Subcategory

Theoretical Methods

Primary author: GAISSER, Thomas (University of Delaware)

Co-author: VERPOEST, Stef (Ghent University)

Presenter: GAISSER, Thomas (University of Delaware)

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