
Search for Muons in Association with Large Solar Flares with the GRAPES-3 Multidirectional Muon Telescope at Ooty

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Abstract

We have measured the variation of muon intensity for the past four years at Ooty (altitude 2,200m, lat. 11.4 N, long. 76.7 E) using the muon detectors of the GRAPES-3 experiment. These muon detectors are constructed primarily to observe the muon component in air showers. We have also installed an angle measurement system for individual incoming muons with total sensitive area of about 420 m². We have searched for short time variations in muon intensity associated with large Solar flare events for the years 2000–2001. Since the total counting rate of muons is very large, $\sim 1.8 \cdot 10^9$ counts/hour, due to the large area of the muon detector, it is possible to detect even very small increase in muon intensity associated with solar flare, at a level of $\sim 5 \cdot 10^{-4}$ in a 100 second interval. Since we know the direction of muons, we are able to estimate the correlation between the muons and Solar Flare by utilizing the Sun's direction, arrival time, intensity of muons, structure of IMF and the magnetic field of the Earth. We present here the experimental results along with detailed simulations on cosmic ray particle trajectories.