

The lateral distribution of vertical and inclined showers during thunderstorms at LHAASO observatory

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Ground-based cosmic ray observatories generally record the information on the arrival time and location of each hit to reconstruct the primary direction of the shower event. During thunderstorms, the direction of secondary charged particles is changed due to the acceleration and deceleration of the particles when they cross layers of electric field. The thunderstorm field also has a secondary effect on the photons generated via bremsstrahlung, emitted by the high-energy positrons and electrons. So, the lateral distribution of ground cosmic rays could be influenced during thunderstorm. In this work, we performed Monte Carlo simulations by using CORSIKA to study the effects of near-earth thunderstorms electric field on the lateral distribution of vertical and inclined showers at LHAASO (4410 m a. s. l., Daocheng, Sichuan, China). We found the lateral distribution of secondary positrons, electrons and photons changed in field. The variation amplitude is not only dependent on electric field, but also highly correlated with the primary energy and direction of the shower event. Our simulation results are useful to understand the acceleration mechanisms of secondary particles caused by an atmospheric electric field, as well as the experimental data obtained by ground-based detectors (such as LHAASO, ARGO-YBJ).

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Near-earth thunderstorms electric field, Lateral distribution, Monte Carlo simulations, Cosmic rays

Collaboration

other Collaboration

Subcategory

Experimental Results

Primary authors: CHEN, Lin (Southwest Jiaotong University); AXI, Kegou (Southwest Jiaotong University); ZHOU, Xunxiu; HUANG, Daihui; HUANG, Zhicheng (Southwest Jiaotong University); WANG, Peihan (Southwest Jiaotong University)

Presenter: ZHOU, Xunxiu

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