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Study of Forbush decrease in Cosmic-Ray Electron plus Positron events detected with DAMPE

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The Forbush Decrease (FD) is characterized by a sharp decline followed by a gradual recovery in the intensity of low-energy cosmic rays. This phenomenon is thought to be caused by disruptions in the heliosphere caused by solar events, such as coronal mass ejections (CMEs). The Dark Matter Particle Explorer (DAMPE), a satellite-based experiment designed for detecting the cosmic radiation, including electrons plus positrons, provides a unique platform to investigate FDs using these particles, which have seldom been studied in detail before. In this study, the DAMPE electron plus positron data are analyzed with the aim of investigating the properties of eight FDs since the mission start in December 2015 until 2024. An explanation on energy correlation with FD recover time is also proposed. In order to address the impact of CMEs on cosmic ray propagation within the solar system, the stochastic differential equation method is utilized. This approach allows for an accurate modeling of the cosmic ray transport under disturbed conditions. Finally, the model predictions are compared with observational data to validate the results.

Collaboration(s)

DAMPE collaboration

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