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Cosmic ray diurnal variation over two decades measured by the GRAPES-3 muon telescope

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The Galactic cosmic ray particles in the inner heliosphere are convected outward by the solar wind while they diffuse into the inner heliosphere along the interplanetary magnetic field direction. A balance between the two processes produces an anisotropic flow of the GCR particles. The ground-based neutron or muon detectors can observe it as a 24-hour periodic variation in their counting rates due to the rotation of the Earth. The GRAPES-3 muon telescope located at Ooty, India, is the largest in the world, and it records four billion muons daily, allowing it to probe tiny variations in cosmic ray flux caused by solar activities. The daily variation called solar diurnal anisotropy (SDA) observed in the GRAPES-3 muon data was modeled using the Fourier series technique, and the respective amplitudes were extracted for 21 years (2001-2021) of data. The yearly mean amplitude of SDA was found to have a strong correlation with the interplanetary magnetic field and a reasonably good correlation with other solar parameters, which will be presented during the symposium.

Session

Astroparticle Physics and Cosmology

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