

Long term variation of the solar diurnal anisotropy of galactic cosmic rays over four solar activity cycles

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The galactic cosmic ray (GCR) anisotropy observed with the muon detector network monitoring high-energy GCR intensity provides us with unique information of physical parameters, such as the spatial density gradient and the scattering mean free path of GCRs, which reflect the large-scale magnetic structure governing the GCR propagation in the heliosphere. The solar cycle variation of the anisotropy particularly gives important information on the temporal variation of the GCR propagation in the heliosphere. In this paper, we analyze the solar diurnal anisotropy observed with a network of surface and underground muon detectors monitoring the primary GCRs in a wide energy range of 50-500 GeV. This network includes a detector at Nagoya which has been in operation more than 40 years. The derived anisotropy shows clear 11-year and 22-year variations respectively in clear correlations with the solar activity- and magnetic-cycles. We will discuss the physical mechanisms responsible for these long-term variations.

Keywords: galactic cosmic rays, solar diurnal anisotropy, muon detector networks