

Diurnal variations of galactic cosmic rays as detected by polar neutron monitors

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Galactic cosmic rays (GCRs) present a small local anisotropy visible as a diurnal variation in the count rates of the ground-based neutron monitors (NMs). NMs have varying capabilities in observing these fluctuations due to their different asymptotic directions that span a wide range of latitudes. Due to the Earth's rotation, they continuously scan the GCR flux producing the diurnal variation in the count rates. Our study reveals that Dome C (DOMC) is the only NM that does not observe this daily variability (the amplitude is $<0.03\%$) in contrast to other polar NMs, whose diurnal variation amplitudes range from 0.16 to 0.4%. The reason for this is the narrow asymptotic cone of the DOMC NM, which is directed almost towards the polar direction with a geographic latitude of over 75 degrees. As a result, DOMC NM is uniquely positioned to receive cosmic rays from outside the equatorial plane, making it particularly useful for investigating 3D cosmic-ray transport in the Earth's vicinity, especially during anisotropic solar energetic particle events.

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