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Time Variations of GeV-range Cosmic Rays

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Time variations of the flux of low-energy (GeV-range) cosmic rays are observed at Earth. On one hand, the flux of Galactic cosmic rays is modulated by the long term magnetic activity of the Sun (11- and 22-year solar cycle). On the other hand, the propagation of transient solar activities in the local space environment disrupts the flux of cosmic rays impinging Earth with a time scale from seconds to weeks (Forbush decreases, Solar Energetic Particles). For about six decades, ground-based neutron monitors have been the premier instruments to measure the time variations of the cosmic rays and provide an unique insight of the Sun's influence on Earth. The United States, which owns and operates ten neutron monitor stations (newly called the Simpson Neutron Monitor Network), is one of the main data providers to the worldwide neutron monitor network. At the dawn of the new solar cycle, I present the status of the neutron monitor network, its key role, alongside space instruments such as AMS-02, to measure the future time variations of the cosmic rays. I discuss recent developments of the neutron monitor observations based on details of the timing distributions of the neutron detections that extend the reach in energy of the neutron monitor network. Finally, preliminary results of the large solar event observed on October 28th, 2021 are presented.