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Diurnal Dips and Forbush Decreases in Galactic Cosmic Rays Observed at High Cutoff Rigidity

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A Forbush decrease (FD) is the decrease in Galactic cosmic ray (GCR) flux, e.g., as observed by a neutron monitor count rate, in association with a coronal mass ejection (CME) and/or its shock. The FD amplitude is known to decrease at higher cutoff rigidity. During Solar Cycle 24, the Mawson neutron monitor in Antarctica, with a low (atmosphere-limited) cutoff rigidity of ~1 GV, observed numerous FDs, while the Princess Sirindhorn Neutron Monitor (PSNM) located near the Earth's equator at Doi Inthanon, Thailand, with the world's highest geomagnetic cutoff rigidity (17 GV), observed only a fraction of these as FDs. Instead, we find that the shock arrival is often followed by repeated dips in the PSNM count rate at only certain times of day, while the GCR flux from other directions remains near the pre-shock level. We refer to decreases of this type as diurnal dips. In this work, we have surveyed FDs and diurnal dip events observed by PSNM and the dependence of their maximum amplitude on the solar wind speed, ICME speed, and interplanetary magnetic field. We acknowledge logistical support from Australia's Antarctic Program for operating the Mawson NM and support from the National Astronomical Research Institute of Thailand and grant RTA6280002 from Thailand Science Research and Innovation.