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Observation of Cosmic Ray Variation with Atmospheric Water Vapor at Doi Inthanon

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Neutron monitor (NM) and Bare (lead-free) neutron counters are ground-based detectors to detect the variation of intensity in cosmic rays. In addition, the bare detector to neutron monitor count rate ratio (Bare/NM) provides information on the cosmic ray spectrum. In the present work, we utilized data from the Princess Sirindhorn Neutron Monitor station at Doi Inthanon, Thailand, with the world's highest cutoff rigidity of 16.8 GV to observe variations in cosmic rays with time. We also found that variation in Bare/NM is strongly anti-correlated with surface atmospheric water vapor (E_w), with a nonlinear relationship. The water vapor pressure data can be inferred from the Global atmospheric Data Assimilation System (GDAS) and Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2). From these database we derive precipitable water vapor (PWV), i.e., the column density of water throughout the atmosphere. The results of comparison of PWV from the two database, from balloon data, and from GPS detectors in Chiang Mai Province will be discussed, and we will examine whether the Bare/NM count rate ratio at Doi Inthanon has a more linear relationship with PWV.

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