Variations in the Neutron Time Delay Distribution at the Princess Sirindhorn Neutron Monitor

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The Princess Sirindhorn Neutron Monitor (PSNM) operates since late 2007 at the summit of Doi Inthanon, Thailand's highest mountain (2565 m altitude). PSNM records the flux of galactic cosmic rays with the world's highest vertical cutoff rigidity for a fixed station, 16.8 GV. In addition to monitoring the count rate, PSNM has special electronics to record the time delay of each neutron from the previous one in the same tube. We accumulate and collect hourly time delay histograms for individual tubes (with over 50,000 counts), which show an exponential tail at long times (> 1 ms) due to chance coincidences, i.e., counts associated with independent atmospheric nucleons. Shorter time delays, however, are dominated by counts from the same interaction between a Pb nucleus in the neutron monitor and an atmospheric nucleon, thus containing information about the energy distribution of atmospheric shower particles. We use time delay analysis to derive the leader fraction, L, i.e., the fraction of neutron counts not associated with a previous neutron count in the same tube from the same nuclear interaction. L has a similar meaning as inverse multiplicity, except that the effects of chance coincidences have been removed. While time variations in PSNM multiplicity are dominated by "contamination" from variations in chance coincidences according to the count rate (uncorrected for pressure), this is not evident for L. We report on variations of L with time and their possible origin.