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Preliminary atmospheric effects through air showers at Agra using DEASA experiment [Online]

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Dayalbagh Educational Air Shower Array is the first detector array in Northern India (Uttar Pradesh) to study cosmic rays. Investigations of the physical behaviour of the cosmic ray variations in various time scales are an important aspect of cosmic ray astronomy. In other words, the modulation of cosmic rays is an important tool for investigating disturbed behaviour in the heliosphere. Longer time scales are related to solar activities of the solar cycle, while shorter time variations can be associated with Earth's atmospheric phenomena.
In this paper, the atmospheric temperature and pressure effect on count rates of DEASA detectors for 7 hours daily spanning 170 days. These detectors have been calibrated since January 2022 and are located at Agra, India (27.18O N, 78.02O E, 170 m above sea level) where the geomagnetic rigidity cut-off value is 22 GV. The barometric coefficient obtained from the graph of atmospheric pressure vs count rates is -1.14 /mbar and the temperature coefficient is 0.4/ degree C. The skewness and kurtosis for pressure distribution were -0.91 and -0.18, for temperature distribution were 0.40 and -1.05, and for count rates were -1.22 and 1.23.
Further, linear regression analysis has been performed, and a scatter plot between relative intensity vs time, relative pressure vs time, and relative temperature vs time. Added graphs between the relative intensity of cosmic ray flux and pressure and temperature respectively are shown and coefficients are compared with other experiments.
Air showers have been simulated by CORSIKA code at specifications of Agra with iron, proton, and alpha as the primary particles. The longitudinal profile of the showers at different atmospheric depths is studied. The Monte Carlo simulation code provides hadronic interaction models at higher energies. EPOS model with QGSJET and later DPMJET models have been selected for the studies. The lateral profile of the showers is also plotted. The muon charge ratio has been observed from the output generated in CORSIKA.

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