World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:18, No:09, 2024

Observational Study Reveals Inverse Relationship: Rising $PM_{2.5}$ Concentrations Linked to Decreasing Muon Flux

Authors : Yashas Mattur, Jensen Coonradt

Abstract : Muon flux, the rate of muons reaching Earth from the atmosphere, is impacted by various factors such as air pressure, temperature, and humidity. However, the influence of concentrations of $PM_{2.5}$ (particulate matter with diameters 2.5 mm or smaller) on muon detection rates remains unexplored. During the summer of 2023, smoke from Canadian wildfires (containing significant amounts of particulate matter) blew over regions in the Northern US, introducing huge fluctuations in $PM_{2.5}$ concentrations, thus inspiring our experiment to investigate the correlation of $PM_{2.5}$ concentrations and muon rates. To investigate this correlation, muon collision rates were measured and analyzed alongside $PM_{2.5}$ concentration data over the periods of both light and heavy smoke. Other confounding variables, including temperature, humidity, and atmospheric pressure, were also considered. The results reveal a statistically significant inverse correlation between muon flux and $PM_{2.5}$ concentrations, indicating that particulate matter has an impact on the rate of muons reaching the earth's surface.

Keywords : Muon Flux, atmospheric effects on muons, $PM_{2.5}$, airborne particulate matter
Conference Title : ICMP 2024 : International Conference on Muon Physics
Conference Location : Prague, Czechia
Conference Dates : September 05-06, 2024

Open Science Index, Physical and Mathematical Sciences Vol:18, No:09, 2024 publications.waset.org/abstracts/174018.pdf