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Exploring cosmic rays with educational outreach activities: a long-term study of the correlation between atmospheric conditions and muon counts

The Earth atmosphere is constantly reached by cosmic rays, energetic and subatomic particles coming from all directions. A muon telescope is hosted in the Legnaro National Laboratories (LNL) of the Italian Istituto Nazionale di Fisica Nucleare (INFN). This instrument is used to introduce the students to research activities in the field of particle physics. In particular, during the International Cosmic Day (ICD) and in following Pathways for Transversal Competences and Orientation (PCTO) activities, students can do measurements and data analysis of the muon flux reaching the Earth's surface. It is indeed well known that this flux is affected by the atmospheric condition where the measurement is done. In this contribution, we present the long-term investigation performed with high school and bachelor students in Physics at the University of Padova, of the anticorrelation between muon counts and atmospheric pressure as measured with the muon telescope in LNL using the data collected from 2022 to 2024. The results from our analysis confirm the stability of this anticorrelation during the data taking. Further analyses allow us to investigate also the time variation of these correlations in different months, indicating a possible effect due to summer and winter conditions. Currently we are investigating also the impact of other atmospheric-related correlations, such as temperature and humidity.

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