

Muon flux measurements during the 2017 total solar eclipse

*Katerina Merrill¹, Kim Nielsen¹

1. Department of Physics, Utah Valley University

Cosmic rays are high energetic particles impacting upon the Earth's atmosphere leaving trails of fundamental particles such as pions, kaons, and muons, which decay into additional particles through cascade processes. These cosmic rays originate mainly from sources outside our solar system but a small fraction originate in the Sun. The objective of this experiment was to determine whether the incidence of secondary cosmic rays fluctuated during the 2017 total solar eclipse, with the hypothesis that the part of the atmosphere directly in the shadow of the Moon would contain fewer muons. As part of the experiment, a muon detector was deployed near the centre of totality in Wyoming, USA. The data acquisition was performed over several hours to establish baselines before and after the eclipse. When a muon enters the detector, it loses some of its kinetic energy, which is then transferred into the atoms of a fluorescent emitter leading to light emission detectable by photomultiplying tubes. In this presentation, we detail the physics behind secondary cosmic rays, the detection unit, and the space weather impact of the 2017 solar eclipse on cosmic rays reaching the Earth's surface.

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