Contribution ID: **190** Type: **Oral**

High-energy photonuclear reactions and muon content of extensive air showers

Monday 25 August 2025 14:34 (17 minutes)

The observed excess of muons in extensive air showers (EAS) compared to Monte-Carlo (MC) simulation predictions emphasizes the need for a more detailed modeling of muon production processes in EAS. While numerous previous studies have primarily focused on the hadronic component of EAS, they have not yet provided a definitive solution to the muon excess.

In this work, we examine a subdominant source of muons in EASs: photonuclear reactions within the electromagnetic component of the showers. Using MC simulations, we have developed a semi-analytical model that, on the one hand, predicts muon yields over a wide range of experimentally allowed photonuclear cross-section models. On the other hand, our model directly constrains the high-energy photonuclear cross-section itself based on relevant EAS's observations.

We discuss the potential of our approach in explaining the muon excess.

Collaboration you are representing

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Session Classification: High-Energy Astrophysics and Cosmic Rays

Track Classification: High-Energy Astrophysics and Cosmic Rays