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## Constraining Hadronic Interaction Models with UHECR Observables

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In the physics of Ultra-High Energy Cosmic Rays (UHECR), there is a well-established disagreement between the predictions of the last generation of hadronic interaction models and the measurement of the number of muons. Lately, there have also been hints of a disagreement on the scale of shower maxima. The MODified Characteristics of Hadronic Interactions (MOCHI) is a simulation framework created for the purpose of exploration of plausible changes to final states of hadronic interactions. We focus on the observables of  $X_{\text{max}}$  and  $R_{\mu}$  measured at the Pierre Auger Observatory and quantify the changes to cross-section, elasticity, and multiplicity of the hadronic interactions that describe the apparent shifts in the scales of the observables. We systematically explore the implications. In particular, we show that such modifications are in conflict with other data measured at Pierre Auger Observatory. Finally, we take a cursory look at the newest generation of hadronic interaction models and describe where they lie in the space of parametric changes explored by MOCHI.

### Collaboration(s)

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