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Starburst Galaxies as possible sources of UHECRs and neutrinos

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The coexistence of powerful accelerators of cosmic rays with intense background radiation fields creates unique conditions in astrophysical sources, where the Ultra-High-Energy-Cosmic-Rays (UHECRs) interactions could take place copiously and produce several secondary particles.
In particular, such phenomena could explain the features observed in the UHECR spectrum measurements.
We explore this scenario extending SimProp, a simulation code for UHECR extra-galactic propagation, allowing us to compute the interactions inside and outside the source.
Inspired by recent results on the anisotropy in the arrival directions of the highest energy cosmic-rays, we perform our simulations in the context of Starburst Galaxies, one of the most promising candidate sources.
We model the interactive and diffusive processes in the region surrounding the Starburst Nucleus, taking into account interactions with background photons and the interstellar medium. The escaping cosmic-ray flux is then propagated to the Earth and compared with the experimental spectrum and composition measured by the Pierre Auger Observatory.
The proposed method could be used to connect the features of the UHECR spectrum and composition at Earth to the parameters describing Starburst Galaxies.
In addition, neutrinos directly produced in these sources can be compared with the measured IceCube flux, thus providing an additional way to constrain some source parameters.

Subcategory

Experimental Results

Keywords

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Collaboration

other Collaboration

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