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Interpretation of the energy spectrum observed with the Telescope Array surface detectors

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We present the latest energy spectrum of ultra-high-energy cosmic rays (UHECRs) with energy E > $10^{18.2}$ eV observed by the surface detectors of the Telescope Array experiment. The broken power law to the spectrum contains two break points, a flattening known as the "ankle" or "dip" at E = $10^{18.70}$ eV, and a steepening at E = $10^{19.75}$ eV. These spectral features are related to the distribution of cosmic-ray sources, their injection spectra, and energy loss processes during the propagation of UHECRs in inter-galactic space. In this talk, we consider a phenomenological model of proton sources distributed either uniformly or following the large-scale structure distribution. We show that in both cases it is possible to produce satisfactory fits assuming a power law injection spectrum and strong evolution of the source density with redshift. We also discuss constraints on the source model parameters, e.g. the injection power law and cosmological evolution and average distance between sources.

Collaboration

Telescope Array

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