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A study of the energy spectrum and composition of cosmic rays up to the highest energies

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Motivated by the recent high-precision measurements of the cosmic-ray energy spectrum and composition by several new-generation experiments, a detailed study to understand the observed properties of cosmic rays up to the highest energies is being conducted. The study involves building a cosmic-ray propagation model in the Galaxy that explains the observed spectra of different cosmic-ray elements at GeV-TeV energies measured by balloon and satellite borne experiments. The contribution of Galactic cosmic rays to the all-particle cosmic-ray spectrum at higher energies measured by air-shower experiments is determined by extrapolating the spectra of different elements obtained from the Galactic propagation model to energies above the "knee" ($\sim 3\times10^{15}$ eV). Only the maximum energy of protons accelerated by the Galactic sources is taken as the model parameter. In addition, the contribution of extra-galactic cosmic rays is calculated by taking a reasonable assumption for the source distribution and the nature of cosmic-ray propagation in the intergalactic magnetic fields. Preliminary results indicate the requirement of an extra component of Galactic cosmic rays in order to explain the observed all-particle energy spectrum between $\sim 10^{16}$ and 10^{18} eV. Details about the comparison of the model predictions with the observed all-particle energy spectrum and composition up to energies $\sim 10^{20}$ eV will be presented.

Collaboration

– not specified –

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