

A new model for VHE CRs in our Galaxy and their diffuse gamma-ray emission

The origin of the knee in the cosmic ray (CR) spectrum is still unknown after 65 years of studies. Here, within the framework of anisotropic CR diffusion models, we show that the knee is a time-dependent feature, and that the flux in this region contains major contributions from one or a few nearby recent CR sources. We calculate the propagation of CRs in the Jansson-Farrar galactic magnetic field model, after injecting them at discrete sources in the disc of the Galaxy. Anisotropic diffusion plays a key role in reconciling the large diffusion coefficient required for CR escape from the Galaxy with the measured value of the Galactic magnetic field. The main difference with the isotropic diffusion case is a significant reduction of the number of sources that contribute to the CR flux in any given location in the Galaxy. As a result, few sources dominate the local flux at the knee. We then calculate the resulting diffuse gamma-ray emission at Very High Energies, and compare our results to the data of gamma-ray observatories.

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