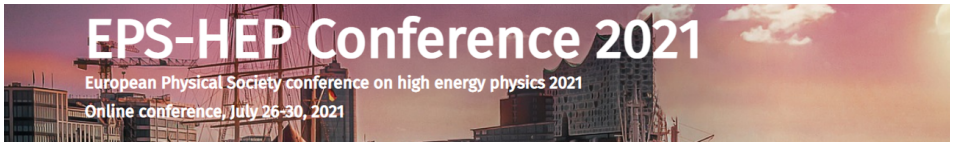

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Propagation of extragalactic cosmic rays in the Galactic magnetic field

Tuesday 27 July 2021 09:50 (15 minutes)

The propagation of extragalactic cosmic rays (EGCRs) in the Galactic magnetic field (GMF) plays a crucial role in understanding the CR signal measured at Earth. Particularly in understanding the transition region from Galactic cosmic rays (GCRs) to EGCRs ($\approx 10^{15.5}$ eV–$10^{18.5}$ eV), the GMF is expected to exhibit a range of effects on CRs as this energy range also constitutes a change in propagation regimes from diffusive to ballistic, which are central to understanding the exact nature of this transition.
Using simulation studies with CRPropa3, we study the propagation effects that the GMF have on CRs in the rigidity range 10^{16} V–10^{20} V for both isotropically and anisotropically injected EGCRs. As a result, we find that the GMF neither modifies the flux nor the arrival direction distribution in case of isotropic injection across the entire rigidity range. For injection of dipole-like flux anisotropies as well as for single point sources, we find that the arrival direction distribution is consistent with isotropy below rigidites of 10^{18} V, and the remaining anisotropy for all particles integrated above rigidities of 10^{18} V manifests in the form of dipoles at the 1–10%-level. Flux modification across the entire rigidity range occur dependent on the direction and nature of the anisotropy. We discuss the consequences of these findings to interpretations of observational results in the transition region from GCRs to EGCRs.

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Collaboration / Activity

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