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Transition from Galactic to Extragalactic Cosmic Rays and cosmic ray anisotropy

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We constrain the energy at which the transition from Galactic to extragalactic cosmic rays occurs by computing the anisotropy at Earth of cosmic rays emitted by Galactic sources. Since the diffusion approximation starts to loose its validity for E/Z >10^(16-17) eV, we propagate individual cosmic rays using Galactic magnetic field models and taking into account both their regular and turbulent components. The turbulent field is generated on a nested grid which allows spatial resolution down to fractions of a parsec. If the primary composition is mostly light or intermediate around E ~ 10^18 eV, the transition at the ankle is ruled out, except in the unlikely case of an extreme Galactic magnetic field with strength >~ 10 {\mu}G. Therefore, the fast rising proton contribution suggested by KASCADE-Grande data between 10^17 eV and 10^18 eV should be of extragalactic origin. In case heavy nuclei dominate the flux at E >~ 10^18 eV, the transition energy can be close to the ankle, if Galactic cosmic rays are produced by sufficiently frequent transients as e.g. magnetars.

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