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EXECUTIVE SUMMARY

Cosmic-ray transport in blazars: diffusive or ballistic propagation?

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The detection of a PeV high-energy neutrino of astrophysical origin, observed by the IceCube Collaboration and correlated with a 3σ significance with Fermi measurements to the gamma-ray blazar TXS 0506+056, further stimulated the discussion on the production channels of high-energy particles in blazars. Many models also consider a hadronic component that would not only contribute to the emission of electromagnetic radiation in blazars but also lead to the production of secondary high-energy neutrinos and gamma-rays.

Relativistic and compact plasma structures, so-called plasmoids, have been discussed in such flares to be moving along the jet axis. The frequently used assumption in such models that diffusive transport can describe particles in jet plasmoids is investigated in the present contribution. While the transport in the stationary scenario is diffusive for most of the parameter space, a flaring scenario is always accompanied with a non-diffusive phase in the beginning. In this paper, we present those conditions that determine the time scale to reach the diffusion phase as a function of the model parameters in the jet. We show that the type of the charged-particle transport, diffusive or ballistic, has a large influence on many observables, including the spectral energy distribution of blazars.

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