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The detectability of fast gamma-ray blazar flares from magnetic reconnection with the Fermi Large Area Telescope

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The physical mechanism for the production of fast gamma-ray variability in blazars remains debated. Plasmoids –magnetized quasi-circular structures of plasma formed self-consistently in reconnecting current sheets –are ideal candidates for the production of broadband variable non-thermal emission. Using state-of-the-art kinetic simulations of magnetic reconnection and radiative transfer calculations, we generate artificial gamma-ray light curves that would be observed with the Fermi Large Area Telescope (LAT). Our goal is to investigate if characteristic features of the theoretical light curves, such as the ultra-rapid gamma-ray flares predicted by the reconnection model, are detectable with the typical Fermi-LAT observations. A comparison with observed luminous and fast gamma-ray flares from flat spectrum radio quasars (FSRQs) reveals that magnetic reconnection events lead to comparable flux levels and variability patterns, especially when the reconnection layer is slightly misaligned with the line of sight. Emission from fast plasmoids moving close to the line of sight could explain fast variability on the time scales of minutes for which evidence has been found in observations of FSRQs. Our results motivate improvements in the existing reconnection model for blazars as well as dedicated searches for fast variability in LAT data as evidence for magnetic reconnection events.

other Collaboration

Keywords

AGN; jets; gamma-ray flares; magnetic reconnection

Collaboration

Subcategory

Theoretical Results

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