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Multi-wavelength polarization signatures as a probe for blazar flaring mechanism

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Blazars are among the most powerful cosmic particle accelerators. They exhibit highly variable emission across the entire electromagnetic spectrum. It is often believed that the blazar flares are driven by dissipating magnetic energy in the blazar jet. Current theories suggest that both turbulence and magnetic reconnection can lead to blazar flares. This talk aims to understand the time-dependent multi-wavelength polarization signatures from magnetic reconnection and turbulence in the blazar flaring region. We combine particle-in-cell and polarized radiation transfer simulations to study temporal behaviors of multi-wavelength radiation and polarization signatures under first principles. Our results suggest that simultaneous optical and X-ray polarization evolution can distinguish turbulence and magnetic reconnection for high-frequency-peaked BL Lac objects. Specifically, reconnection predicts flashes of highly polarized emission in the X-ray band without optical counterpart, while turbulence generally predicts similar optical and X-ray polarization.

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