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Time-Dependent Modeling of Blazar Spectral Variability with Diffusive Shock Acceleration

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Jets in blazars are an excellent forum for studying acceleration at relativistic MHD shocks, since this process is likely to spawn the highly-variable emission seen across the electromagnetic spectrum from radio to gamma-rays. Our recent work on combining time-dependent multi-wavelength leptonic emission models with complete simulated thermal + non-thermal particle distributions from shock acceleration theory has resulted in new insights into plasma conditions in AGN jets. This has demonstrated the ability to infer the plasma density, and suggested the interpretation that turbulence levels decline with remoteness from jet shocks, with a significant role for non-gyroresonant diffusion. Using our time-dependent two-zone construction, we are able to model together both extended, enhanced emission states from larger radiative regions, and prompt flare events in select Fermi-LAT and TeV blazars. In this contribution, I present recent applications of this simulation framework to AstroSAT and multi-wavelength observations of the prototypical VHE gamma-ray blazar 1ES 1959+650 and NuSTAR and multi-wavelength observations of the high-redshift FSRQ PKS 0537-286. A prime goal is to ascertain whether such flares are truly associated with prompt shock acceleration activity in relatively confined regions. The results illustrate how parametric degeneracies in shock acceleration conditions can lead to refined determinations of the plasma density and particle diffusion character in blazar jets.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

N/A

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