



Stochastic Acceleration and the Evolution of Spectral Distributions in SSC Sources: A Self Consistent Modeling of Blazars' Flares

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The broad-band spectral distributions of non-thermal sources, such as those of several known blazars, are well described by a log-parabolic fit. The second degree term in these fits measures the curvature in the spectrum. In this paper we investigate whether the curvature parameter observed in the spectra of the synchrotron emission can be used as a fingerprint of stochastic acceleration. As a first approach we use the multiplicative Central Limit theorem to show how fluctuations in the energy gain result in the broadening of the spectral shape, introducing a curvature into the energy distribution. Then, by means of a Monte-Carlo description, we investigate how the curvature produced in the electron distribution is linked to the diffusion in momentum space. To get a more generic description we turn to the diffusion equation in momentum space. We first study some "standard" scenarios, in order to understand the conditions that make the curvature in the spectra significant, and the relevance of the cooling over the acceleration process. We try to quantify the correlation between the curvature and the diffusive process in the pre-equilibrium stage, and investigate how the transition between the Klein-Nishina and the Thompson regime, in Inverse Compton cooling, can determine the curvature in the distribution at the equilibrium. We apply these results to some observed trends, such as the anticorrelation between the peak energy and the curvature term observed in the spectra of Mrk 421, and a sample of BL Lac objects whose synchrotron emission peaks at X-ray energies.

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