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Extreme TeV Blazar: a stochastic acceleration model

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Active Galactic Nuclei are the most powerful persistent sources in the Universe. Among them, blazars, AGN whose jet is pointed towards the Earth, present the most energetic emission. Lately a specific kind of blazar drew the attention of the gamma ray astronomy community: the extreme TeV blazars. These sources exhibit a peak of radiation at TeV energies and a hard intrinsic spectrum at sub-TeV range. In most cases their exceptional TeV emission appear to be steady over years.

Explaining the features of the extreme TeV blazars is still an open challenge, in fact the most used phenomenological models, based on shock acceleration alone, are not able to totally reproduce their SED and the parameters required by the fit are close to the theoretical limits.

In our model we suppose that the non-thermal particle are firstly accelerated by a jet recollimation shock caused by the difference between the jet and the external pressure, which then induces turbulence in the rest of jet, presuming a low plasma magnetization. Non-thermal particles are therefore reaccelerated by the turbulence, which harden the particle spectra and accordingly the radiative emission.

Since we are treating stochastic acceleration, in order to study the time evolution and the steady state of the system, we must describe the phase-space distribution of the non-thermal particles and of the turbulence through diffusion equations. Supposing isotropy and homogeneity, their interaction and spectra have been studied solving a system of two non-linear and entangled Fokker Planck equations, while the radiative emission has been calculated through the Synchrotron Self Compton model. The emission from our model has been compared with prototype extreme TeV blazar 1ES 0229+200.

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