Contribution ID: **369** Type: **Contributed e-poster**

Testing the limits of continuous-loss approximation for inverse Compton cooling in blazars

Blazar flares are perfect phenomena to probe the extreme physics of relativistic outflows. The key method for this task is physical modeling of the variable non-thermal emission from blazar jets. Most of the numerical codes developed for blazar flare modeling, are based on the kinetic approach and solve the kinetic equation governing the evolution of the particle spectrum, as well as compute the associated varying spectral energy distribution (SED). In the leptonic scenario, the blazar gamma-ray emission is considered to be produced by inverse Compton (IC) upscattering of synchrotron and/or external photons by relativistic electrons in the jet. The IC cooling of electrons is described in existing models with a continuous loss term in the kinetic equation, which however is only valid when the relative fractional losses during the electron cooling are much smaller than unity. In case the IC scattering proceeds in Klein-Nishina regime, this is no longer the case, and one has to treat properly the large relative jumps of electrons in energy. The full cooling term taking that into account, includes the integral of the electron distribution, and so the exact kinetic equation becomes an integro-differential equation. Since it is quite challenging to solve such an equation, certain authors derived a dedicated continuous loss approximation aiming to reasonably describe IC cooling in both Thomson and Klein-Nishina regime. In our study, we test the accuracy of this approximation for typical conditions during blazar flares. In order to solve the integro-differential kinetic equation, we employ our blazar flare modeling code (EMBLEM), which we extend to handle the non-continuous cooling. Using the code, we examine the effect of non-continuous cooling on the electron spectrum and SED compared to the continuous-loss approximation case. Finally, we explore the range of physical conditions in which the standard continuous-loss approximation becomes unsatisfactory.

Primary authors: DMYTRIIEV, Anton (North-West University); Prof. BOETTCHER, Markus (North-West University, South Africa)

Presenter: DMYTRIIEV, Anton (North-West University)

Session Classification: Contributed posters