Comprehension of jet physics from the analysis of Swift Gamma-Ray Bursts

Alessandra Berretta

Alessandra.Berretta@pg.infn.it

1. Introduction

A new era in the high energy astrophysics began with the discovery of a short Gamma-Ray Burst (GRB780705A) in association with a Gravitational Wave and a bright kilonova. The observation of another short GRB, GRB090510A, and a long one, GRB121226A, with possible associated kilonovae, strongly motivates the need of a new typology of classification, not only based on T0p. Short GRBs are believed to be associated with the merger of compact objects and long GRBs with a collapsar system. A new kind of classification could be to relate different properties to different groups of bursts, based on physical parameters. We then apply the same method described in [4] on Swift/BAT$^2$ data, extending the original GRB sample to August 2020. Moreover we fit the afterglow light curves (LC) of GRB sample till August 2020. In figure we fit the afterglow light curves (LC) data for GRB with a "boosted fireball" model and a Synchrotron SSM. The "boosted fireball" model is characterized by two Lorentz factors ($\eta_f$ and $\eta_g$) describing the geometry of the outflow, from the mildly-relativistic fireball to a highly collimated structure jet. The analysis presented in this paper can be divided in two parts.

2. Results and conclusions

The median values extracted from the best-fit distributions obtained with JetFit could provide a realistic initial set of parameters for the construction of an SSC model. Here we apply our emission model to multiaxial data of GRB 090510, demonstrating the reliability of our simulation code. The next step of the analysis will be the implementation of a fit procedure, in order to provide robust constraints on model parameters and better understand the physics of the high-energy GRB emission.

3. Bibliography