An expanding hadronic supercritical model for γ-ray burst emission

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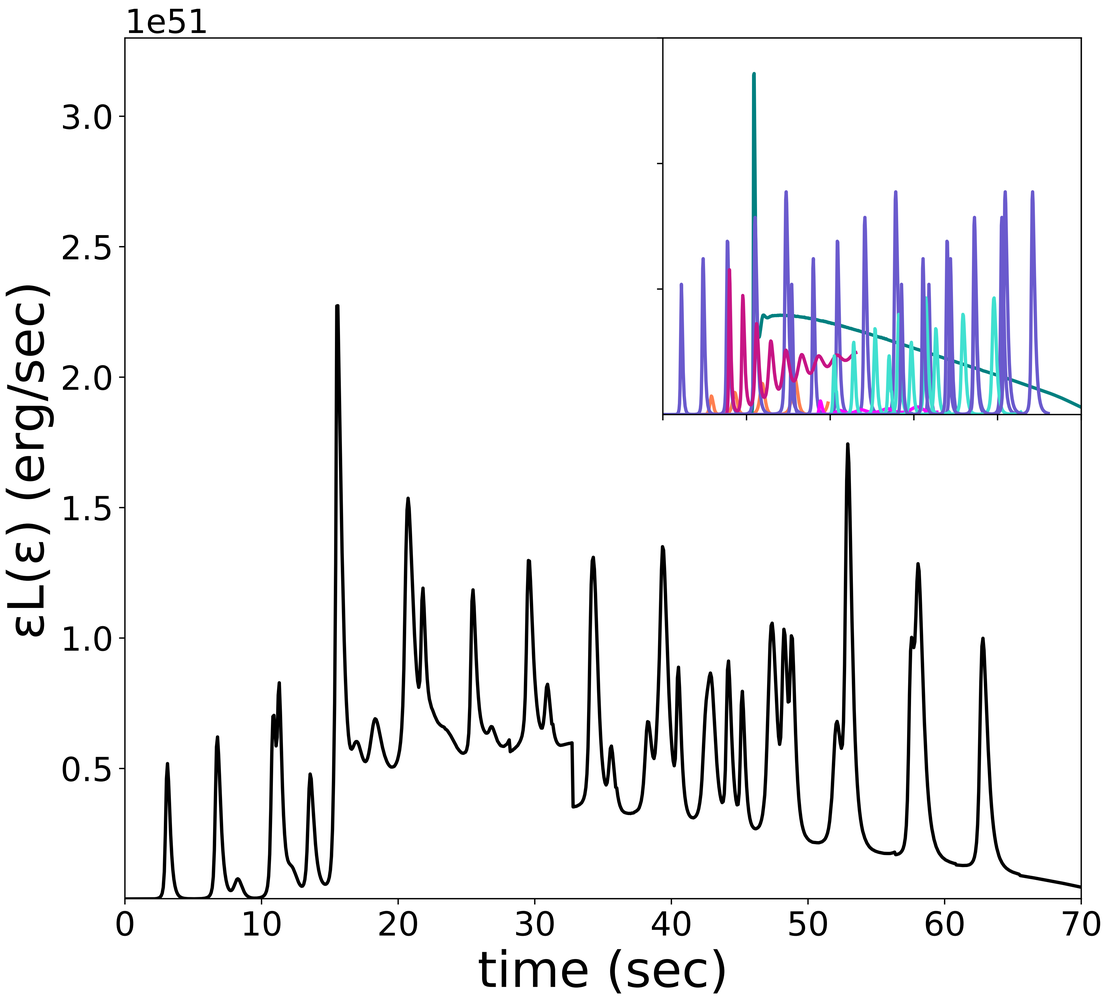
What is the talk about?

We adopt an expanding hadronic supercritical model in order to reproduce a GRB prompt emission.

Why is the model interesting?

- We investigate for the first time the supercritical phenomenon in an expanding system.
- We find initial parameters that lead to the production of highly variable photon flares and photon spectra, which both have a direct analogy to the GRB phenomenology.



Central plot: The superposition of the supercritical lightcurves produced by ten expanding blobs that are emitted from a central region every two seconds (black line). The Bulk Lorentz factor and the redshift are assumed $\Gamma = 100$ and $z = 2.27$ respectively.

Inset plot: The lightcurve produced from each expanding supercritical blob shown in colour. Both axis are the same as in the central plot

What do we do?

- We simulate a variable GRB engine, by assuming that a discrete number of blobs are produced at the base of the GRB jet due to an episodic energy injection.
- We perform a Monte Carlo simulation and randomly select the physical parameters of each expanding blob which also ensure the onset of hadronic supercriticality.

What are our results?

- The total observed light curve is highly variable and lasts about a minute
- The total broadband photon spectrum peaks at a photon energy approximately equal to 1 MeV
- The total neutrino fluence peaks at lower energies compared to a standard neutrino model.