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Numerical simulations of photospheric emission in GRBs

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We explore the nature of photospheric emission in long and short GRBs by performing hydrodynamical simulations of relativistic jet and post-process radiation transfer calculations. Our simulations show that the structure of the jet developed during its propagation has strong imprints on the resulting light curves, spectra, and polarization. In particular, it is found that the viewing angle dependence of the emission gives rise to correlations among the spectral peak energy, E_p, peak luminosity, L_p, and isotropic energy, E_{iso}, which may provide natural explanations for the Yonetoku- and Amati-relations. We also find that the degree of polarization is small for the emission from the jet core (<2%), while it tends to increase with viewing angle outside of the core and can become as high as ~10-40% for energies larger than E_p.

Primary author: Dr ITO, Hirotaka (RIKEN)

Co-authors: Dr MATSUMOTO, Jin; Dr NAGATAKI, Shigehiro; Dr WARREN, Donald; Dr BARKOV, Maxim; Prof. YONETOKU, Daisuke

Presenter: Dr ITO, Hirotaka (RIKEN)

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