吉田研セミナー

講演者: Maria G. Dainotti 氏 (理研/Jagellonian U.)
日時: 5月16日 (金) 午後 1時 – 2時30分
場所: 青山学院大学 理工学部 L棟 L706b

題目: An intrinsic luminosity-time correlation in X-ray afterglows: study of selection effects due to redshift evolution, implications for cosmology and for theoretical models.

We present an update of the $L_X T_X$ correlation with a larger data sample of 101 GRBs with well sampled lightcurves. Since some of this correlation could result from the redshift dependences of these intrinsic parameters, namely their cosmological evolution we use the Efron-Petrosian method to reveal the intrinsic nature of this correlation. We find that a substantial part of the correlation is intrinsic and describe how we recover it and how this can be used to constrain physical models of the plateau emission, whose origin is still unknown.
We extended the analysis of the $L_X T_X$ correlation to correlations between the afterglow and the prompt emission. We find a tight physical scaling between the afterglow luminosity L_x and the prompt emission mean luminosities. The highest correlated subsample in the afterglow leads also to the highest prompt–afterglow correlations. Such events can be considered standard GRBs for astrophysics and cosmology.
Regarding the cosmological problem, we show how changes of the observed slope, b_{obs}, of the $L_X T_X$ correlation in GRB afterglows affect the determination of the cosmological parameters. With 101 GRBs simulated with a central value of b_{obs} that differs on the intrinsic one by a 5σ factor, we find an overestimated value of the matter density parameter, Ω_M compared to the value obtained with SNe Ia, while the Hubble constant, H_0, best fit value is still compatible in 1 σ. Instead, for a subsample of high luminous GRBs (HighL), H_0 and Ω_M are not more compatible in 1 σ and Ω_M is underestimated by the 13%. However, the HighL sample choice reduces dramatically the intrinsic scatter of the correlation, thus possibly identifying this sample as the standard canonical `GRBs'. We conclude that any approach that involves cosmology should take into consideration only intrinsic correlations not the observed ones.