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# Gamma Ray Bursts in the comoving frame

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We estimate the bulk Lorentz factor Gamma_0 of 31 GRBs using the measured peak time of their afterglow light curves. We consider two possible scenarios for the estimate of Gamma_0: the case of a homogeneous circumburst medium or a wind density profile. The values of Gamma_0 are broadly distributed between few tens and several hundreds with average values ~138 and ~66 for the homogeneous and wind density profile, respectively. We find that the isotropic energy and luminosity correlate in a similar way with Gamma_0, i.e. Eiso Gamma_0^2 and Liso Gamma_0^2, while the peak energy Epeak Gamma_0. These correlations are less scattered in the wind density profile than in the homogeneous case. We then study the energetics, luminosities and spectral properties of our bursts in their comoving frame. The distribution of Liso' is very narrow with a dispersion of less than a decade in the wind case, clustering around Liso'=5x10^48 erg/s. Peak photon energies cluster around Epeak'=6 keV. The newly found correlations involving Gamma_0 offer a general interpretation scheme for the spectral-energy correlations of GRBs. The Epeak-Eiso and Epeak-Liso correlations are due to the different Gamma_0 factors and the collimation-corrected correlation, Epeak-Egamma (obtained by correcting the isotropic quantities for the jet opening angle theta_j), can be explained if theta_j^2*Gamma_0=constant. Assuming the Epeak-Egamma correlation as valid, we find a typical value of theta_j*Gamma_0 ~ 6-20, in agreement with the predictions of magnetically accelerated jet models.

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