

Gamma Ray Bursts as Standard Candles?

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Gamma ray bursts (GRBs) are cosmic sources of high energy radiation and are, for their short duration, the most luminous objects in the universe. They are observable at great distances and may therefore be useful for cosmological studies. In order to use them as cosmological probes, however, we must be able to infer their total emitted energy independently of their redshift measurements. Their total energy, assuming isotropic emission, extends over several orders of magnitude, making indirect energy estimation very difficult. Evidence from afterglow measurements suggests that the emission is not isotropic, but confined to a small solid angle. Correcting for this collimation, the observed energy range is narrowed, making GRBs potentially feasible as standard candles. We have considered the consistency of the methods used to correct for the collimation by checking the accuracy of the collimation angle estimation. We did this by creating a computer simulated population of afterglows and estimated their collimation angle using standard techniques. This estimation was then compared to the known collimation angle from our model calculations. Our results indicate that it is difficult to accurately determine the opening angle from the light curves. This may have implications for the use of GRBs as cosmological probes.