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Estimating Long GRB Jet Opening Angles and Rest-Frame Energetics[1] ADAM GOLDSTEIN, NASA/MSFC, VALERIE CONNAUGHTON, USRA, MICHAEL BRIGGS, ERIC BURNS, University of Alabama in Huntsville —
We present a method to estimate the jet opening angles of long Gamma-Ray Bursts (GRBs) using the prompt gamma-ray energetics and a correlation between the time-integrated peak energy of the GRB prompt spectrum and the collimation-corrected energy in gamma rays. The derived jet opening angles using this method match well with the corresponding inferred jet opening angles obtained when a break in the afterglow is observed. Furthermore, using a model of the predicted long GRB redshift probability distribution observable by the Fermi Gamma-ray Burst Monitor (GBM), we estimate the probability distributions for the jet opening angle and rest-frame energetics for a large sample of GBM GRBs for which the redshifts have not been observed. Previous studies have only used a handful of GRBs to estimate these properties due to the paucity of observed afterglow jet breaks, spectroscopic redshifts, and comprehensive prompt gamma-ray observations, and we expand the number of GRBs that can be used in this analysis by more than an order of magnitude. We also present an inferred distribution of jet breaks which indicates that a large fraction of jet breaks are not observable with current instrumentation and observing strategies.

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