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The Energy-Dependence of GRB Minimum Variability Timescales V. ZACHARY GOLKHOU, NATHANIEL BUTLER, OWEN LITTLEJOHNS, ASU — We constrain the minimum variability timescales for 938 GRBs observed by the *Fermi*/GBM instrument prior to July 11, 2012. The tightest constraints on progenitor radii derived from these timescales are obtained from light curves in the hardest energy channel. In the softer bands – or from measurements of the same GRBs in the hard X-rays from – we show that variability timescales tend to be a factor 2–3 longer. Applying a survival analysis to account for detections and upper limits, we find median minimum timescale in the rest frame for long-duration and short-duration GRBs of 45 ms and 10 ms, respectively. Fewer than 10% of GRBs show evidence for variability on timescales below 2 ms. These shortest timescales require Lorentz factors $\gtrsim 400$ and imply typical emission radii $R \approx 1{\times}10^{14}$ cm for long-duration GRBs and $R \approx 3{\times}10^{13}$ cm for short-duration GRBs. We discuss implications for the GRB fireball model and investigate whether GRB minimum timescales evolve with cosmic time.
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V. Zachary Golkhou
ASU

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