A Reanalysis of the Time Evolution and Spectroscopy of the BATSE TGFs

B. W. Grefenstette*[1], D. M. Smith[1], J. R. Dwyer[2], and G. J. Fishman[3]

[1] Santa Cruz Institute for Particle Physics, University of California, Santa Cruz, 1156 High St., Santa Cruz, CA, 95064, USA
[2] Department of Space Sciences, Florida Institute of Technology, Melbourne, Florida, 32901, USA
[3] NASA Marshal Space Flight Center, Huntsville, Alabama, 35812, USA

Terrestrial Gamma-Ray Flashes (TGFs) were discovered by the Large Area Detectors (LADs) of the Burst And Transient Source Experiment (BATSE) onboard the Compton Gamma Ray Obervatory (CGRO). BATSE saw a total of 70 TGFs during its 10 year lifetime. A new study of TGFs by the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) has increased the number of TGFs observed (750 and counting) and the detail of the spectroscopic analysis of TGFs. We present a reanalysis of the BATSE data in light of the large statistical sample of the RHESSI events. Specifically, we show that the BATSE LADs are suffering from deadtime during the peak of the BATSE LAD events, which could have a substantial impact upon the types of TGFs that triggered BATSE. We now believe that the long, soft tail found in most BATSE events can be understood as a combination of the expected effects of Compton scattering in the atmosphere – in agreement with a new analysis of the RHESSI data – plus effects associated with the instrumental deadtime. In addition, we examine the prospects for extracting significant information about the source altitude of TGFs from the coarse spectroscopic data provided by the LADs given the uncertainty in the distance of BATSE from the TGF source region.