Geophysical Research Abstracts
Vol. 15, EGU2013-8234, 2013
EGU General Assembly 2013

Temporal Properties of Fermi TGFs

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The Fermi Gamma-ray Burst Monitor (GBM) has detected more than 300 Terrestrial Gamma-ray Flashes (TGFs) in over four years of observations. With 14 detectors, including two large BGO detectors, GBM collects a large number of counts per TGF, enabling unprecedented studies of the time profiles of TGFs. Here we present the temporal properties of the GBM sample of TGFs, including the distributions of the rise times and fall times of the pulses. The TGF pulses may be symmetrical or have faster rise times than fall times and are well fit with simple Gaussian or log-normal functions. The fast rise times of some TGFs can be used to constrain the radius of the emission region. A variety of time profiles are observed including TGFs with multiple pulses separated in time and some clear cases of TGFs consisting of partially overlapping pulses. The multiple TGF pulses may be signatures of multiple lightning discharges.