

October 25-27, 2010

The Latest Space-borne Observations of TGFs from Fermi-GBM

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Abstract

The Gamma-ray Burst Monitor (GBM) on the Fermi Gamma-ray Space Telescope Observatory (Fermi) is detecting about two TGFs per week. This rate has increased by a factor of ~eight since launch when flight software was uploaded to the spacecraft in November 2009 in order to increase the sensitivity of GBM to TGFs. Weaker, un-triggered TGFs are now also being observed about once per day over selected low-latitude regions Americas. The high efficiency and time resolution ($2\mu\text{s}$) of GBM allows temporal features to be resolved so that some insight may be gained on the origin and transport of the gamma-ray photons through the atmosphere. TGFs are observed to be shorter than previously thought, with an average duration of $\sim 100\mu\text{s}$. The absolute times of TGFs are known to $\sim 10\mu\text{s}$, allowing accurate correlations of TGFs with lightning networks and other lightning-related phenomena. The events are observed in the thick bismuth germanate (BGO) scintillation detectors of GBM with photon energies above 40 MeV. Other new results on the temporal and spectral characteristics of TGFs will be presented, along with properties of several electron-positron TGF events that have been identified.