High-Energy Secondary Electron Beams Produced by Terrestrial Gamma-Ray Flashes

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Recent analysis of RHESSI and CGRO/BATSE Terrestrial Gamma-ray Flash (TGF) data have shown that some of these events are in fact composed of high-energy electron beams directly striking the spacecraft. These events are likely to consist of secondary electrons produced by Compton Scattering and pair-production of TGF photons near the top of the atmosphere. Once produced, these electrons can escape the atmosphere along the geomagnetic field lines where they can be detected by spacecraft, either near the TGF or at the conjugate point several thousand kilometers away. Monte Carlo Simulations show that these electron beams can be more intense at spacecraft altitudes than the TGF that produced them and have energy spectra extending to more than 20 MeV. In this presentation, an overview of the TGF observations and modeling will be given. It will be shown that high-energy electron beams in the inner magnetosphere are a necessary byproduct of these events, and evidence will be presented that these electrons beams have already been observed by RHESSI and BATSE. Finally, using detailed Monte Carlo simulations, new results on the properties of TGFs and the resulting electron beams will be presented.