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Particle Acceleration Inside Thunderstorms and the Variation in Source Spectra of Terrestrial Gamma-ray Flashes ERIC CRAMER, NSSTC, CSPAR, Univ of Alabama, JOSEPH R. DWYER, Dept. of Physics, Univ., New Hampshire, MICHAEL S. BRIGGS, NSSTC, CSPAR, Univ., of Alabama, HAMID K. RASSOUL, Dept. of Physics and Space Sciences, Florida Institute of Technology — One of the unresolved questions in the atmospheric sciences is the origin of Terrestrial Gamma-ray Flashes (TGFs) [1]. These flashes are short but intense gamma ray bursts emanating from Earth's atmosphere. This phenomenon has been observed by gamma ray detectors on orbiting satellites, e.g. NASA Fermi, intended to study astrophysical phenomena such as Gamma-ray Bursts. TGFs are thought to originate inside thunderstorms where electrons can be accelerated and emit radiation in the multi MeV range due to *bremsstrahlung* interactions with air molecules. These so called "runaway electrons" are seeded from cosmic ray air showers hitting the Earth's atmosphere from (extra) galactic sources. In this work, we present a Monte Carlo model that simulates particle physics inside a thunderstorm region [2]. The subsequent transport of high energy gamma rays through the Earth's atmosphere and up to satellite orbit is also included. We show that by varying both the potential difference and the ambient electric field inside the thundercloud, different electron and photon energy distributions are produced. This effect may be detectable by orbiting spacecraft, and therefore serves as a method to remote sense the electric fields that exist inside thunderstorms. [1] Fishman, Gerald Jay, et al. "Discovery of intense gamma-ray flashes of atmospheric origin." *Science* 264.5163 (1994): 1313-1316. [2] Dwyer, Joseph R. "Relativistic breakdown in planetary atmospheres." *Physics of Plasmas (1994-present)* 14.4 (2007): 042901.

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