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X-and gamma- emissions in the upper atmosphere related with thunderstorms

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Abstract
In this paper we present preliminary results of the Monte Carlo model that is used to study acceleration of electrons in a background electric field originating from thunderstorms to energy necessary to produce hard emissions. The study is motivated by the discovery of Terrestrial Gamma Ray Flashes (TGFs) observations from satellites (Fishman et al., 1994, Smith et al., 2005, Marisaldi et al., 2010, Briggs et al., 2010) and is related to the space missions ASIM and TARANIS.
It is understood that the radiation comes from bremsstrahlung from high energy electrons accelerated in the electric field of discharges associated with the thunderstorm (Fishman et al., 1994, Neubert, 2003). The source of these energetic electrons is not fully understood. Two mechanisms are suggested: relativistic electrons are initiated by cosmic rays (Wilson, 1925a, 1925b; Gurevich et al., 1992), and cold electrons are accelerated near the enhanced field regions of leader tips of a lightning (Gurevich, 1961).
The Monte Carlo study has started with standard simulation of electron drifting in an electric field and colliding with the neutrals via elastic, in-elastic, and ionization processes. Simulations have shown the possibility for streamers to generate runaway electrons from cold electrons (Chanrion et al., 2010).
The code has been extended to include the bremsstrahlung, by using data from Seltzer et al., (1986). The preliminary results discuss the influence of the seed electron energy distribution on the photon emission spectrum.