



The two-component model of Thunderstorm Ground Enhancements (TGEs)

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Electrical fields in thunderclouds effectively transfers field energy to electrons; electrons generate gamma rays and gamma rays by photonuclear reactions born neutrons During thunderstorms at Mount Aragats, hundreds of Thunderstorm Ground Enhancements (TGEs) comprising millions of energetic electrons and gamma rays, as well as neutrons, were detected. Observed large TGE events allow for the first time to measure the energy spectra of electrons and gamma rays well above the cosmic ray background. To explain the origin of these events we introduce 2 component model of the TGE: the RRE avalanches in energy domain up to 30–40 MeV and Modification Of energy Spectra (MOS) process operating on all energy scales and providing an extension of gamma ray energy spectra up to 100 MeV. The RREA process can multiply particle flux up to 10 times above ambient background of secondary cosmic rays; the MOS process can provide several percent excess above cosmic rays, however, for the much higher energy. Most of TGEs occur in the large negative near surface electrical field and particle flux is accompanied with intracloud lightning occurrences (IC-) and suppression of cloud-to-ground lightning occurrences (CG-). The measured structure of lightning occurrences supports creation of developed lower positive charge region (LPCR) as a fundamental condition of TGE origination.