



ON THE ORIGIN OF THE THUNDERSTORM GROUND ENHANCEMENTS (TGEs): ENERGY SPECTRA ANALYSIS

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We present comparisons of measured and modeled thunderstorm ground enhancements observed in May-June 2013 on Mt. Aragats at altitude 3200 m. We prove that the origin of small TGEs is the MOS process – modification of energy spectra of cosmic ray electrons in the electric fields of thunderclouds. The gamma ray differential energy spectra are well described with power law function with power indexes -1.7 – -2.2 for electric field strengths 0.8 – 1.6 kV/cm. When the intracloud field rose and reaches the threshold to unleash the relativistic runaway electron avalanches the intensity of TGE exponentially rose and at energies up to 20 MeV the exponential function describes gamma ray differential spectra. At higher energies power law describes the spectra rather well with enlarged absolute value of spectral index. These modeled features also well coincide with experimental observations of largest TGE events at Aragats when direct evidence of avalanche propagation from thunderclouds was obtained.

Good agreement of characteristics of experimental and simulated TGEs allows estimation of intracloud electric field by the observed TGE parameters.