

## **Generation of Runaway Electrons Induced by Radon Progeny Products in Thundercloud Electric Fields**

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Gamma ray dose-rate increases associated with winter thunderstorm activities have been observed in the coastal areas facing the Sea of Japan. In order to investigate the generation of energetic photons which originate in thunderstorm electric fields, we have calculated the behavior of electrons and photons in electric fields with Monte Carlo method. In case of the calculation for the energetic electron emitted in the atmosphere, the electron and photon fluxes have increased greatly in the region with high electric field. Then, we have carried out the Monte Carlo transport calculations of the beta and gamma rays emitted by radon progeny products, as a source of energetic electrons, in thundercloud electric fields. From the calculated results, it is confirmed that the electron flux shows notable increases in the high field region, while the photon flux does not fluctuate significantly. Since the radon progeny products form a large part of the energetic electrons in the atmosphere, they can serve as the source of a considerable amount of electrons.