

Observation of energetic radiation associated with a thunderstorm activity at the top of Mt. Fuji

Tatsuo Torii[1]; Takeshi Sugita[2]; Sachiko Tanabe[3]; Yoshihisa Kimura[4]; Masashi Kamogawa[4]; Kazuaki Yajima[5]; Hiroshi Yasuda[5]

[1] JAEA; [2] SSL, Inc.; [3] Labo. Equip.; [4] Dep. of Phys., Tokyo Gakugei Univ.; [5] NIRS

Fluctuations of energetic radiation that were seemed to be caused by a summer thunderstorm activity were observed at the top of Mt. Fuji. The largest of such fluctuations was gradual and lasted for about 20 minutes, and was found to be high-energy gamma rays having a continuous energy spectrum up to 10 MeV or more. As for the feature of these fluctuations, it seems naturally that such fluctuations are caused by the bremsstrahlung photons generated by the runaway electrons produced continuously with an intense electric field in the thundercloud rather than originated in the process of lightning discharge.

The NaI detector used in the observation was so sensitive to photons that it could not have differentiated electrons from photons even if high-energy electrons had been incident upon the detector. When conducting the analysis of energy spectrum, sufficient convergence was achieved in the calculation even in the case where only the sensitivity to photons was considered. Therefore, we believe that the majority of incident particles were photons, though we did not know the ratio of incident electrons and photons coming from the source.

In the observations made during the winter thunderstorms, the energy was up to about 10 MeV, which was almost the same as in the observations made at Mt. Fuji, but its duration was observed to be several tens of seconds at most. This suggests that, during summer thunderstorms in which the region of an intense electric field exists for a long time, such source region existed for several tens of minutes near this high peak of nearly 4,000 m above sea level since the duration of the pocket positive charge in winter thunderstorms, which is responsible for producing the most intense electric field, is estimated to be in the order of several minutes, which is shorter than that in summer thunderstorms.