



Measurement of energetic radiation generated during thunderstorm by a sounding balloon and an airplane

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Energetic radiation caused by thunderstorm activity is observed at various places, such as the ground, high mountain areas, and artificial satellites. In order to investigate the source location of the radiation and its energy distribution, we observed radiation using a sounding balloon and an airplane in the inside and above the thundercloud which would be near a source of radiation. On the measurement in the thundercloud, we conducted a sounding observation using a radiosonde mounted two GM tubes (for gamma-rays, and for beta/gamma-rays), besides meteorological instruments. The balloon passed through a region of strong echoes in a thundercloud shown by radar image, at which time an increase in counting rate of the GM tube about 2 orders of magnitude occurred at the altitude from 5 km to 7.5 km. Furthermore, the counting rate of 2 GM tubes indicated the tendency different depending on movement of a balloon. This result suggests that the ratio for the gamma-rays (energetic photons) of the beta-rays (energetic electrons) varies according to the place in the thundercloud. Then, we measured the variation of the energetic radiation from the top of the thundercloud using an airplane. At this time, we used two NaI detectors different in the size – the large one is with the size of 5 inches ($12.7\text{cm}\phi \times 12.7\text{cm}$) to detect the energetic radiation (< 30 MeV) that will be emitted from strong electric field in a thundercloud, and 3 inches ($7.62\text{cm}\phi \times 7.62\text{cm}$) detector for the measurement of low energy gamma-rays (< 3 MeV). We performed the radiation measurement by flying around the thunderclouds at 12 – 14 km in height by the observation in the summer. Furthermore, in the winter season, we flew 5 – 6 km in height and measured the radiation around the thunderclouds. The event that the counting rate was slightly exceeding a normal variation was observed by a result of the winter observation. About the cause, we are analyzing it now. We report the result of these measurements and analysis in the EGU meeting.