

Measurement of radiation caused by thunderstorm activities by a sounding balloon, an airplane, and the ground

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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 radiation source and its energy distribution, we measured energetic radiation by a sounding balloon, an airplane, and the ground observation. On the measurement inside the thundercloud, we conducted a sounding observation using a radiosonde mounted two GM tubes (for gamma-rays, and for beta/gamma-rays), in addition to 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. We performed the radiation measurement by flying around the thunderclouds at 12 ? 14 km in height by the observation in the summer. Moreover, in the winter season, we flew 5 ? 6 km in height and measured the radiation around the thunderclouds. Furthermore, we carried out a ground observation of the energetic gamma rays during winter thunderstorm at a coastal area facing the Sea of Japan. Two types of the energetic radiation have been observed at this time. We report the outline of these measurements and analysis in the session of the JpGU meeting.

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