

Development of a new multipoint observation system for gamma-rays from winter thunderstorm

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Recent observations have shown that winter thunderstorm along the Japan sea radiates gamma-rays with energy extending up to 10 MeV (Torii et al., 2002, Tsuchiya & Enoto et al., 2007). Inside the thunderstorm, electrons are accelerated to relativistic energy by strong electric field. So far, since observations have been performed at a single location, it has been difficult to trace generation, growth, and disappearance of the acceleration region of relativistic electrons. In order to reveal this acceleration mechanism, we are planning to build a multi-point mapping system of the gamma-ray radiation which can trace a path of the radiation and can detect a change of gamma ray intensity and spectrum. Since a typical velocity of the winter thunderstorm is about 500 meter per min and a duration of the gamma-ray radiation at a single point is about a few minutes, new observation sites are expected to be about 20 points with their separation of a few kilometers. We have developed a small radiation detector composed of scintillators (CsI, BGO, and plastic) coupled with new data acquisition system using a small computer Raspberry Pi. The detector size is about 30 cm. In 2015FY winter, we set these detectors on the roof at Kanazawa University and one high school at Kanazawa, and started the observation, collecting photon energy and arrival time of individual photons, and environmental temperature. We are planning to increase observation sites. This project has been also supported by fund from an academic crowd-funding.

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