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Observations of energitic radiation bursts from thunder activities

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Energetic radiation bursts have been observed during strong thunderstorms by ground-based detectors as well as high-mountain ones. Those radiation bursts are thought to result from runaway electrons originating from electrons accelerated by strong electric field in lightning discharges and thunderclouds, and hence provide a valuable key to understand particle acceleration in thunder activity. Interestingly, they can be categorized into two bursts by their duration. One consists of short bursts lasting for milli-seconds or less. The other comprises long bursts having duration of a few seconds. In order to better understand both short and long bursts, we have conducted experiments at coastal area of the Japan Sea and a 2770-m altitude observatory. In this talk, we will report on those experiments, showing the two experiments has successfully observed both short and long bursts. Especially, we will focus on high-energy radiations extending over MeV energies, and then discuss a plausible model to explain how those high-energy radiations are produced in thunder activity.