Observations of summer thunderstorms using dual polarized phased array weather radar and three-dimensional lightning location system using LF band in Kanto area

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In Japan, a X-band dual polarized phased array weather radar (DP-PAWR), which simultaneously transmits pulses of horizontal and vertical polarized radiation, was developed and installed in December 2017 at Saitama University. The DP-PAWR has a scanning scheme similar to the PAWR, which also performs mechanical and electronic scanning at azimuth and elevation angles, respectively. The DP-PAWR yields polarimetric precipitation measurements via three-dimensional volume scanning in less than 1 min, 10 sec at the shortest, in a range of up to 80 km. The DP-PAWR is also able to provide coverage of urban areas in Tokyo.
In 2020, our research group (Japan Aerospace Exploration Agency, Kobe City College of Technology, Osaka University, Kinki University, and UEC are included) has installed 13 LF sensor network to obtain the 3D location of lightning discharges in the Kanto area in Japan. The system provides the 3D location of lightning discharges using the time-of-arrival location technique. The mean distance between stations is approximately 20-30 km. The electric field antenna bandwidth is broad from 51 Hz to 550 kHz. Its signal is sampled at 5 MHz. The recorded waveforms allow detailed analysis of lightning discharge processes.
In this presentation, we will show the case study of simultaneous lightning and precipitation observations with the DP-PAWR and 3D Lightning location system. The relationship between the initiation of lightning discharges and hydrometer types in the thunderstorm is also discussed.

Keywords: Phased array weather radar , Lightning discharges

