High temporal resolution observations of Precipitations with Multi-Parameter Phased Array Weather Radar

*Hiroshi Kikuchi[1], Kai Oikawa[1], Kento Nakamura[2], Tomoo Ushio[3], Yasuhide Hobara[1]

1. The University of Electro Communications, 2. Tokyo Metropolitan University, 3. Osaka University

The 40 X-band multi-parameter (e.g. dual polarized) weather radars, which consists of a parabolic antenna, have been operating around the urban area, such as Tokyo and Osaka, in Japan. The observation network is called ‘the extended radar information network; XRAIN’. The five X-band phased array weather radars (PAWRs) have also been operating in Japan since 2012. The PAWRs give us a high temporal resolution and high-density observations for precipitations at high altitude as compared with the XRAIN. As a next weather radar development project, a dual polarized phased array weather radar, which is also termed as multi-parameter phased array weather radar; MP-PAWR, has been developed. It can provide dual polarized parameters that reveal detailed microphysics of storms in addition to accurate the precipitation estimation.

The MP-PAWR, which simultaneously transmits pulses of horizontal and vertical polarized radiation, has been developed and installed in December 2017, at the Saitama University, Japan, as shown in Fig. 1. The center of frequency and observation range are 9.43 GHz and 80 km, respectively. The MP-PAWR has a scanning scheme similar to the PAWR, which uses the mechanical and electronic scanning in azimuth and elevation angles, respectively. The MP-PAWR provides the polarized precipitation measurements in three-dimensional volume scanning in less than 30 or 60 seconds in a range of 60 or 80 km in real-time, respectively. The 114 samples are observed from 0 deg to 90 deg in elevation angles. The spatial resolution for the elevation angles is about 0.8 deg. For azimuth angles, the spatial resolution is 1.2 deg. Consequently, the rapid scanning and high-density observations are simultaneously achieved with the MP-PAWR.

In this presentation, we will show the observation results including a hydrometer classification for an thunder storm. Furthermore, we will show a simultaneous observation plan in 2020 between the three-dimensional lightning discharges and precipitations.

Keywords: Dual Polarized Radar, Phased Array Radar, Precipitation Observation

