

Initial observations with X-band multi-parameter phased array radar in Japan

*Hiroshi Kikuchi¹, Taku Suezawa², Tomoo Ushio², Yasuhide Hobara¹

1. The University of Electro-Communications, 2. Tokyo Metropolitan University

The five X-band single polarization phased array weather radars (SP-PAWR) are under operation in Japan. The 40 X-band multi-parameter (e.g. dual polarization) weather radars, which consists of a parabolic antenna, are also operating around the urban area in Japan. The observation network is called the extended radar information network; XRAIN.

As a next weather radar development project, a dual polarimetric phased array weather radar, which is termed as multi-parameter phased array weather radar; MP-PAWR, has been developed. It can provide dual polarimetric 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 2017, at the Saitama University, Japan. 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 polarimetric 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 initial observation results. To confirm reliability of the measurements and to evaluate the accuracy of the measurements by the MP-PAWR, the initial observation results of the MP-PAWR are compared with a disdrometer data, which is installed at Tokyo Metropolitan University (TMU) about 30 km away. From the comparison results between the radar reflectivity factor with the MP-PAWR and the disdrometer. The observation data is 24 hrs in July 28, 2018. The value of the radar reflectivity factor of the MP-PAWR is corrected by the value of the specific differential phase. In comparison with the disdrometer, the mean bias of the MP-PAWR is -2 dB. In this presentation, we will discuss the accuracy of the measurements by the MP-PAWR, quantitatively. We will also show the case study of a convective storm observed with the MP-PAWR. The detailed analysis of a storm scenario will be presented.

Keywords: dual polarization observations, phased array weather radar , Initial observations