

Analysis of convective precipitations using one-minute rainfall rate dataset by X-band MP radar network in MLIT, Japan

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The convective precipitation which comprised of several convective cells develops very rapidly and sometimes it concentrates in a small area and, as a result, causes urban flooding. A number of radar observation studies have reported that individual convective cells have average lifetimes of about 30 minutes. To investigate the three-dimensional structure of precipitation cell and system, volume scan radar data can provide useful dataset, but it takes about 5-10 minutes at the least. This time-consuming volume scan could not trace a violent change of convective precipitation entirely. Therefore, to understand convective precipitation, high spatiotemporal observations are essential.

Recently, National Research Institute for Earth Science and Disaster Prevention (NIED) developed an operational data processing system, which estimates the rainfall intensity from the radar data, and which creates regional composite data every one minute, under a Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in Japan. This system provides a very high temporal resolution rainfall intensity data in the large area, which is useful to study violent convective precipitation. The purpose of present study is to clarify statistical characteristics of spatiotemporal structure of convective precipitation using X-band multi-parameter (MP) radar data.

The present study uses one minute rainfall intensity data obtained by X-band MP radar network situated in the Tokyo Metropolitan area from July to September 2010. The data has the spatial resolution of longitudinal 45/4" and latitudinal 30/4" (250 m, approximately). In the analysis, 1) rainfall duration, 2) number of peak in each rainfall duration, 3) accumulated rainfall amount, 4) rainrate intensity of each rainfall peak, etc are calculated based on time change of rainfall rate at each grid point, and spatial patterns of 6) rainfall area and 7) distribution of rainfall peak are also analyzed.

Results of analysis of one peak continuous precipitation which has one peak during the rainfall period show the average lifetime is less than 30 minutes, the maximum rainrate is 20-70 mm h⁻¹, the accumulated rainfall amount is less than 10 mm and the rainfall area is 8-9 km². The statistical analysis of two or more peak continuous precipitation (multi-peak continuous precipitation cell) is undergoing and the results will be presented at the conference.

Keywords: X-band MP radar, Convective precipitations, One-minute rainfall rate dataset