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Behavior of precipitation cores in the 5 July 2010 torrential rainfall system in northern Tokyo

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Local torrential rainfall event occurred on 5 July 2010 in northern Tokyo. Shakujii river basin was flooded by the rainfall event. National Research Institute for Earth Science and Disaster Prevention (NIED) conducted two X-band polarimetric radar observation for a rainfall system that caused the local heavy rainfall.

The rainfall system appeared around 14 LST (LST = UTC + 9h) in the western Tokyo, and propagated eastward, then disappeared on around the border among Tokyo, Saitama, and Chiba Prefectures at around 22 LST. The rainfall system showed significant intensification at around 1730 and 1930 LST. Heavy rainfall in Shakujii river basin was associated with the development at around 1930 LST. Echo-top heights of 20 dBZ at these intense periods were about 7-km altitude each. The height of precipitation cores were from 2 to 3-km altitudes. Values of differential reflectivity (Z_{DR}) in the precipitation cores were larger than 3.5 dB, and those of specific differential phase (K_{DP}) were larger than 9 deg km^{-1} . These values indicate that the precipitation cores in the intense periods of this rainfall system contained a number of large raindrops.

Horizontal distributions of accumulated rainfall amount in two periods, A) from 1520 to 1850 LST and B) from 1850 to 2120 LST which include two intense periods each, are compared to examine the characteristics of the rainfall system. In period B, intense rainfall area with accumulated rainfall amount more than 60 mm was concentrated in a smaller area (20km(east-west) x 5km(north-south)) than in period A. Around Nerima Ward, accumulated rainfall amount more than 100 mm was observed in period B. In this study, behavior of precipitation cores appeared and developed in the of concentrated heavy rainfall area in period B.

Three-dimensional distribution of polarimetric radar measurements and wind fields indicate that the multiple precipitation cores aligned in the east-west direction in the concentrated heavy rainfall area in period B. The precipitation cores in the area moved eastward slowly. But several new precipitation cores appeared in the west (upshear) side of the preexisted precipitation cores. In consequence, intense rainfall area in the precipitation system was stalled in the Shakujii river basin.

Keywords: Local heavy rainfall, Urban flood, Polarimetric radar