Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

U022-P09 Room:Convention Hall Time:May 22 10:30-13:00

Doppler lidar and wind profiler observation of a localized heavy rainfall event on 5 July 2010

Hironori Iwai[1*], Yasuhiro Murayama[1], Shinya Sekizawa[1], Katsuhiro Nakagawa[1], Ryoko Oda[1], Shoken Ishii[1], Kohei Mizutani[1]

[1]NICT

Heavy rainfall increasingly occurred last decades, and urban floods caused by those events. Localized rainfalls are often observed, which has been also increasingly of concern to the general society. Such heavy rainfall has small horizontal scales of 1-10 km, occurring in apparently a random manner in a course of cloud system development, thus forecasting those events is a subject of meteorological research. Doppler radars can observe regions and temporal development of the rainfall events in detail, however non-precipitation region around the rainfall region could not be studied because of little observation therein. Once we can observe wind field surrounding the rain region, air circulation in and out of the cloud and precipitation systems is expected to significantly improve the model, and thus would contribute to improvement of forecasting of the localized rainfall events. There have been significant advances in Doppler lidar and wind profiler, which can observe wind fields under clear air conditions or non-precipitation. So those instruments are expected to improve forecasting the small-scale cloud and precipitation systems. In this study, we will show the NICT Doppler lidar and wind profiler observation results of a localized heavy rainfall that occurred on 5 July 2010 in the Tokyo metropolitan area.

A coherent 2-micron differential absorption and wind Doppler lidar was developed by NICT to measure CO_2 concentration and radial wind velocity. Wind profilers to which the radio interference reduction techniques such as digital coding and frequency multiplexing are applied were also developed to measure radial wind velocity in the lower troposphere. The Doppler lidar and wind profilers were deployed at the NICT headquarters located in the Tokyo metropolitan area. The Doppler lidar performed plane position indicator scans (horizontal scan) at a 4-degree elevation angle which provided information about the horizontal variability below several hundred meters above ground level (AGL). The wind profilers were operated in Doppler beam swinging mode at a 14-degree zenith angle which provided information about the horizontal and vertical wind up to 8 km AGL. The rainfall data used for the present study comes from the operational X-band polarimetric radar networks of the River Bureau, Ministry of Land, Infrastructure, Transport and Tourism.

A heavy rainfall area moved eastward across the central part of Kanto Plain from 15 JST to 21 JST on 5 July 2010 and came close to the observation site at about 18 JST. Both Doppler lidar and wind profiler observed that the southeasterly wind blowing toward the heavy rainfall area gradually intensified at several hundred meters AGL. In presentation, we will show the results of detailed analysis of the heavy rainfall.

Keywords: Doppler lidar, Wind profiler, Localized heavy rainfall