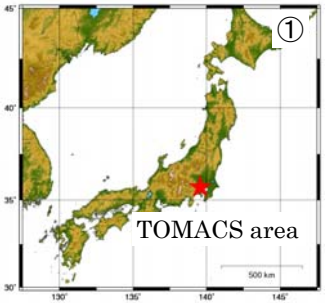
Measurements of DSD with a dense network of disdrometers associated with convective initiation and evolution.

S. Saito, C. Fujiwara, K. Kusunoki, and E. Sato
Meteorological Research Institute / JMA

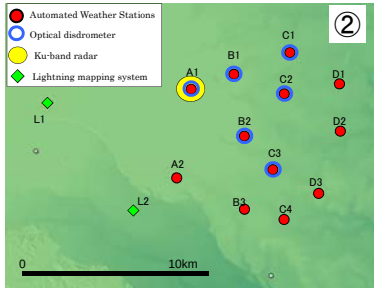
1, Introduction

During the warm season over the Kanto Plain of Japan, strong isolated thunderstorms are often responsible for flooding and other rainfall-related hazards. However, forecasting of quantitative precipitation associated with these mesoscale systems has been difficult because of the poor knowledge of the convective initiation and evolution processes.
The Tokyo Metropolitan Area Convection Study(TOMACS) has been described for better understanding of various mesoscale mechanisms over Kanto Plain.
As a part of this project, a high-resolution radar and dense network of optical disdrometers ware designed and implemented in the study area.
In this poster, I'd like to indicate drop size distribution(DSD), reflectivity of Ku-band radar etc. in initiating and developing isolated cumulonimbus case.

2, Location and Instruments



Map of TOMACS area.



Distribution of observation instruments.

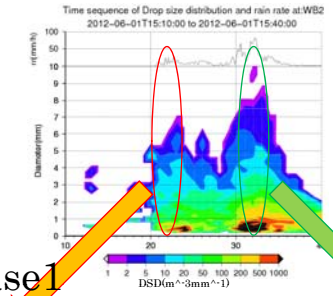
Frequency	5290 MHz
Observation range	120 km
Antenna rotation rate	4 rpm
Pulse length	1.0micro s
Range resolution	150m
Azimuth resolution	0.7
Doppler velocity range	48 ms−1
Scan	Multiple−PPI scan
Elevations:	15
Update rate	6min

Various elements of Ku-band radar.

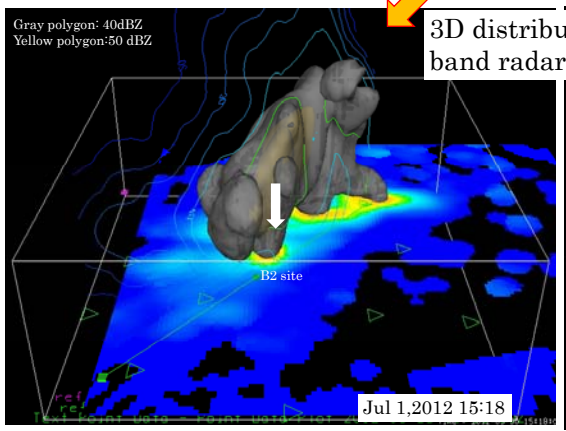
TOMACS area is in western part of Tokyo metropolitan(left figure).
Surface observation network contains 12 Automated Weather Stations(AWS) with its spatial interval is about 3km(right figure). So, it can observes the state of the cumulonimbus in detail.
AWS observes pressure, temperature, relative humidity, wind speed / wind direction and precipitation parameters like rain intensity, drop size distribution, fall velocity distribution, and so on. Temporal observation intervals is 1 second for wind speed / wind direction and 10 seconds for other elements. However, precipitation parameters are observed only blue-circled marked sites.
At station A1, Ku-band FM-Chirp radar is placed in addition to AWS. Ku-band radar has very high spatial/temporal resolution. It can make full volume scan about 1 minute. And other details are shown above table.

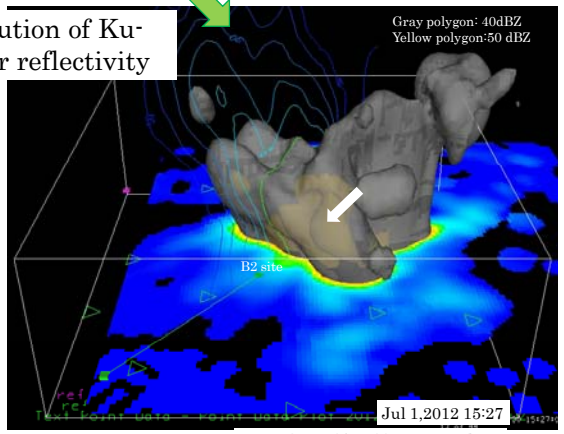
3, Results

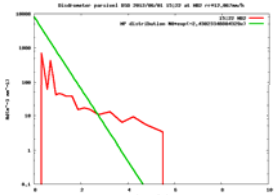
On July 1 2012, isolated cumulonimbus were initiated and developed inside AWS area.
In this case, 2 types of characteristic DSD patterns were observed at B2 station.
Case1: Precipitation core is made in upper sky and it dropped to the station.
Case2: Precipitation core is made in near surface and it moved to the station.



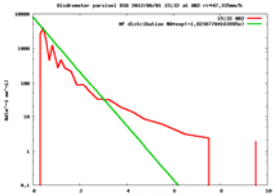
Case1 Case2







Observed DSD(red line) and Marshal-Palmer distribution(green line)



Small size particles: little
Large size particles: many

Small size particles: consistent
Large size particles: many

Acknowledgment

This research is conducted under the financial support of "Social System Reformation Program for Adaption to Climate Change" / "Strategic Funds for the Promotion of Science and Technology".