ACTIVITIES ON THE FIELD EXPERIMENTS OF PRECIPITATION SYSTEM AROUND THE EAST CHINA SEA FROM 2006 TO 2008

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1. Introduction

- Several intensive observations are performed for the purpose of the prevention from disaster caused by severe weather and the understanding of those mechanisms in June from 2006 to 2008 around the East China Sea.
- The rainfall system on 5th and 6th July is analyzed and its results are briefly introduced during intensive observation period in 2007.

Observation Instruments

- POSS(Precipitation Occurrence Sensor System)
- S-band radars(KMA)
- Rain gauges (0.1mm, 0.5mm)
- Laser Particle Counter (KANOMAX, Japan, TF-500)
- Radiosonde (GRAW, DFM-06, Germany)
- AWS (Automatic weather systems)
- Filter paper for DSD

Data analysis

- NCEP/NCAR reanalysis data
- Dual Doppler radar analysis
- Rain gauges data
- Sounding data
  - TVWS(Total Vertical Wind Shear)
  - DVWS(Directional Vertical Wind Shear)
- Drop Size Distribution (DSD)

2. Experimental design and method

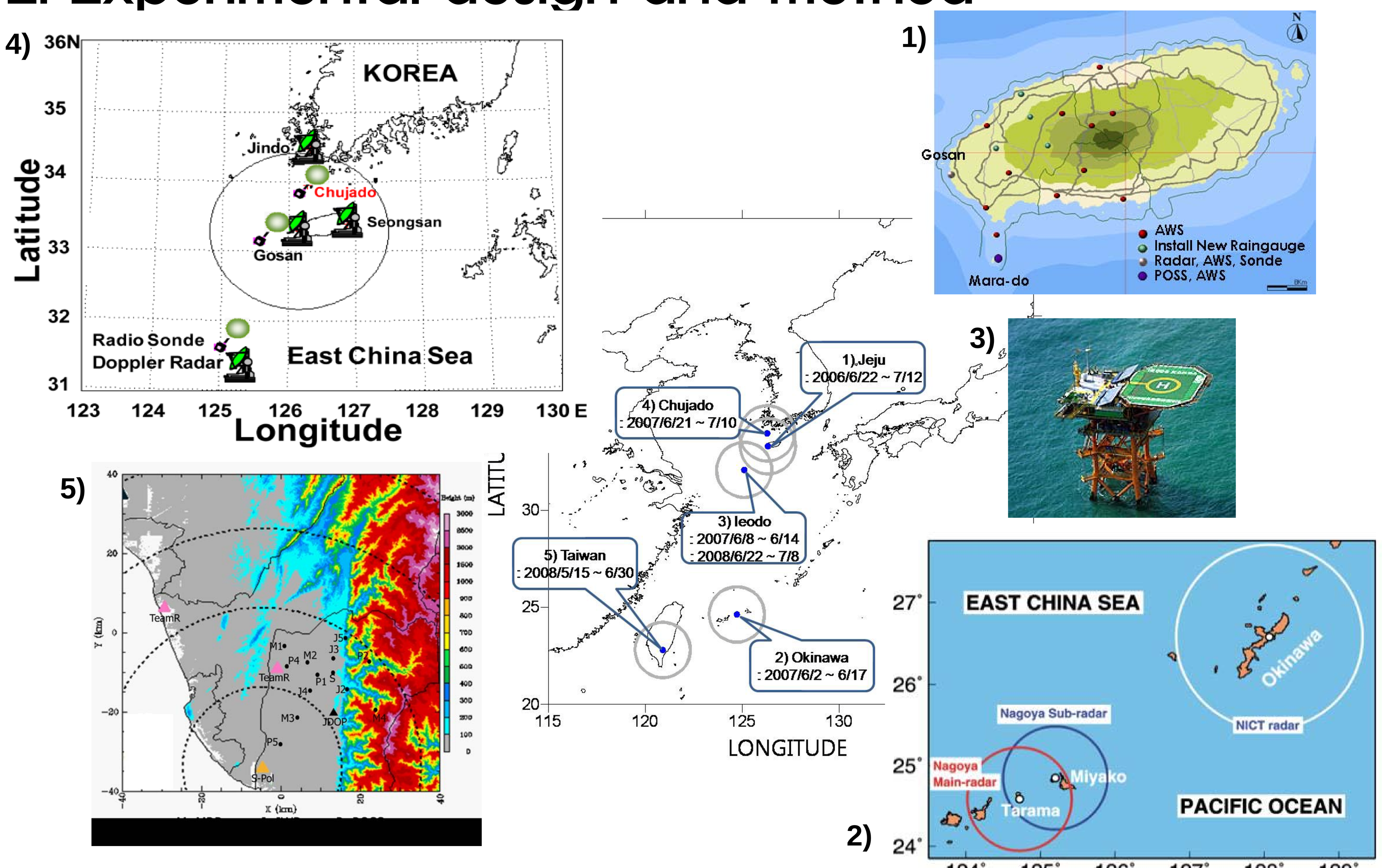
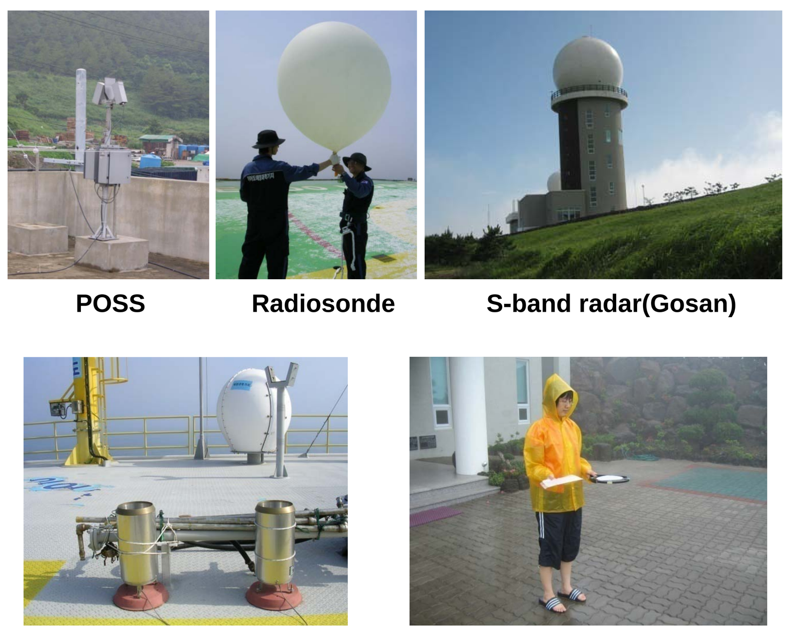


Fig. 1. Location and time period of field experiments.

Table 1. Characteristics of radars

Sites	Jindo	Gosan	Sungsanpo
Wavelength (cm)	10.37(S-band)	10.61(S-band)	10.61(S-band)
Bin Spacing (m)	250	250	250
Range (km)	240	250	250
Nyquist Velocity (m/s)	31.14	63.17	63.17
# of Elevation angle	12 (0.2 - 20°)	15 (0.5 - 24°)	15 (0.5 - 24°)



a) TVWS

$$\left|\frac{dV}{dz}\right| \equiv \sqrt{\left(\frac{du}{dz}\right)^2 + \left(\frac{dv}{dz}\right)^2} \quad (1)$$

$$V = u\hat{i} + v\hat{j}$$

$$\bar{u} = (u(k+1) + u(k-1))/2$$

$$\bar{v} = (v(k+1) + v(k-1))/2$$

b) DVWS

$$\frac{dD}{dz} \equiv -\left(\bar{u}\frac{dv}{dz} - \bar{v}\frac{du}{dz}\right) \quad (2)$$

c) Drop Size Distribution

$$N(D) = N_0 D^m \exp(-\Lambda D) \quad (3)$$

3. Results

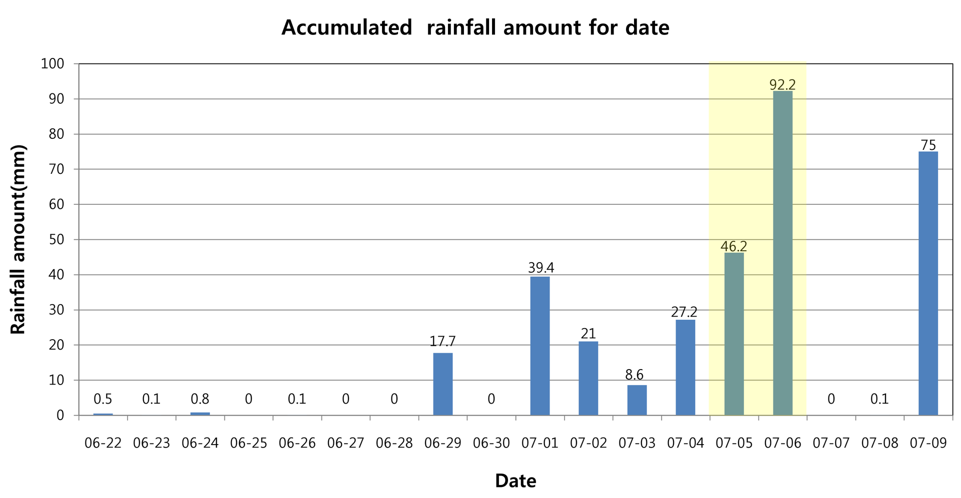


Fig. 2. Rainfall amount of Chujado during intensive observation period in 2007.

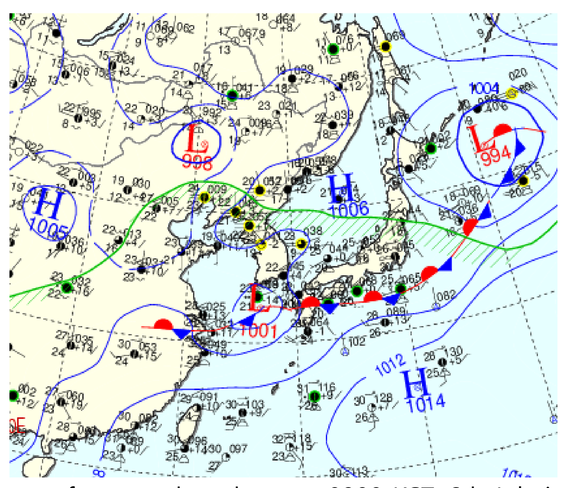


Fig. 3. The surface weather chart on 0900 KST, 6th July in 2007.

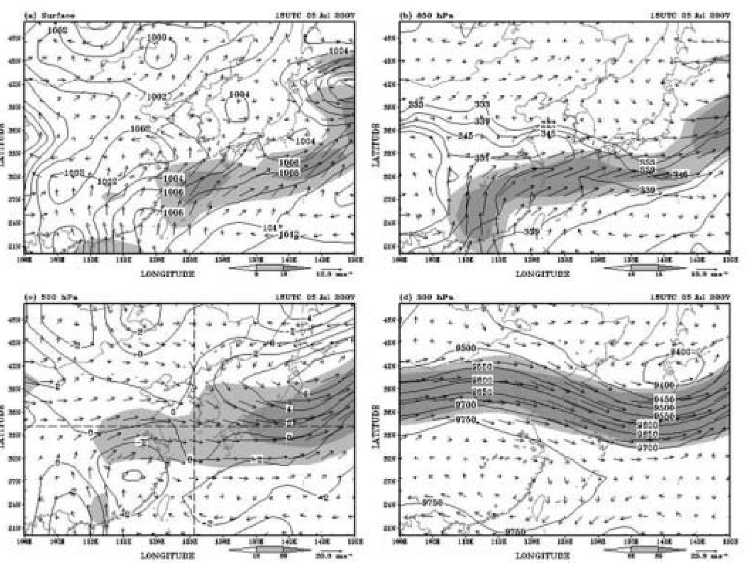


Fig. 4. (a) Pressure and wind vector at surface, (b) equivalent potential temperature and wind vector at 850hPa, (c) relative vorticity and wind vector at 500hPa, (d) geopotential height and wind vector at 300hPa 0300 KST on 6th July in 2007.

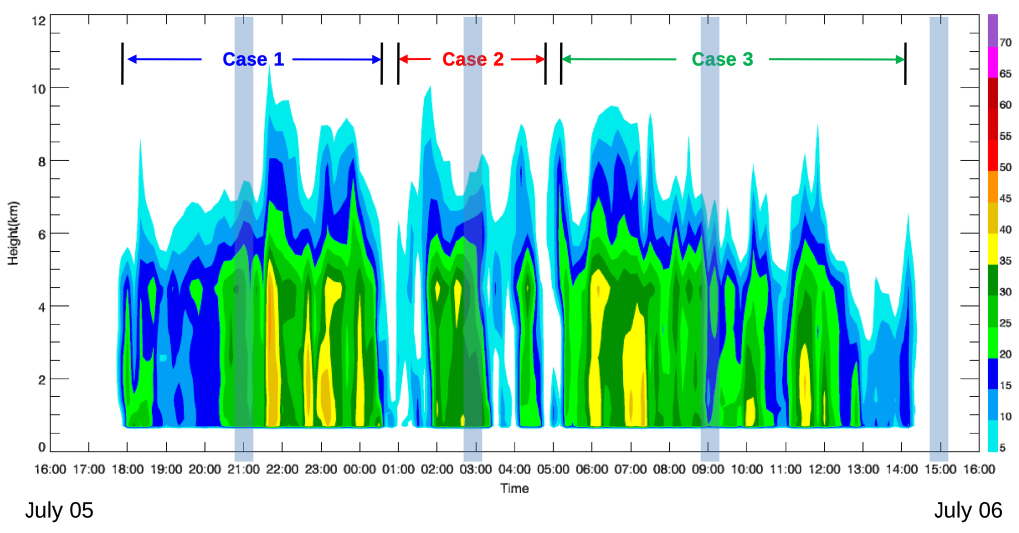


Fig. 5. The vertical profile of temporal reflectivity with time at Chujado from Gosan weather radar. Blue shaded boxes show the time launched radio sondes.

Dual Doppler analysis

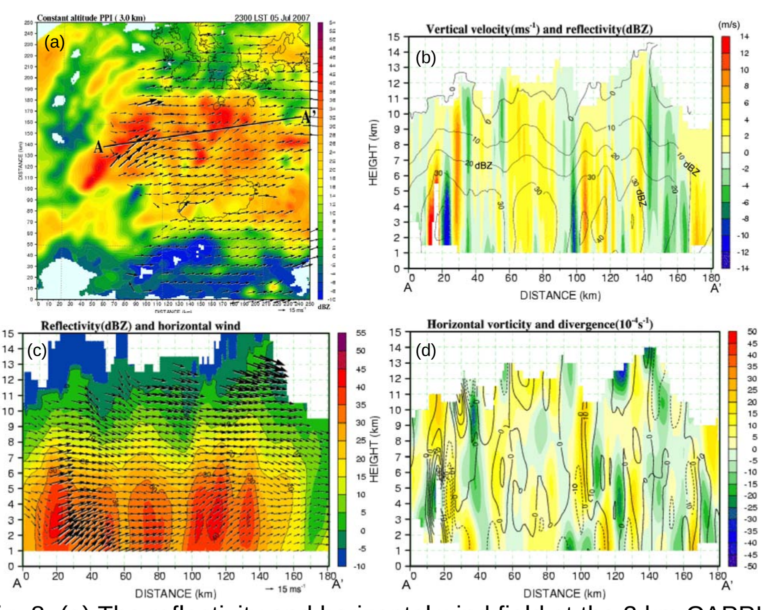


Fig. 8. (a) The reflectivity and horizontal wind field at the 3 km CAPPI at 2300 KST 5 July in 2007. Vertical cross sections along A-A' in (a) vertical velocity and reflectivity (b), horizontal wind and reflectivity (c), and horizontal vorticity and divergence (d).

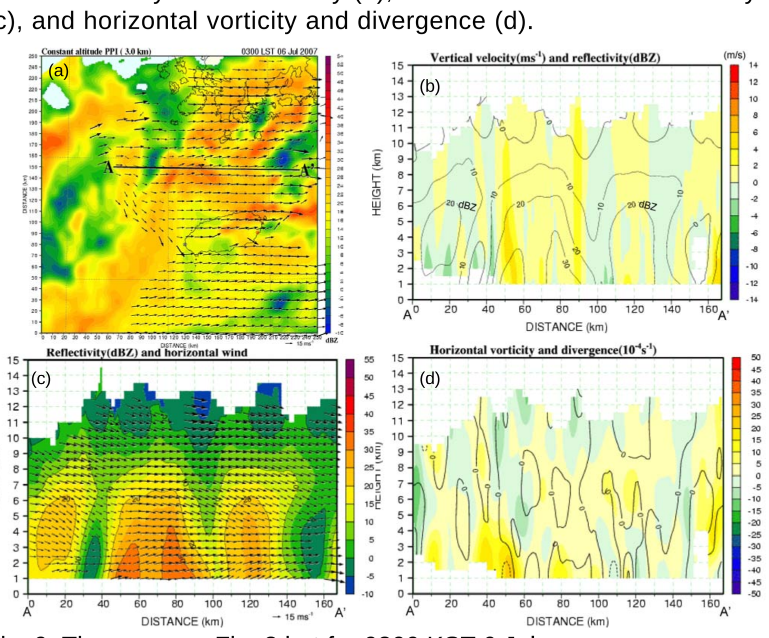


Fig. 9. The same as Fig. 8 but for 0300 KST 6 July.

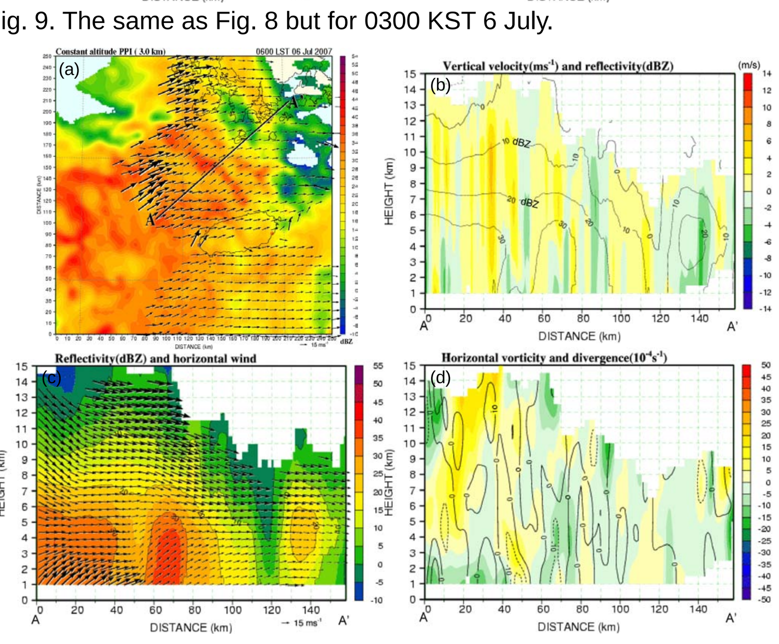


Fig. 10. The same as Fig. 8 but for 0900 KST 6 July.

DSD analysis

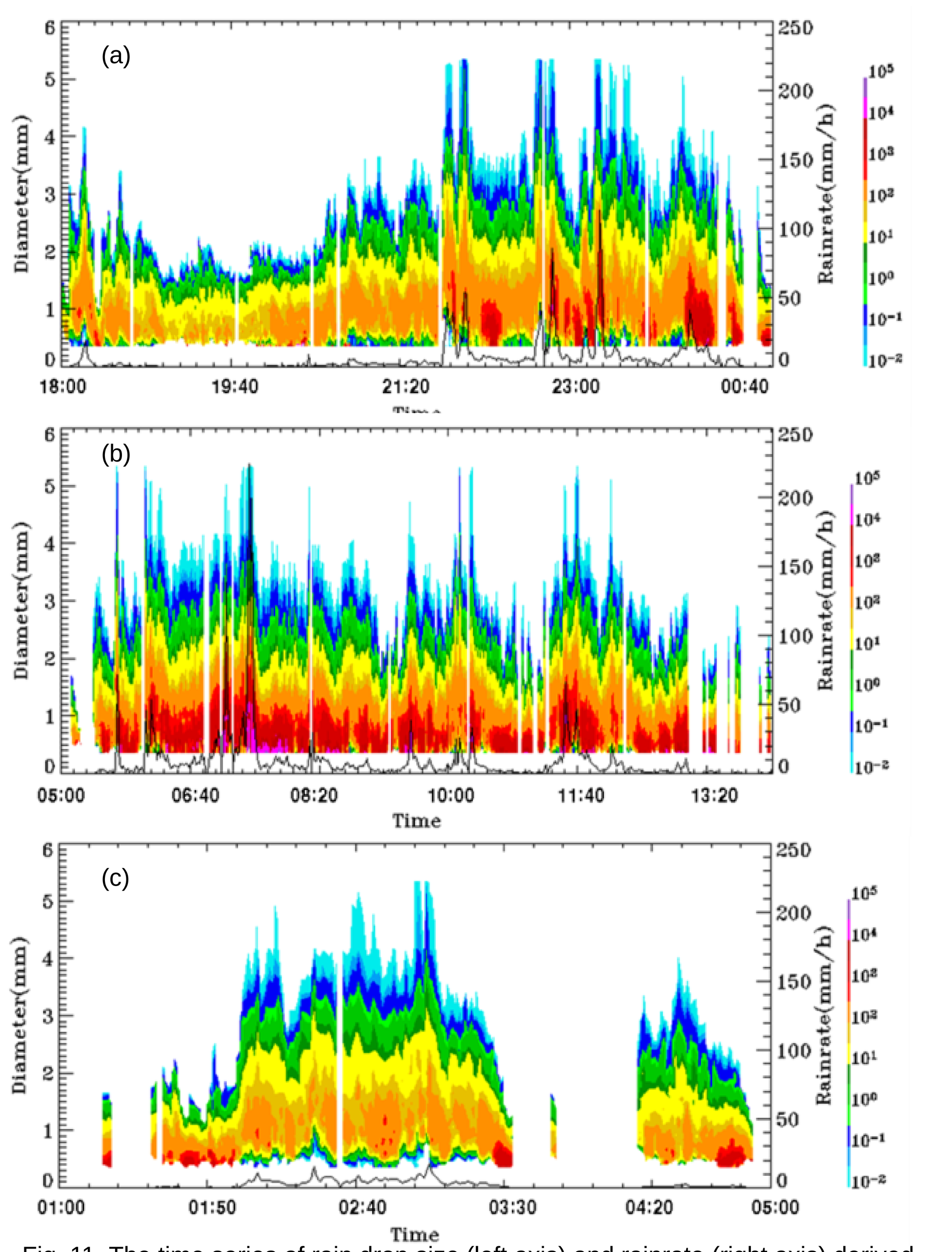


Fig. 11. The time series of rain drop size (left axis) and rainrate (right axis) derived from POSS (a) case 1, (b) case 2, and (c) case 3.

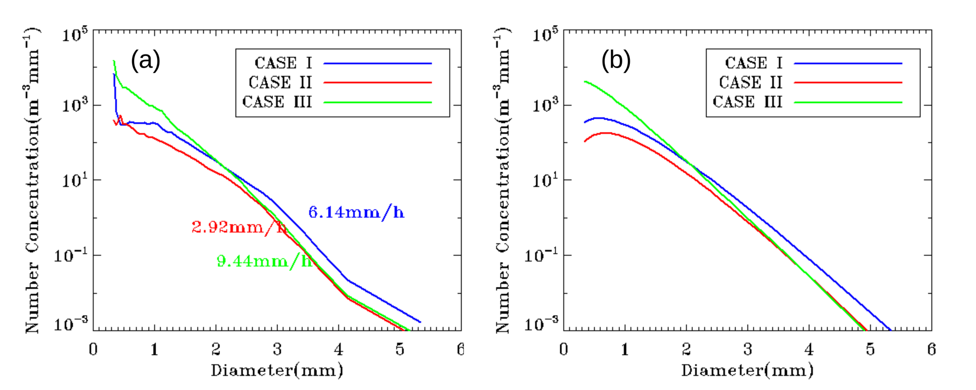


Fig. 12. Averaged DSD from (a) POSS disdrometer and (b) gamma distribution.

Sounding analysis

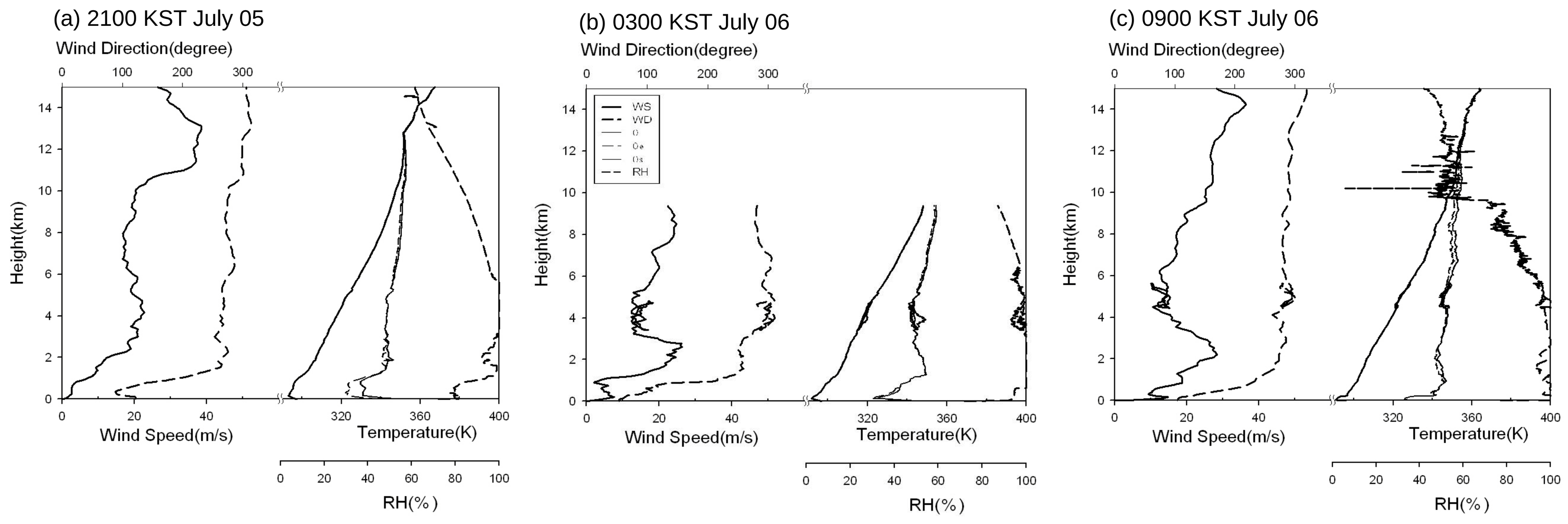


Fig. 6. The vertical profiles of wind speed, wind direction, potential temperature θ, equivalent potential temperature θe, saturated equivalent potential temperature θs, and relative humidity from radio sonde.

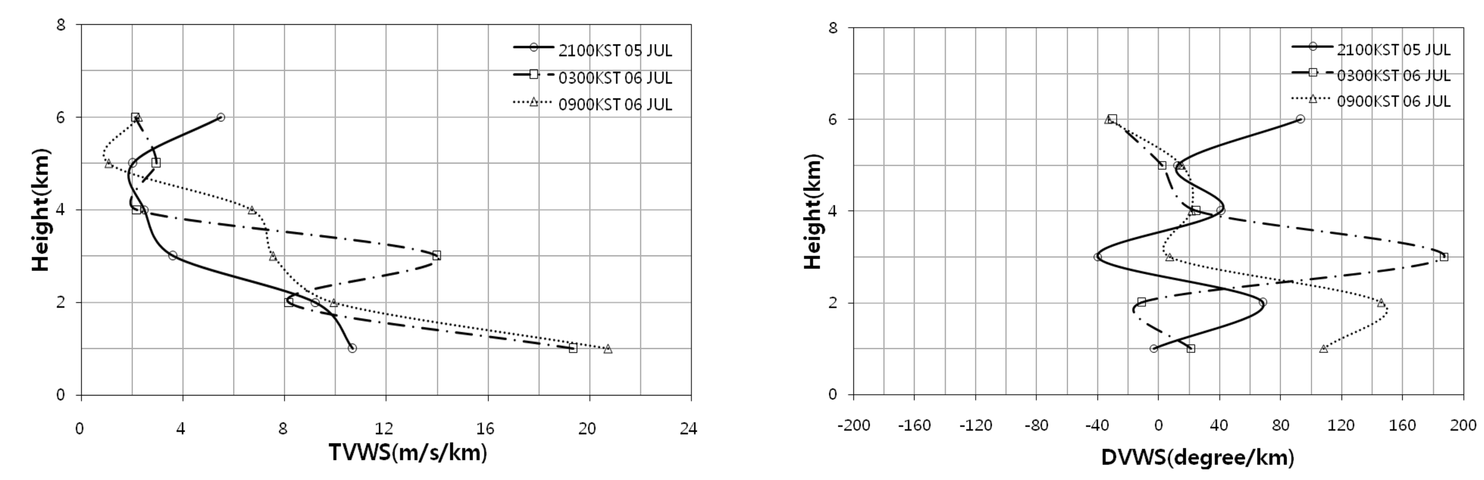


Fig. 7. The total vertical wind shear (TVWS, (a)) and directional vertical wind shear (DVWS, (b)) obtained from radio sondes.

4. Summary

- The deep warm advection was proved to make rainfall system maintained for longer time and stronger rain rate but smaller size diameter of raindrop was contributed as shown in case 3.
- The unstable instability, which means the cold advection at the surface and the warm advection at higher layer, would make larger size diameter of raindrop contributed to the rainfall system as occurred in case 1.
- The characteristics of meso scale precipitation system might be further valid by analyzing the system for shorter time and focusing on the precipitation appearance like band shape type with its orientation as it is propagating.