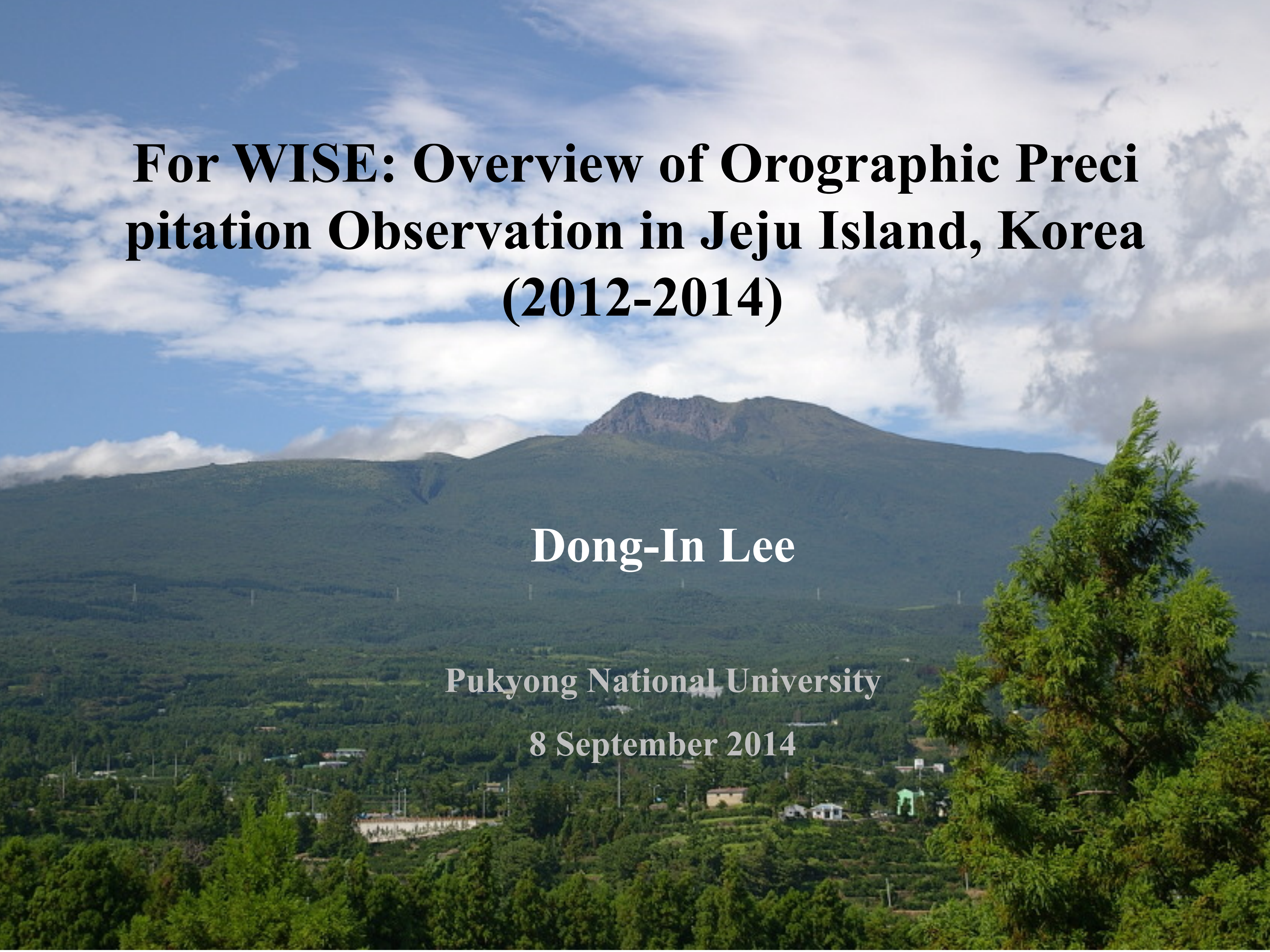
For WISE: Overview of Orographic Precipitation Observation in Jeju Island, Korea (2012-2014)

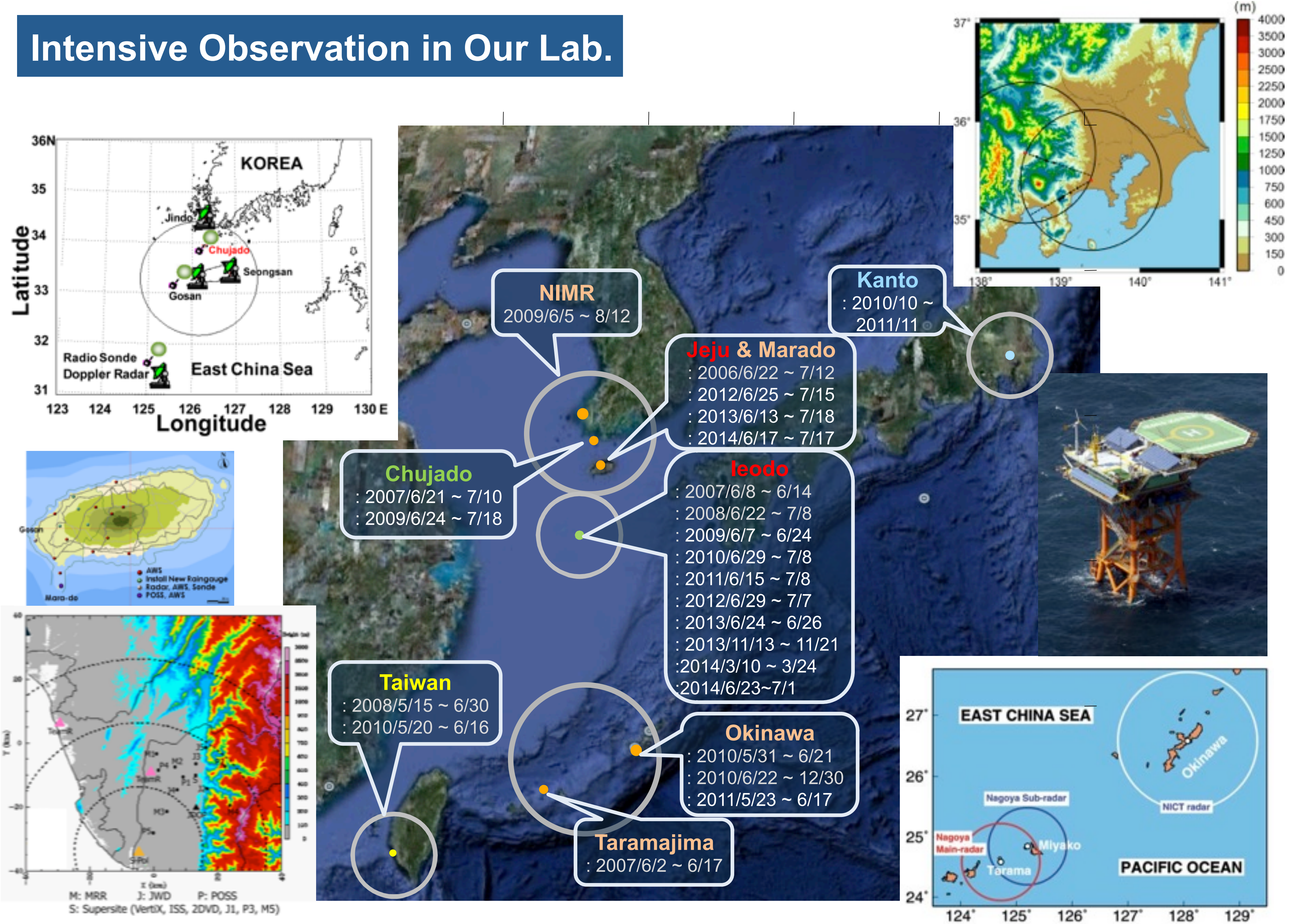
Dong-In Lee

Pukyong National University

8 September 2014



Intensive Observation in Our Lab.



Introduction

Topography of Jeju Island (interval: 200 m
)

Width: 78 km
Length: 35 km
Height: 1,950 m

1. **Orography plays an important role i
n controlling cloud formation, amou
nt and precipitation distribution.** ***(Lin, 2007)***

2. **The size and shape of topography ha
s a profound effect on the ultimate di
stribution of flow and precipitation a
round the ground.** ***(Houze, 2011)***

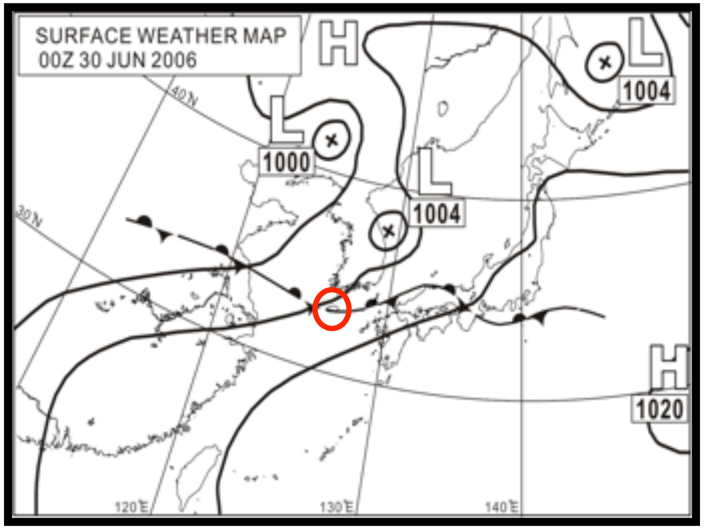
3. **To prevent or reduce natural disaste
r by orographic precipitation, actual
observation and accurate analysis is
necessary.**

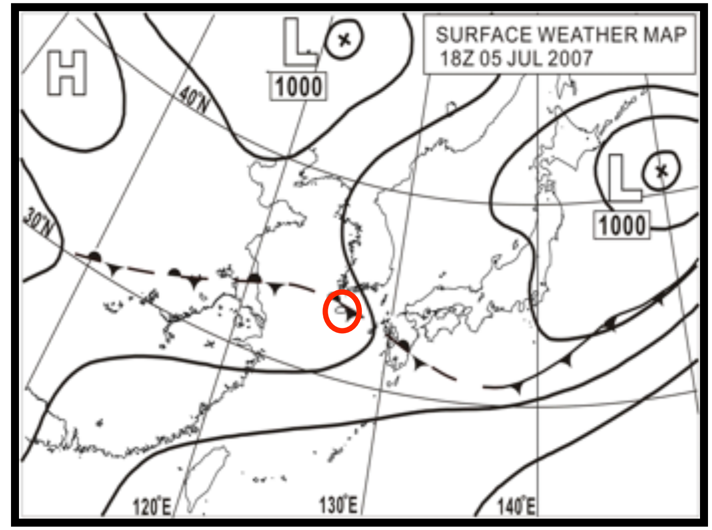
The enhancement mechanism of orographic precipitation over Mt. Halla in Jeju Island during Changma season

Previous study

- Lee et al. (2012) analyzed the enhancement mechanism of an precipitation s ystem using dual S-band Doppler radar data in 2007.

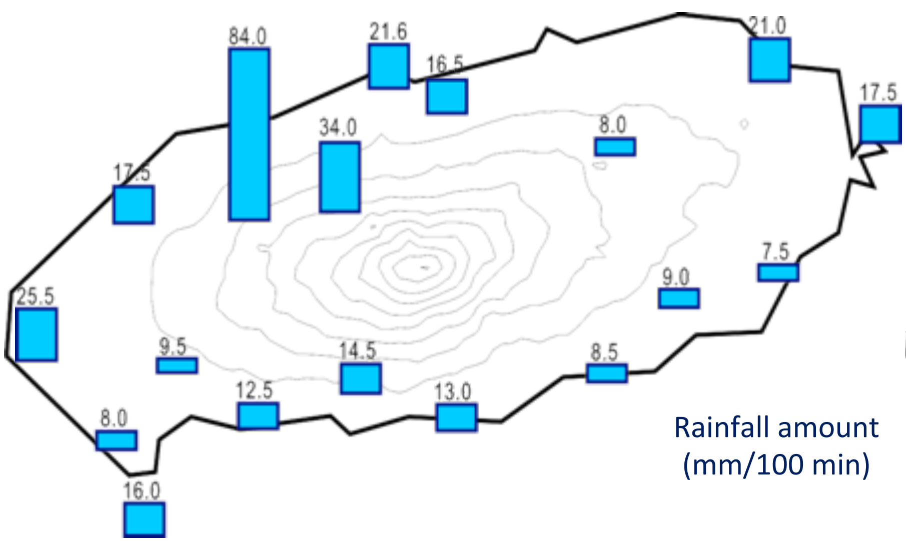
Two selected rainfall systems accompanied with Changma front





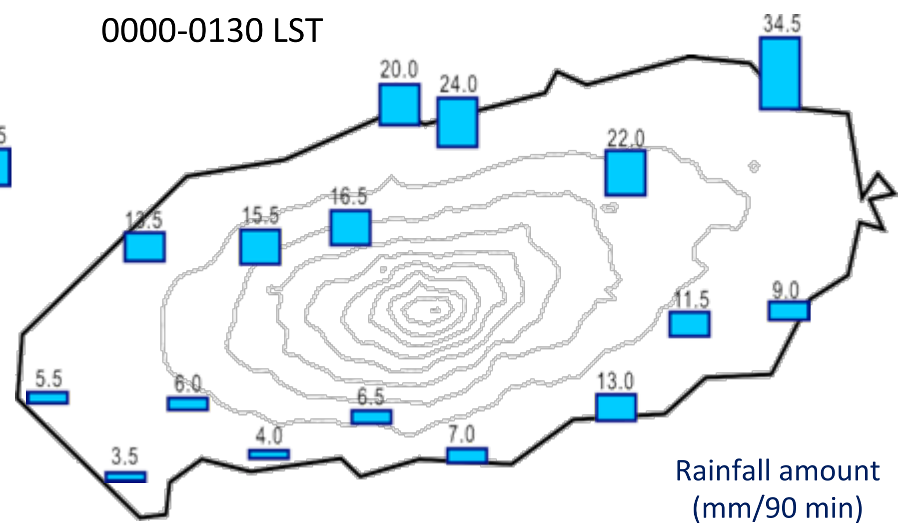
30 June 20**06** **P**recipitation system (**06P**)♪

1320-1500 LST



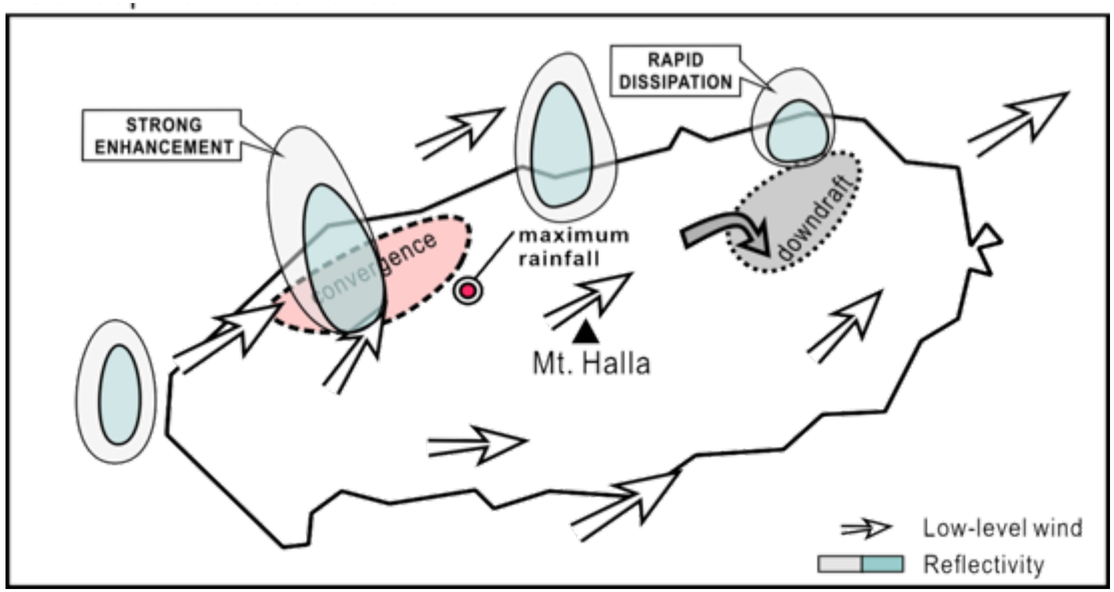
6 July 20**07** **P**recipitation system (**07P**)♪

0000-0130 LST



Schematic illustration of enhancement of 06P

Conceptual model of **06P**



- A pre-existing rainfall system passed over the northern Jeju Islan d; moist southwesterlies prevailed in low altitudes with *Fr* of 0.55.

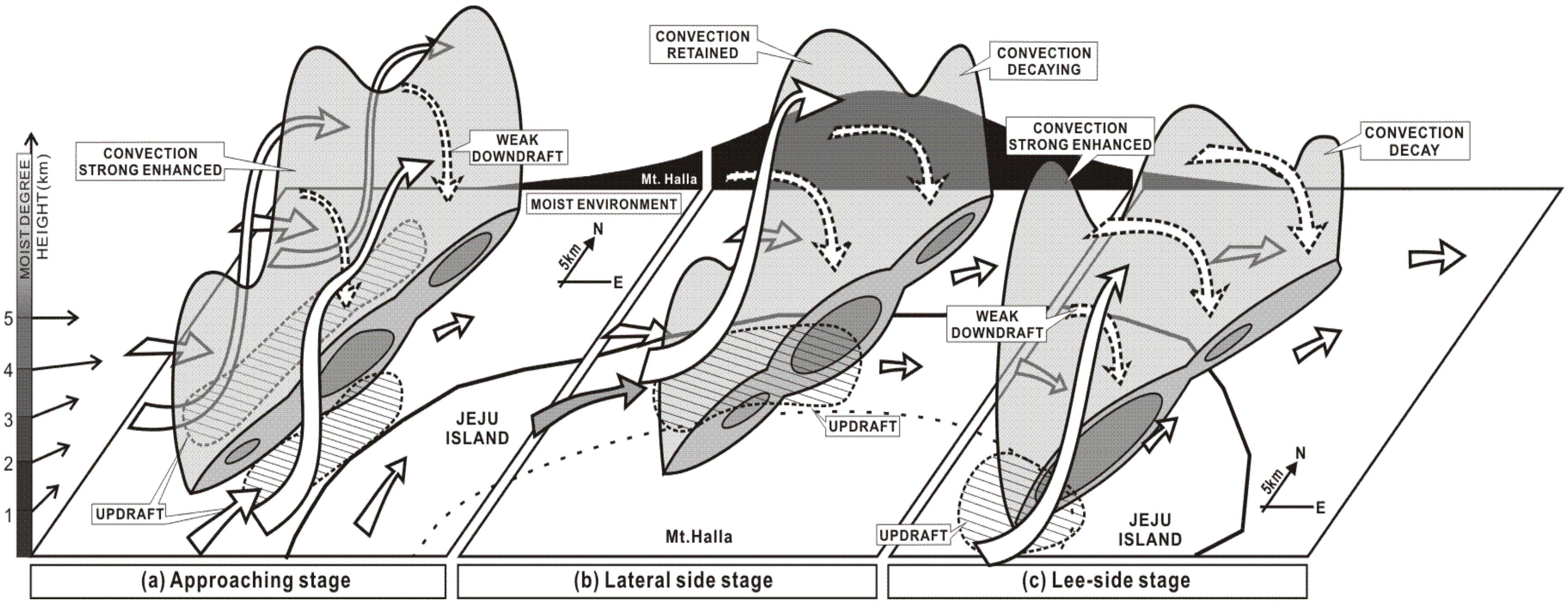
- Regarding system enhancement on NW lateral side of terrain, wi nd convergence with high RH was identified.

- Regarding of rapid system-dissipation on NE lee side, dry descend ing air was identified.

Lee et al. (2010)

Schematic illustration of enhancement of 07P

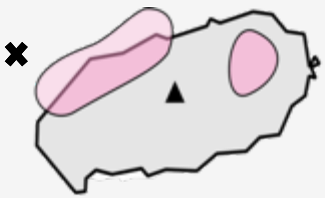
Conceptual model of **07P**



System enhancement	System maintain	System enhancement
• Local wind convergence between southern part of the system and island • Concentrated moist air in low altitudes	• Terrain-modified south-westerly wind (*Fr*, 0.2) in low altitudes • Steady inflow of moist to the northern slope	• The westerly converged with moist southwesterly on the eastern slope

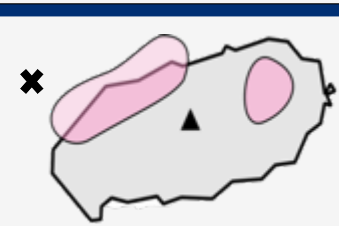
Lee et al. (2010)

Comparison of **06P** and **07P**

	Parameter		06P	07P
ENVIRONMENT	Surface Humidity		**MOIST** 92 %	**MOIST** 90 %
	Surface Temperature		**WARM** 26 °C	**WARM** 24 °C
	Wind Direction	Mid Level		
		Low Level		
	Froude Number		**MODERATE** 0.55	**LOW** 0.2
	Stability		**STABLE** $1.4 \times 10^{-2}\ s^{-1}$	**STABLE** $1.7 \times 10^{-2}\ s^{-1}$
SYSTEM	Passage	Direction	Eastward	Eastward
		Speed	~ 13 $m\,s^{-1}$	~ 11 $m\,s^{-1}$
	Evolution Enhancement Dissipation			

✖: Center location of approaching system

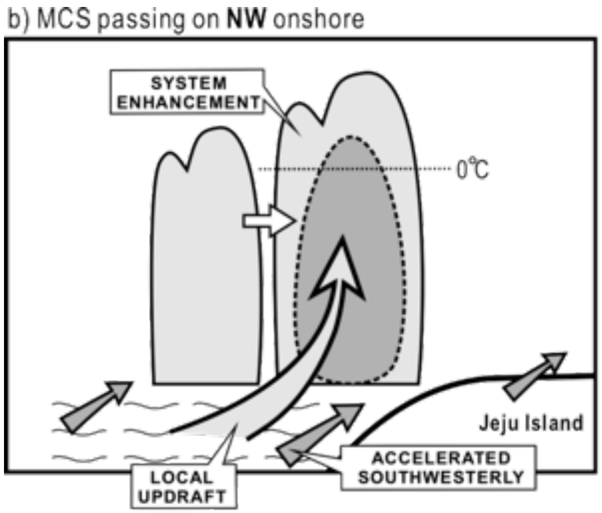
Comparison of **06P** and **07P**

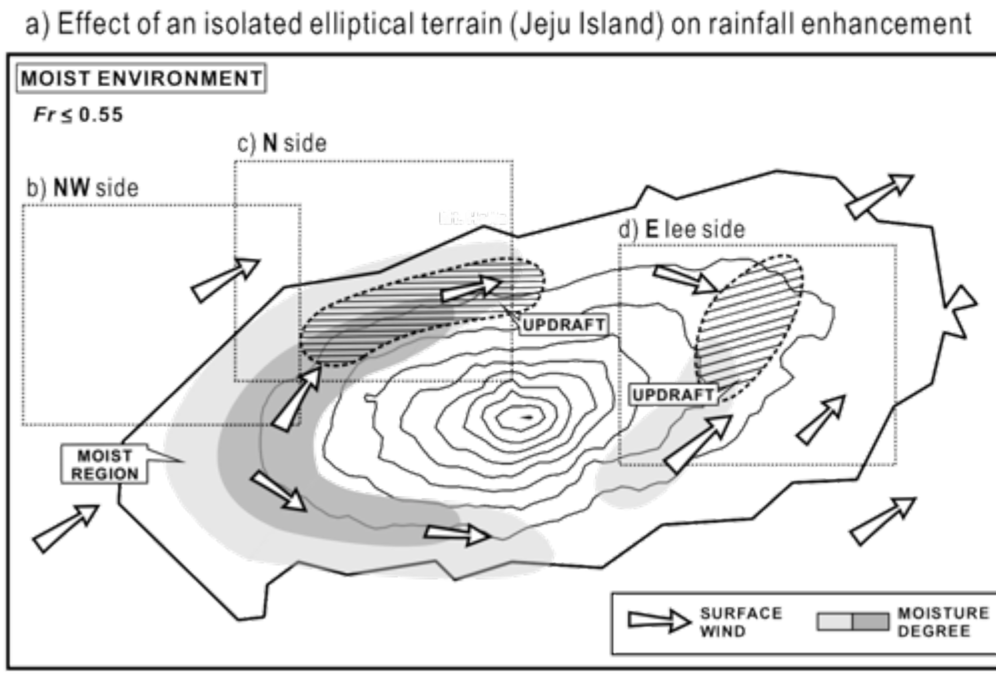
	Parameter		06P	07P
ENVIRONMENT	Surface Humidity		**MOIST** 92 %	**MOIST** 90 %
	Surface Temperature		**WARM** 26 °C	**WARM** 24 °C
	Wind Direction	Mid Level		
		Low Level		
	Froude Number		**MODERATE** 0.55	**LOW** 0.2
	Stability		**STABLE** $1.4\times10^{-2}\ s^{-1}$	**STABLE** $1.7\times10^{-2}\ s^{-1}$
SYSTEM	Passage	Direction	Eastward	Eastward
		Speed	$\sim 13\ m\,s^{-1}$	$\sim 11\ m\,s^{-1}$
	Evolution (Enhancement, Dissipation)			

✖: Center location of approaching system

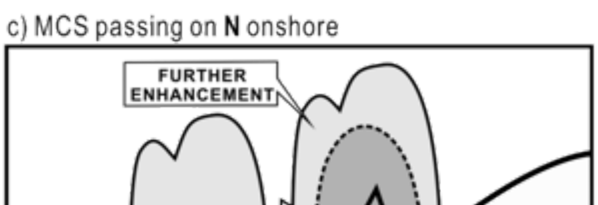
Orographic effect of Jeju Island on rainfall enhancement

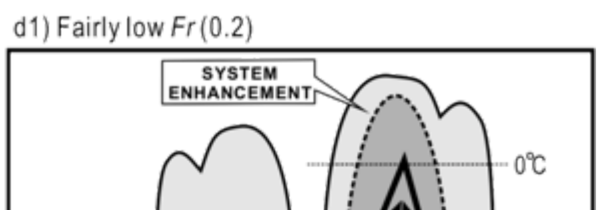
Lee et al. (2013)

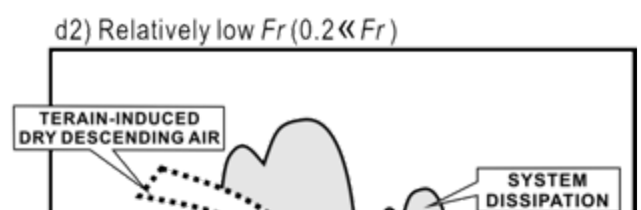




Abundant moisture on sea surface intensifying rainfall







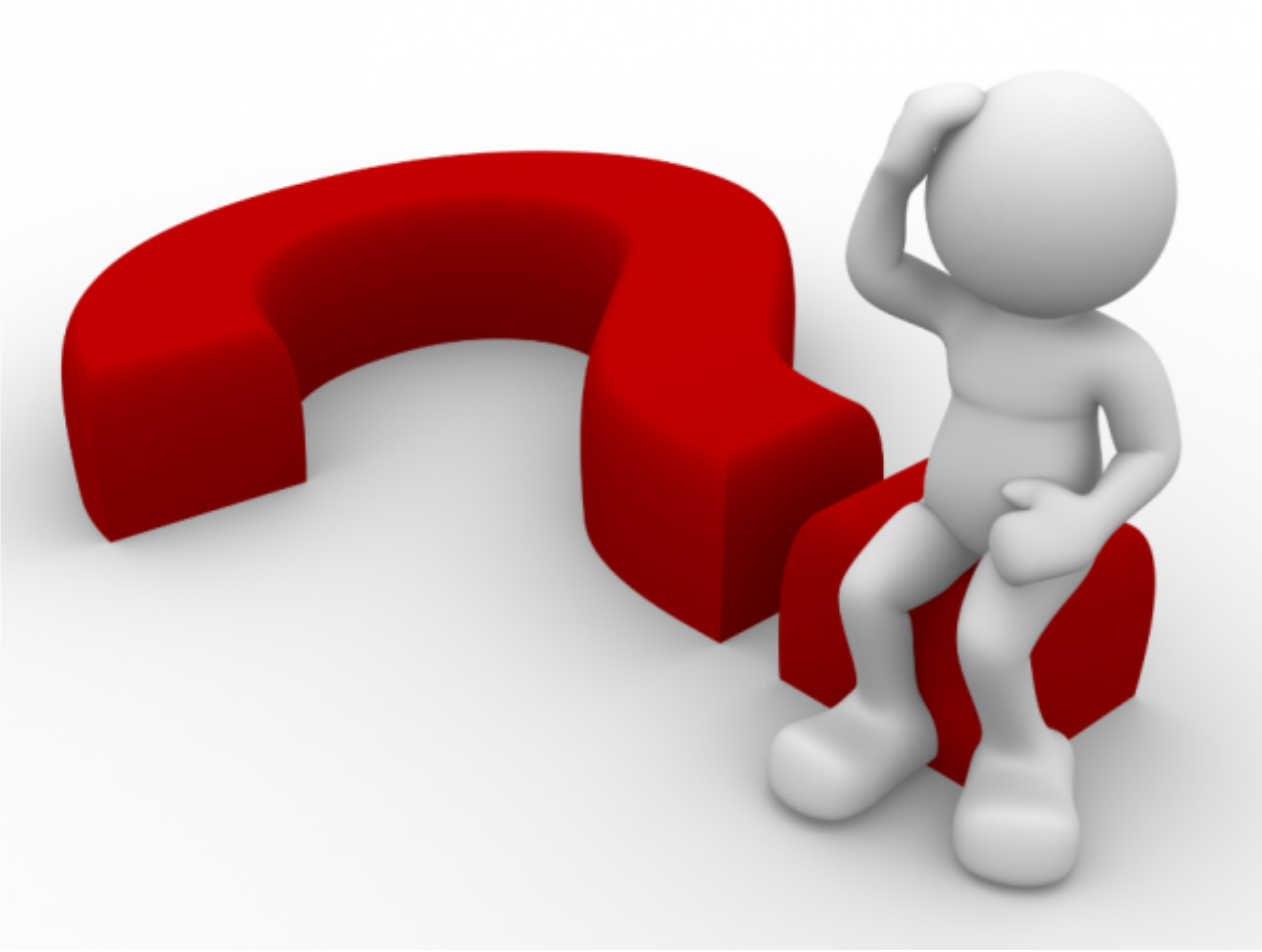
Local winds (SW) intensity plays a role with moist environment to make orographic heavy precipitation over Mt. Halla in Jeju Island during Changma season. (By ideal experimental model simulation)

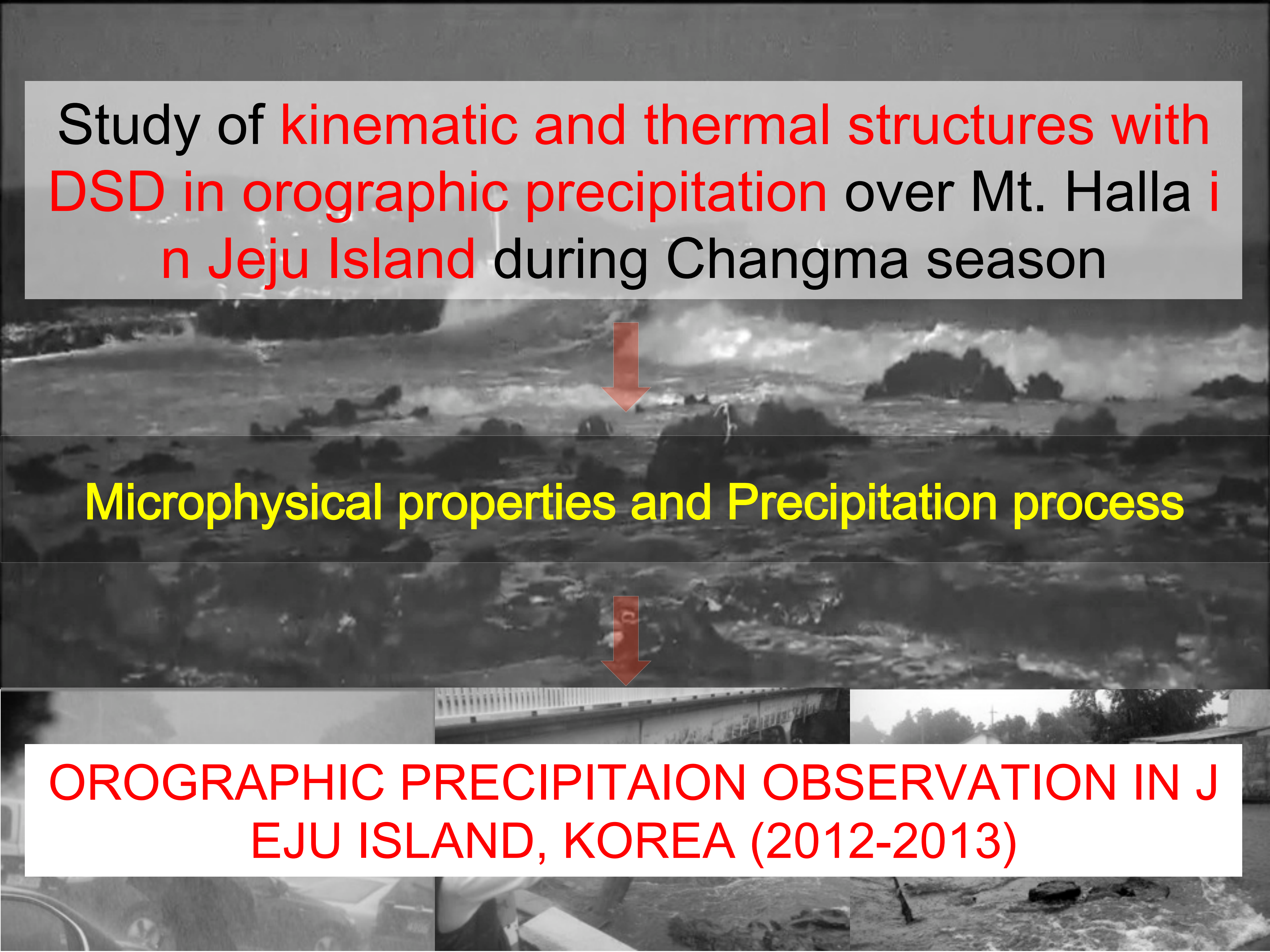
Local moist updraft on the lateral side of terrain (Fr ≤ 0.55)

Co-existing local moist updraft and absence of dry descending air

Accelerated low-level wind resulting in dry descending air

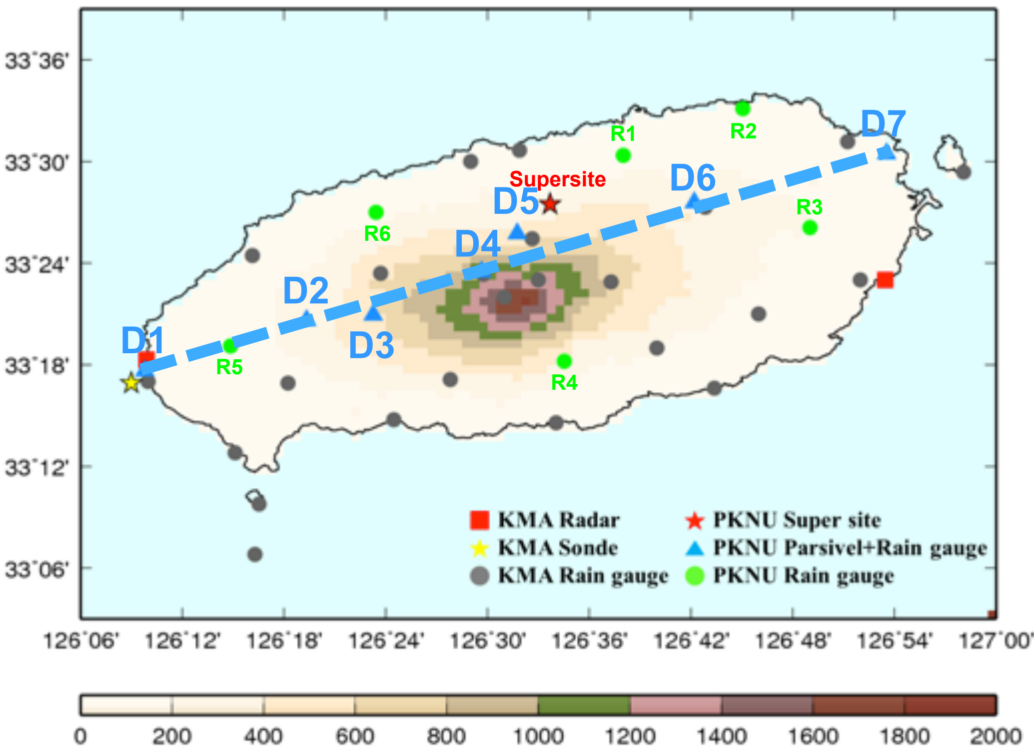
Next Step…



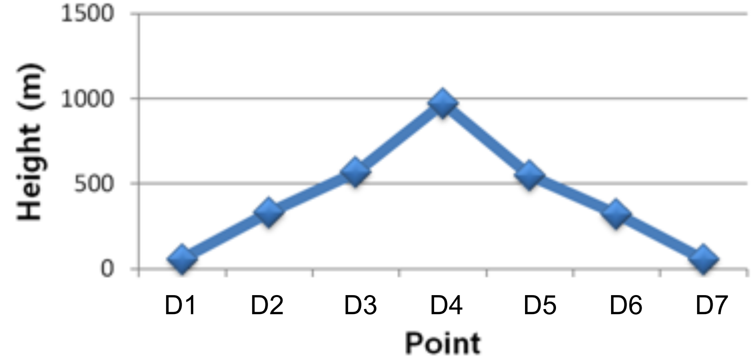

Study of kinematic and thermal structures with DSD in orographic precipitation over Mt. Halla in Jeju Island during Changma season
Microphysical properties and Precipitation process
OROGRAPHIC PRECIPITAION OBSERVATION IN JEJU ISLAND, KOREA (2012-2013)

Intensive Observation on Jejudo in 2012

Topography of Jeju Island

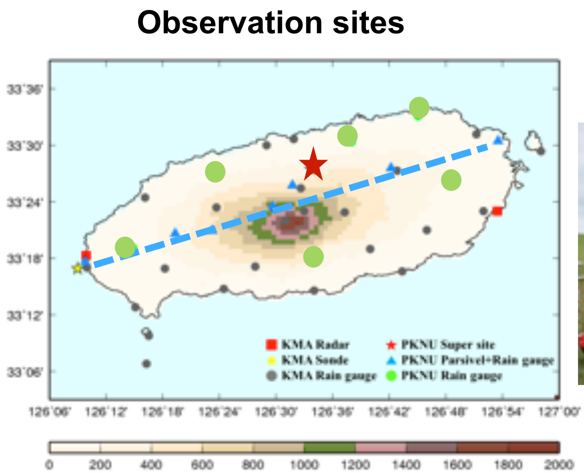


The height of parsivel site



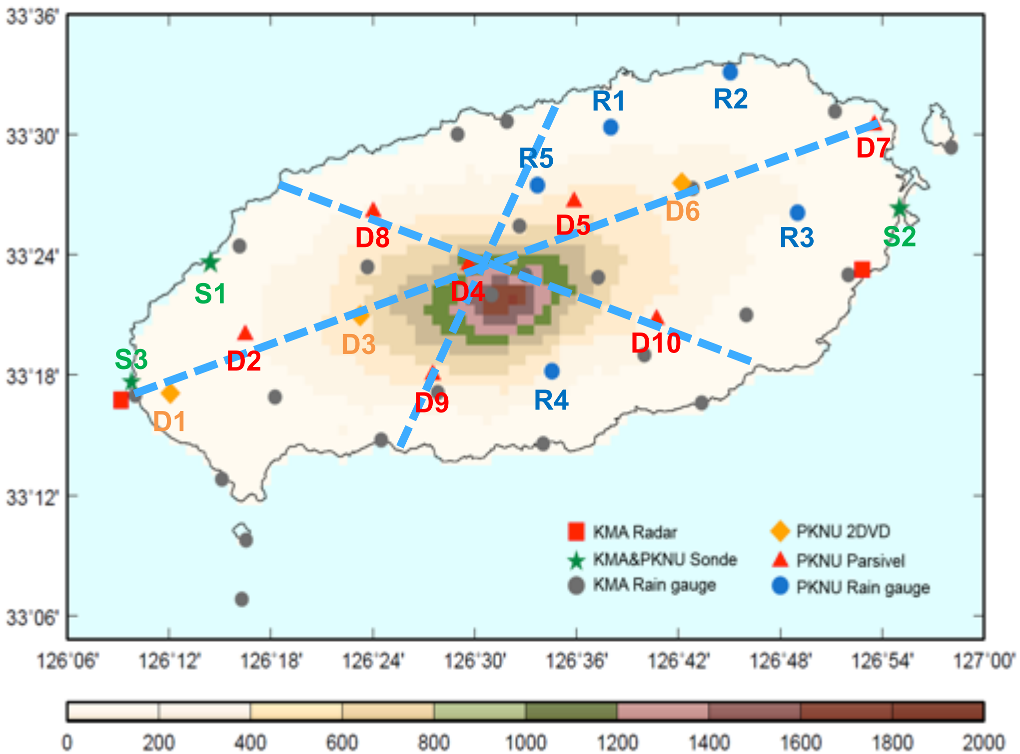
- **Period : 25 June ~ 15 July 2012**
- **Instruments :**
  - **KMA**
    - 2 S-band Doppler radars
    - 1 GPS sonde
    - 23 Raingauges
  - **PKNU**
    - 1 GPS sonde, Automatic weather s ystem (Supersite)
    - 7 Parsivel
    - 13 Raingauges

Image of site in 2012



Intensive Observation on Jejudo in 2013

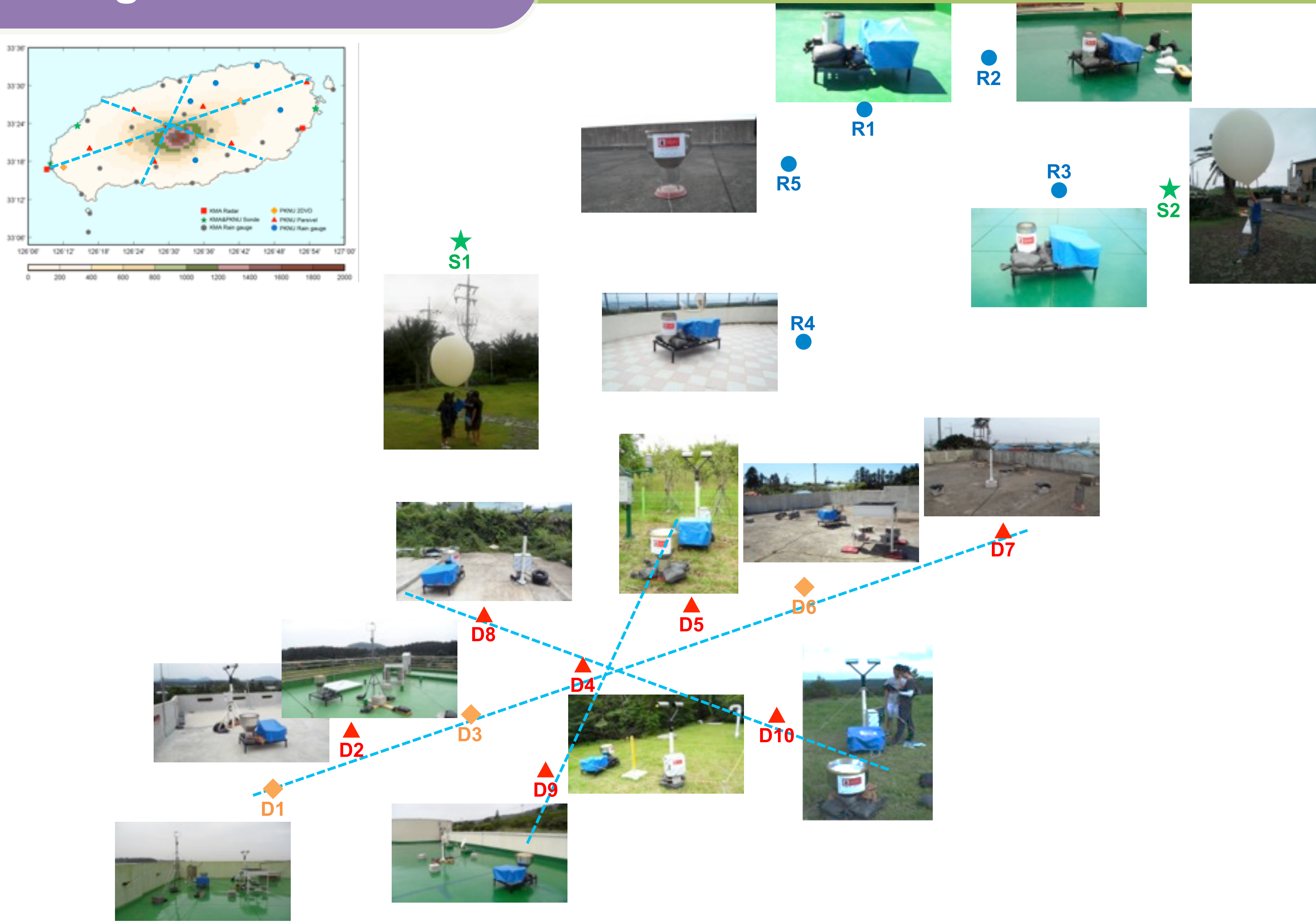
Topography of Jeju Island



Period : 13 June ~ 18 July 2013

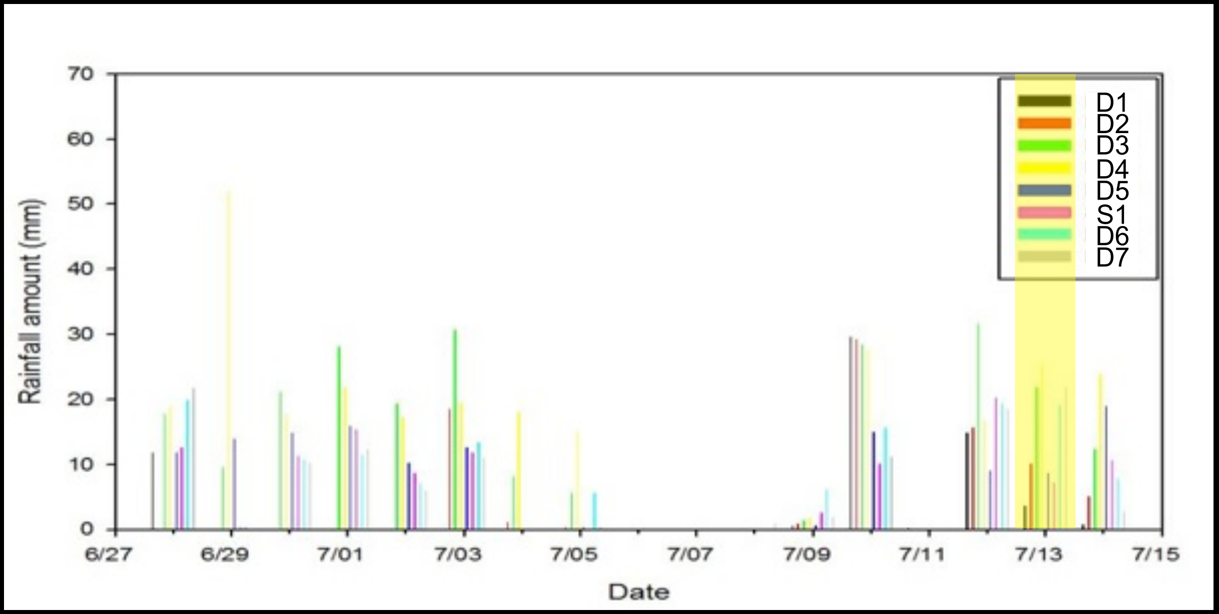
- **PKNU**
  - 2 GPS sondes & 1 LPC
  - 2 Automatic weather systems
  - 3 Ultrasonic anemometers
  - 15 Raingauges
  - 1 2DVD & 6 Parsivels
- **KNU** - 1 2DVD
- **IJU** - 1 2DVD & 2 Parsivels
- **KMA & NIMR**
  - 2 S-band Doppler radars
  - 1 GPS sonde & Mobile sonde
  - 23 Raingauges
- **GISANG 1 HO**
  - 1 GPS sonde & 1 PM_{10}
  - 1 Automatic weather system

Image of site in 2013

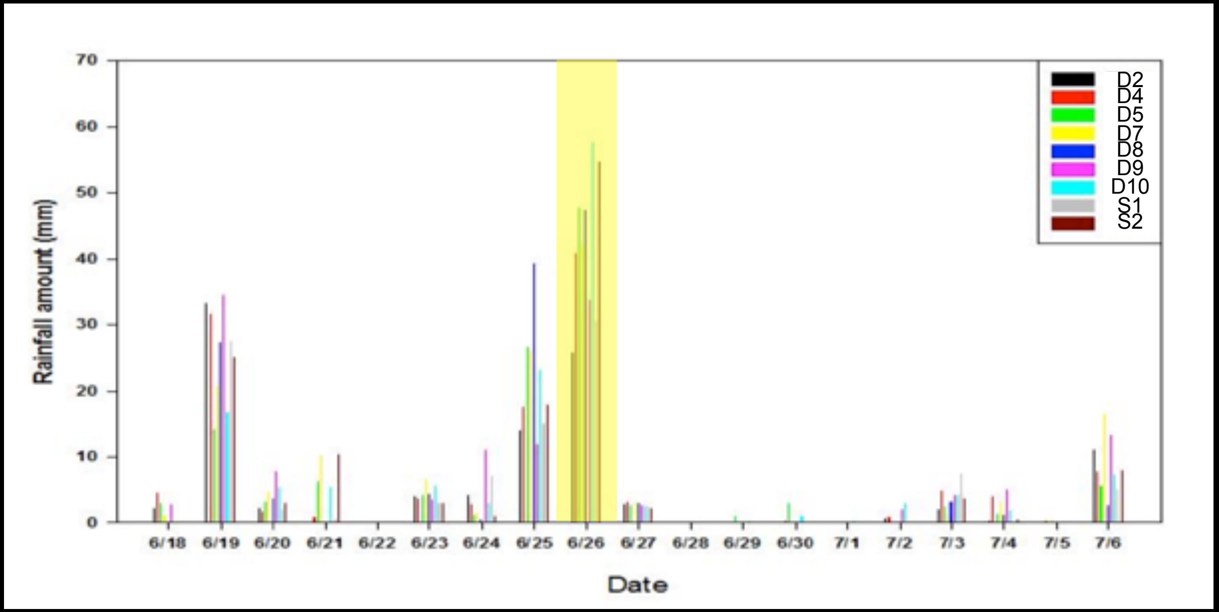


Case overview in 2012 & 2013

2012 Case
(13 July 2012)

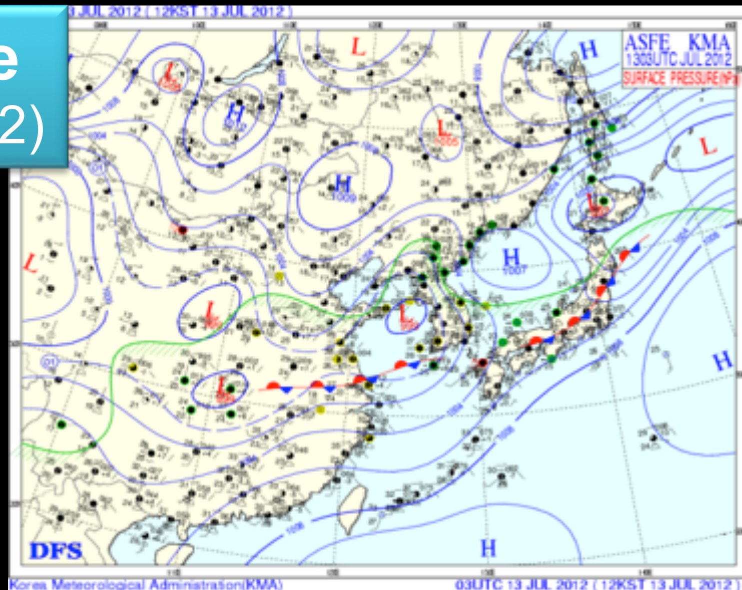


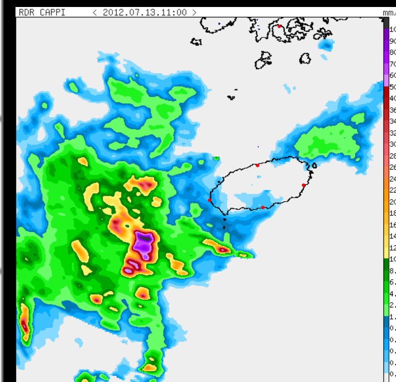
2013 Case
(26 June 2013)

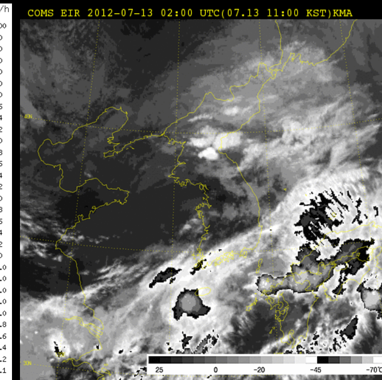


Synoptic analysis in 2012 & 2013

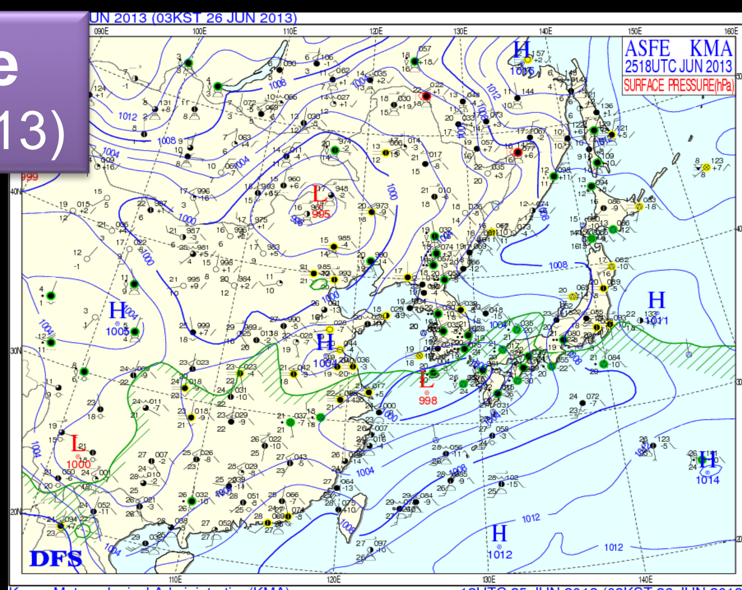
2012 Case
(13 July 2012)

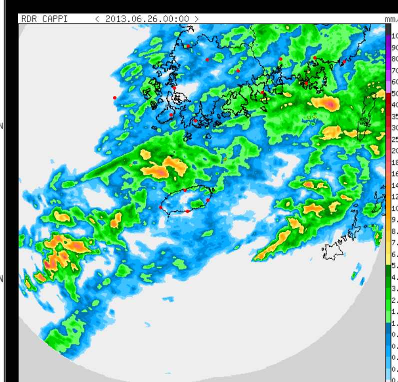


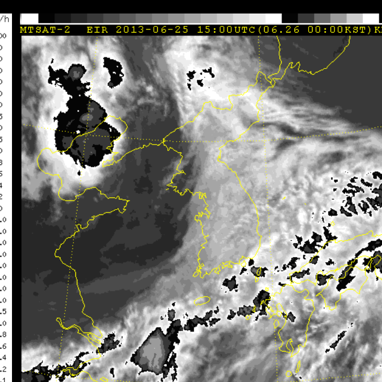




2013 Case
(26 June 2013)





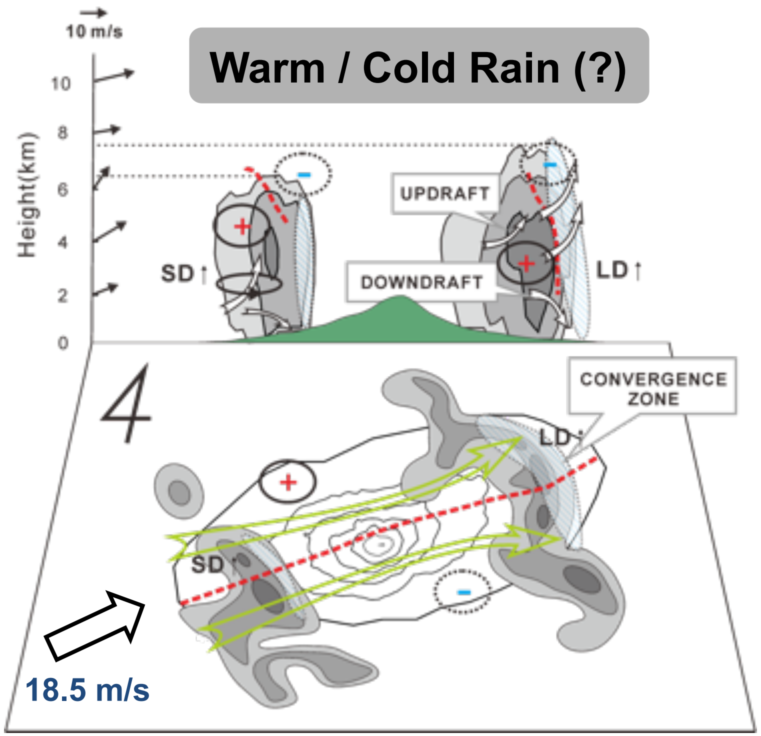


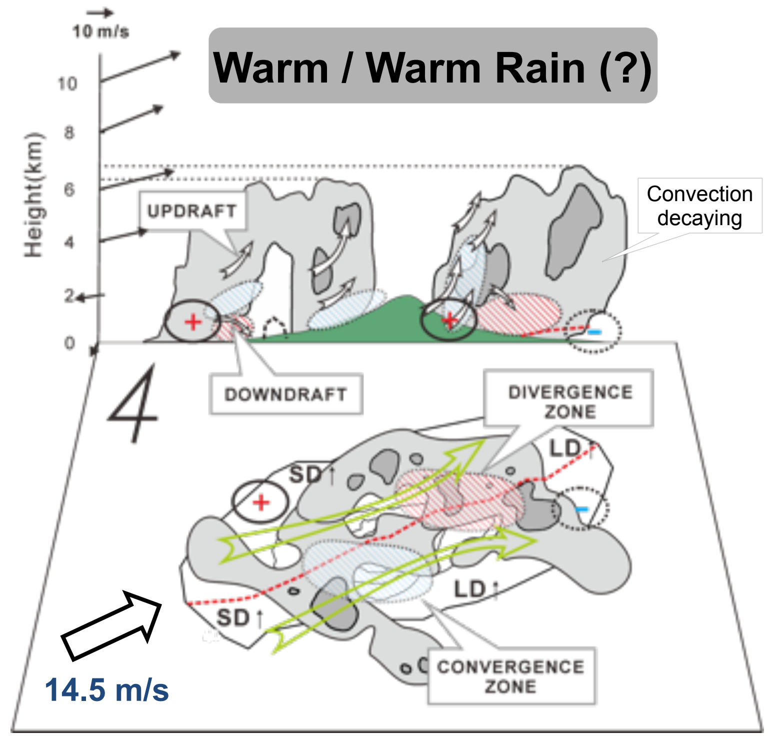
Conclusion

Parameter		2012 Case	2013 Case
Synoptic condition	Date & Time	1150 -1300 LST 13 July	0210 - 0320 LST 26 June
	Location of Changma front	**North** of Jeju Island	**Center** of Jeju Island
	Thermodynamic structure	**Cold advection** in lower layer and **warm advection** in upper layer	**Warm advection** in lower layer and **cold advection** in upper layer
	Surface humidity & wind	**Moist** southwesterly (~ 10 m/s)	**Moist** southwesterly (~ 10 m/s)
Rainfall System	Froude number	**0.27**	**0.26**
	Moving direction	**southwest to northeast**	**southwest to northeast**
	Maximum reflectivity	51 dBZ north and northeast sides	42 dBZ north and south sides
	Wind field	**convergence** and **updraft** in forward direction	**convergence** and **updraft** above mountain
	Drop size distribution	- high number concentration in D2 **(west)** **with small size rain drops (< 0.3 mm)** - high number concentration in D6 **(east)** **with middle and large size rain drops (> 3 mm)**	- high number concentration at D4, D5, **and** D8 **(north) with small size rain drops (< 2 mm)** - high number concentration at D7 **(north east) and D9 (southwest) with large size rain drops (>6 mm)**

Conclusion

2012 Case	2013 Case





	Windward side	Lee side

	E	W	N	S

Future study

To investigate the relation and comparison between these different effects and meso-scale gravity wave by topography in developing precipitation mechanism, we will analyze **the model simulation and microphysics on DSD-Parameter (D_0, N_t, Λ, μ, N_0 etc.).**

2014 IOP in Jeju

(17th June ~ 15th July, 2014)

Dong-In Lee

Pukyong National University

부경대학교 PUKYONG NATIONAL UNIVERSITY

제주지방기상청 Jeju Regional Meteorological Administration

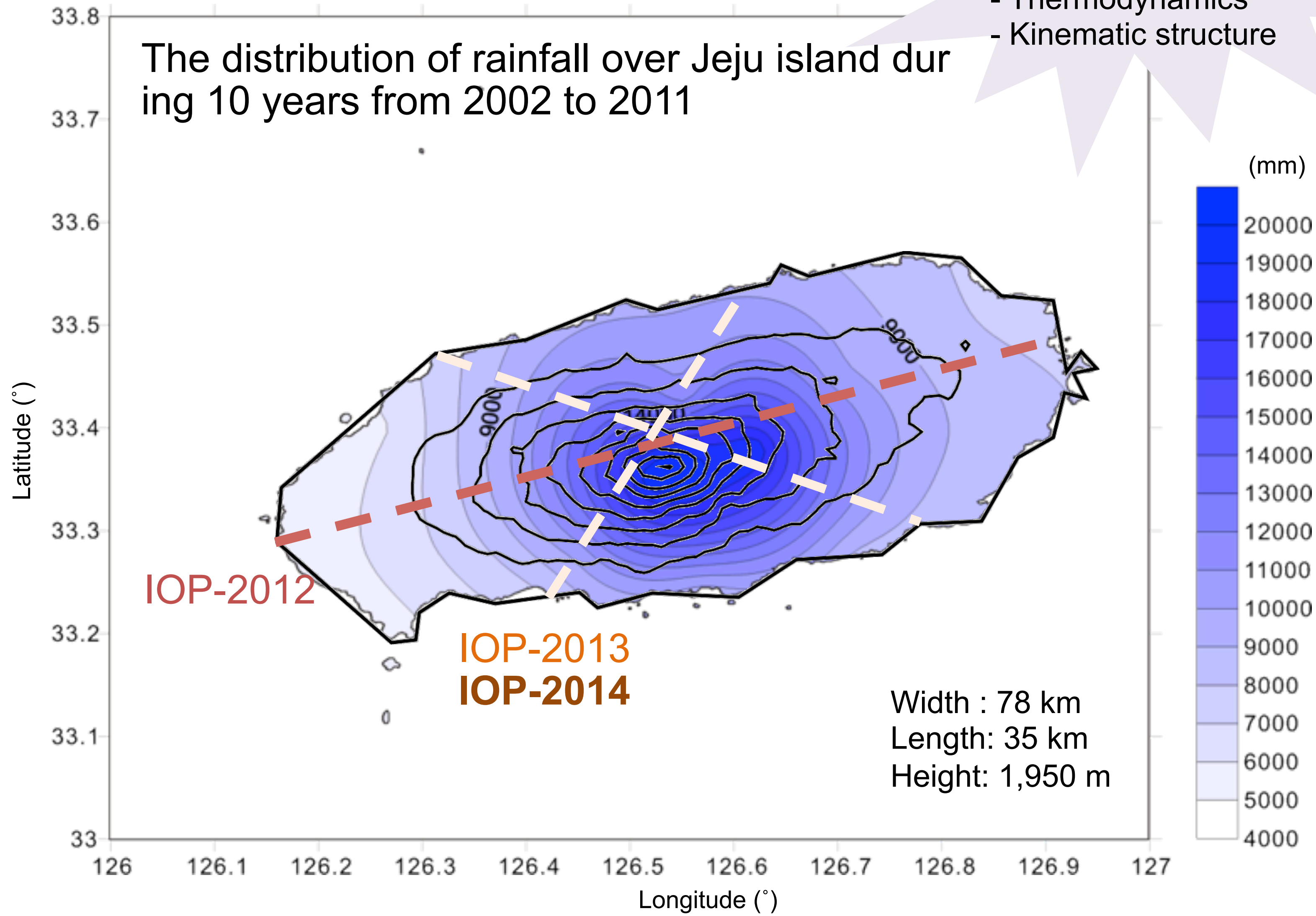
nimr 국립기상연구소

제주대학교 JEJU NATIONAL UNIVERSITY

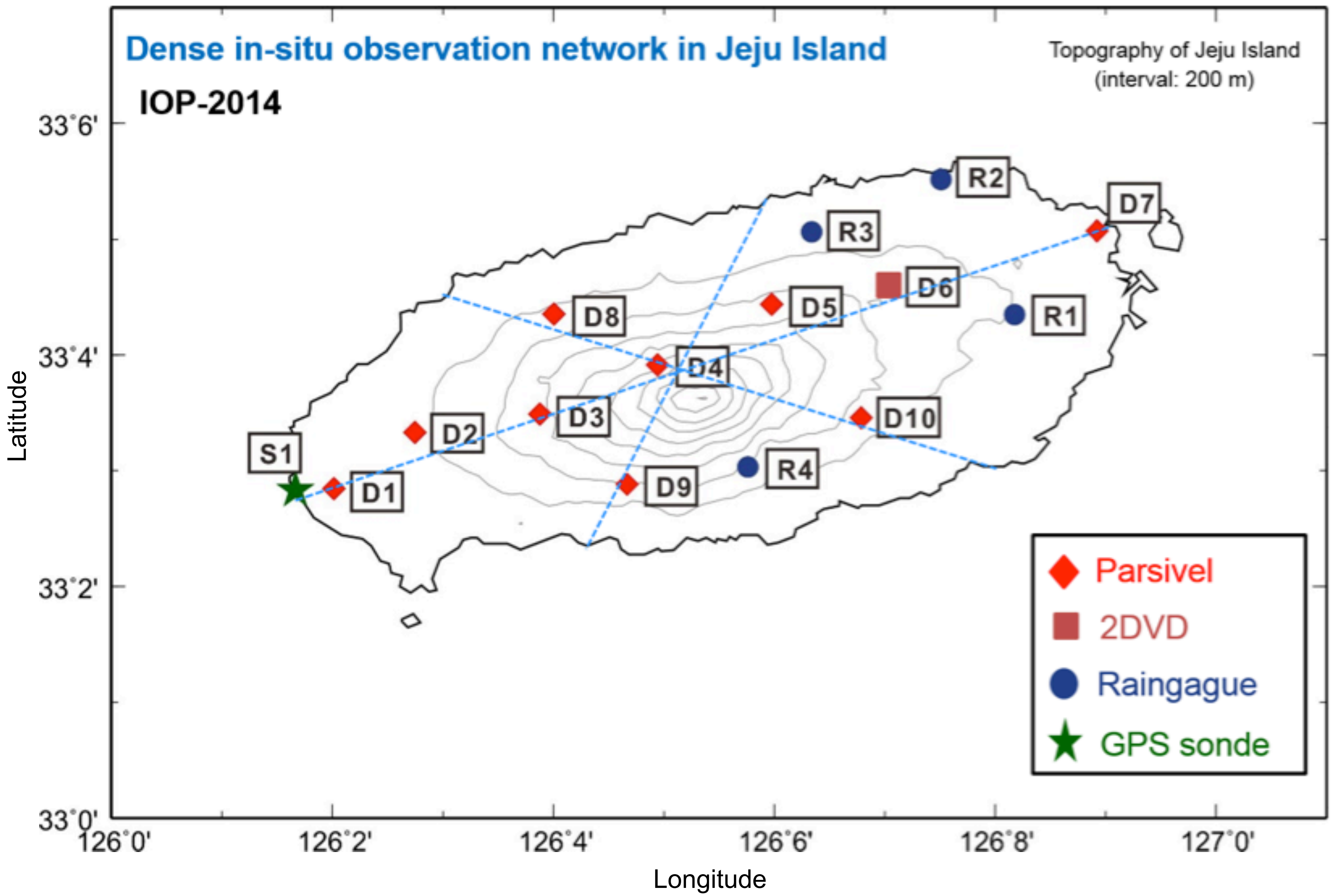
인제대학교 INJE UNIVERSITY

Motivation

Research highlight
- Microphysics
- Thermodynamics
- Kinematic structure



Observation map & instruments



Observation schedule

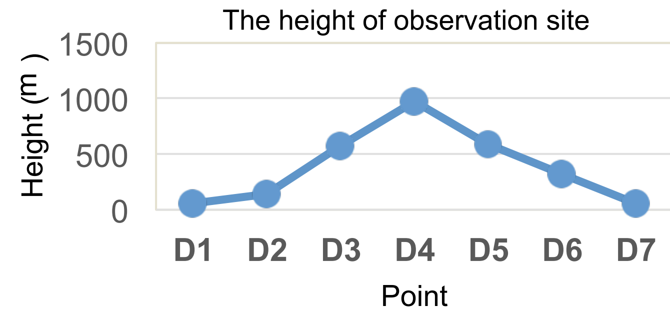
- Instrument Installation and Dissolution
- Intensive Observation in Jeju Island
- Intensive Observation in Ieodo
- Radio Sonde Observation Period: →

(2014.06.17. ~ 07.16)

Sun	Mon	Tue	Wen	Thu	Fri	Sat
15	16	Move to Jeju 17	18	19	20	21
22	23	24	25	IOP in Ieodo 26	27	28
29	IOP in Ieodo 30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	Move to Busan 17	18	19

Observation instruments

- Sonde(1), AWS(1), Parsivel(9), Raingauge(14), 2DVD(1), UVW(2)

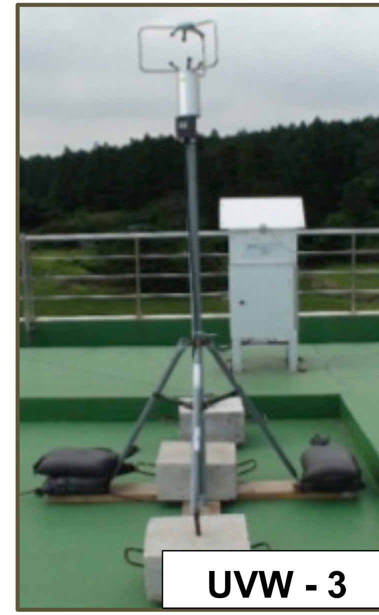


Point	Name	Instrument	Longitude	Latitude	Height
S1	Chagwido port	Radiosonde, AWS	126.1838˚	33.3500˚	307m
D1	Gosan Weather Station	Parsivel, Raingauge, UVW	126.2012˚	33.2848˚	58 m
D2	Jeoji-ri	Parsivel, Raingauge	126.2748˚	33.3334˚	140m
D3	National Institute of Environmental Research	Parsivel, Raingauge, UVW	126.3876˚	33.3491˚	571 m
D4	Eorimok Rest Area	Parsivel, Raingauge	126.4943˚	33.3917˚	975 m
D5	Halla Eco-forest		126.5975˚	33.4440˚	587m
D6	Seonheul-ri Welfare Center	2DVD, Raingauge, UVW	126.7034˚	33.4594˚	324 m
D7	Hadodongdong Welfare Center	Parsivel, Raingauge	126.8922˚	33.5076˚	57 m
D8	Yusuam village		126.4005˚	33.4355˚	322m
D9	KVN Tamla Radio Astronomy Observatory		126.2735˚	33.1721˚	390m
D10	National Typhoon Center		126.6785˚	33.3460˚	232m
RG1	Seongsan-eup public cemetery office	Raingauge	126.8172˚	33.4349˚	204 m
RG2	Gimnyeong Elementary School		126.7508˚	33.5518˚	15 m
RG3	Waheul-ri		126.6336˚	33.5061˚	124 m
RG4	Seogwipo Memorial Park charnel house		126.5757˚	33.3034˚	341 m

Observation instruments

2DVD - 1

Parsivel - 9



UVW - 3

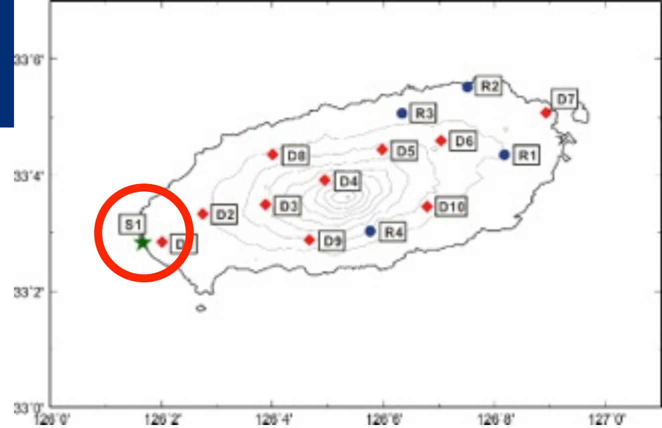
Rain gauge - 14

LPC - 1

Sonde - 1

AWS - 1

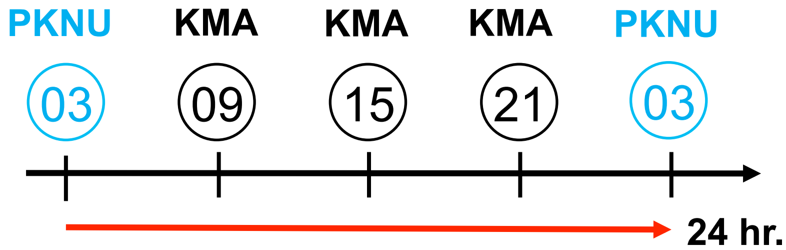
GPS Sonde observation (2014)



- **Radio sonde**

:Discussion and report for every sonde observations (total 29
)

GPS sonde	03 h	GPS sonde	03 h
2014-06-17 (Tue)	1	2014-07-01 (Tue)	15
2014-06-18 (Wed)	2	2014-07-02 (Wed)	16
2014-06-19 (Thu)	3	2014-07-03 (Thu)	17
2014-06-20 (Fri)	4	2014-07-04 (Fri)	18
2014-06-21 (Sat)	5	2014-07-05 (Sat)	19
2014-06-22 (Sun)	6	2014-07-06 (Sun)	20
2014-06-23 (Mon)	7	2014-07-07 (Mon)	21
2014-06-24 (Tue)	8	2014-07-08 (Tue)	22
2014-06-25 (Wed)	9	2014-07-09 (Wed)	23
2014-06-26 (Thu)	10	2014-07-10 (Thu)	24
2014-06-27 (Fri)	11	2014-07-11 (Fri)	25
2014-06-28 (Sat)	12	2014-07-12 (Sat)	26
2014-06-29 (Sun)	13	2014-07-13 (Sun)	27
2014-06-30 (Mon)	14	2014-07-14 (Mon)	28
		2014-07-15 (Tue)	29

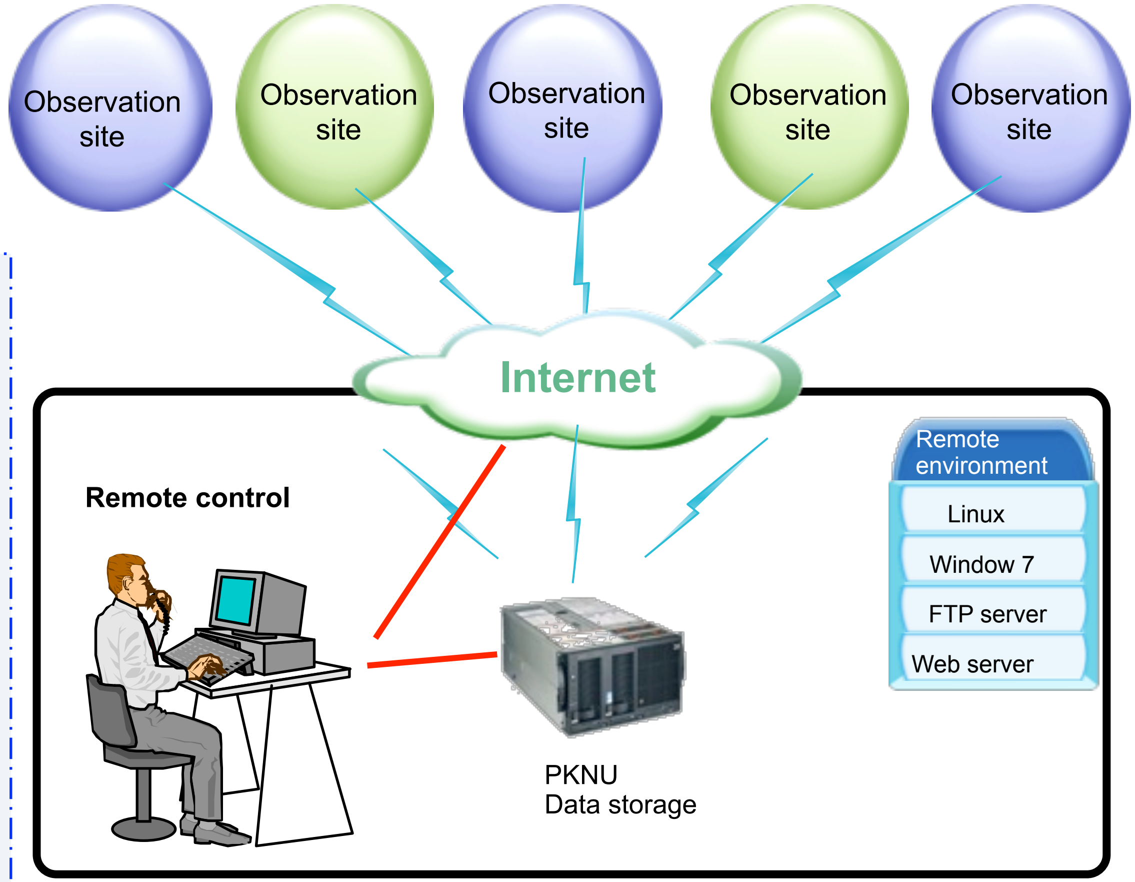


Remote surveillance system

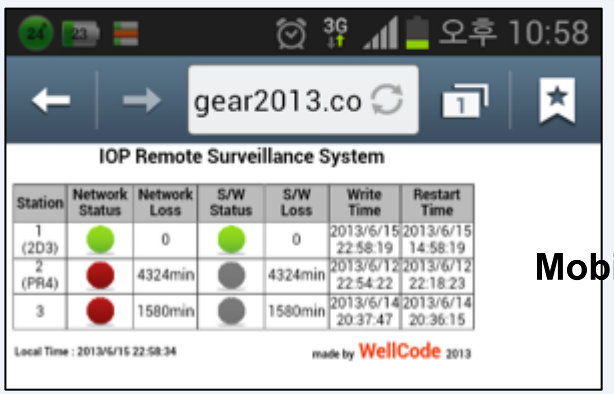
Real-time function

- Software current status
- Software restart
- Remote control(Desktop)
- Data collection
- Warning(Desktop, mobile)

Observation site → Web server → Data storage

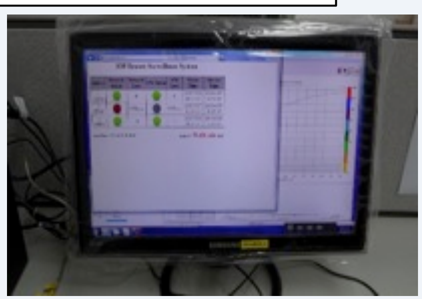


Monitoring (Mobile, desktop)

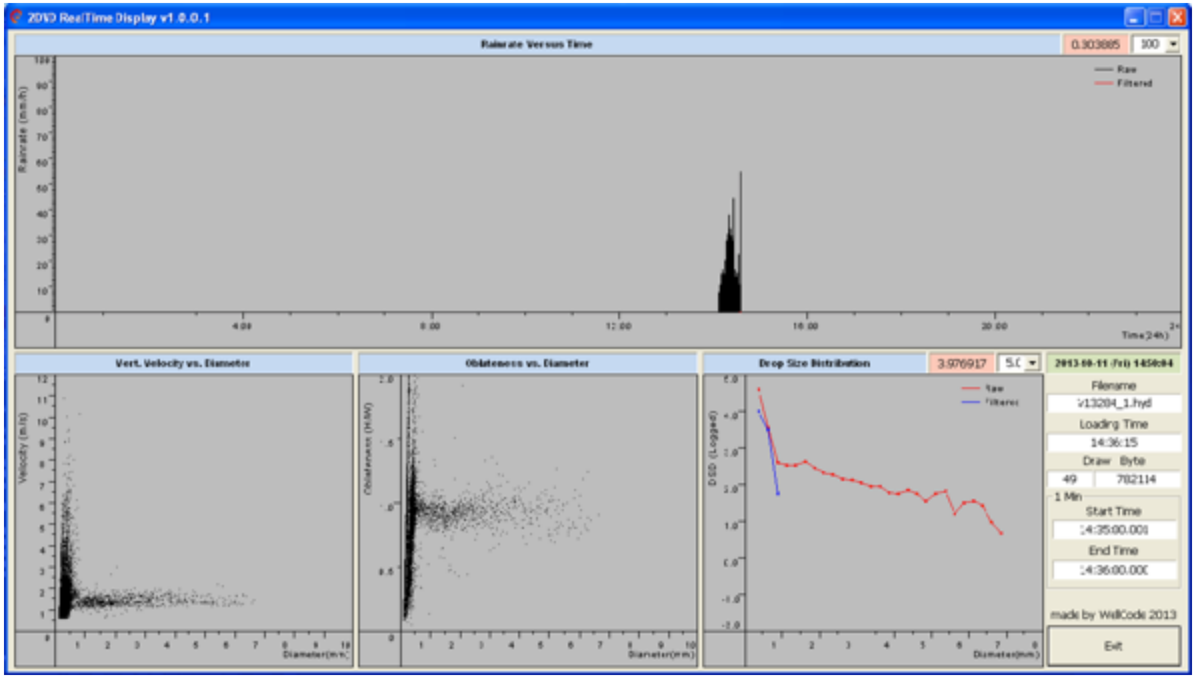


Mobile

Desktop



2DVD display program



- The real-time display program using 2DVD data
- Display contents
  - Rain rate vs Time
  - Velocity vs Diameter
  - Oblateness vs Diameter
  - Drop Size Distribution
- Filter setting function to revise the particle of excessive fall velocity

2014-IOP STRATEGY

2012

- Intensive observation
  - Line-network
- Quality control
- Case study

2013

- Intensive observation
  - Radial-network
- Development of Remote surveillance system
- Quality control
- Case study

2014

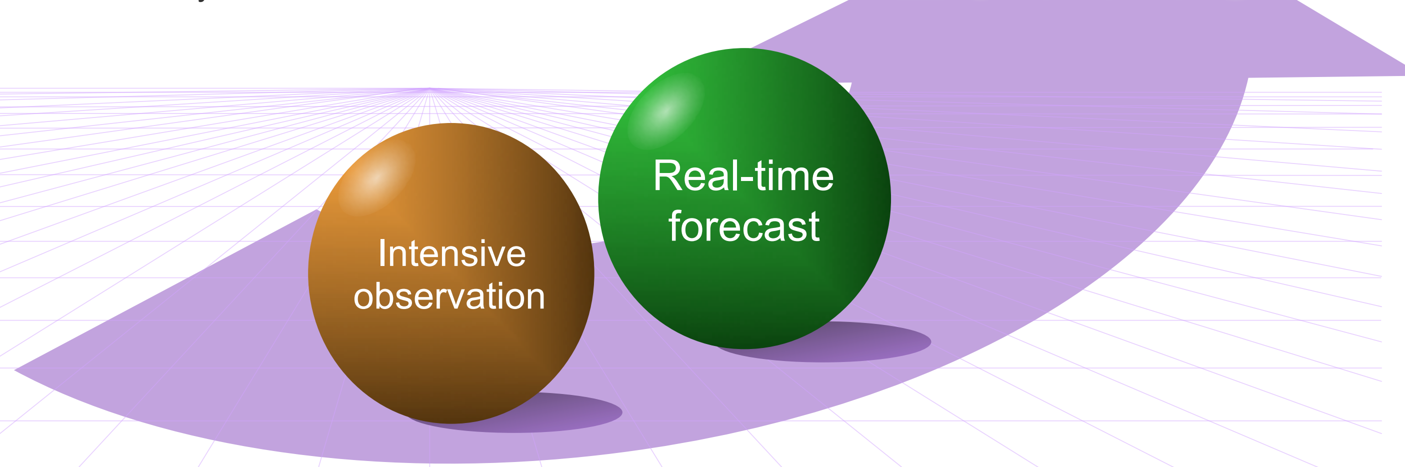
- **2013 Intensive observation**

+

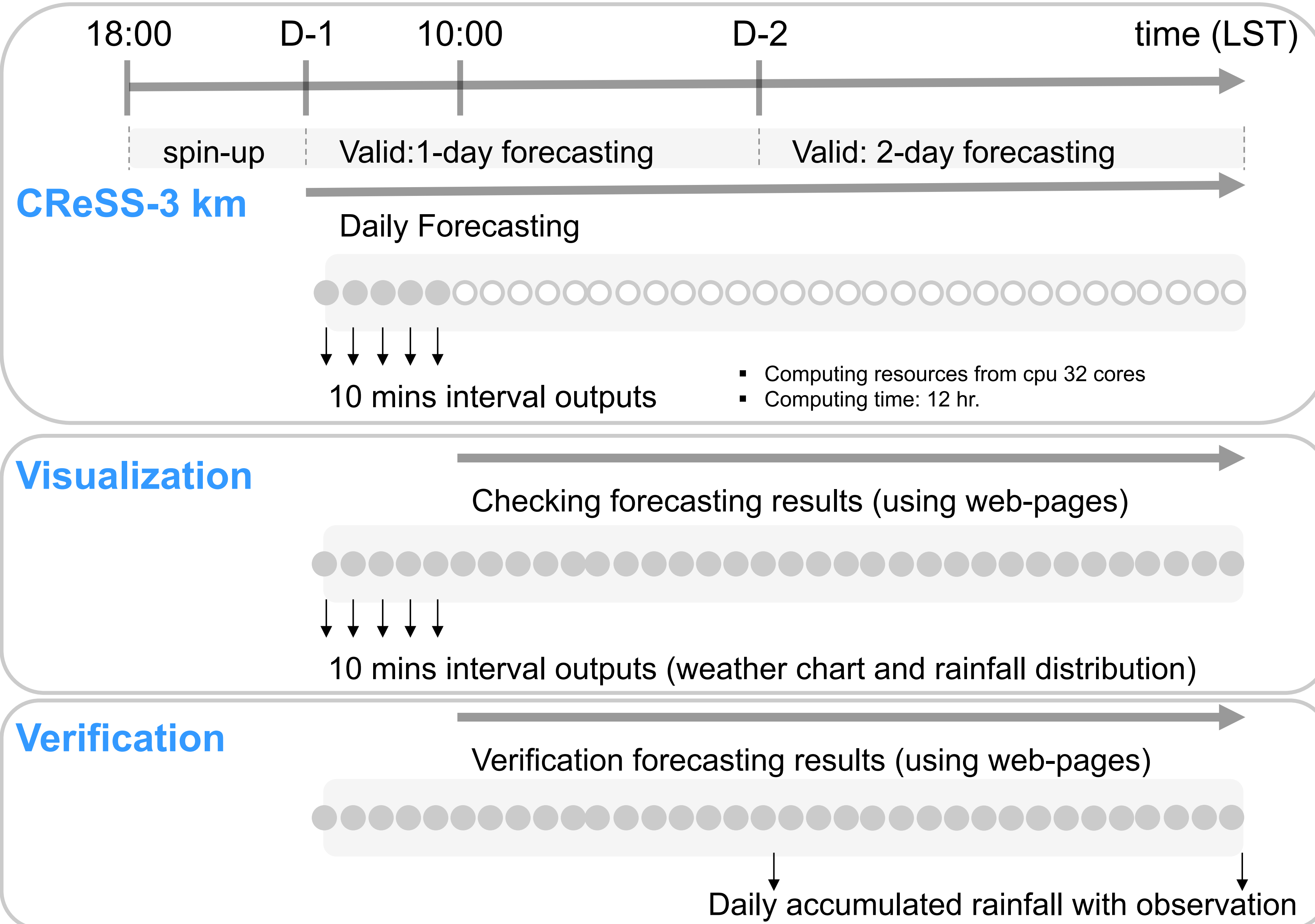
Forecast system

- **Upgrade of Remote surveillance system**
- **Case study**
- **Statistics of orographic precipitation**

2014-IOP

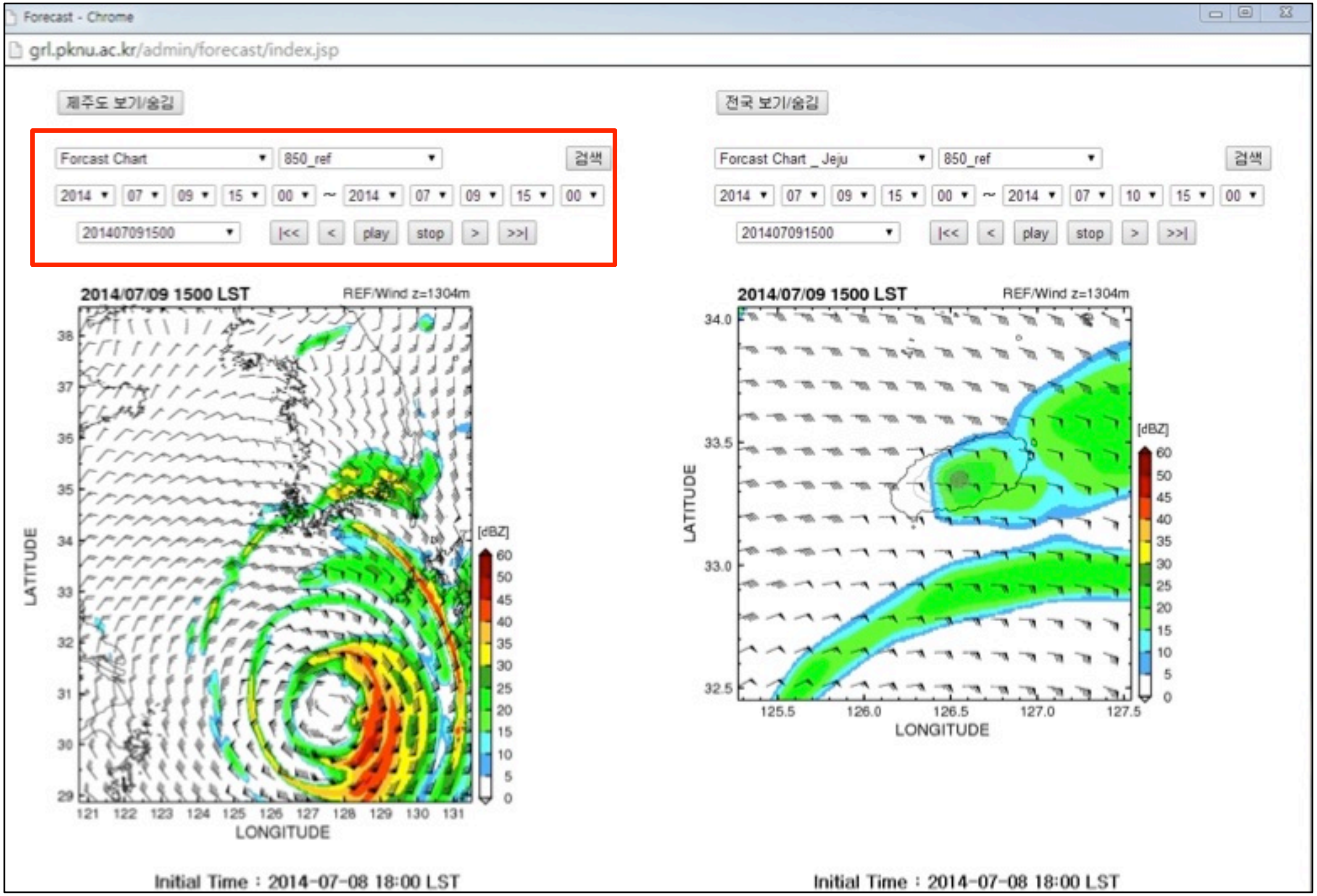


PKNU CReSS forecast system strategy



Examples (web-pages)

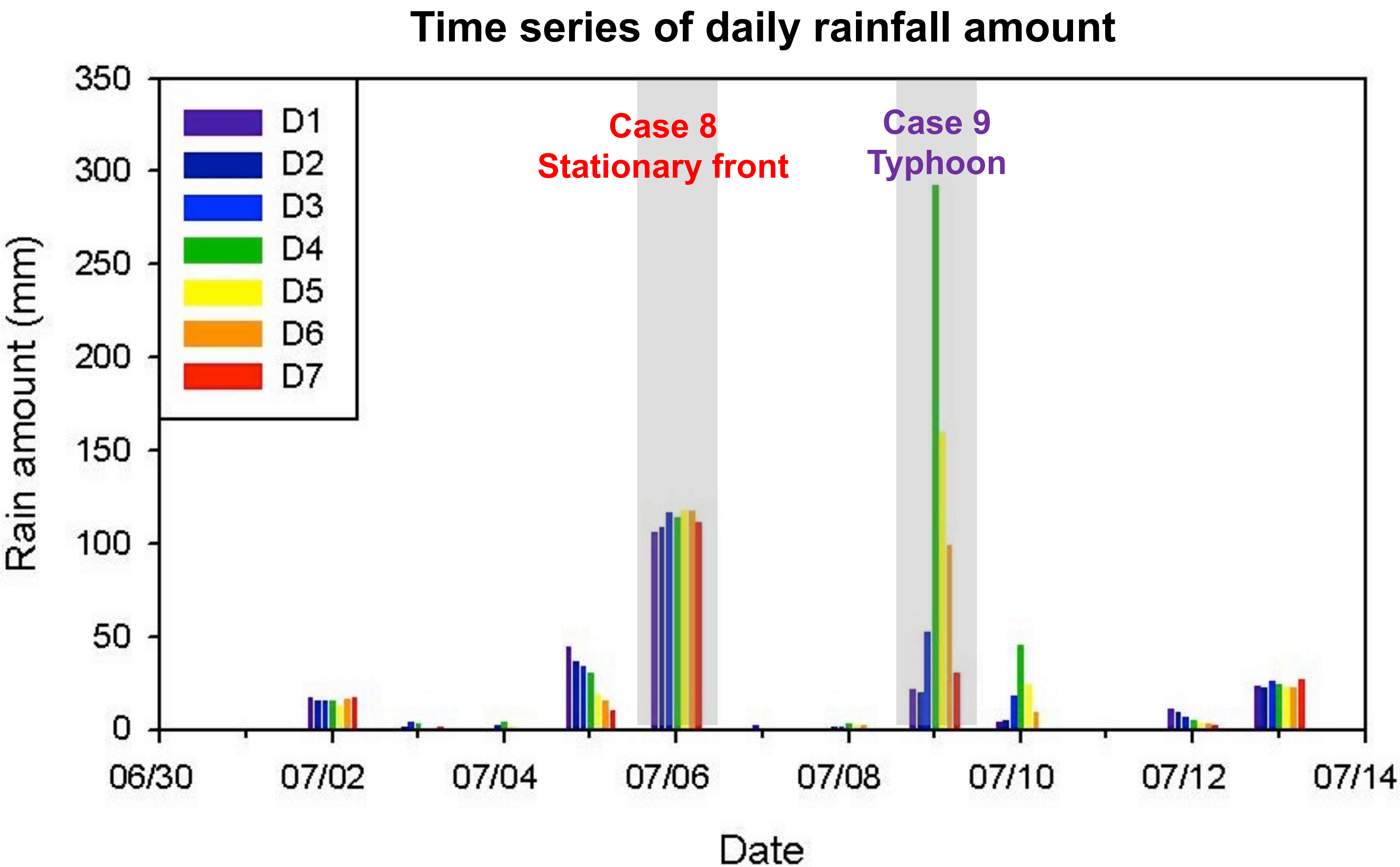
Mode: double (Korea and Jeju)



Case overview (2014)

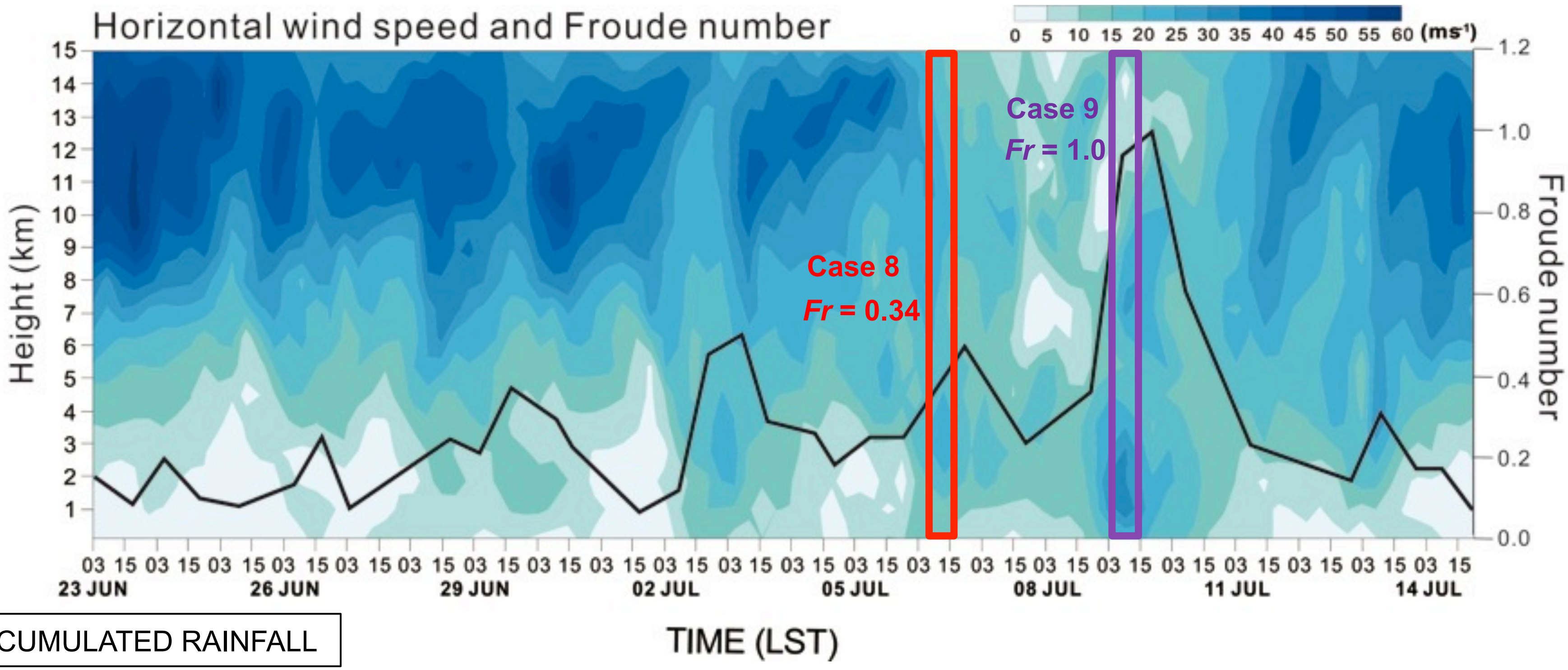
No.	Period	Case description
CASE 1	2014-06-21 1600 LST ~ 2014-06-21 1700 LST	Convective rain band associated with stationary front
CASE 2	2014-06-21 2300 LST ~ 2014-06-21 2400 LST	Convective rain band associated with stationary front
CASE 3	2014-06-26 0130 LST ~ 2014-06-26 0330 LST	Developing weak rain in lee side
CASE 4	2014-07-02 1250 LST ~ 2014-07-02 1440 LST	Developing convective system in lee side
CASE 5	2014-07-02 1710 LST ~ 2014-07-02 1810 LST	Developing convective system associated with stationary front
CASE 6	2014-07-05 1830 LST ~ 2014-07-06 0900 LST	Orographic precipitation associated with stationary front
CASE 7	2014-07-06 0900 LST ~ 2014-07-06 1140 LST	Orographic precipitation in north of Jeju
CASE 8	2014-07-06 1140 LST ~ 2014-07-06 1400 LST	Convective rain band associated with stationary front
CASE 9	2014-07-09 0330 LST ~ 2014-07-09 0900 LST	Typhoon
CASE 10	2014-07-09 0930 LST ~ 2014-07-09 1800 LST	Typhoon
CASE 11	2014-07-12 1740 LST ~ 2014-07-12 1940 LST	Convective rain band associated with stationary front
CASE 12	2014-07-13 0200 LST ~ 2014-07-13 0350 LST	Convective rain band associated with stationary front

Daily rainfall amount



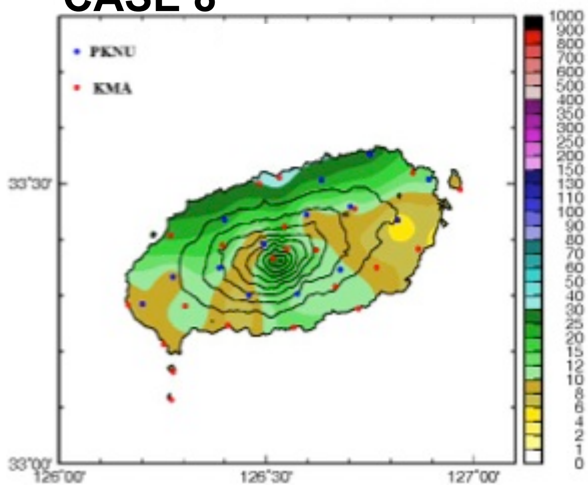
GPS sonde observation (2014)

23 June ~ 14 July 2014

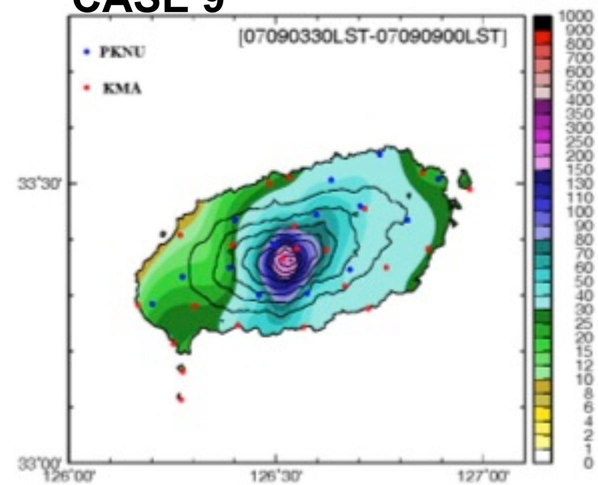


ACCUMULATED RAINFALL

CASE 8

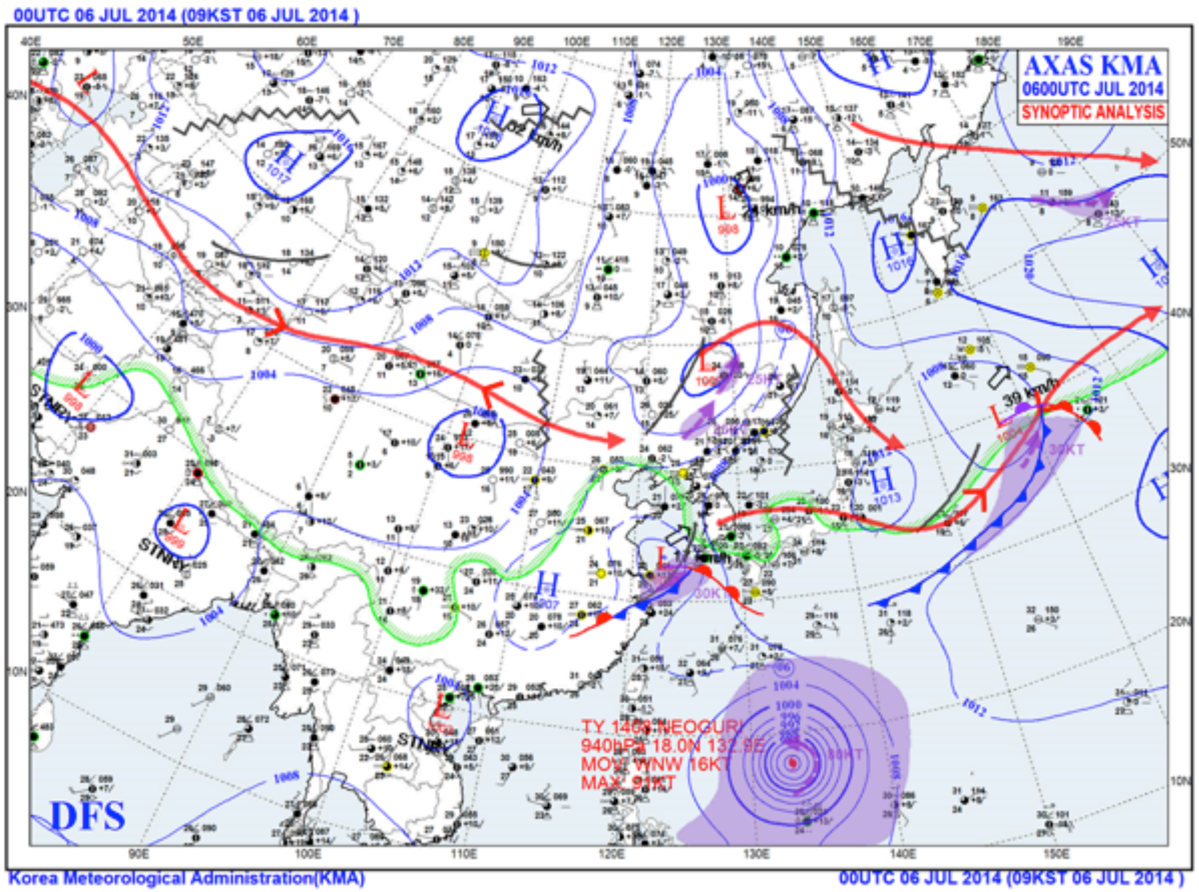


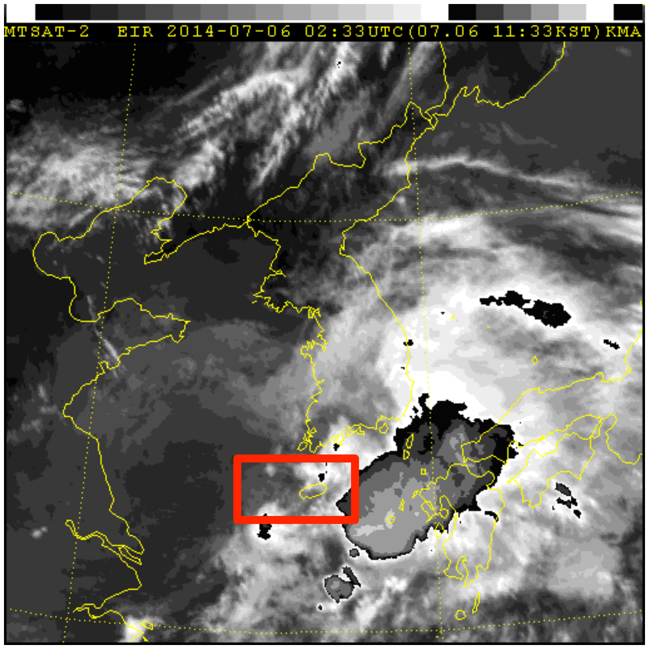
CASE 9

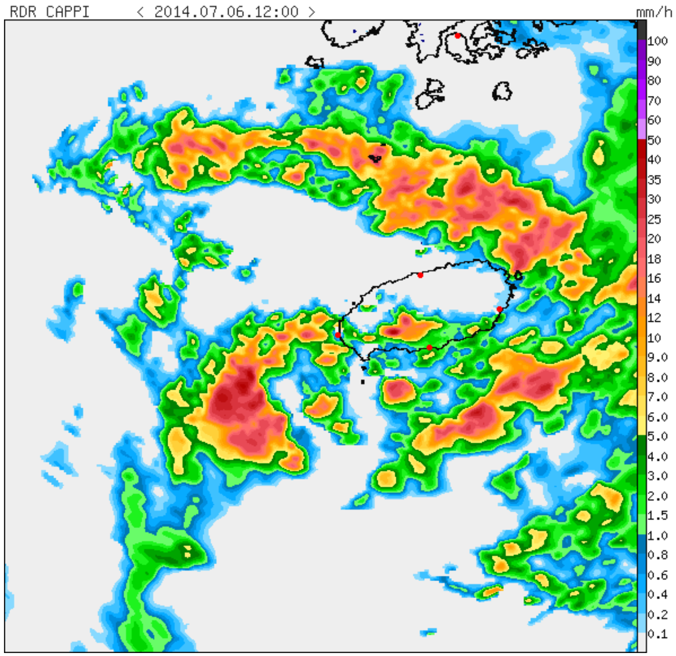


CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

Synoptic Environment

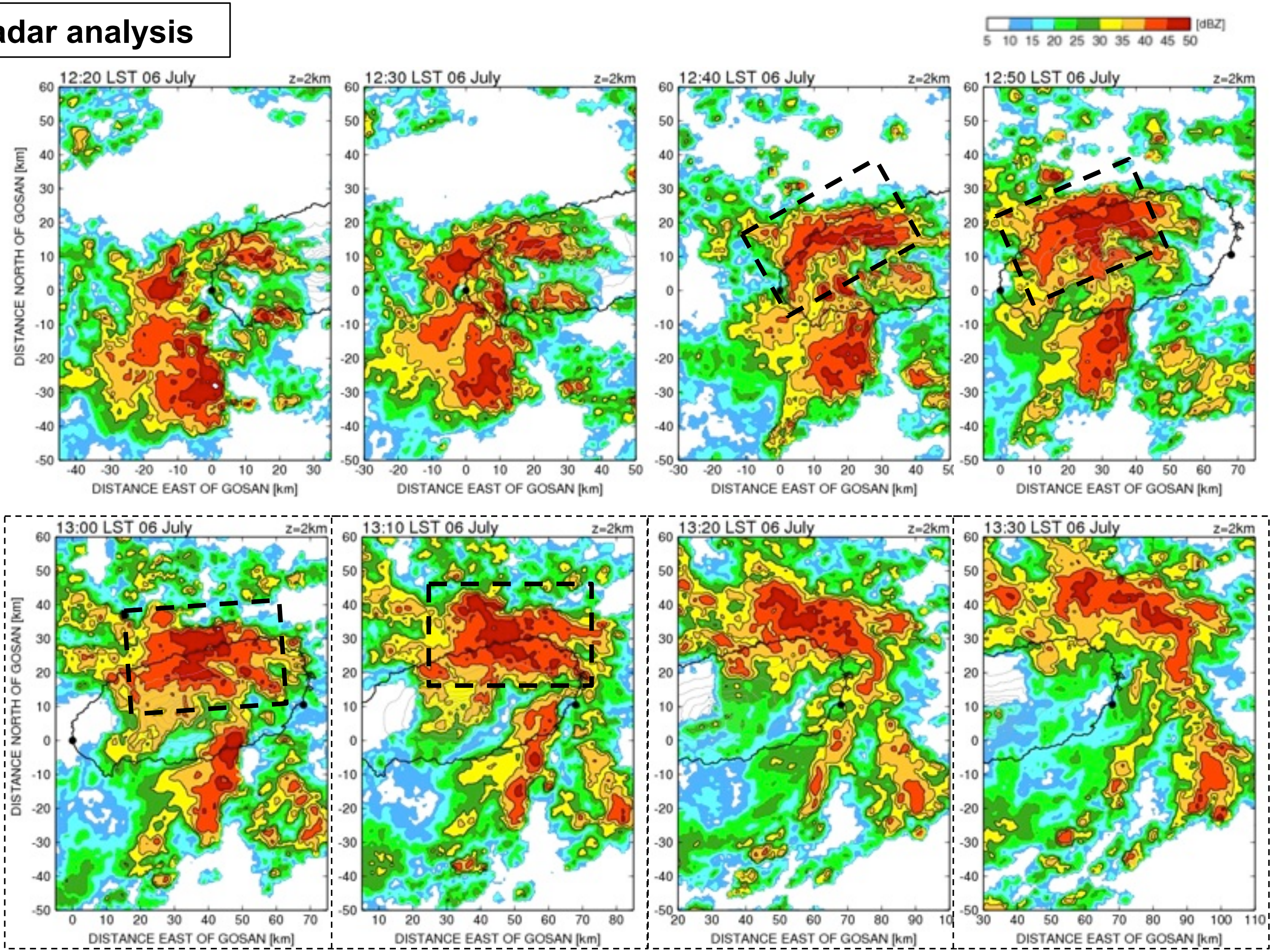






CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

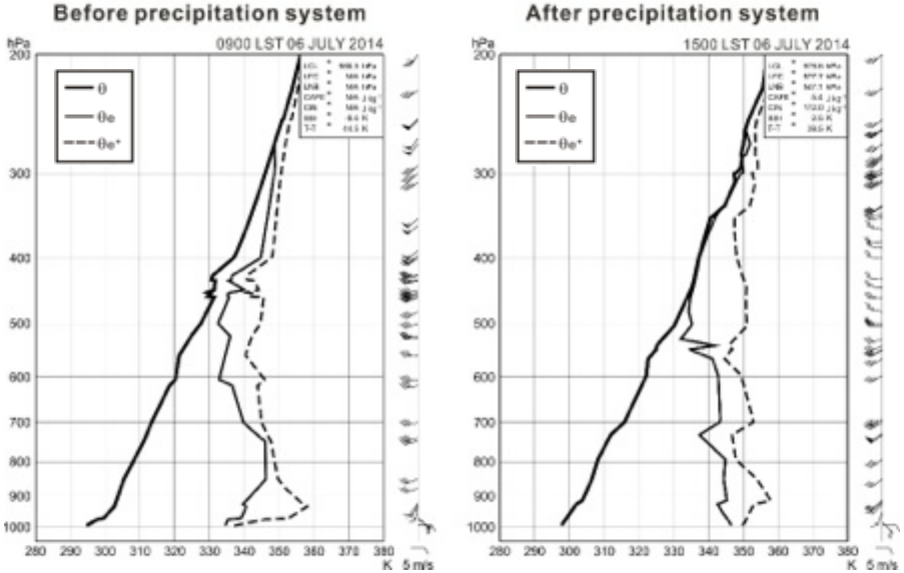
Radar analysis



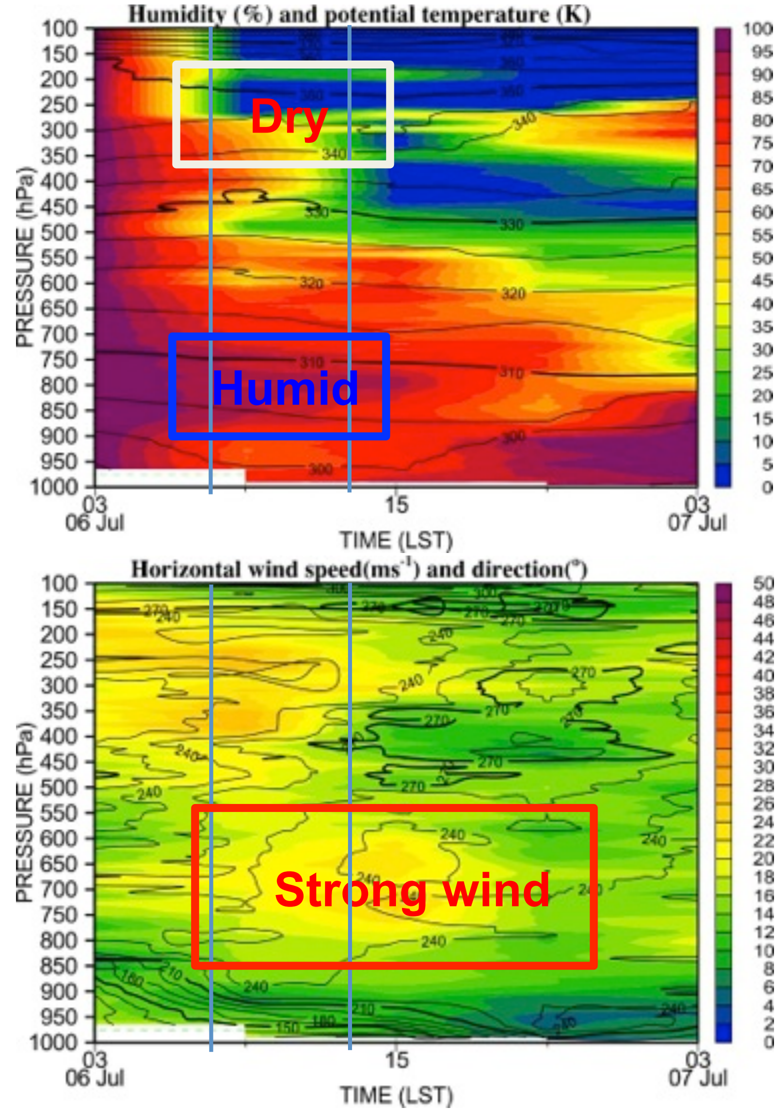
CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

Launching interval 6 hour

Upper air Sounding

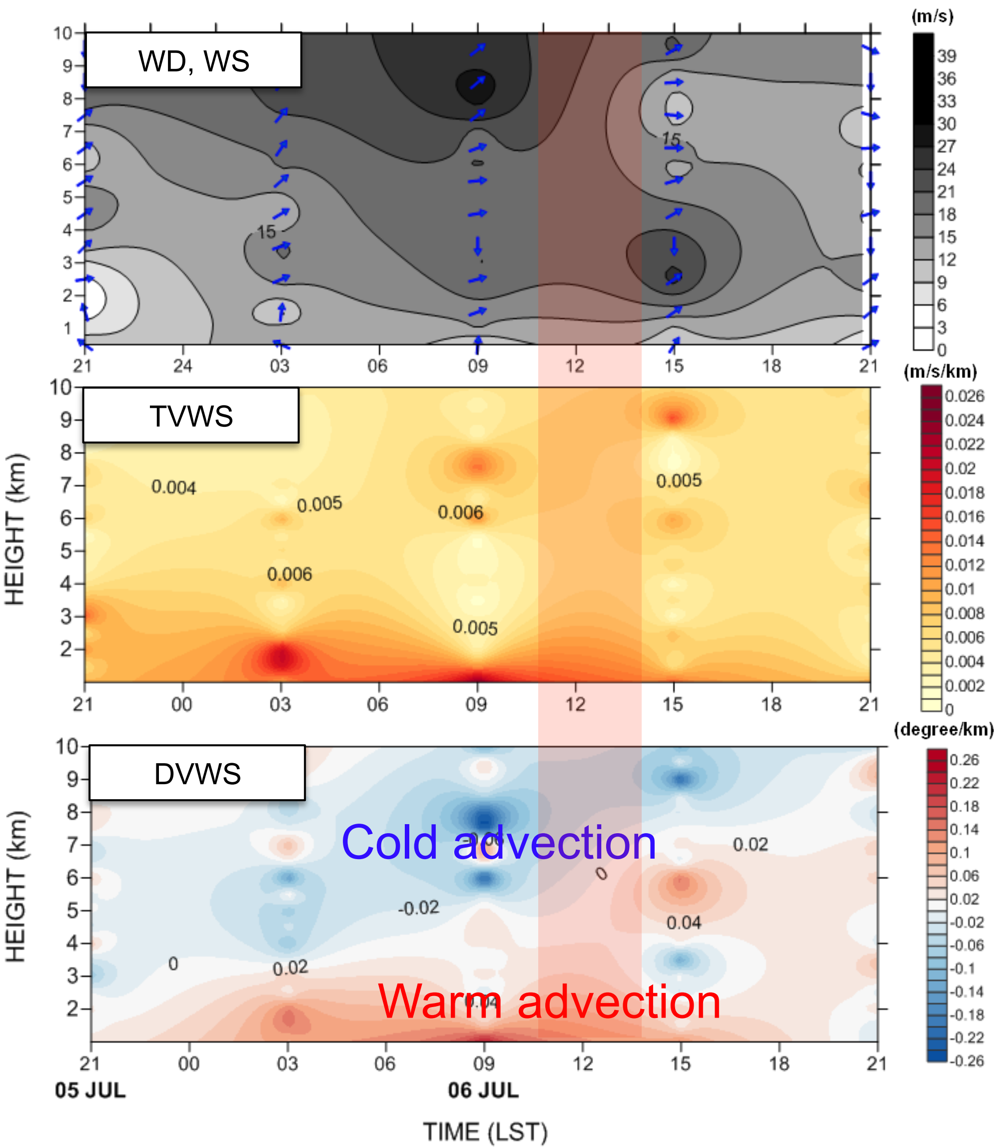


Parameter	20140706 0900 LST	20140706 1500 LST
LCL (hPa)	980.5	979.6
LFC (hPa)	-	577.7
CAPE (J/kg)	-	547.1
CIN (J/kg)	-	5.4
PW (mm)	54.49	53.46
Mixing ratio (g/kg)	14.33	16.80



CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

WD, WS, TVWS, and DVWS



__Total Vertical Wind Shear__

; Strength of temperature gradient

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

__Directional Vertical Wind Shear__

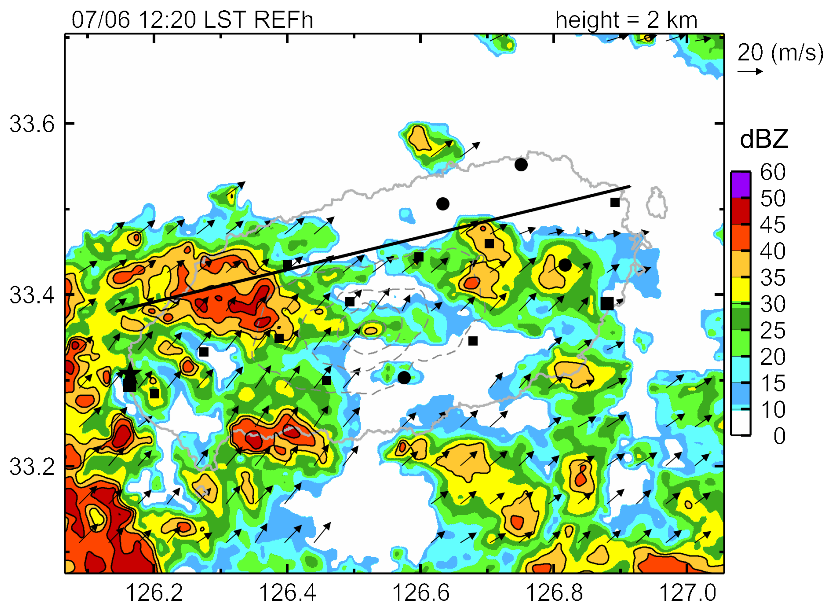
; Warm (or Cold) advection

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

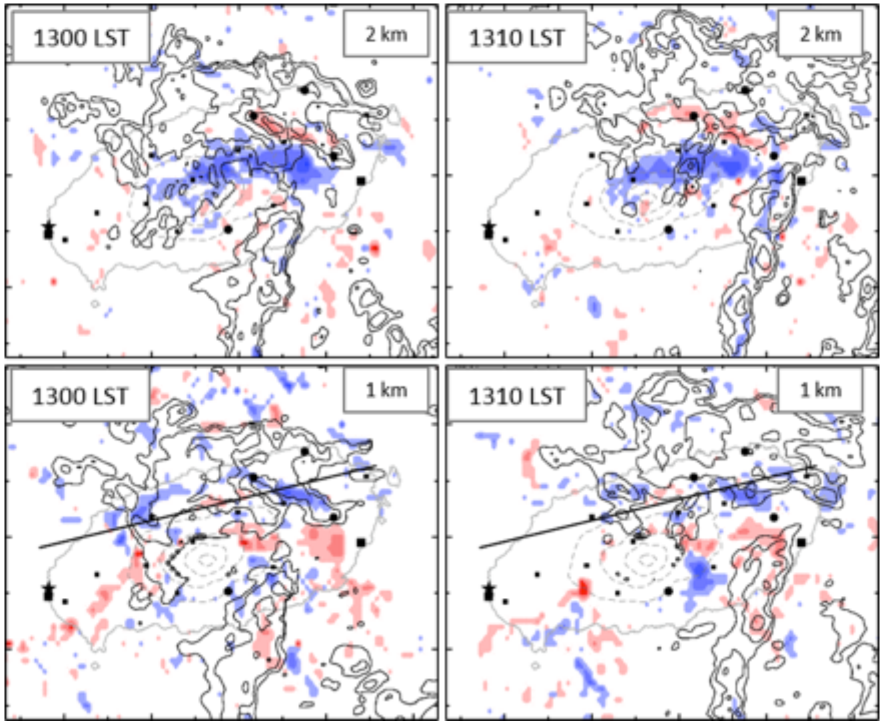
(Neiman, 2003)

CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

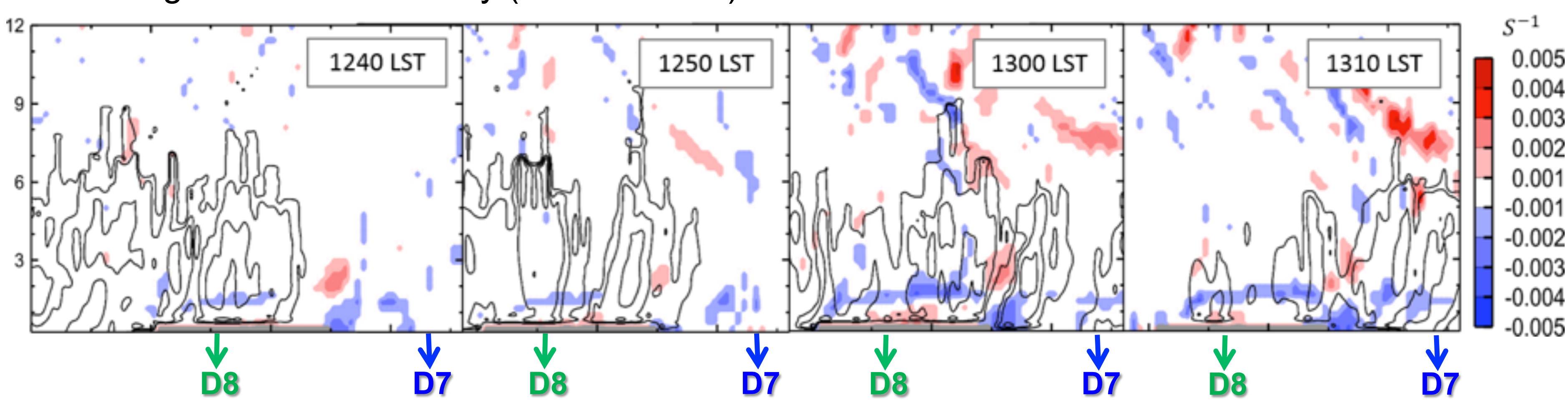
Retrieved horizontal wind (u-v) and reflectivity



Convergence and reflectivity (35dbz↑) *(Liou et al., 2012)*

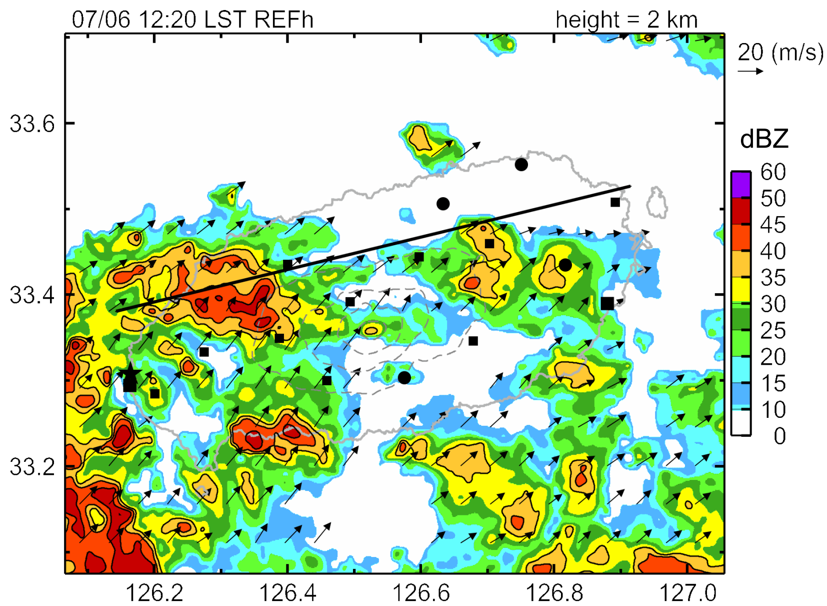


Convergence and reflectivity (cross section)



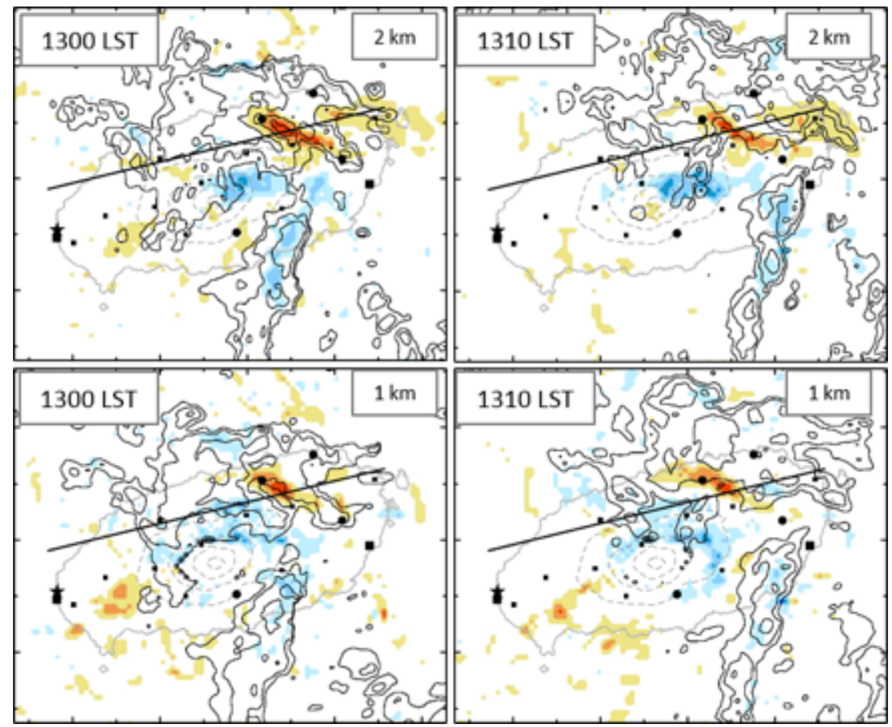
CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

Retrieved horizontal wind (u-v) and reflectivity

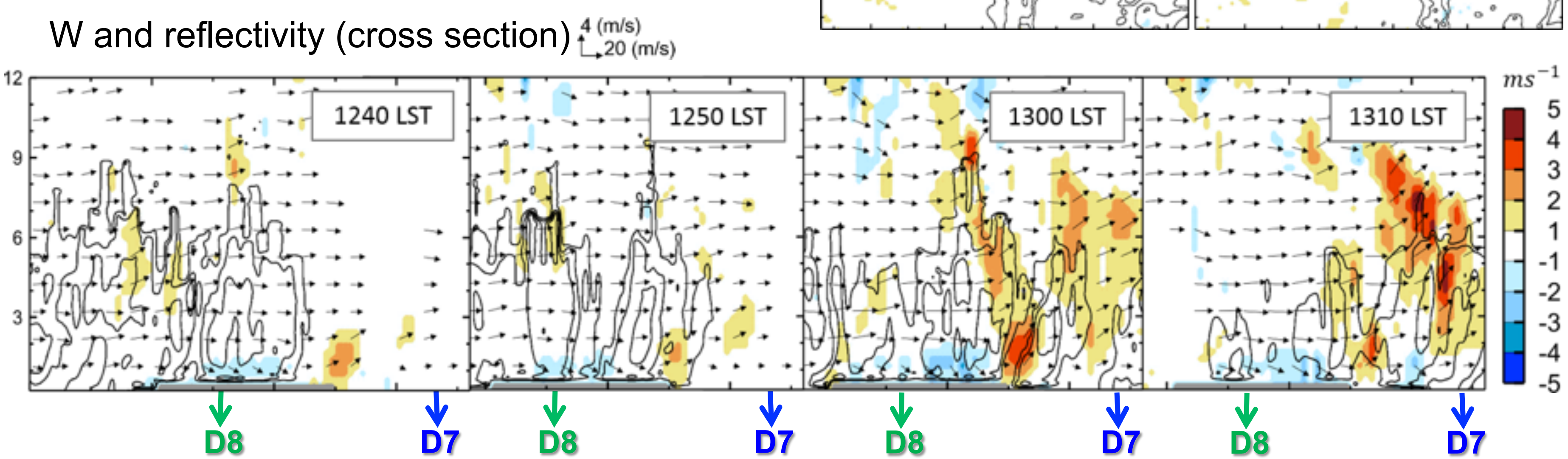


W and reflectivity (35dbz↑)

(Liou et al., 2012)

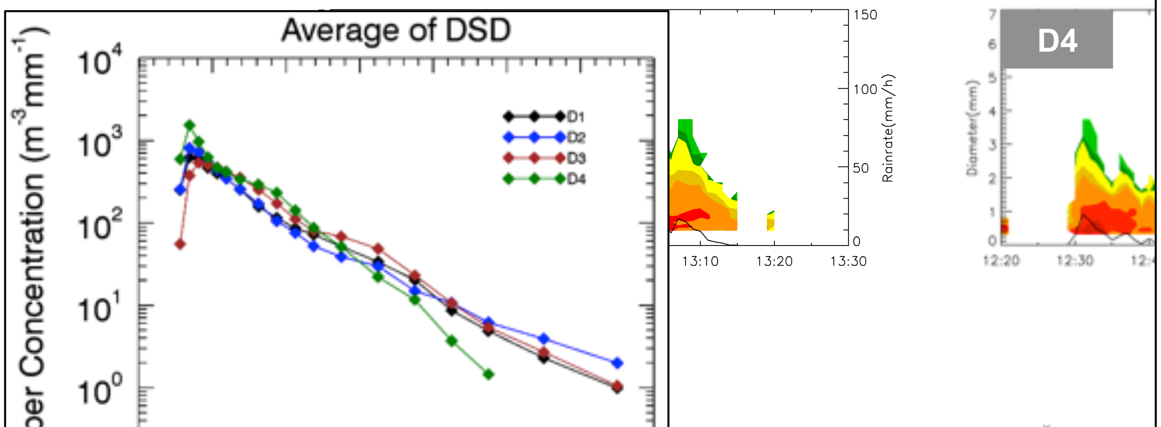


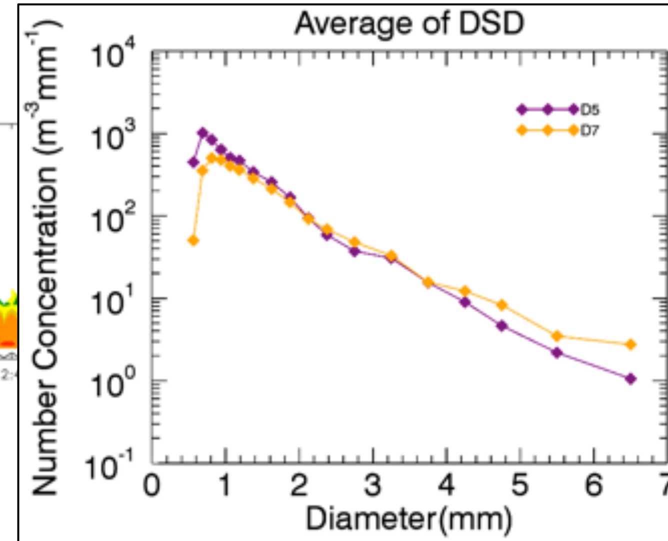
W and reflectivity (cross section)

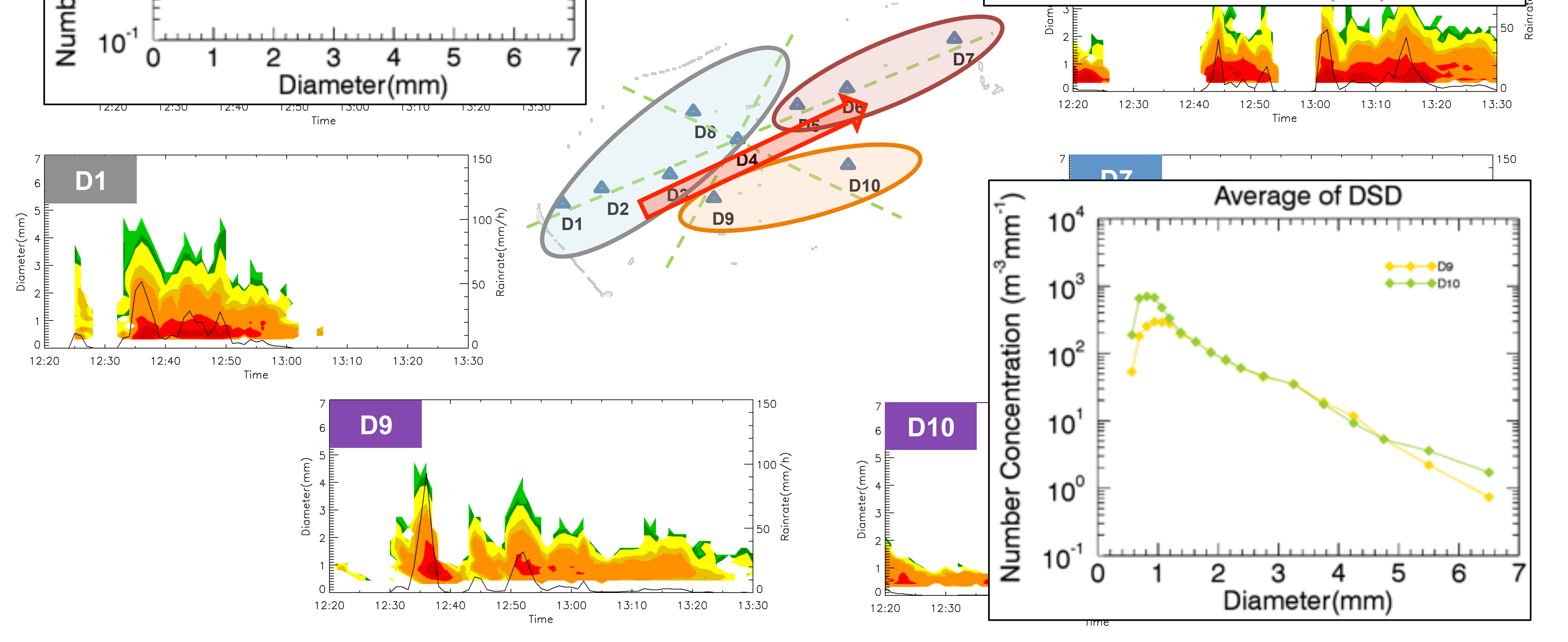


CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

Surface weather condition_distrometer







CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

Parsivel analysis

Analysis of DSD parameter and contribution ratio

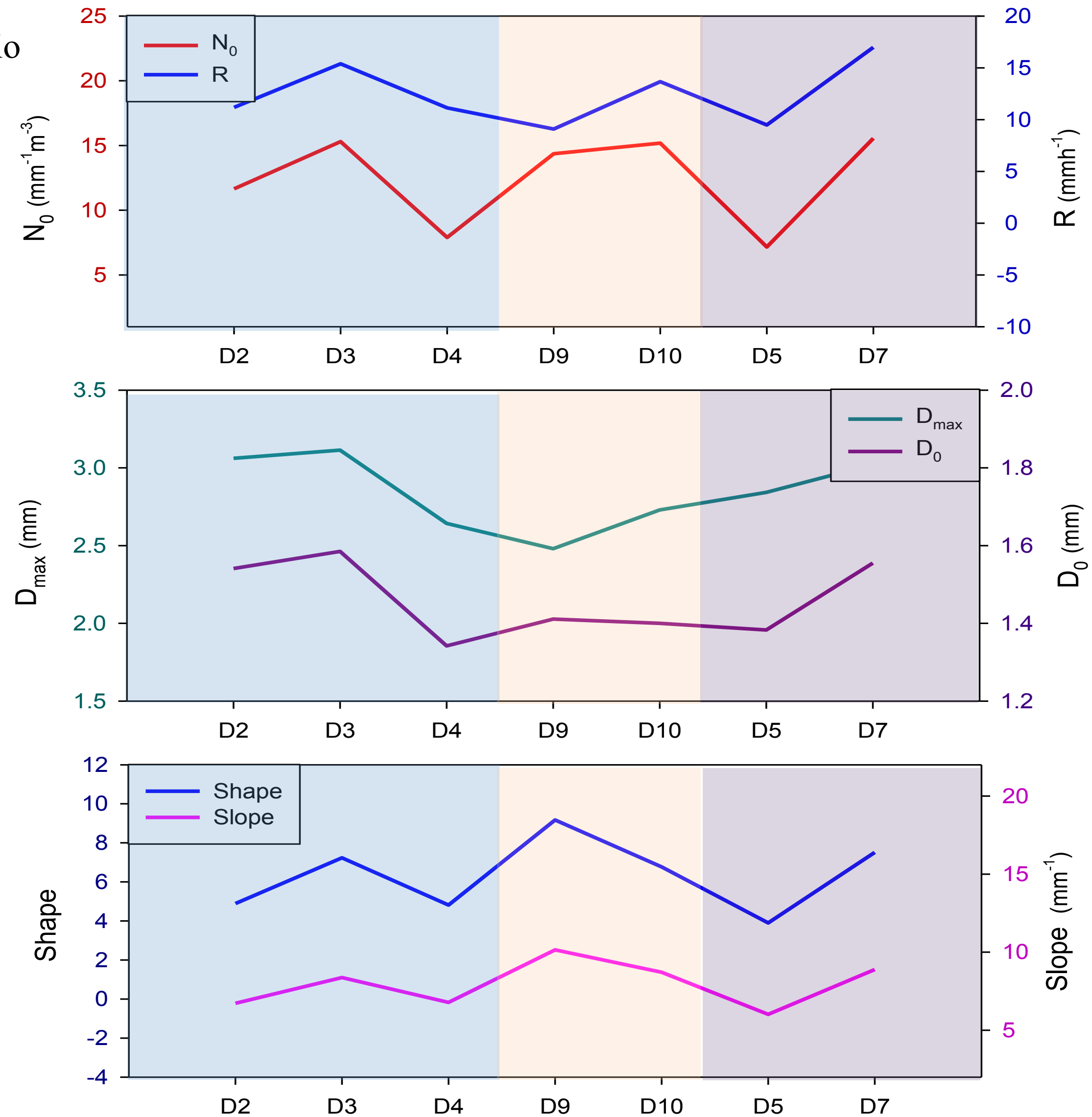
* D6 : missing data

Parameter	Equation
Liquid water content	$w = 10^{-9} \rho_w \pi/6 \sum N(D) D^3 dD$ $\rho_w = 10^6\ g/m^3$ for rain
	$N_0 = \ldots \Lambda^{(\mu+4)} \ldots / \Gamma(\mu+4)$

Parameter	Equation
Median Volume Diameter	$\int_0^{D_0} D^3 N(D) dD = 1/2 \int_0^{D_{max}} D^3 N(D) dD$
Rain Rate	$R = \int_0^{D_{max}} v(D) D^3 N(D) dD$

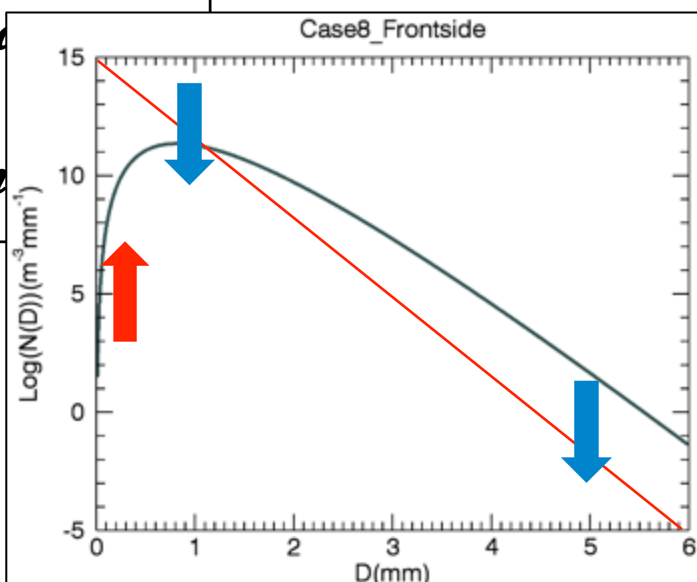
Parameter	Equation
Shape	$\mu = ((8-11m)-(m^2+8m)^{1/2})/2(m-1)$
Slope	$\Lambda = m_3/m_4 (\mu+4)$

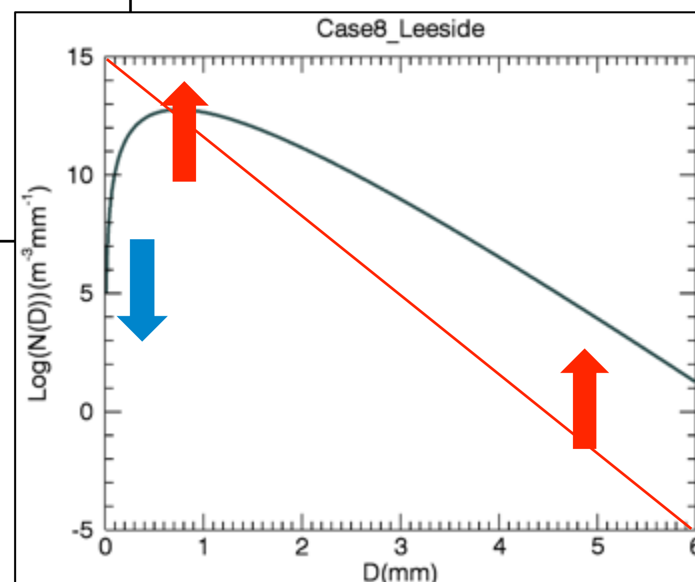
(Kozu, and Nakamura, 1991; Chu et al. (2008), Yuter et al, 2006)



CASE 8. 2014. 07. 06. 11:40 ~ 14:00 LST

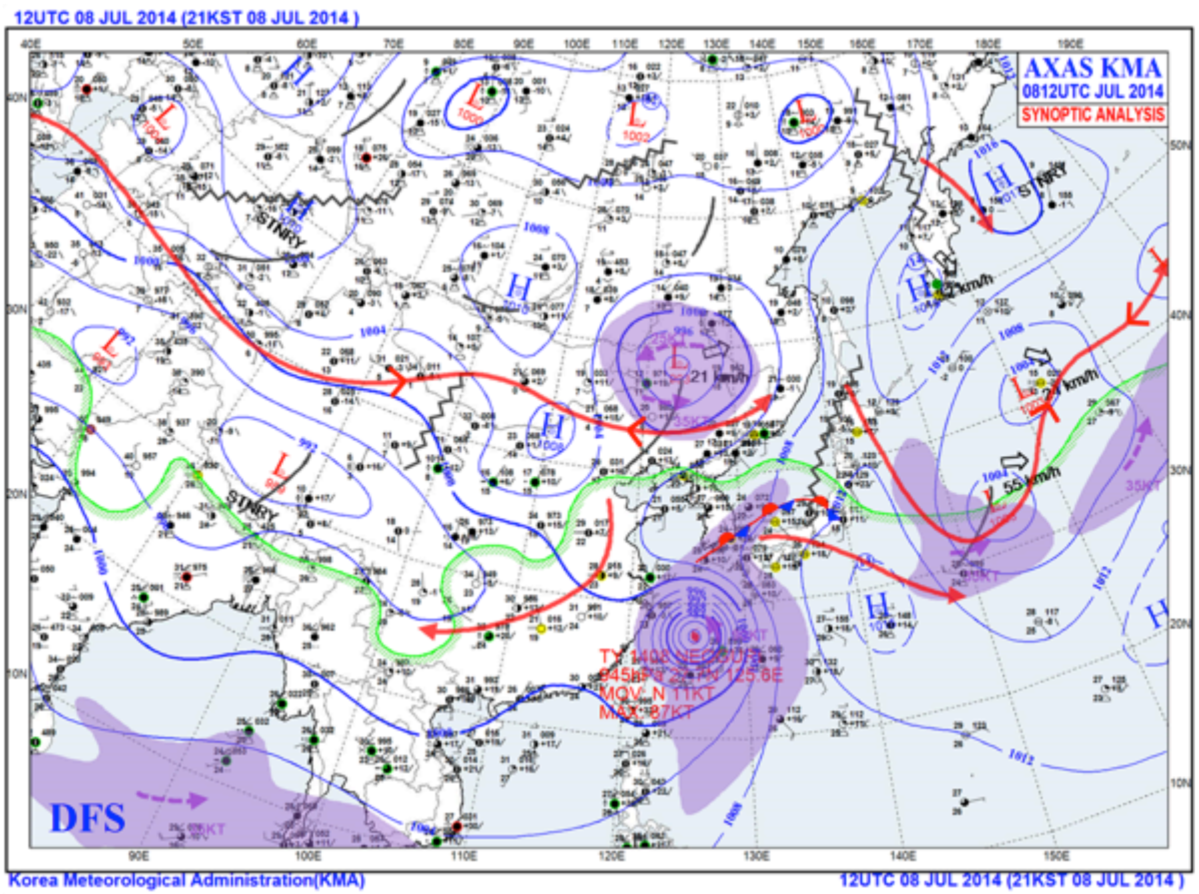
Parameters	Front side	Lee side
Atmospheric Condition		
$W(ms^{-1})$	-0.40	0.943
R(mmh^{-1})	11.9725	13.232
DSD Parameters		
$Log(N_0)$ $(mm^{-1-\mu}$ $m^{-3})$	6.083	5.733
D_0 (mm)	1.448	1.452
D_m		
$\Lambda(m$		

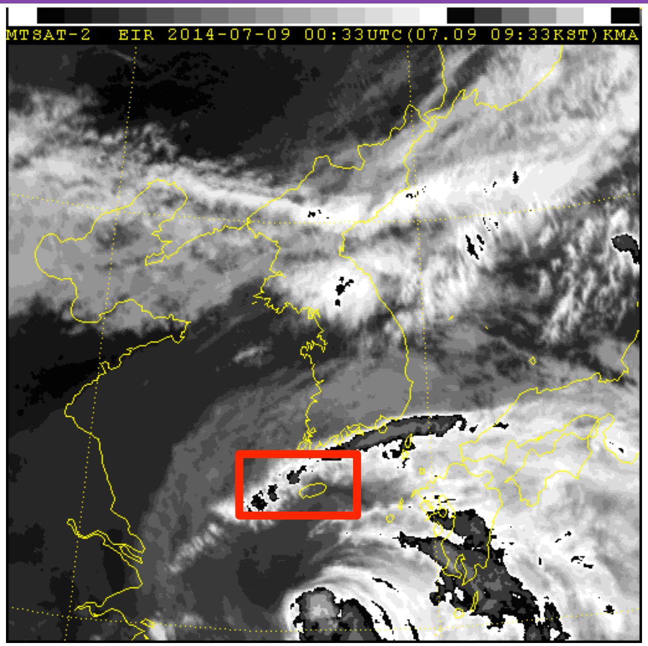


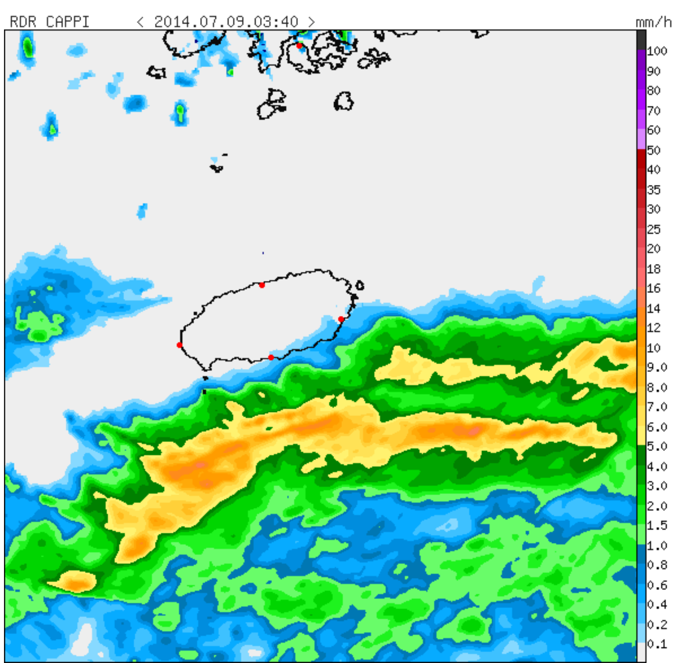


CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Synoptic Environment

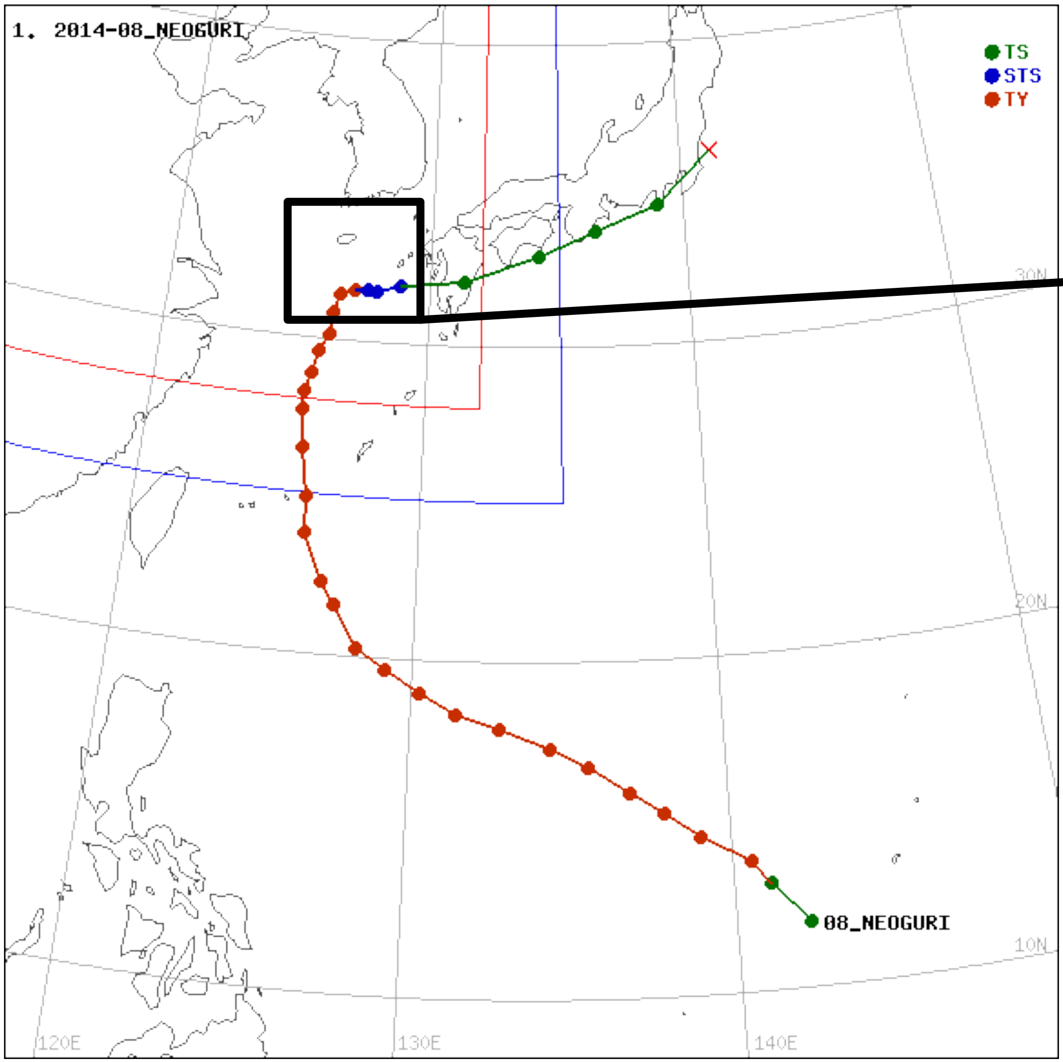






CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Typhoon Neoguri

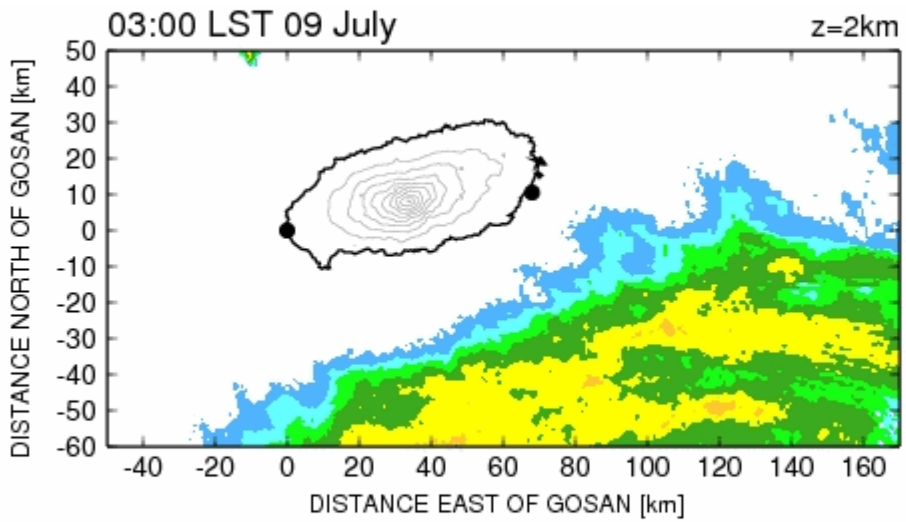


- Formed: 2 July 2014
- Dissipated: 13 July 2014

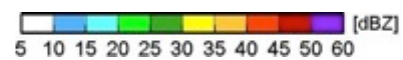
Parameter	201407090600
Eye of typhoon(Lat.)	31.5
Eye of typhoon(Lon.)	126.6
Propagation	NNE
Moving speed (km/h)	23
Center pressure (hPa)	965.0
Max. wind speed (m/s)	38.0
Intensity	TY
Radius (km)	360.0

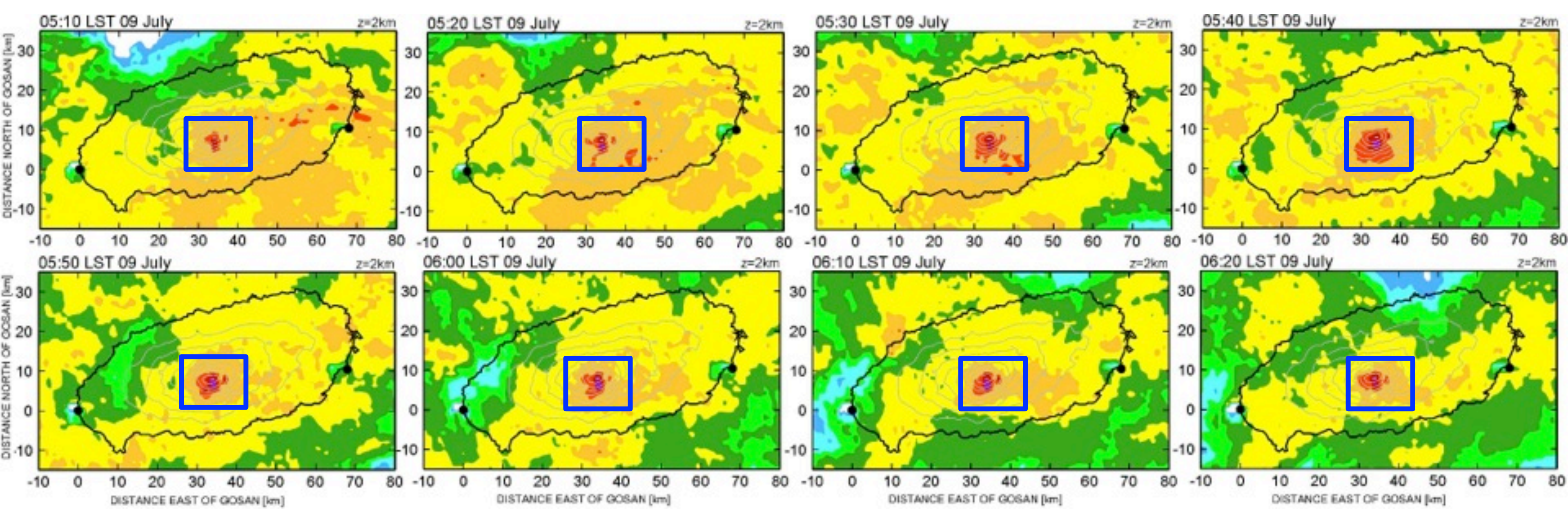
CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Radar analysis



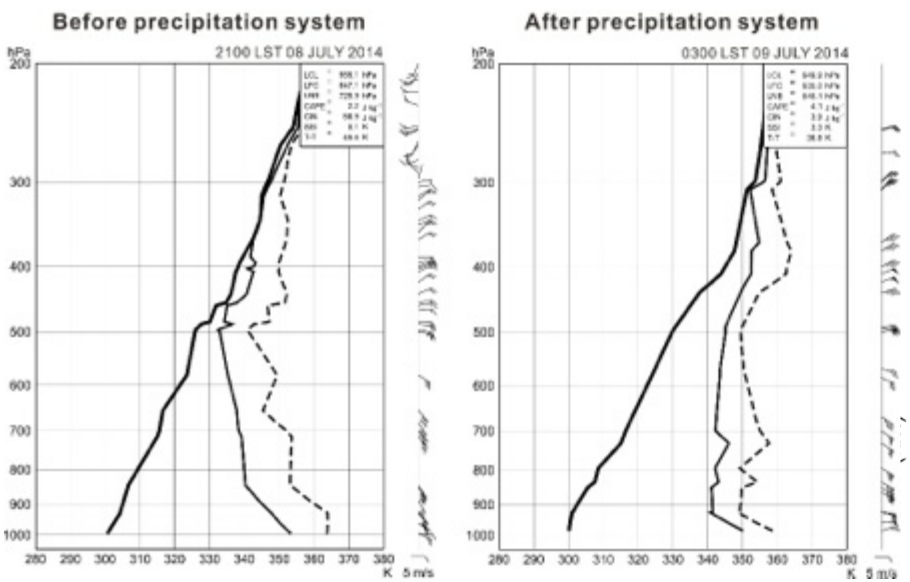
- Reflectivity distribution at 2 km ASL from 0300 to 0710 LST on 09 July 2014





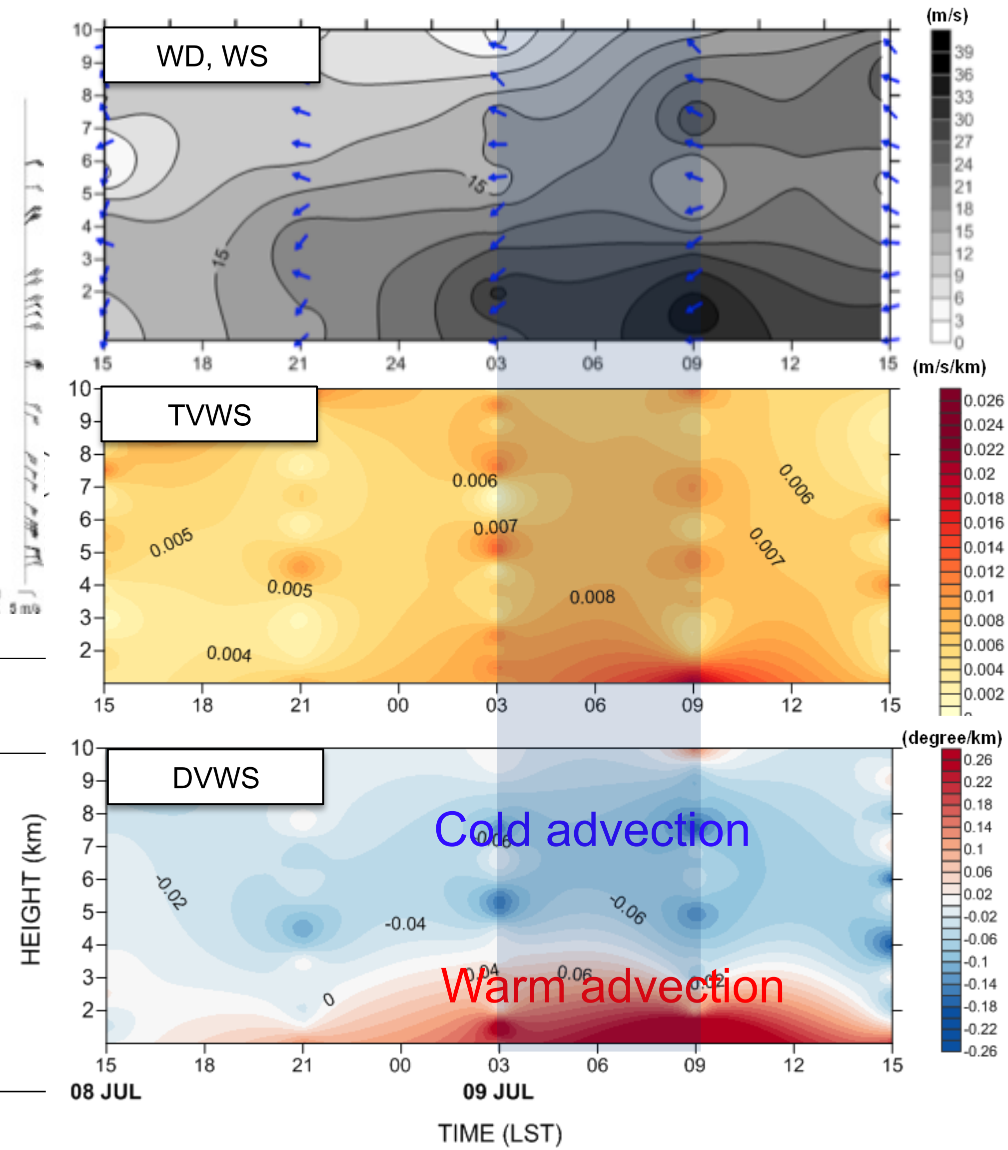
CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Upper air Sounding



Parameter	20140708 2100 LST	20120709 0900 LST
LCL (hPa)	955.1	949.9
LFC (hPa)	847.1	935.0
CAPE (J/kg)	2.2	4.1
CIN (J/kg)	58.9	3.9
PW (mm)	50.7	57.37
Mixing ratio (g/kg)	17.9	16.62

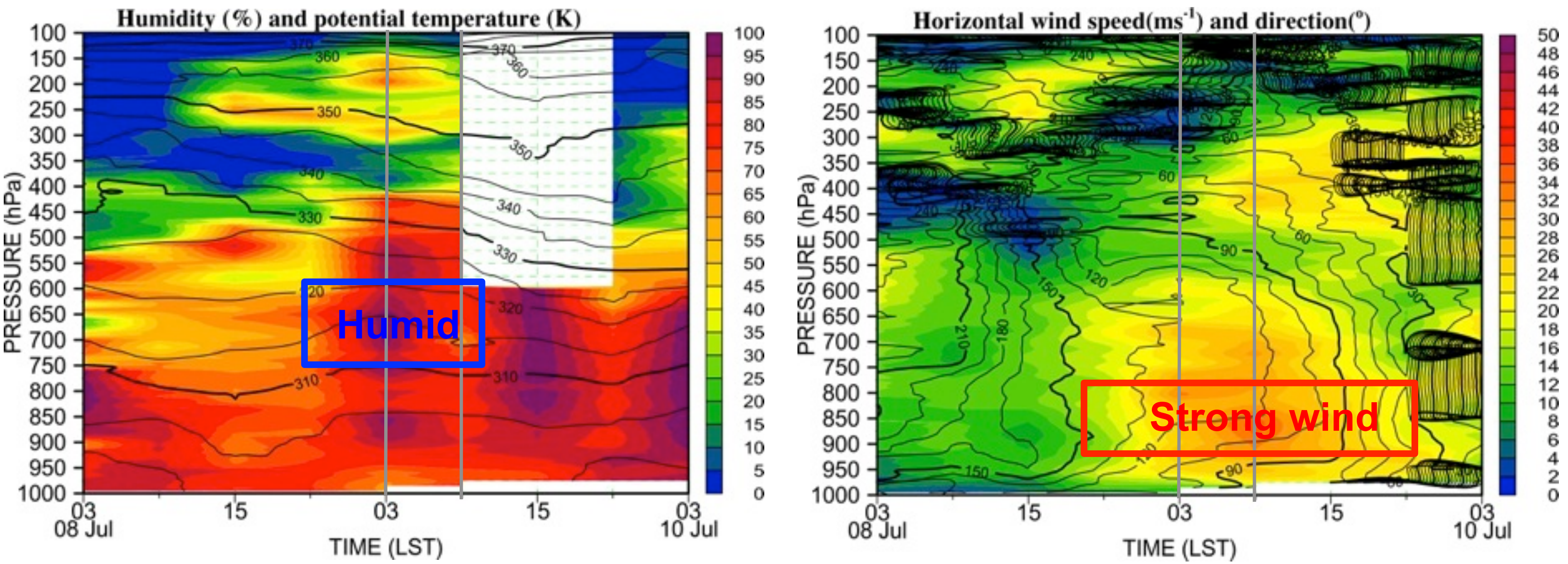
WD, WS, TVWS, and DVWS



CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Time series of sounding

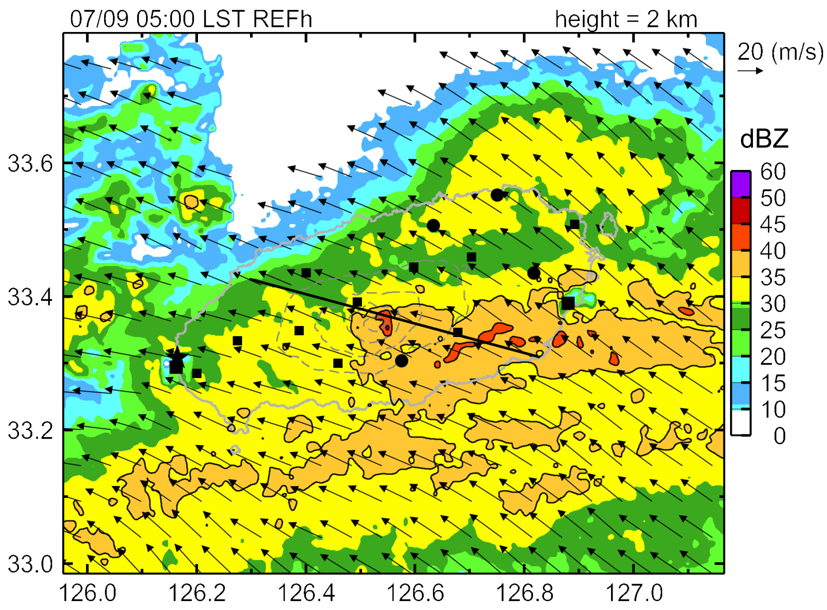
Launching interval 6 hour



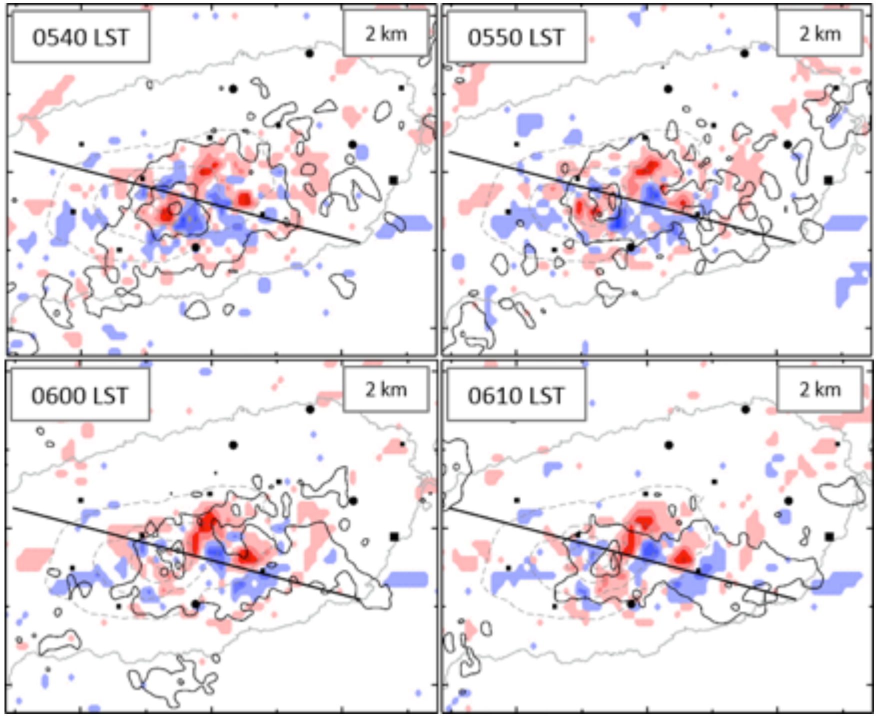
- Humid air condition (0300 LST, 1500 LST 09 Jul).
- Strong wind is represented at 950 hPa – 800 hPa (0900 LST 09 Jul).

CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

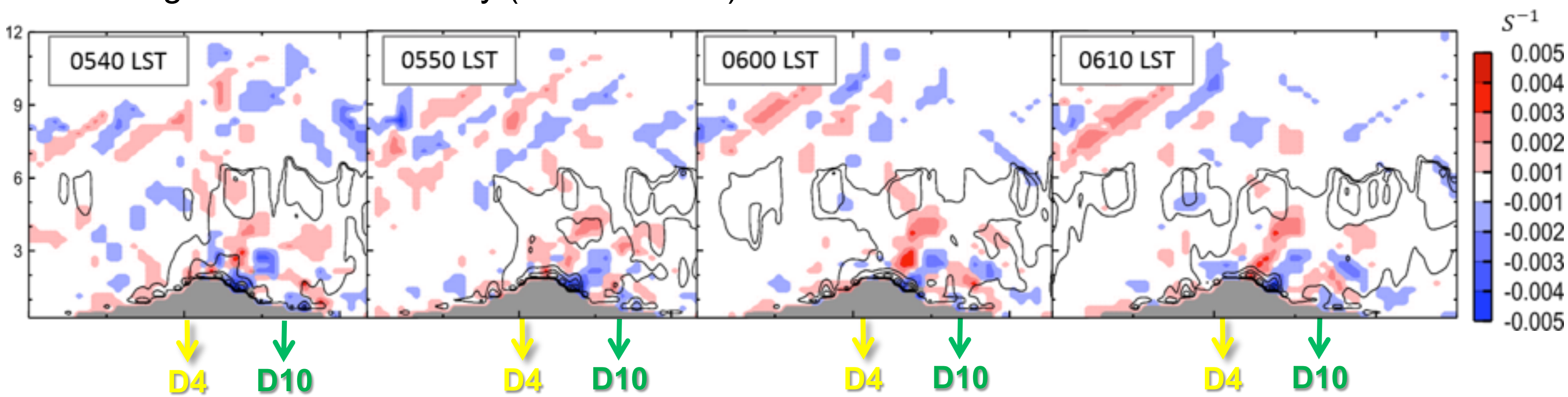
Retrieved horizontal wind (u-v) and reflectivity



Convergence and reflectivity (35dbz↑)

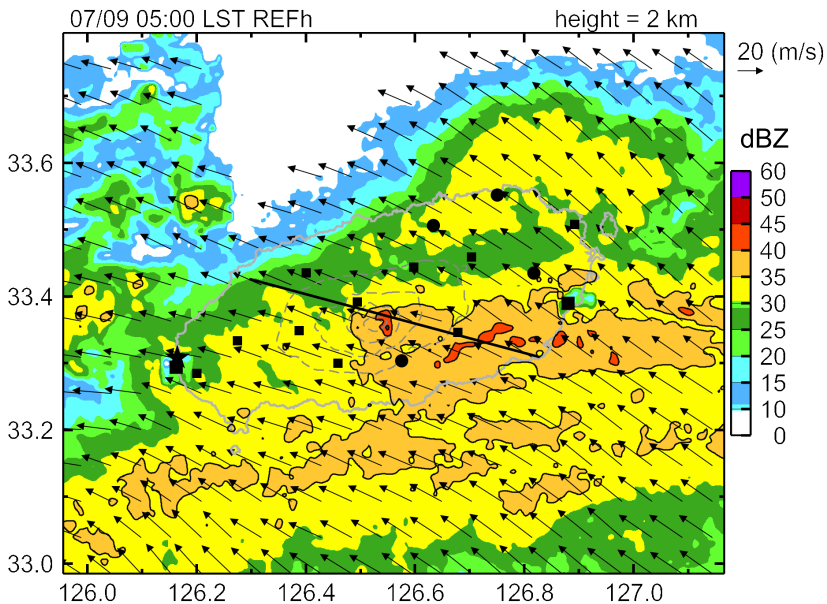


Convergence and reflectivity (cross section)



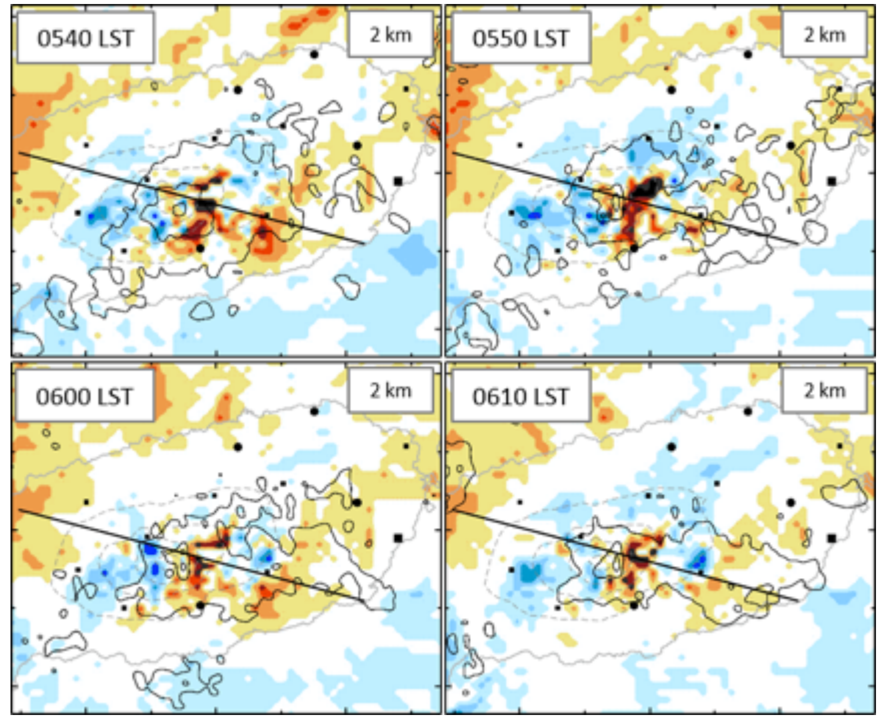
CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Retrieved horizontal wind (u-v) and reflectivity

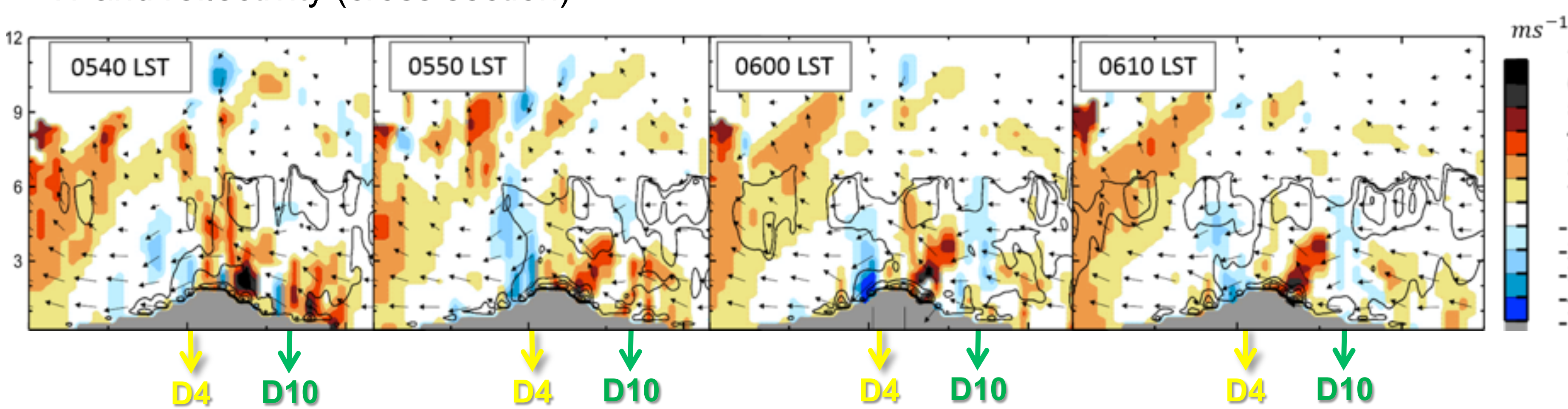


W and reflectivity (35dbz↑)

(Liou et al., 2012)

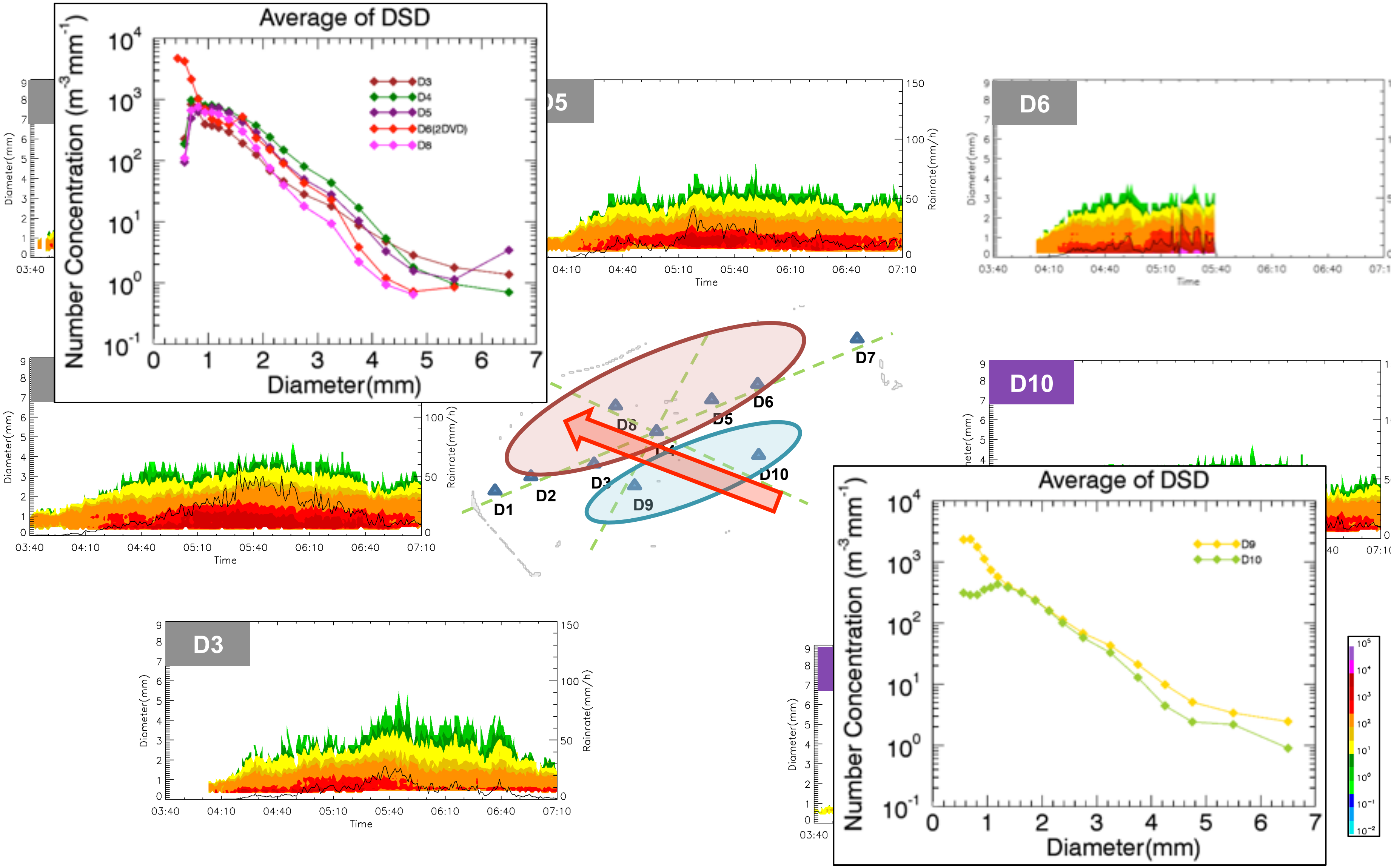


W and reflectivity (cross section)



CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Surface weather condition_distrometer



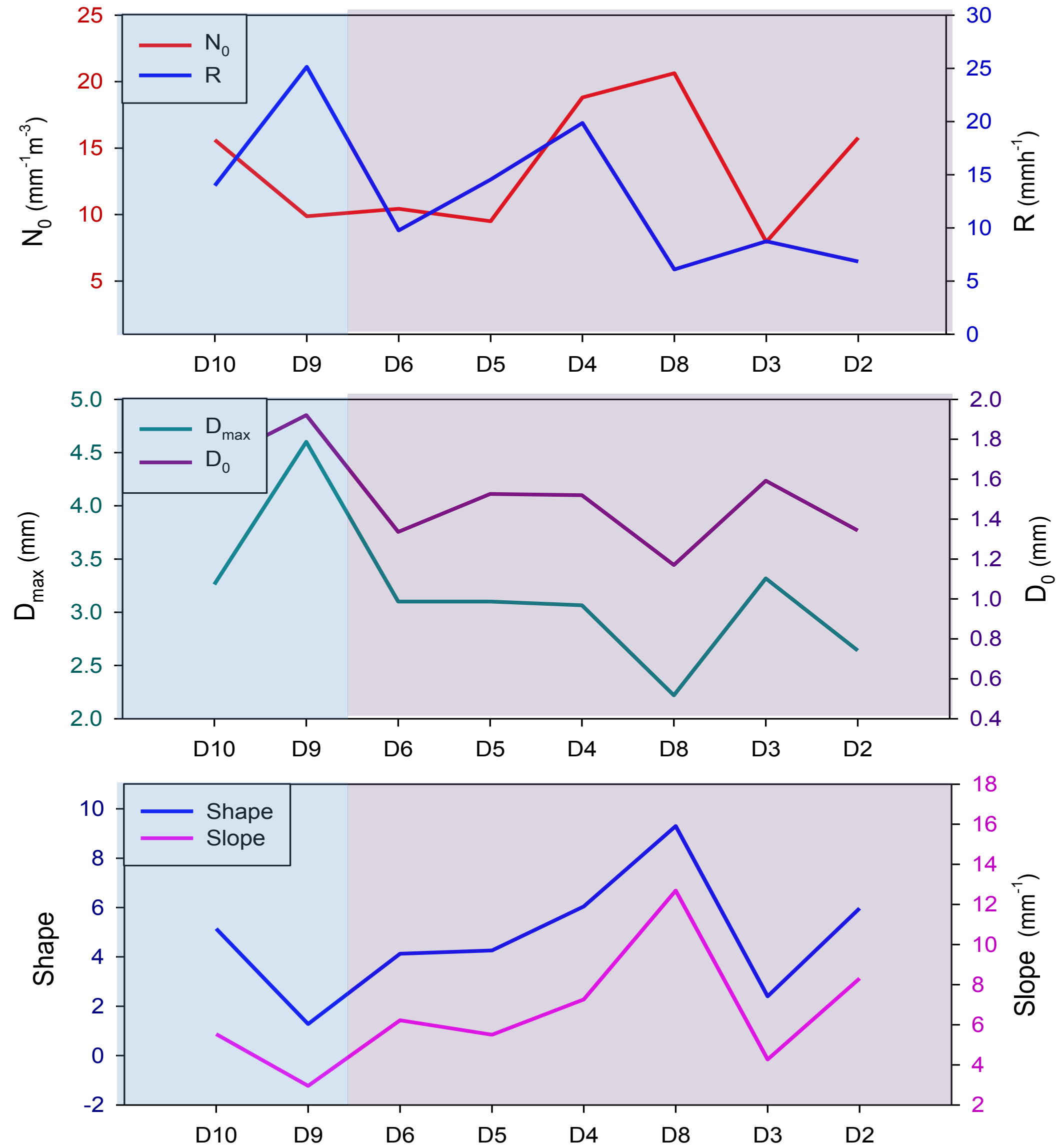
CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Parsivel analysis

Analysis of DSD parameter and contribution r

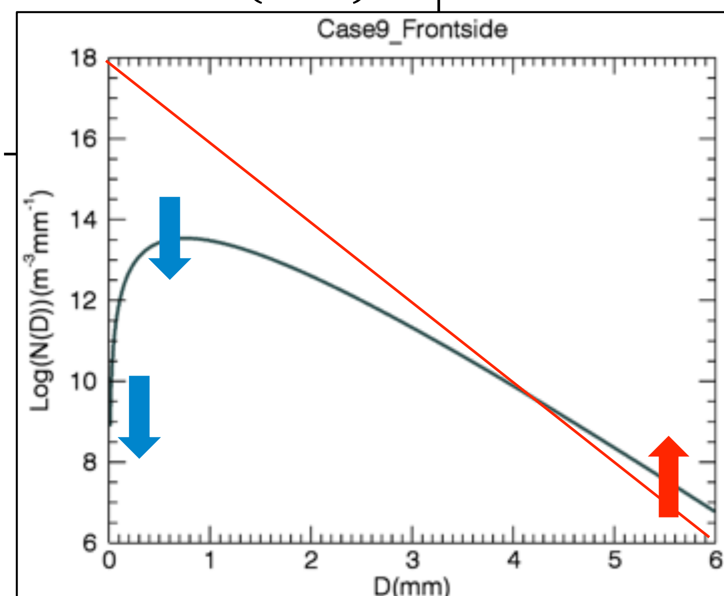
Parameter	Equation
Liquid water content	$w = 10^{-9} \rho_w \pi/6 \sum N(D) D^3 dD$ $\rho_w = 10^6\ g/m^3$ for rain
[illegible, partly covered]	$N_0 = \Lambda^{(\mu+4)} \ldots / \Gamma(\mu+4)$ [partly covered]
Median Volume Diameter	$\int_0^{D_0} D^3 N(D) dD = 1/2 \int_0^{D_{max}} D^3 N(D) dD$
Rain Rate	$R = \int_0^{D_{max}} v(D) D^3 N(D) dD$ [partly covered]
Shape	$\mu = (8-11m)-(m^2+8m)^{1/2} / 2(m-1)$
Slope	$\Lambda = m_3 / m_4 (\mu+4)$

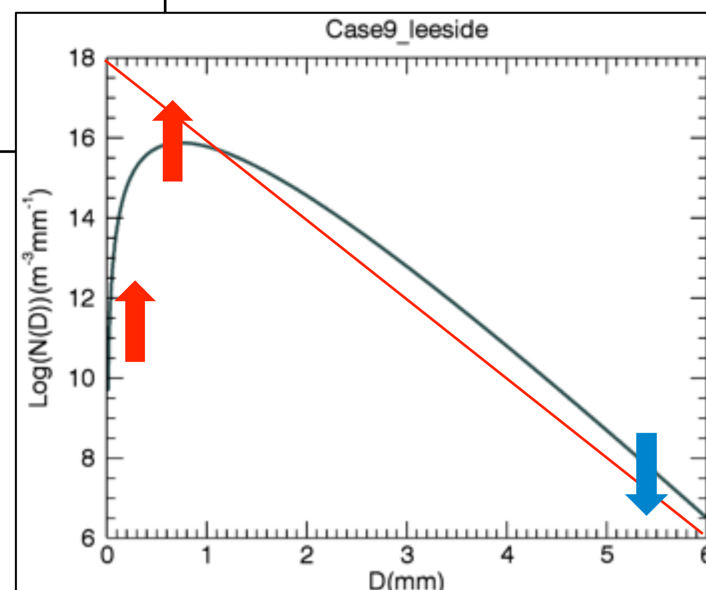
(Kozu and Nakamura, 1991; Chu at al., 2008; uter et al, 2006)



CASE 9. 2014. 07. 09. 03:30 ~ 09:00 LST

Parameters	Front side	Lee side (Except for D2, D7, D8)
Atmospheric Condition		
$W (m s^{-1})$	0.897	0.280
$R (mm h^{-1})$	19.554	13.225
DSD Parameters		
$Log(N_0)(mm^{-1-\mu} m^{-3})$	4.483	5.263
$D_0 (mm)$	1.804	1.518
$D_{max} (mm)$	3.931	3.156
	212	
	244	





Next Step

NEXT…

2012

- Intensive obser vation
  - Line-network
- Quality control
- Case study

2013

- Intensive observ ation
  - Radial-network
- Development of Remote surveilla nce system
- Quality control
- Case study

2014

- **2013 Intensive observation**

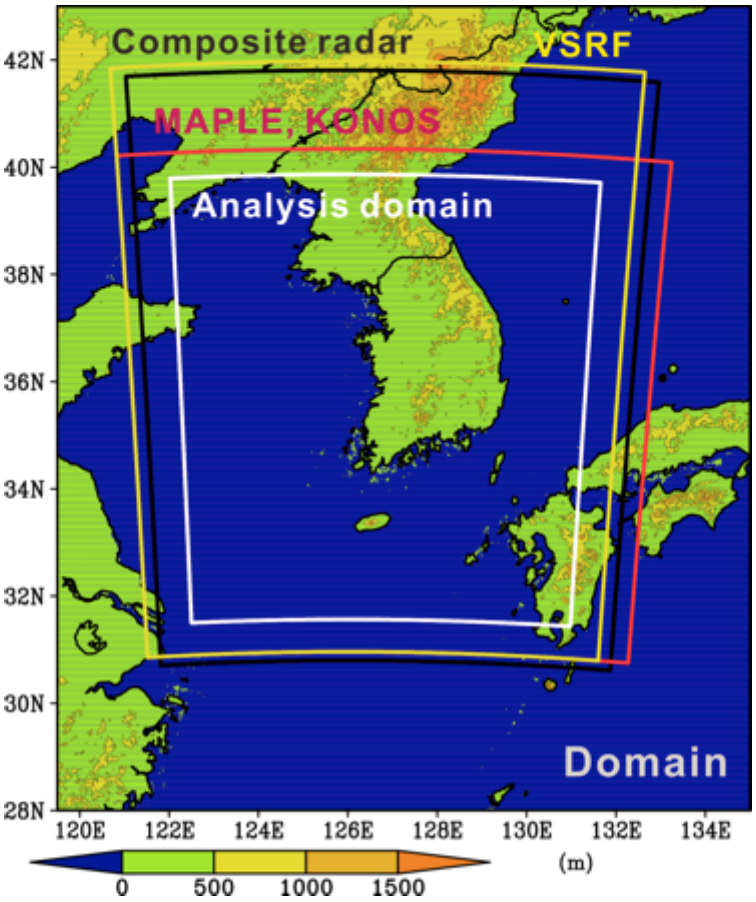
+

Forecast system

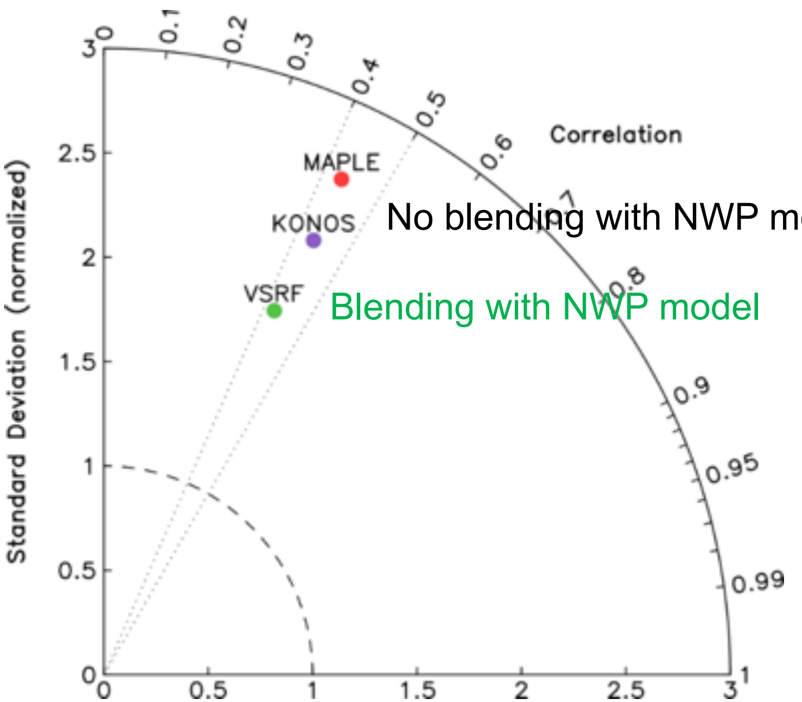
- **Case studies for microphys ical process**
- **Development of blending te chnique with numerical mo del for radar nowcasting**
- **Statistic analysis of orogra phic precipitation**

Development of blending technique with numerical model for radar nowcasting

Nowcasting systems based on Radar in KMA



- **Time period:** **Jun. – Aug., 2011 and 2012**
- Verification on MAPLE, VSRF, and KONOS using gauges



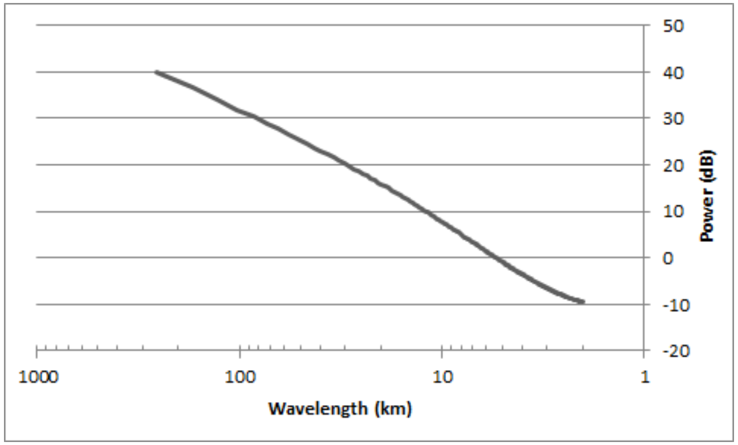
- VSRF had better performance comparing with other two systems, MAPLE and KONOS
- We have focused on the accuracy of calculating advection vector of precipitation

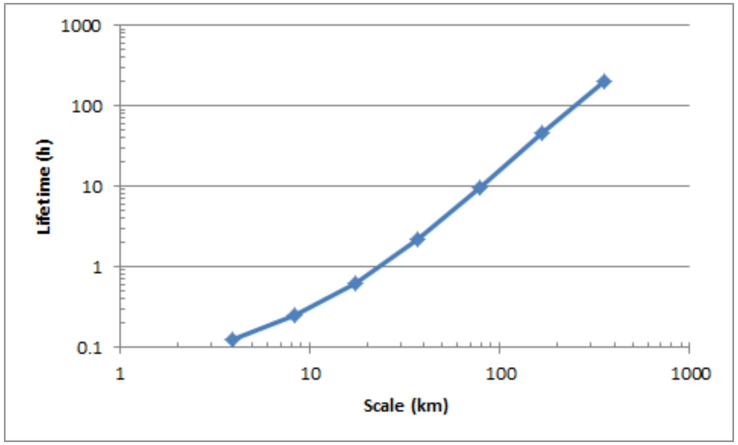
Development of blending technique with numerical model for radar nowcasting

- **Introduction of a new nowcasting system**
  - STEPS (Short Term Ensemble Prediction System) will be introduced for this purpose
  - STEPS is used in Met Office and BOM of Australia operationally
  - We visited at BOM of Australia from 14 th to 29 th June in this year
- **Overview of STEPS**

➢ Statistical structure of rainfall

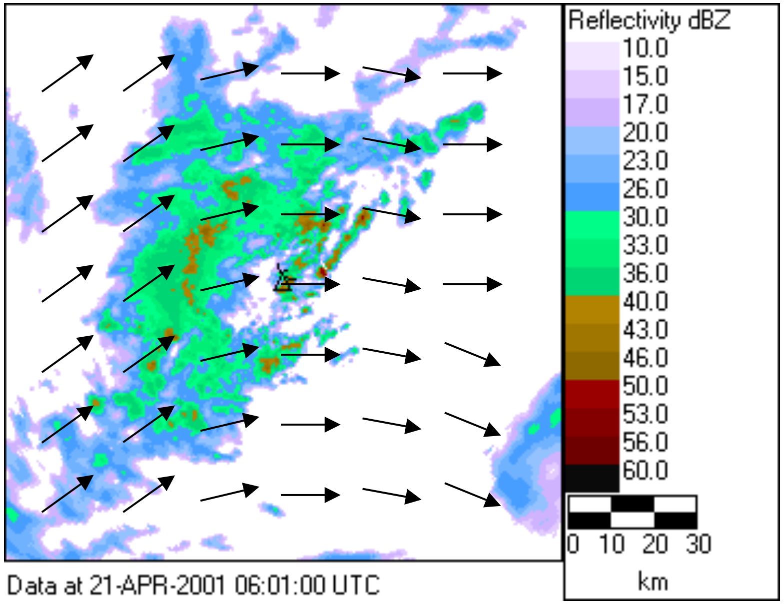
- Rainfall fields are usually hierarchical in structure, with smaller areas of higher i ntensity rain embedded in larger of lower intensity rain
- The lifetime of a storm increases as a power law of its size

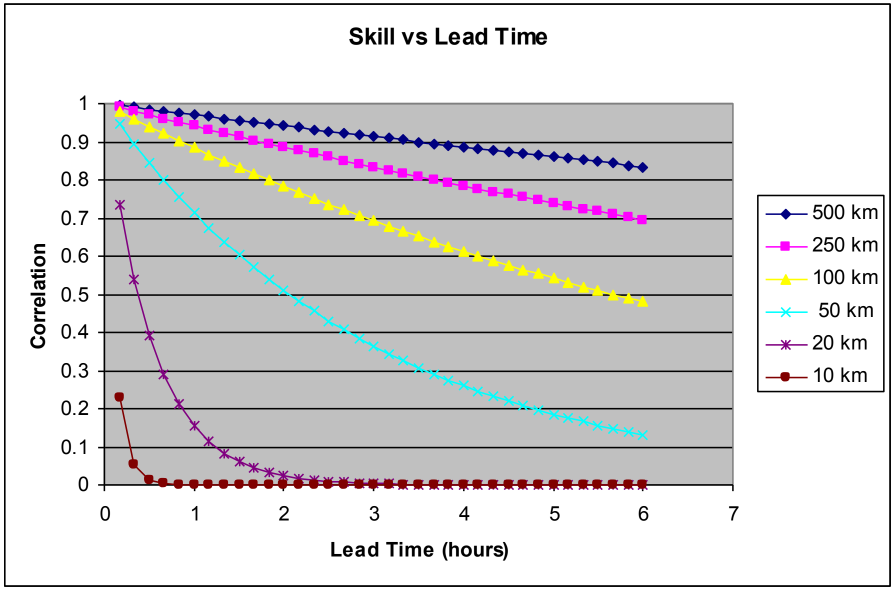




Courtesy of Dr. Alan Seed

- **Overview of STEPS**
  - Very short term rainfall forecasts
    - Track the motion of the rainfall
    - Move current rainfall pattern forwards in time to make the forecasts
    - Errors are a function of scale and lead time because the rainfall pattern changes during the forecast period





Courtesy of Dr. Alan Seed

Development of blending technique with numerical model for radar nowcasting

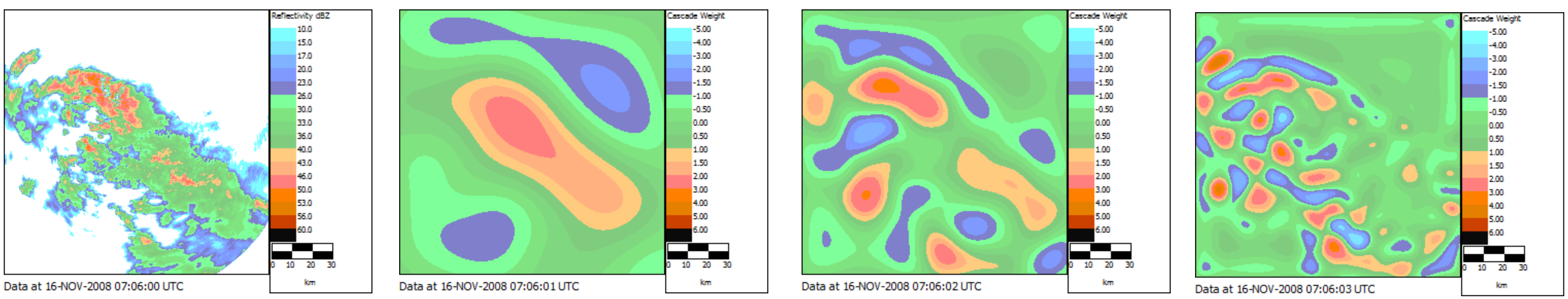
- **Overview of STEPS**
  - Multiplicative cascade

$$x_{x,y} = \mu + \sum_{k=0}^{N} \sigma_k w_{k,x,y}$$

x is the field of radar reflectivity (dBZ)

w_k is the field with wavelength $l = Lq^k$

$\sigma_k = \sigma_0 q^{hs}, q < 1$



Radar

k=0
256 km

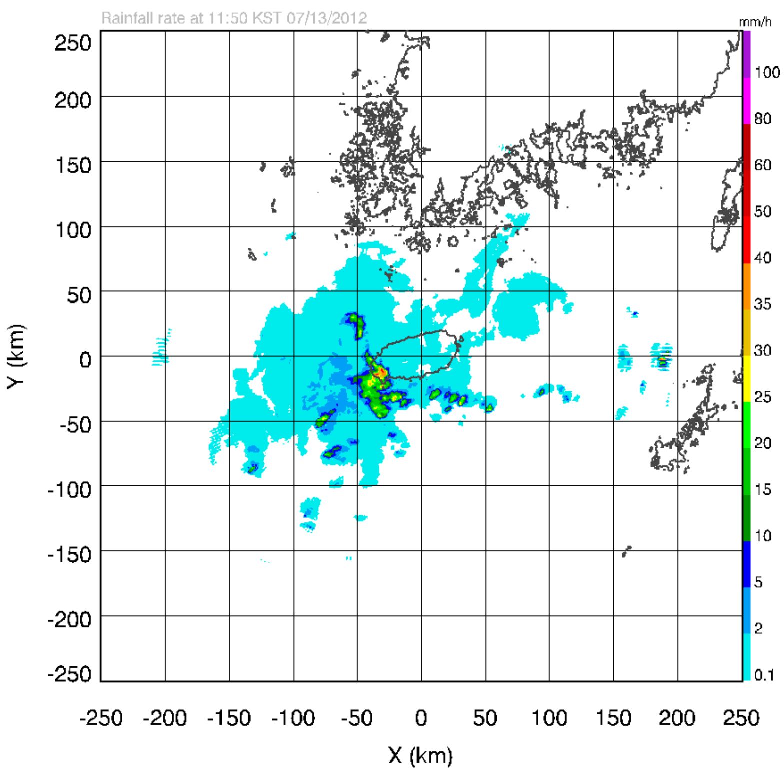
k=1
128 km

k=2
64 km

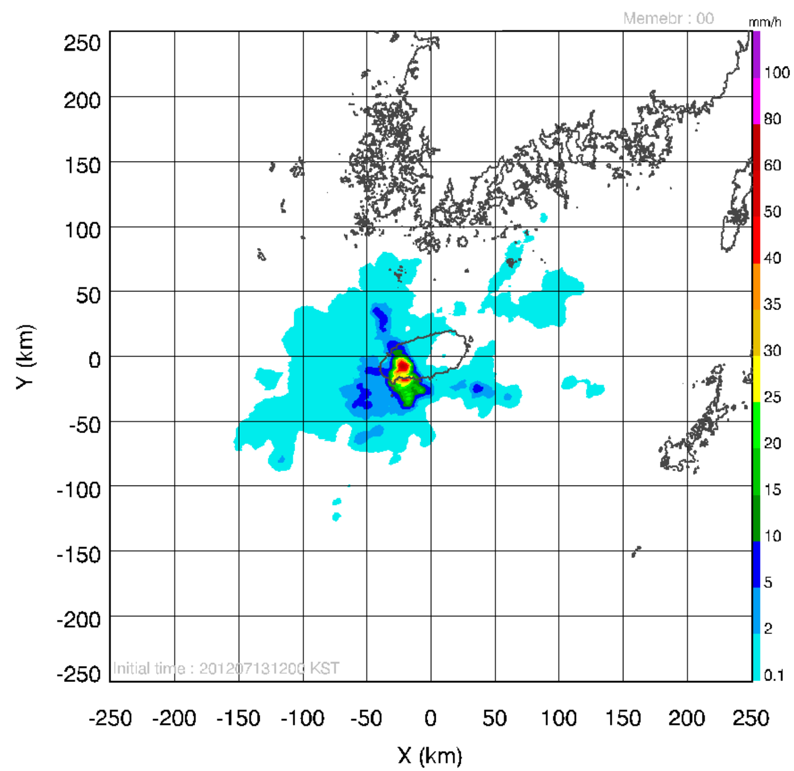
Courtesy of Dr. Alan Seed

- **Example of STEPS run using Korean radar data**
  - Specifications
    - Radar data : GSN and SSP, Domain : 500 km by 500 km with 1 km resolution
    - Input : 2.0km rainrate using $Z=200R^{1.6}$

• Observation



• STEPS different ensembles



- Future works : calculations of ensemble statistics, blending with model output

References

Chu Y. H., and C. L. Su, 2008: An Investigation of the Slope–Shape Relation for Gamma Raindrop Size Distribution, *J. Climate Appl. Meteor*., **47**, 2531-2544

Houze, R. A. Jr., 2011: Orographic effects on precipitating clouds. *Rev. Geophys*., doi:10.1029/2011RG000365.

Kozu, T., and K. Nakamura, 1991: Rainfall parameter estimation from dual-radar measurements combining reflectivity profile and path-integrated attenuation. *J. Atmos. Oceanic Technol*., **8**,59-271

Lee, K.-O., H. Uyeda, S. Shimizu, D.-I. Lee, 2012: Dual-Doppler radar analysis of the enhancement of a precipitation system on the northern side of Mt. Halla, Jeju Island, Korea on 6 July 2007. *Atmos. Res.,* **118**, 133–152.

Lin, Y.-L., 2007: Mesoscale dynamics, *Cambridge University Press*, 442-488.

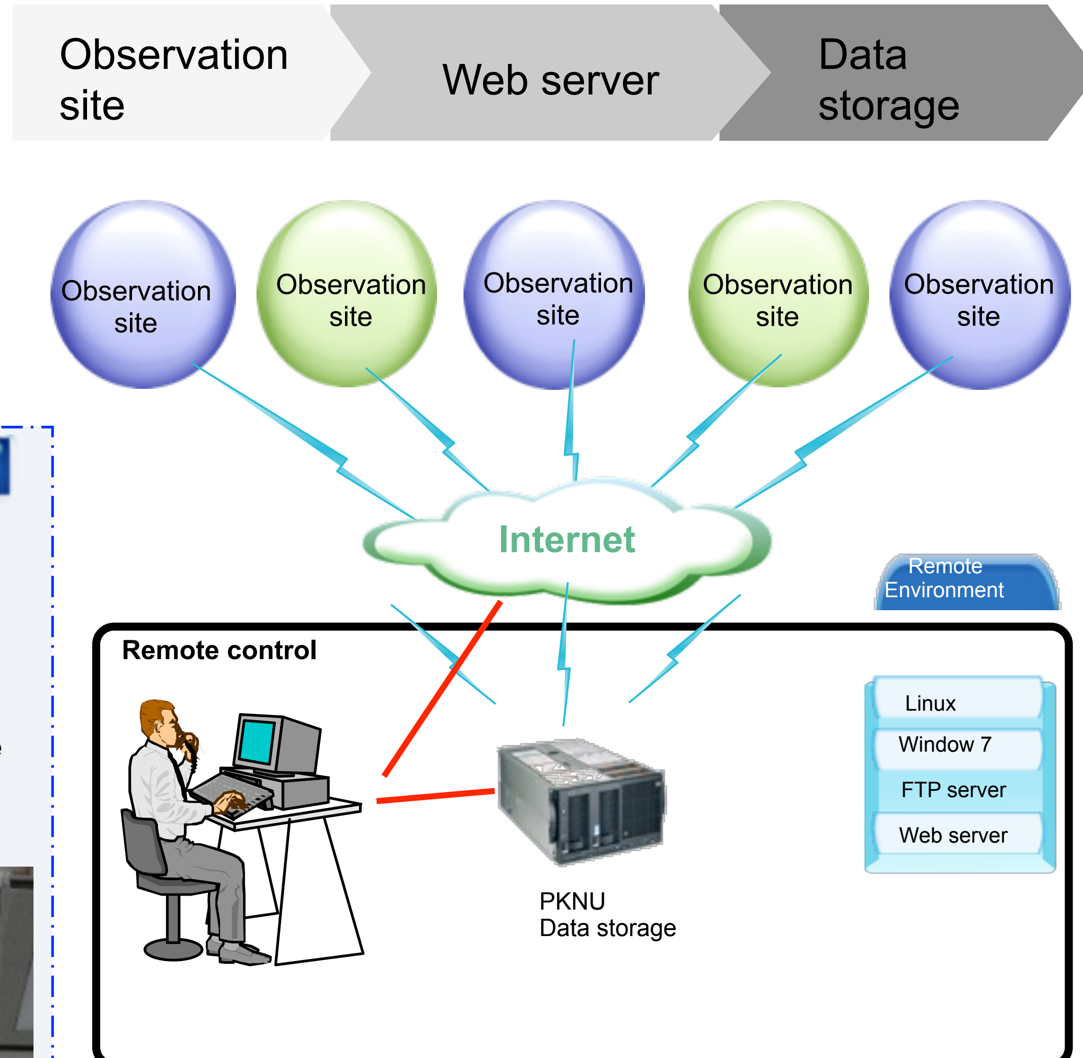
Liou, Y.-C and Y.-J. Chang, 2012: An Application of the Immersed Boundary Method for Recovering the Three-Dimensional Wind Fields over Complex Terrain Using Multiple-Doppler Radar Data. *Mon. Wea. Rev*., **140**, 1603-1618.

Neiman, P. J., 2003: Private communication.

Testud, J., S. Oury, R. A. Black, P. Amayenc, and X. Dou, 2001; The Concept of "Normalized" Distribution to Describe Raindrop Spectra: A Tool for Cloud Physics and Cloud Remote Sensing, *J. Climate Meteor*., **40**, 1118-1140

1). Support System to WISE Program

Remote Surveillance System



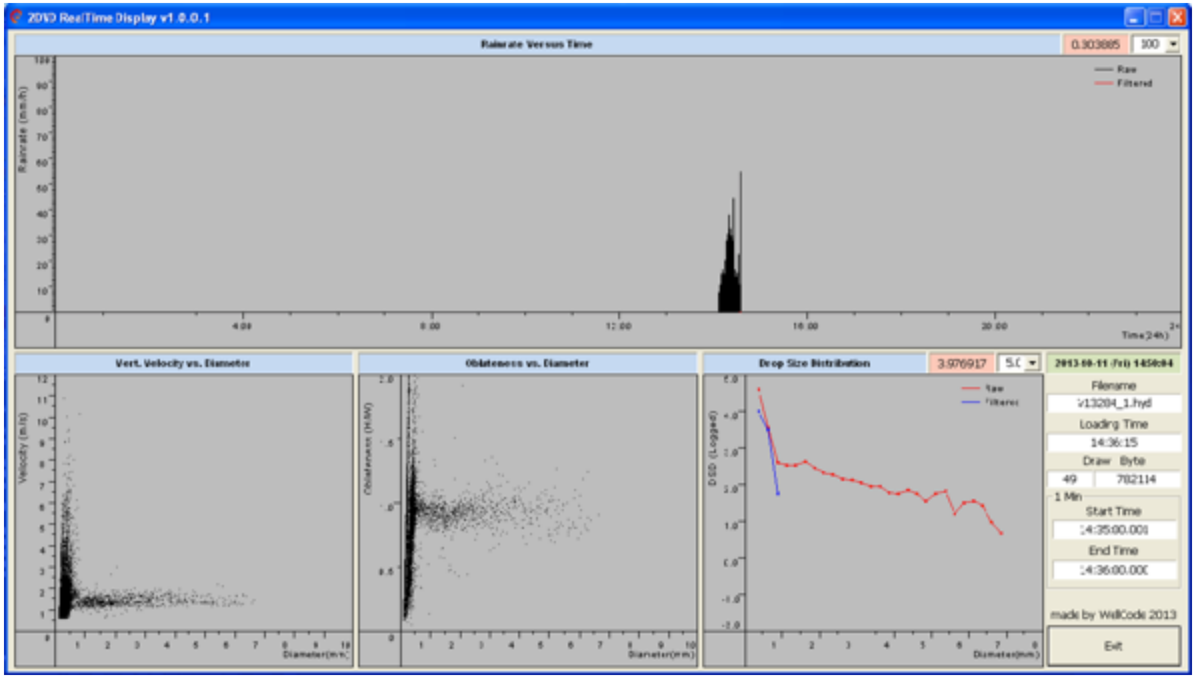
Monitoring (Mobile, desktop)

Mobile

Desktop

2). Support System to WISE Program

2DVD display program



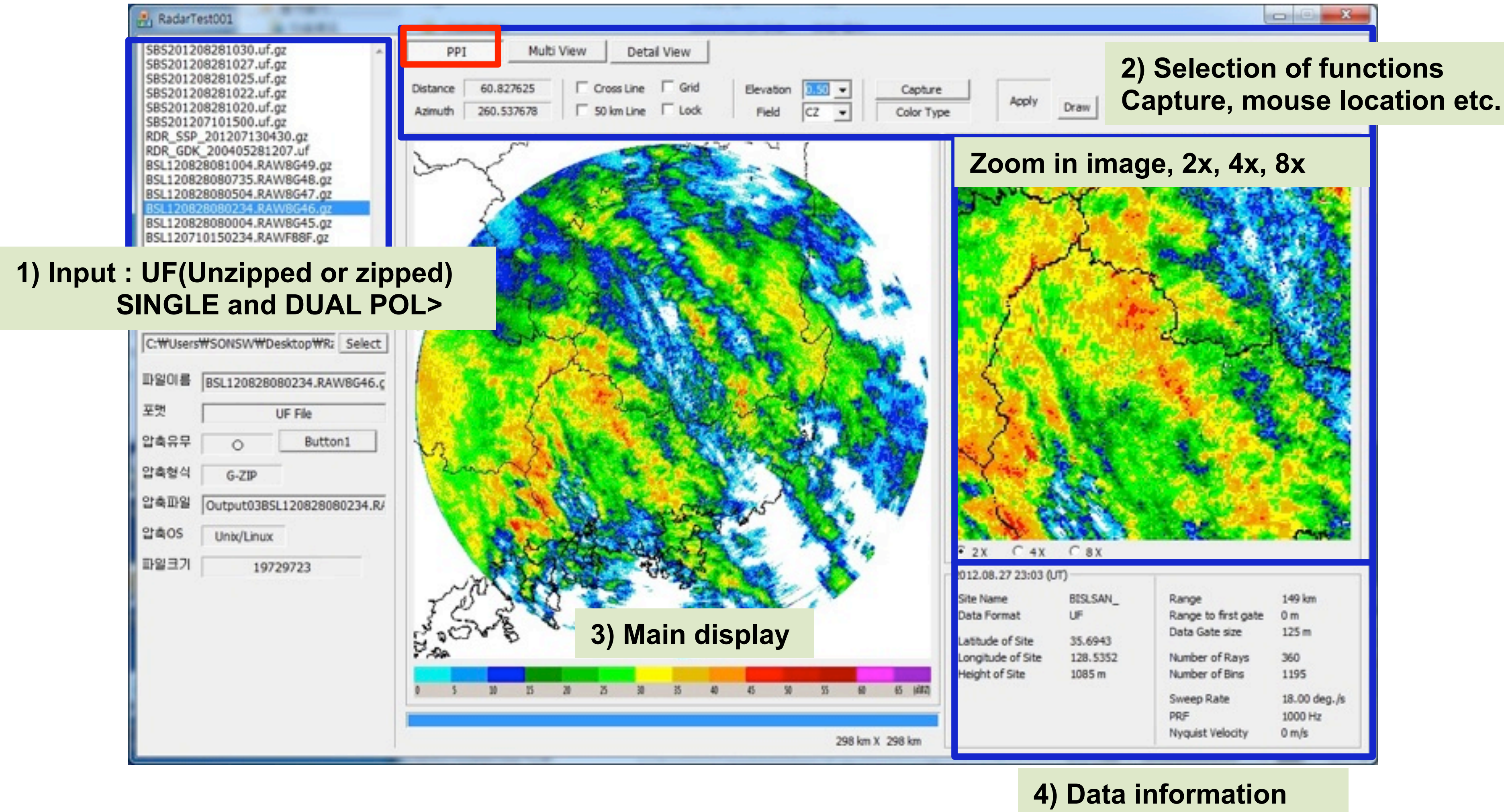
- The real-time display program using 2DVD data
- Display contents
  - Rain rate vs Time
  - Velocity vs Diameter
  - Oblateness vs Diameter
  - Drop Size Distribution
- Filter setting function to revise the particle of excessive fall velocity

3). Support System to WISE Program

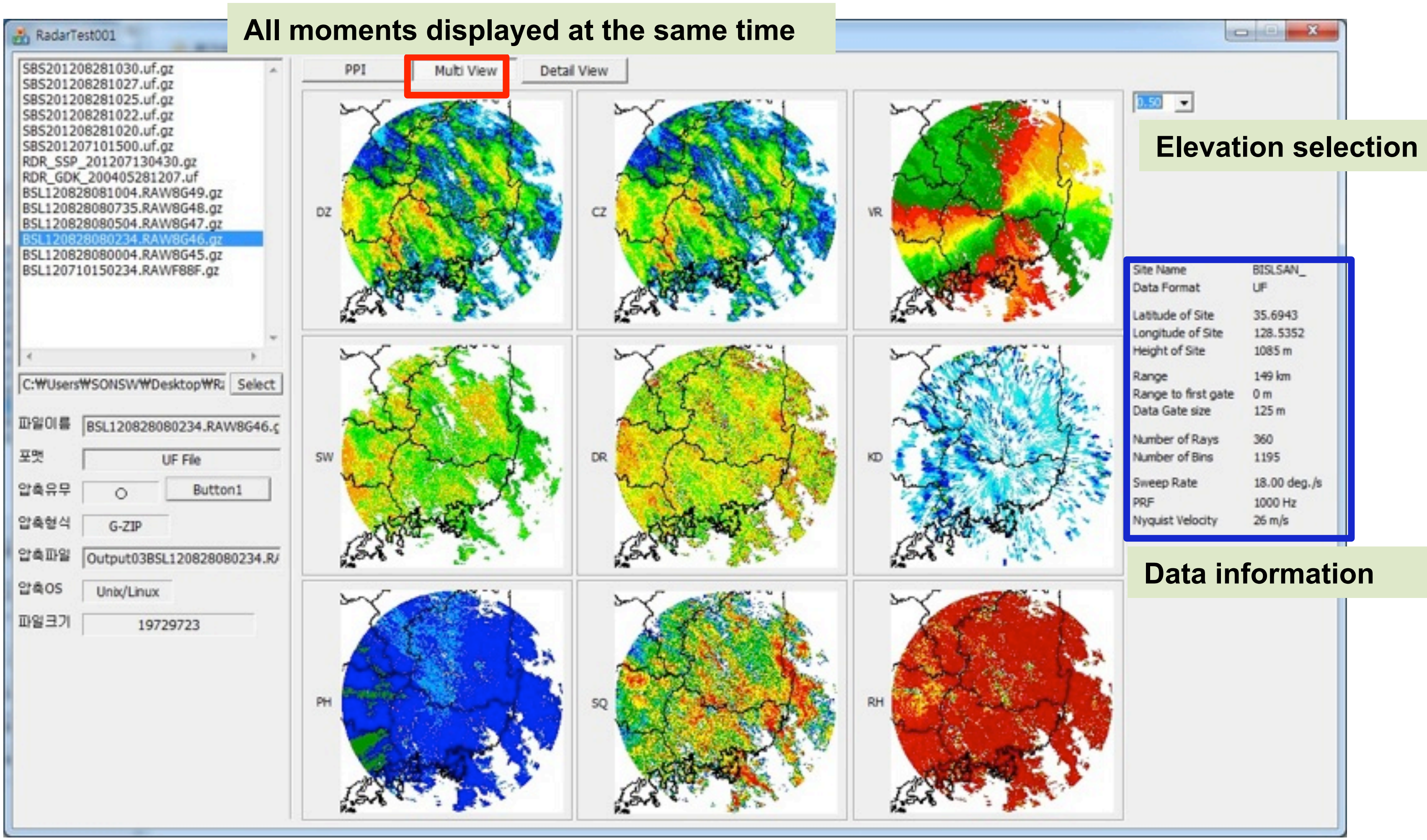
Radar Data Analysis System and Applications

RDAS (Radar Data Analysis System)

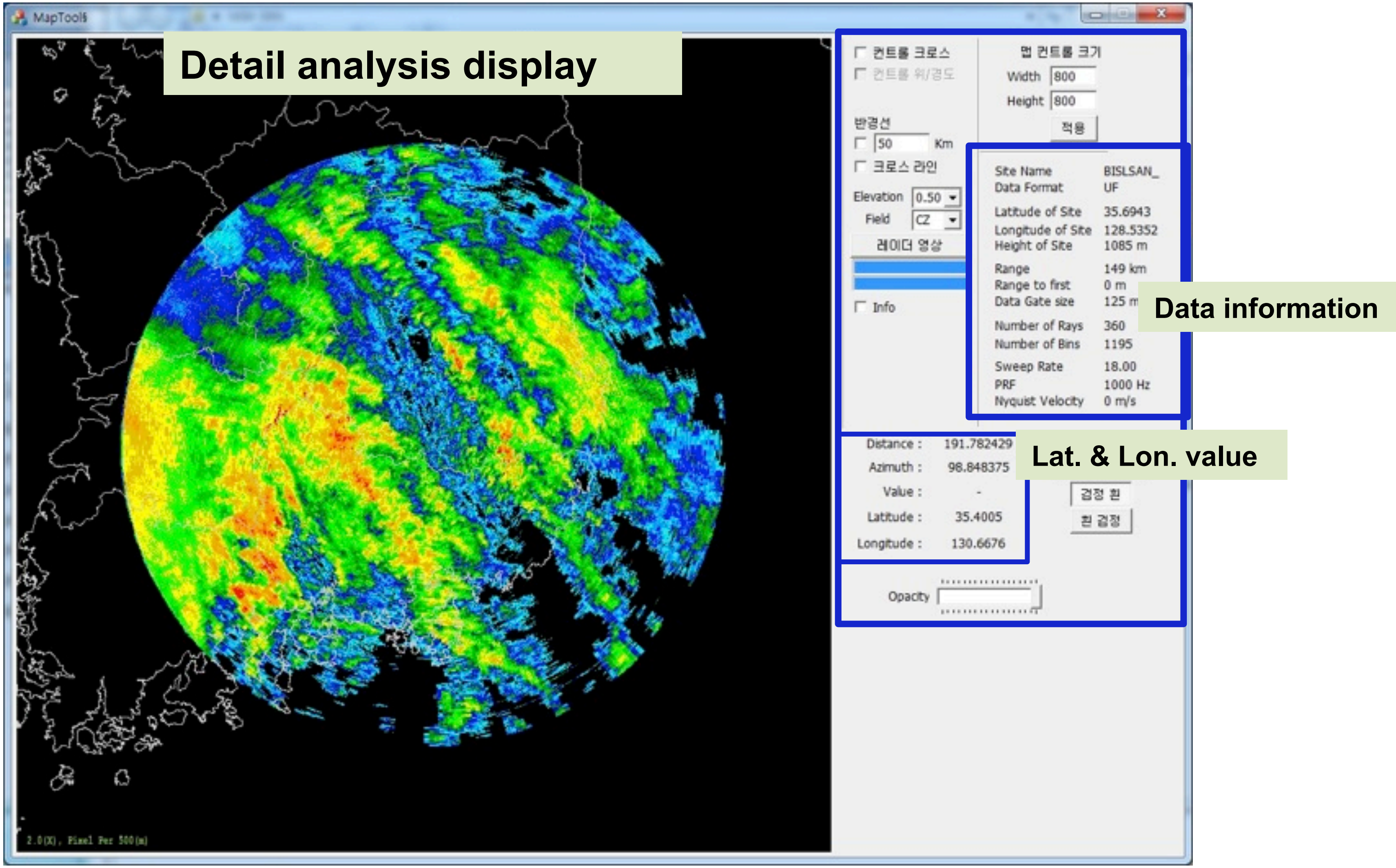
- To support radar analysis, PKNU team develops **RDAS** (radar data analysis system) with u ser-friendly interface.
- RDAS is initial stage of product development and currently being evaluated.



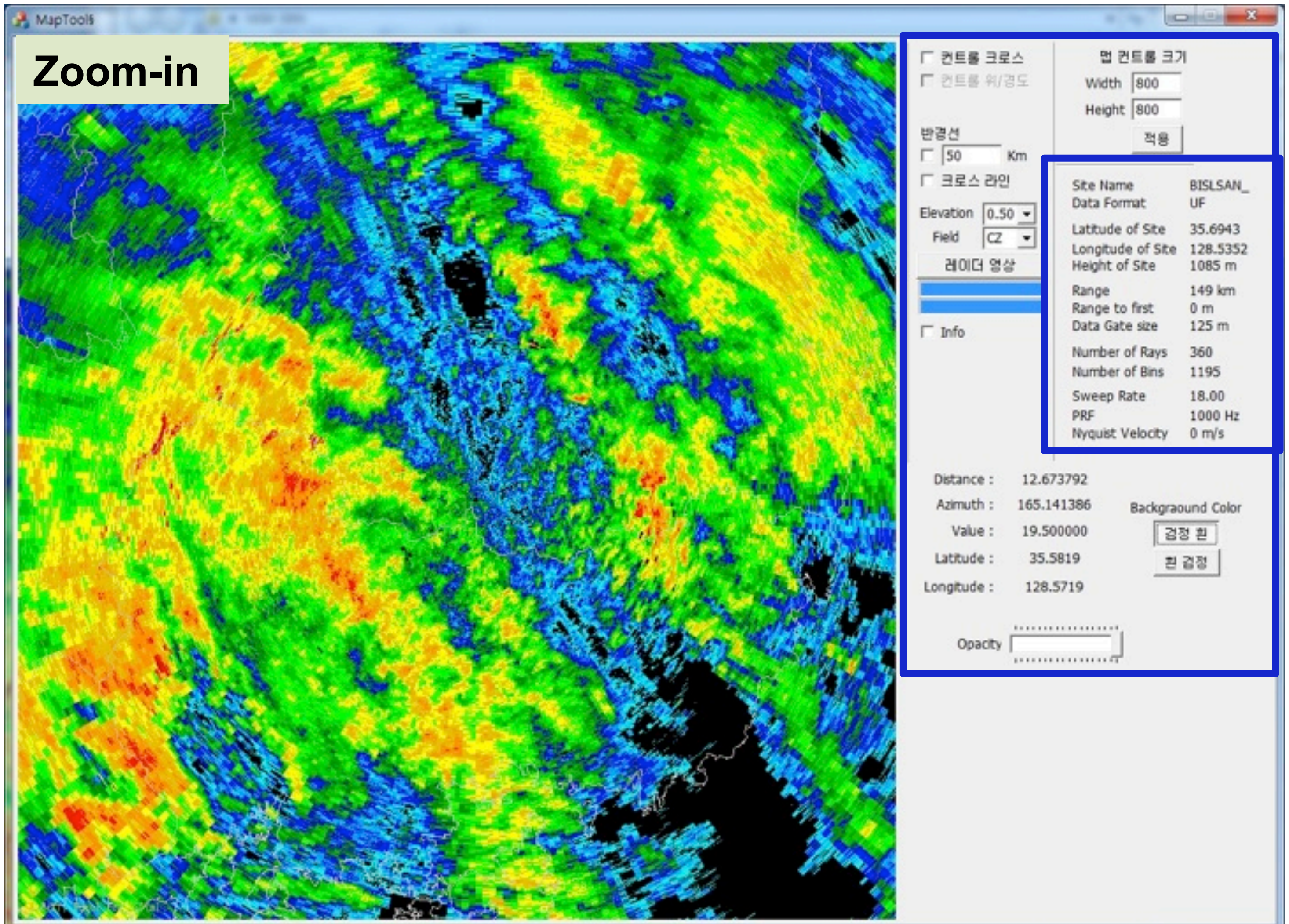
RDAS (Radar Data Analysis System)



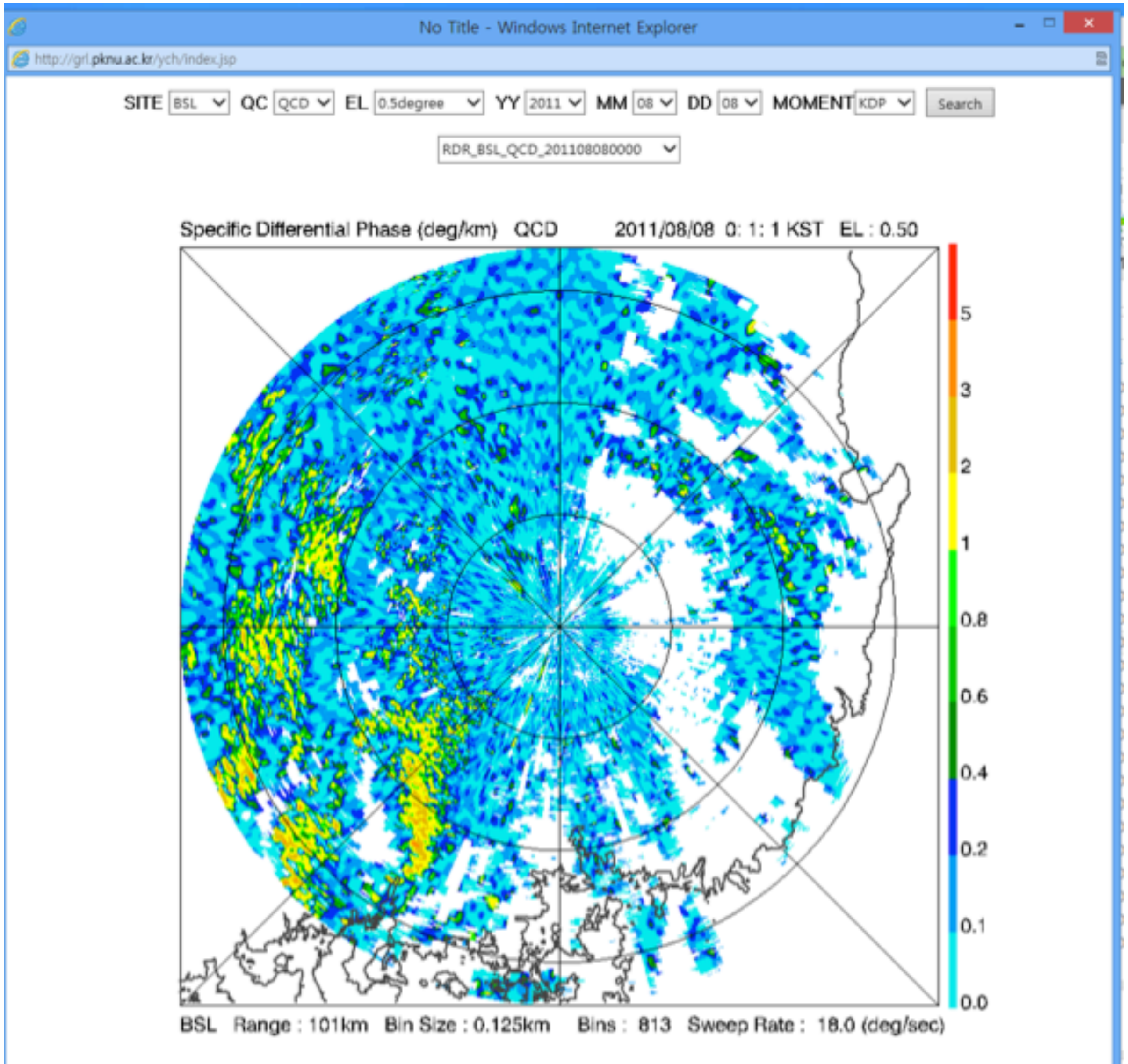
RDAS (Radar Data Analysis System)



RDAS (Radar Data Analysis System)

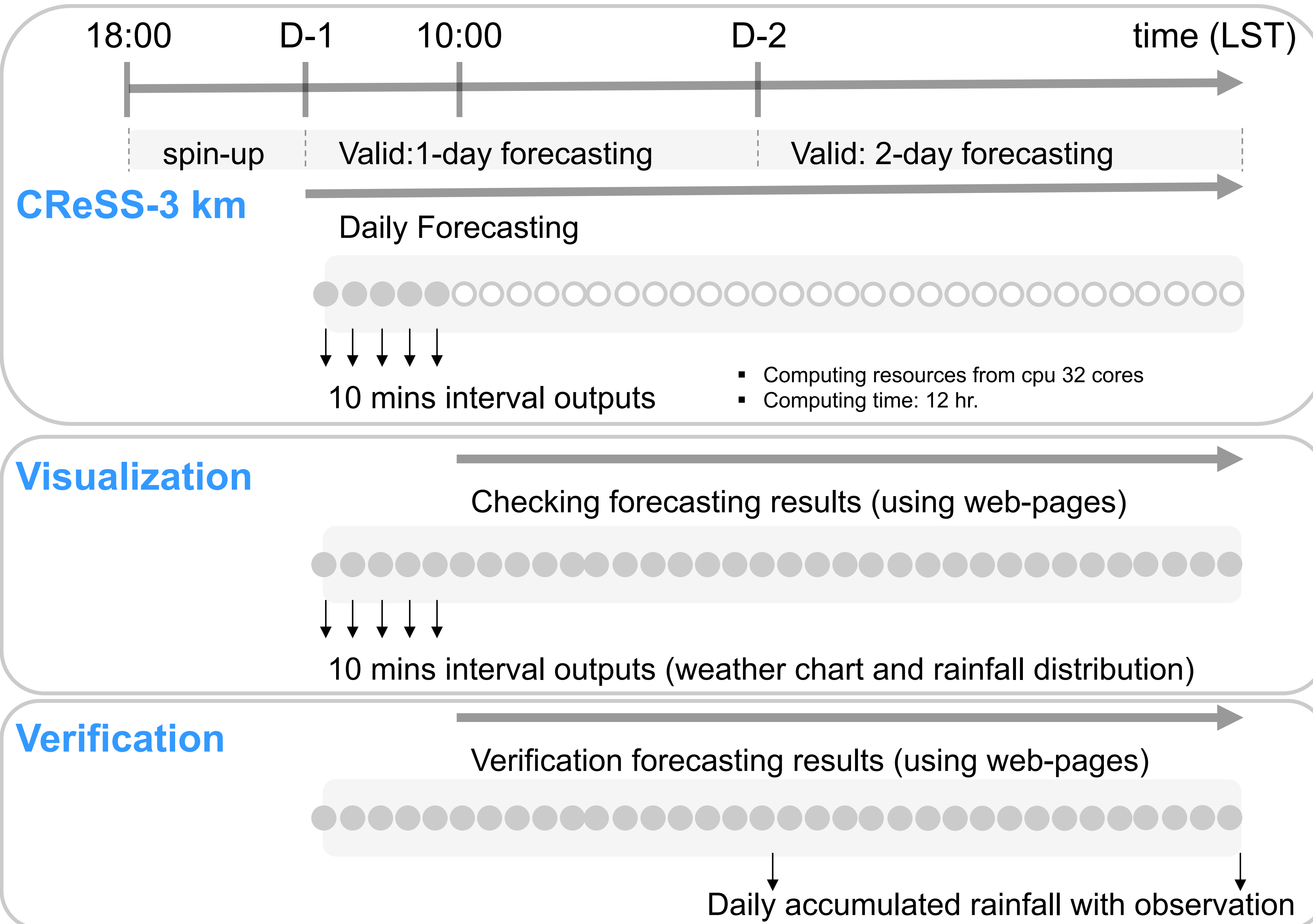


Web page : II. Radar data

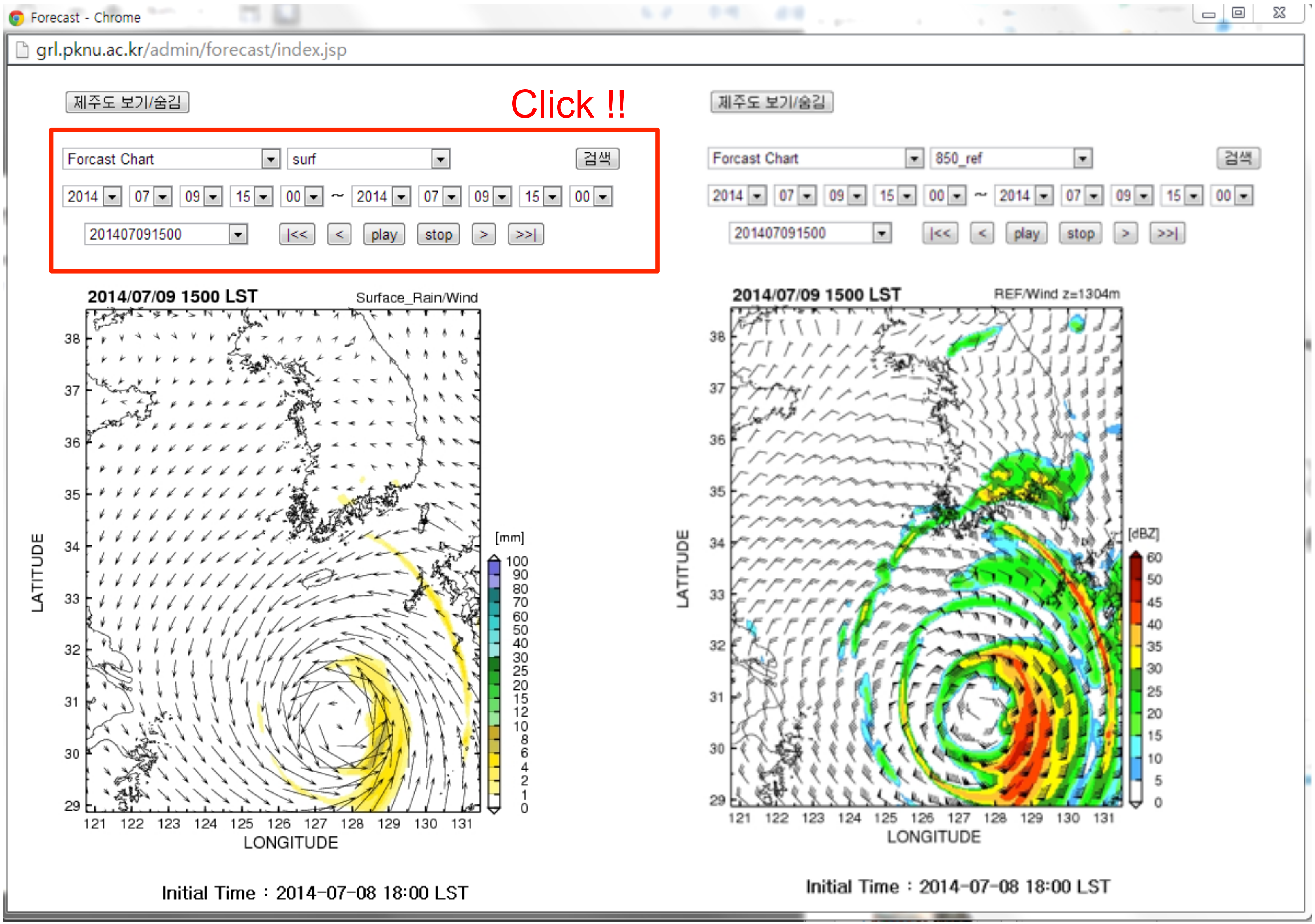


- SITE : BSL, SBS
- QC : QCD, RAW
- EL : -0.5, 0.5, 0.8 , 0, 1.2, 1.6 degre e
- YY : 2011, 2012
- MMDD : Month, d ate
- Moment: KDP, Z DR, RH, CZ, DZ, SW, VR, SQI

PKNU CReSS forecast system strategy

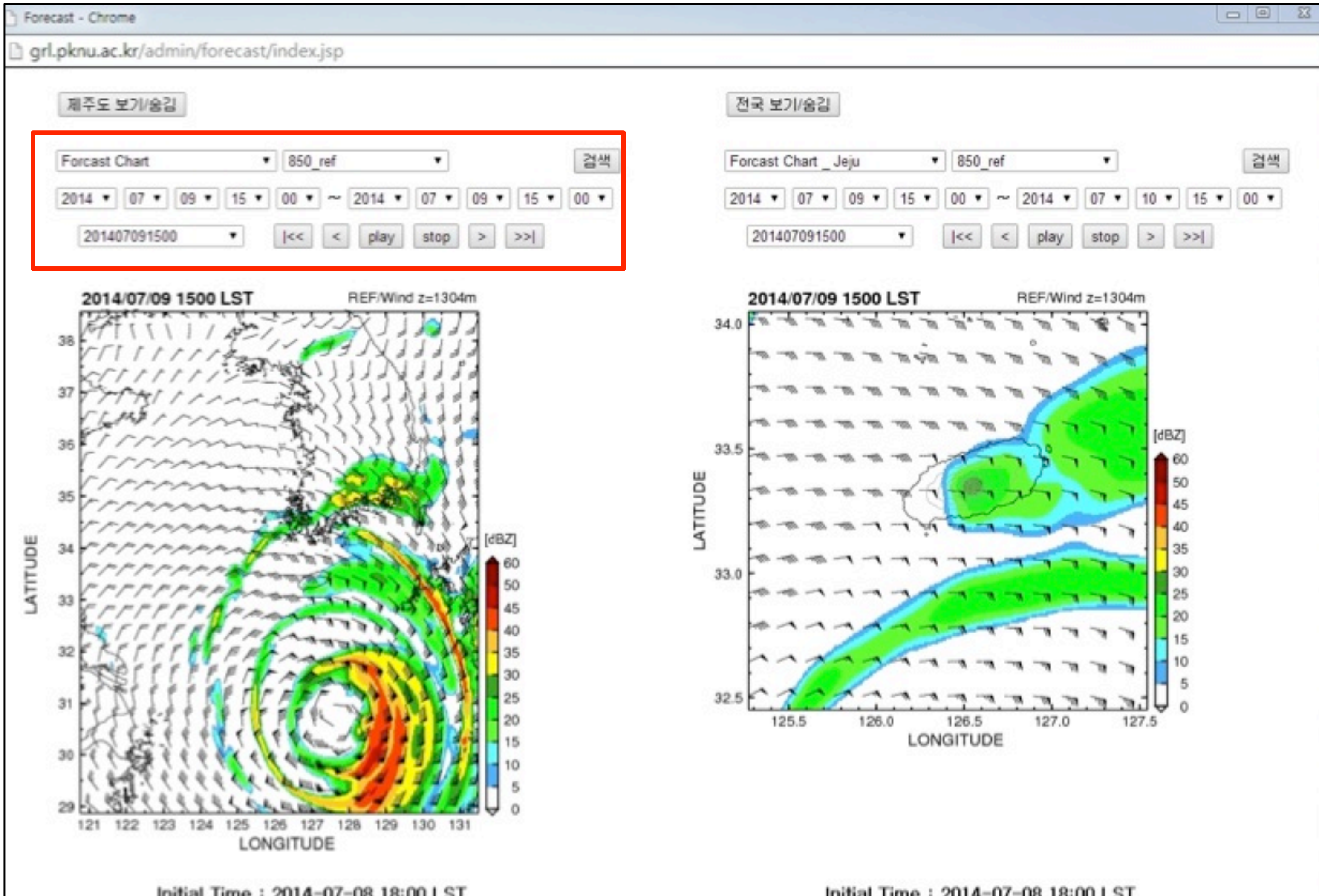


Web page : I. CReSS Model



Examples (web-pages)

Mode: double (Korea and Jeju)



Continuous study in our Lab.

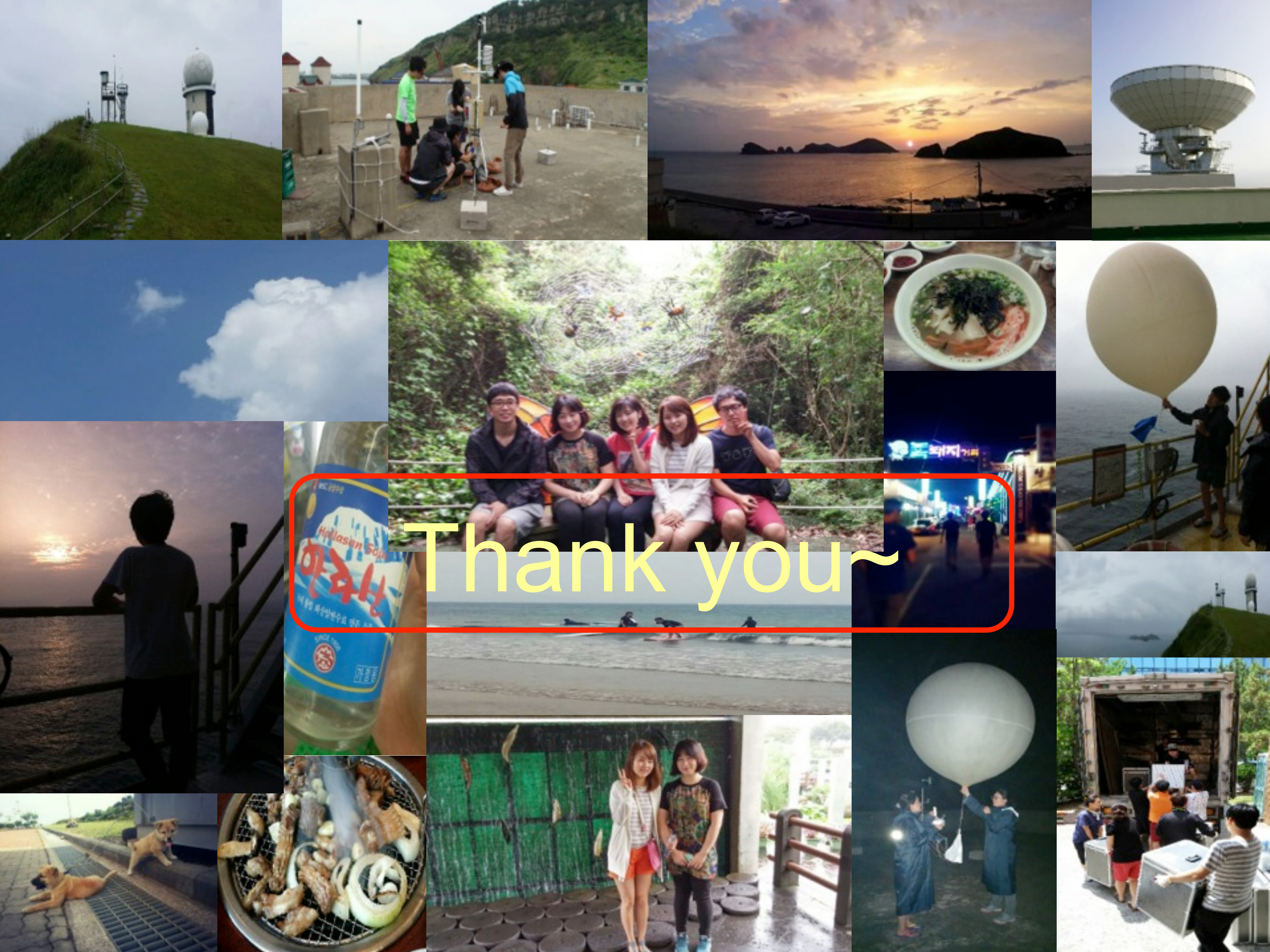
Radar data Blending for Nowcasting

WISE: Observation Preparation Stage

Instrument Setup

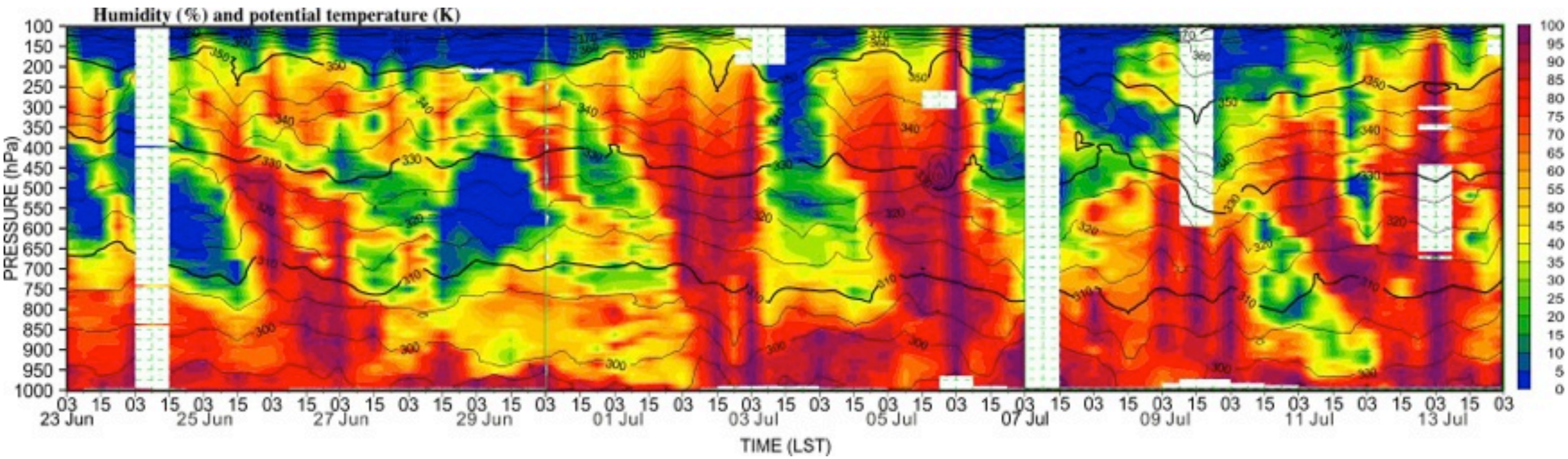
Researchers Collection

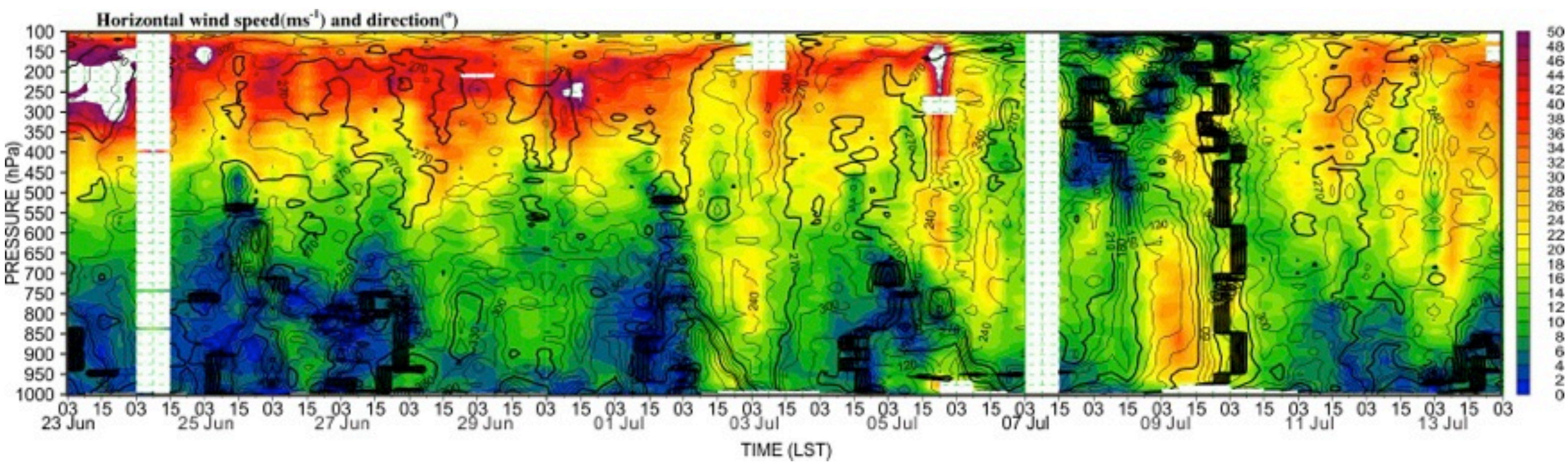
Sites Networking (How ???)


Thank you~
Hallasan Soju
한라산

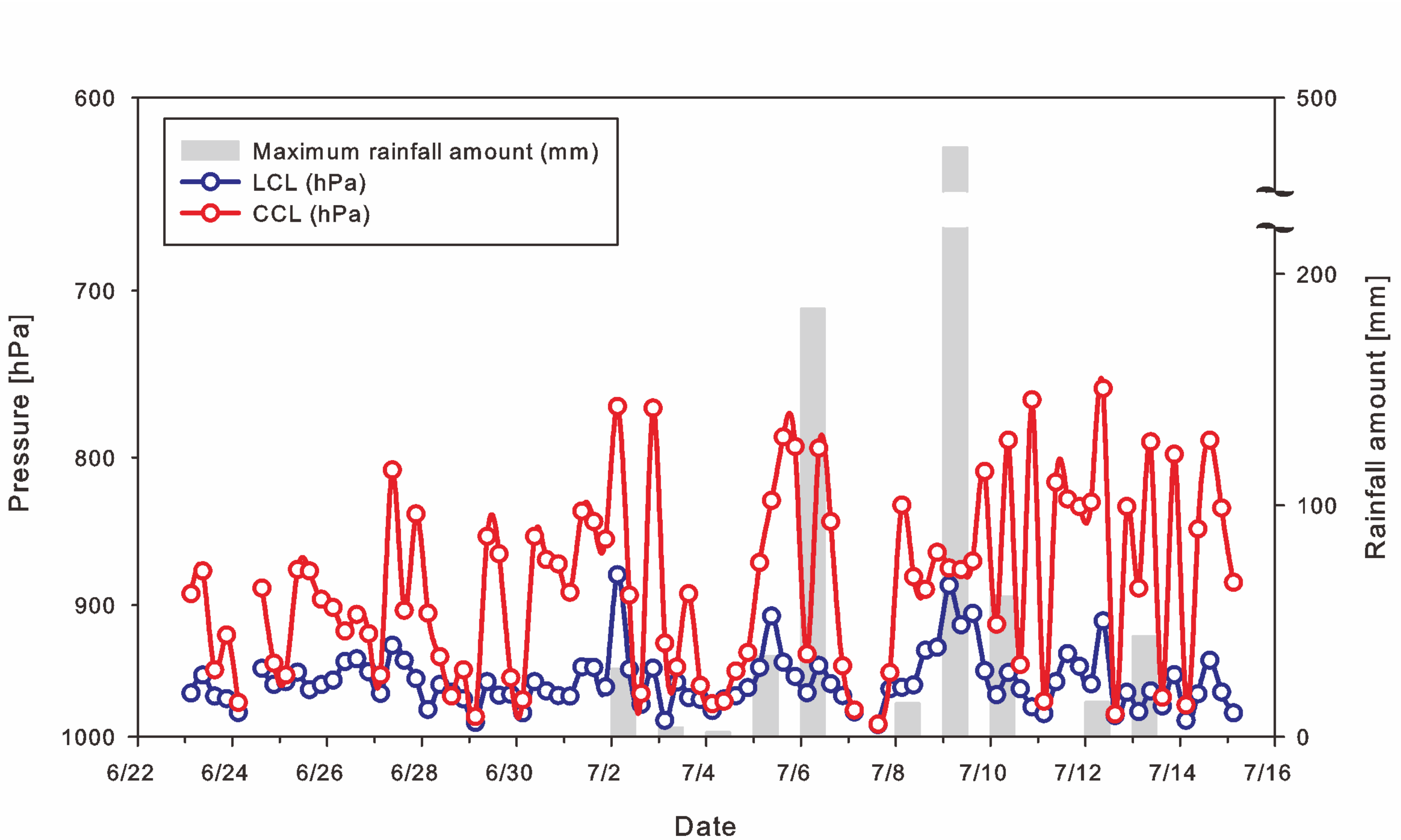
GPS sonde observation (2014)

23 June ~ 14 July 2014





GPS sonde observation (2014)



GPS sonde observation (2014)