JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observation in RAII (ASIA), Tokyo, Japan, 27-30 July 2010

Surface Meteorological & Upper-air Services in KMA

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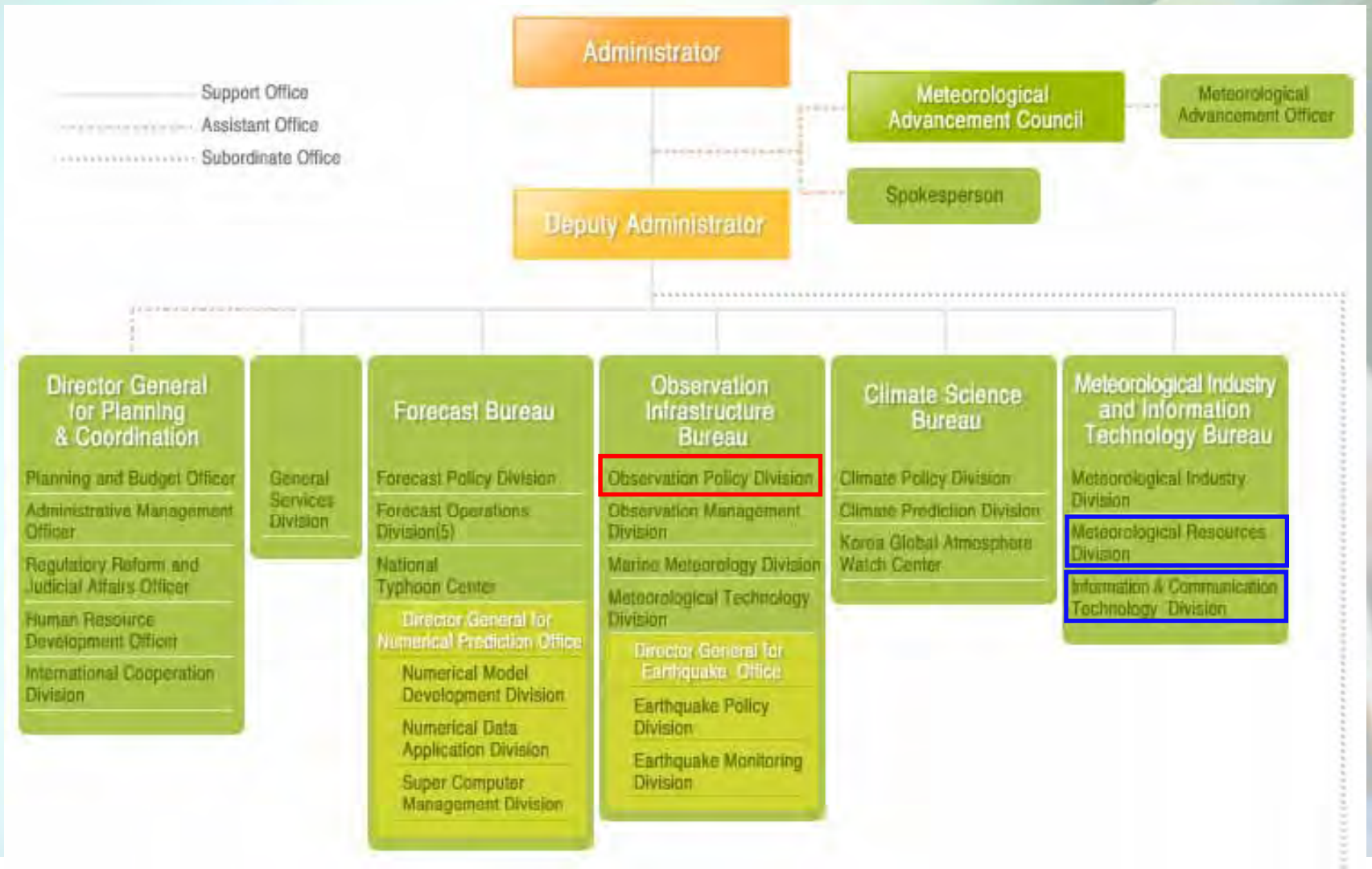
Observation Policy Division
Korea Meteorological Administration (KMA)

KMA KOREA METEOROLOGICAL ADMINISTRATION

Organization of KMA



KMA KOREA METEOROLOGICAL ADMINISTRATION

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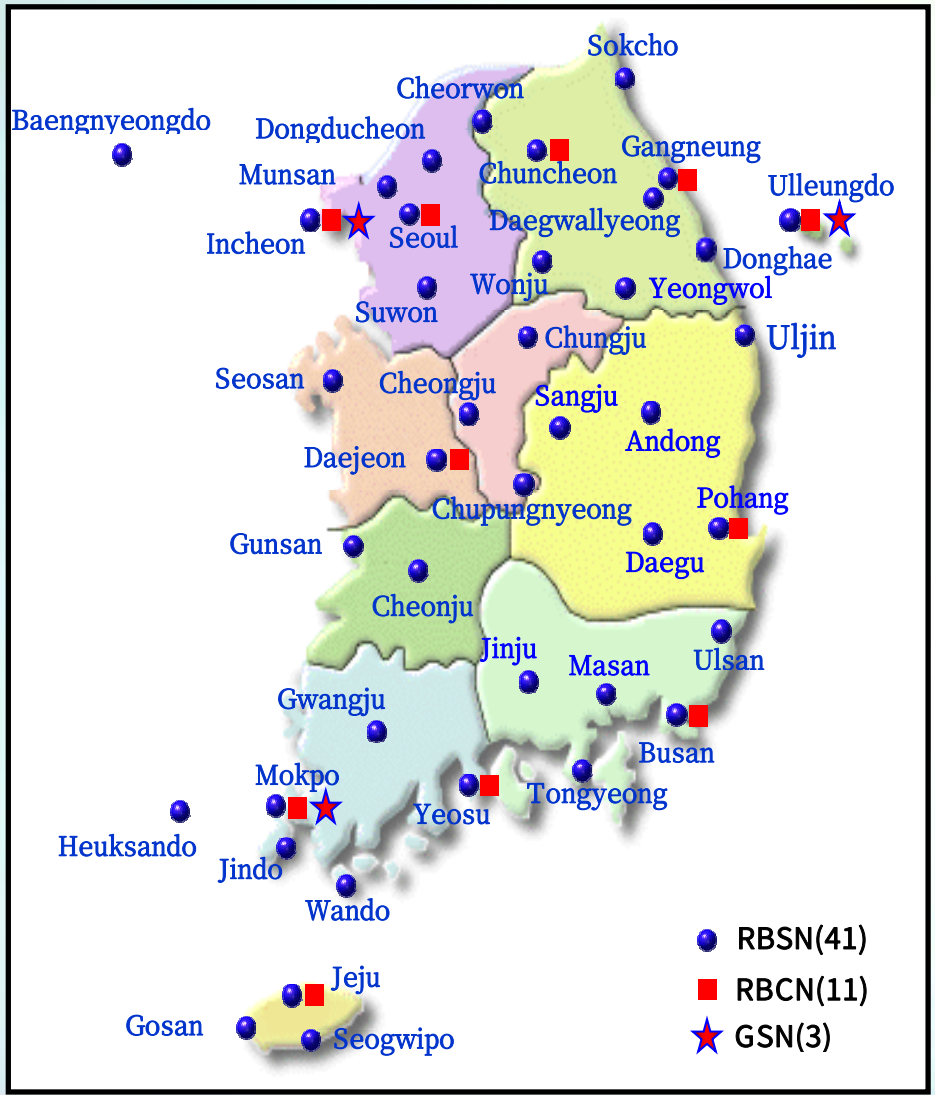
Surface Observation



◆ Number of Station

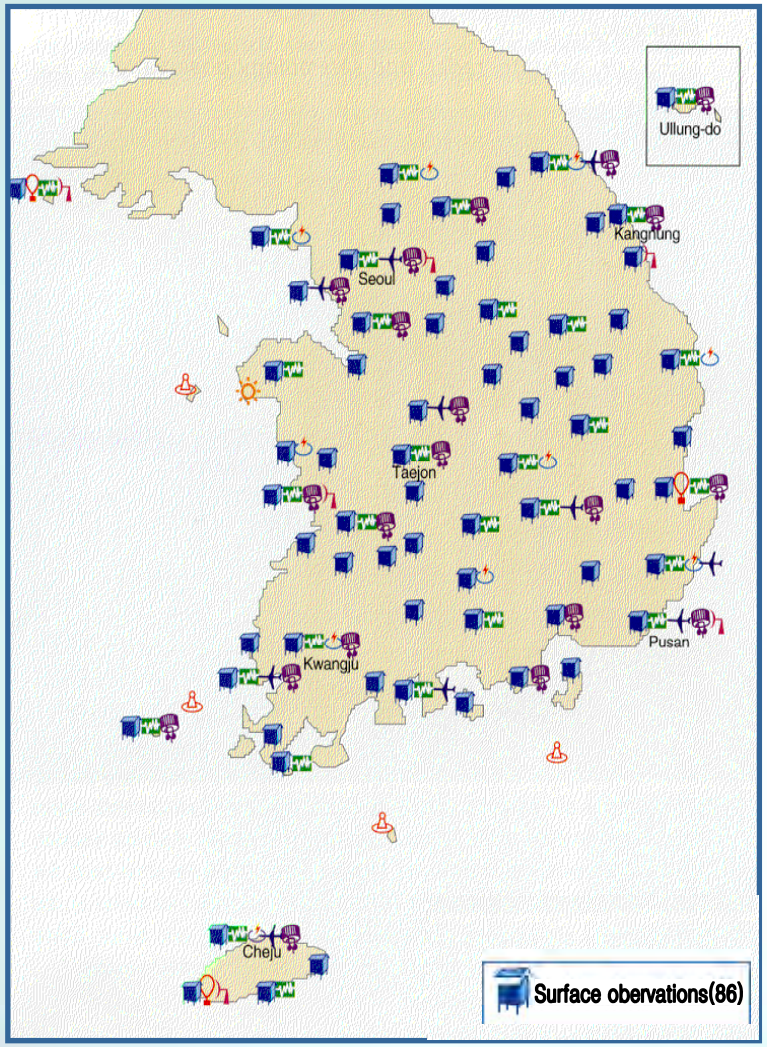
- RBSN : 41
- RBCN : 11
- GSN : 3
- Manned stations : 86(78+8)

* 8 are joint stations with several local governments

- AWS : 483

KMA KOREA METEOROLOGICAL ADMINISTRATION

Surface Observation



◆ Conventional Station

No. / Obs.	No. of station	No. of daily observation
Surface	78	18-24

◆ Observation time and frequency

- Basically 18 times per day

  * No observation : 01, 02, 19, 20, 22, 23(local)
    → 16, 17, 10, 11, 13, 14(UTC)

- On special events : 24 times per day

  * Heavy rain/snow, typhoon, severe storm…

- Report to GTS : 8 times per day

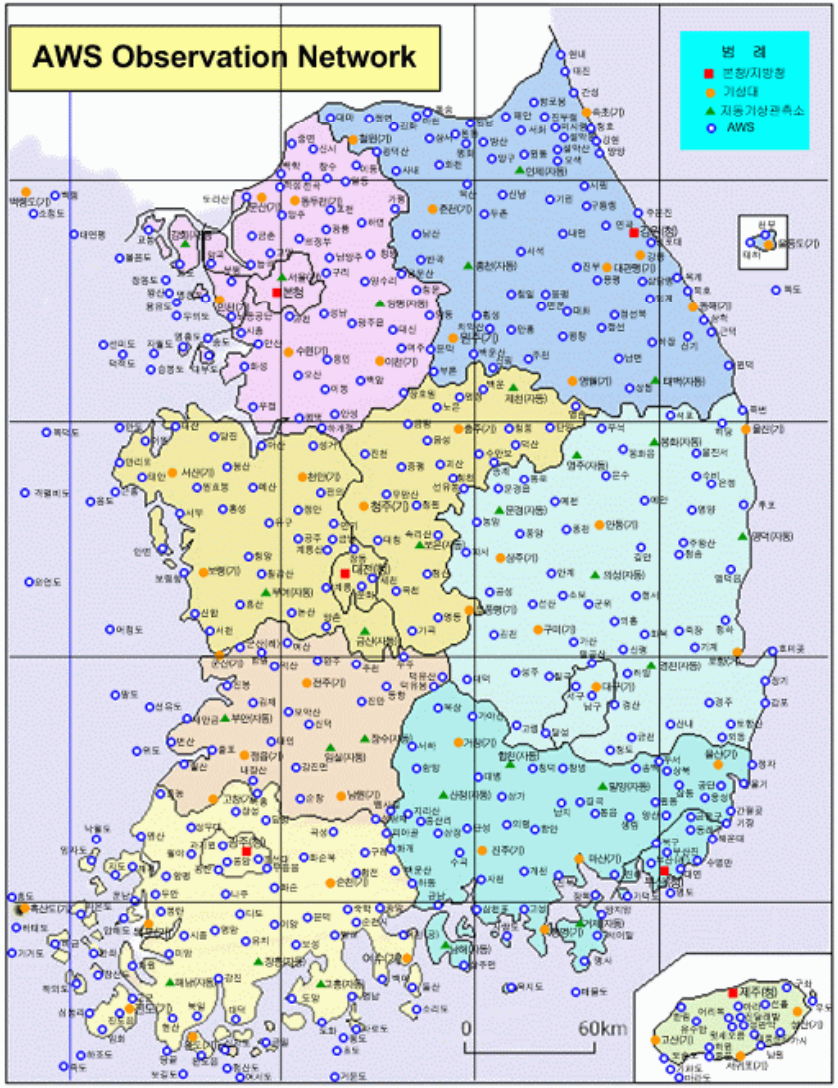
  * 00, 03, …, 18, 21(UTC)

KMA KOREA METEOROLOGICAL ADMINISTRATION

Automatic Weather Station (AWS)

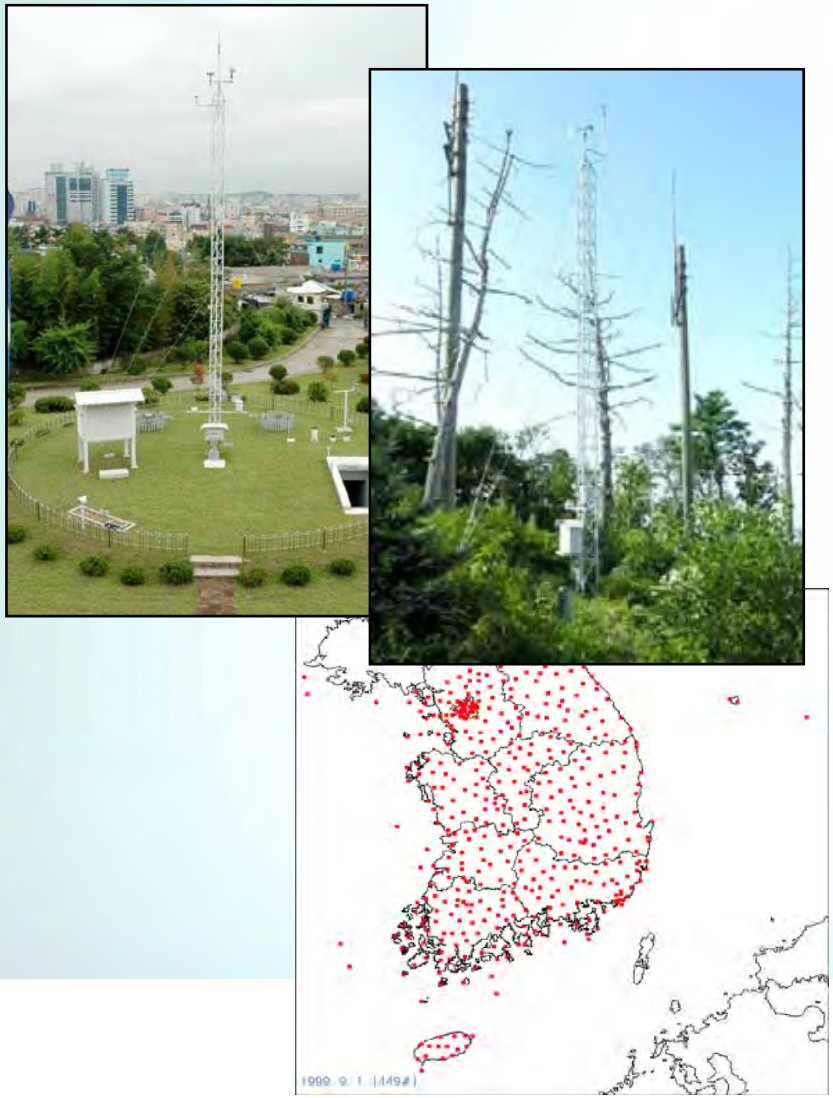
Outlines

- ASOS / AWS
- Monitoring local severe weather
- 569 sites in Korea
- Horizontal resolution : 13km
- Data acquisition interval : 1 min.



KMA KOREA METEOROLOGICAL ADMINISTRATION

Automatic Weather Station (AWS)



- **Automatic weather stations: 569**
  - ASOS (86), AWS (483)

- **To monitor severe meso-scale weather phenomena, like severe storms and heavy rains.**

- **Since 1990, a total of 483 AWSs have been established over the country.**
  - Horizontal resolution: 13km

- **Two types of AWS**
  - AWS (483) : 6 basic meteorological elements
  - ASOS (86) : 12 elements (installed at manned stations)

- **Real-time data collection and analysis**
  - Distribution to all weather stations of KMA and disaster prevention authorities in Korea

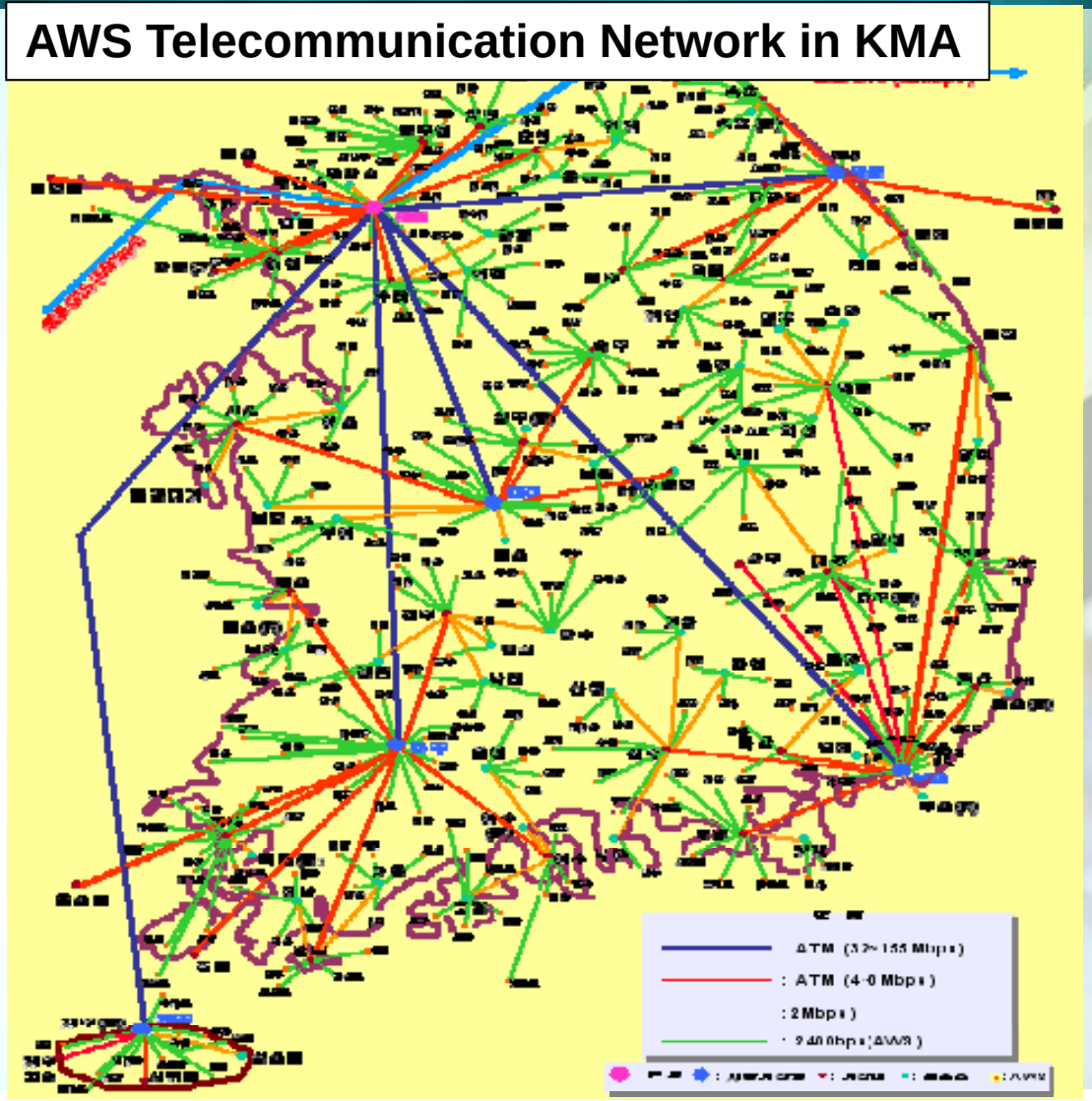
KMA KOREA METEOROLOGICAL ADMINISTRATION

Comparison ASOS with AWS

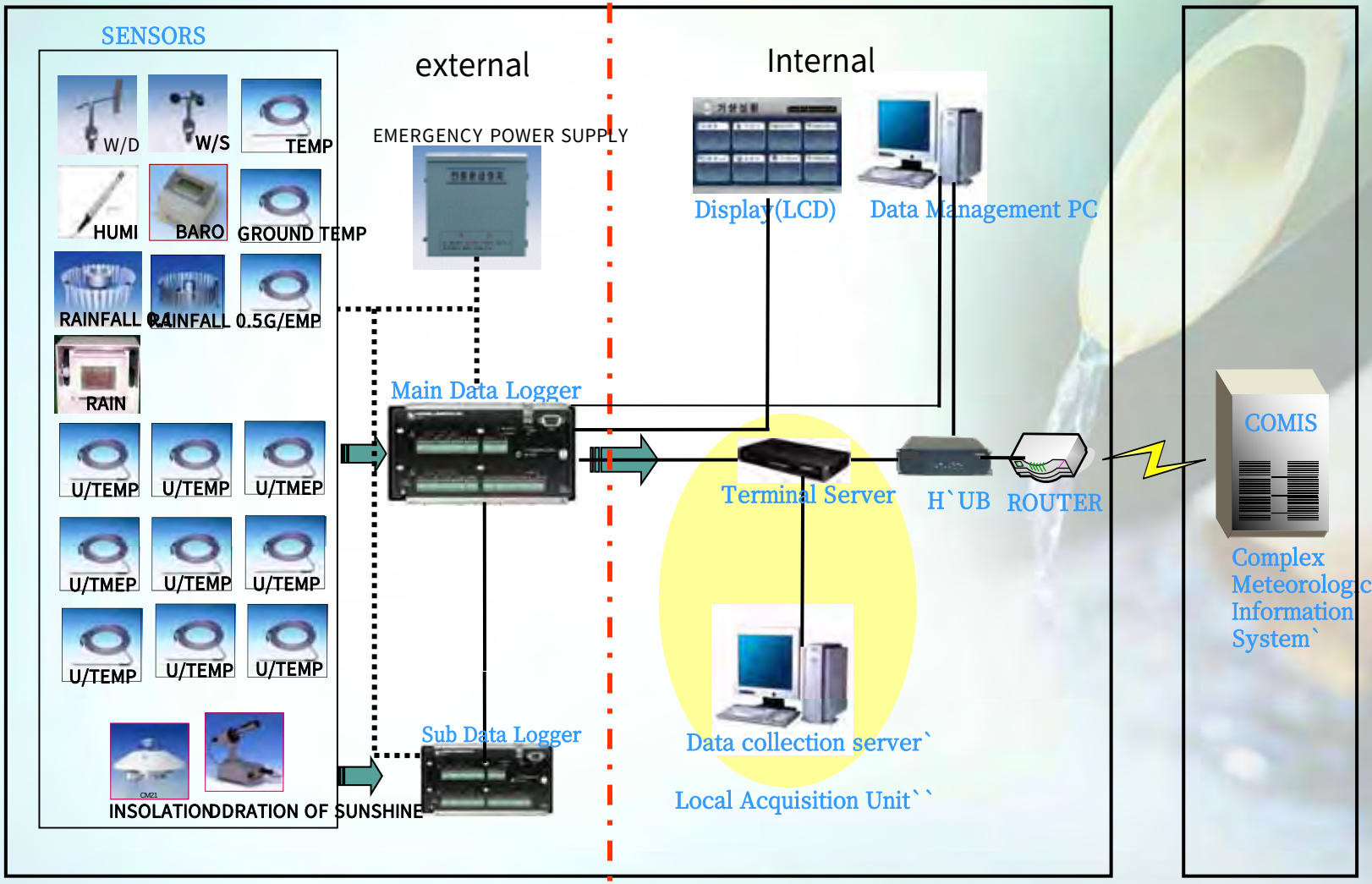
Section	Meteorological elements	Installed place	Remarks
ASOS	① Air Temperature ② Wind Direction ③ Wind Speed ④ Air Pressure ⑤ Humidity ⑥ Precipitation ⑦ Insolation ⑧ Duration of Sunshine ⑨ Grass Temperature ⑩ Surface Temperature ⑪ Underground Temperature ⑫ Wetness(Rain Detection)	Manned Station (Meteorological offices)	86 sites
AWS	① Air Temperature ② Wind Direction ③ Wind Speed ④ Air Pressure ⑤ Precipitation ⑥ Wetness(Rain Detection)	Unmanned Station (land/islands/mountains)	483 sites

AWS Telecommunication Network

AWS Telecommunication Network in KMA



ASOS Data collection Network



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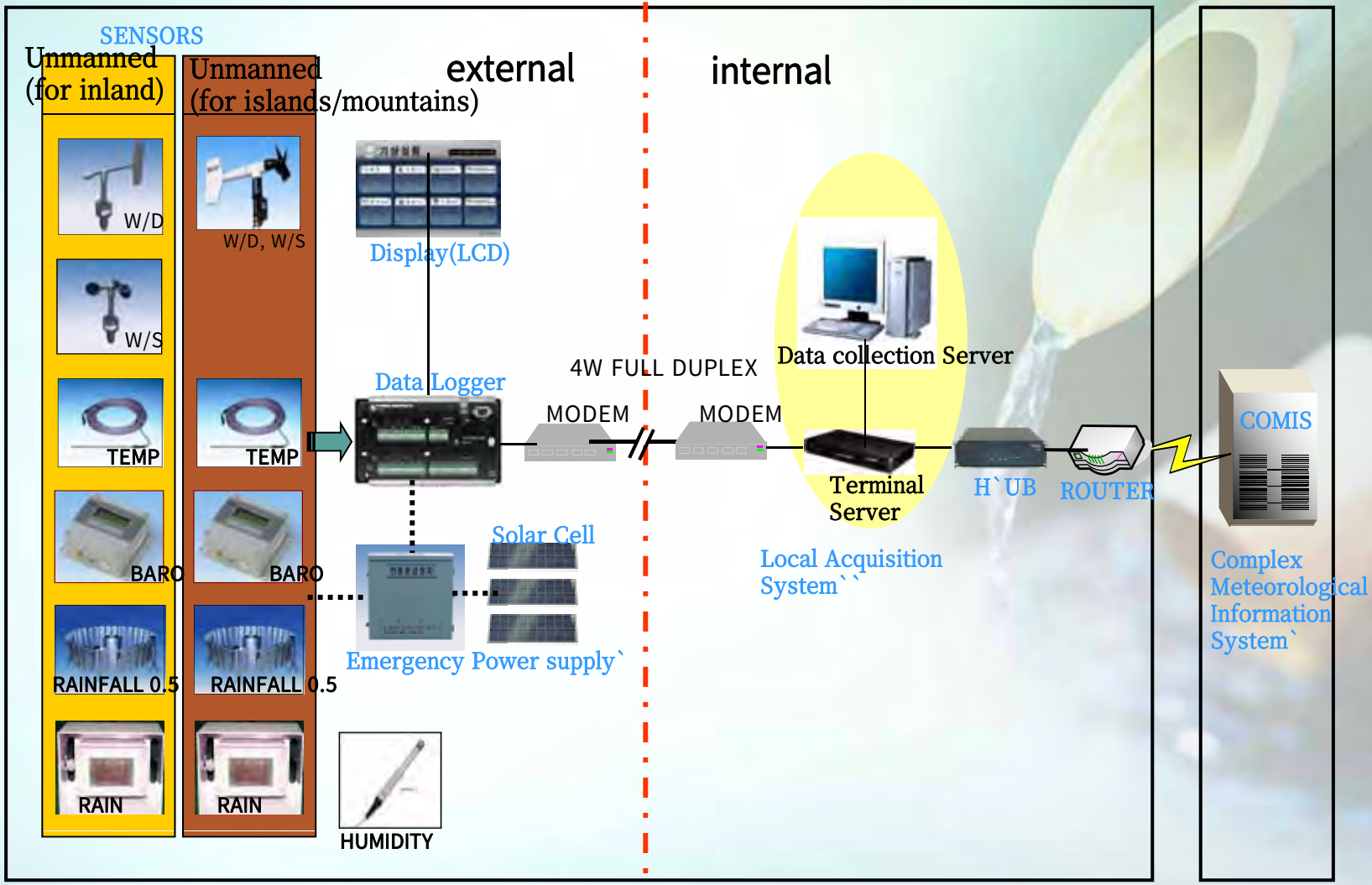
AWS Data collection Network



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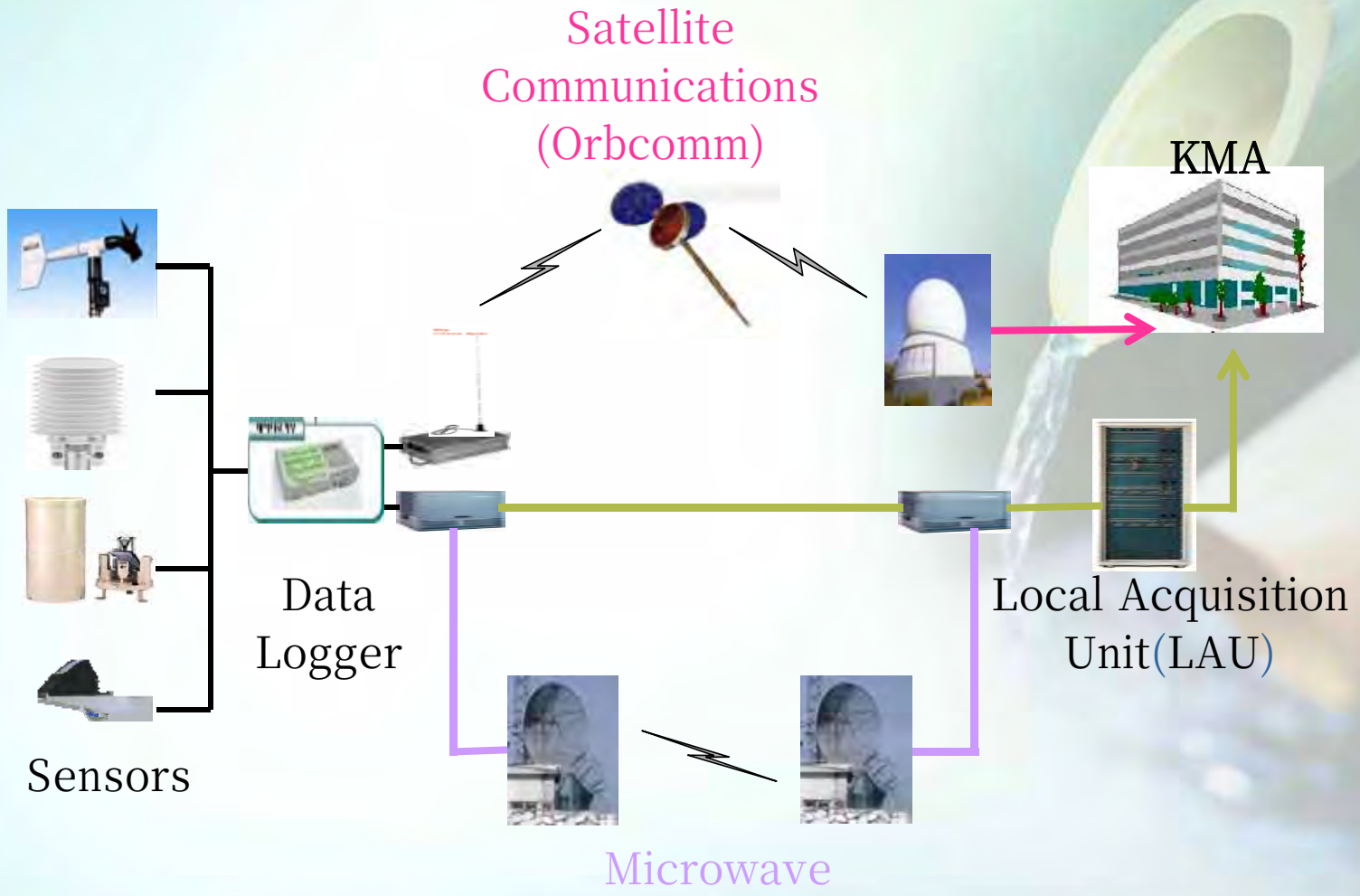
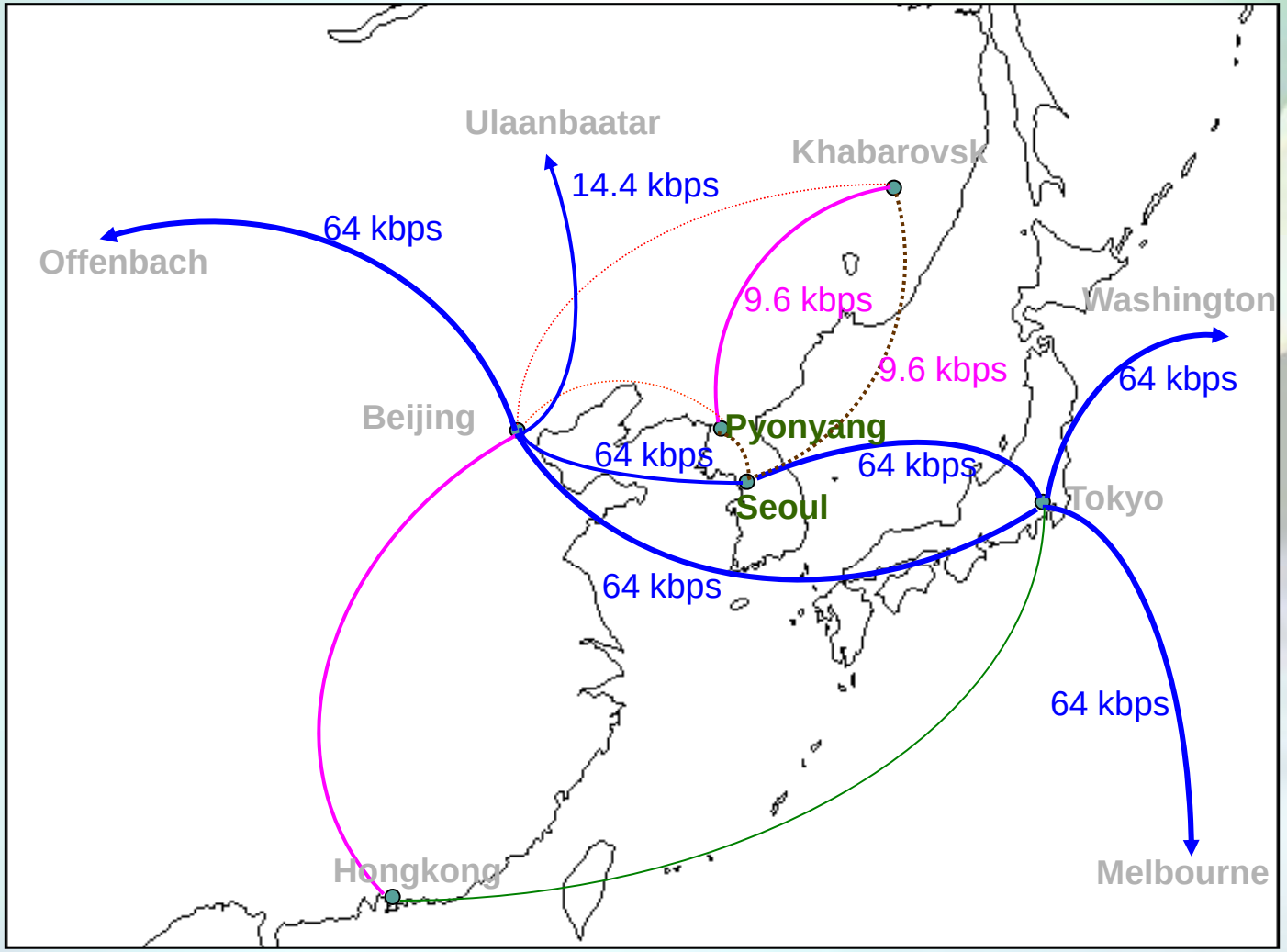
AWS Data collection Network



GTS in the region



64000bps

9600bps

200baud

75baud

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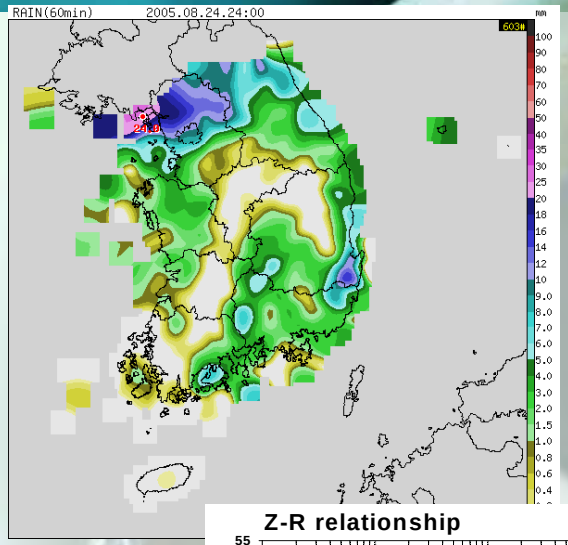
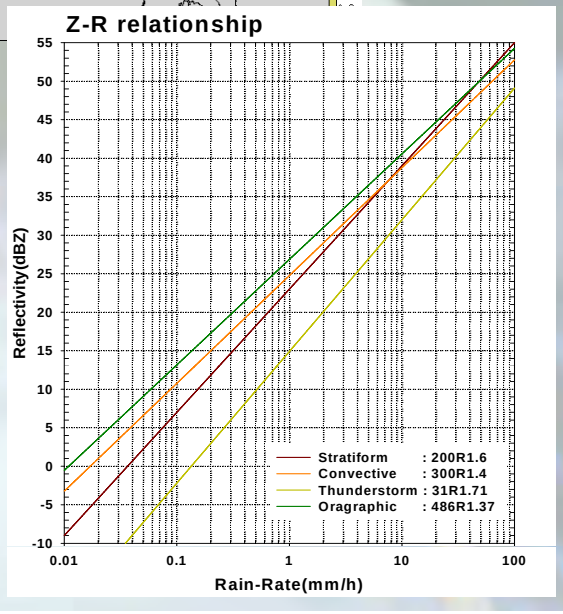
Application for AWS

- Real time monitoring of severe weather for the weather forecaster
- The calibration for the Radar precipitation Improve Z-R relationship
- Ground validation of Satellite data GMP-GV
- To enhance the understanding of severe precipitation systems.





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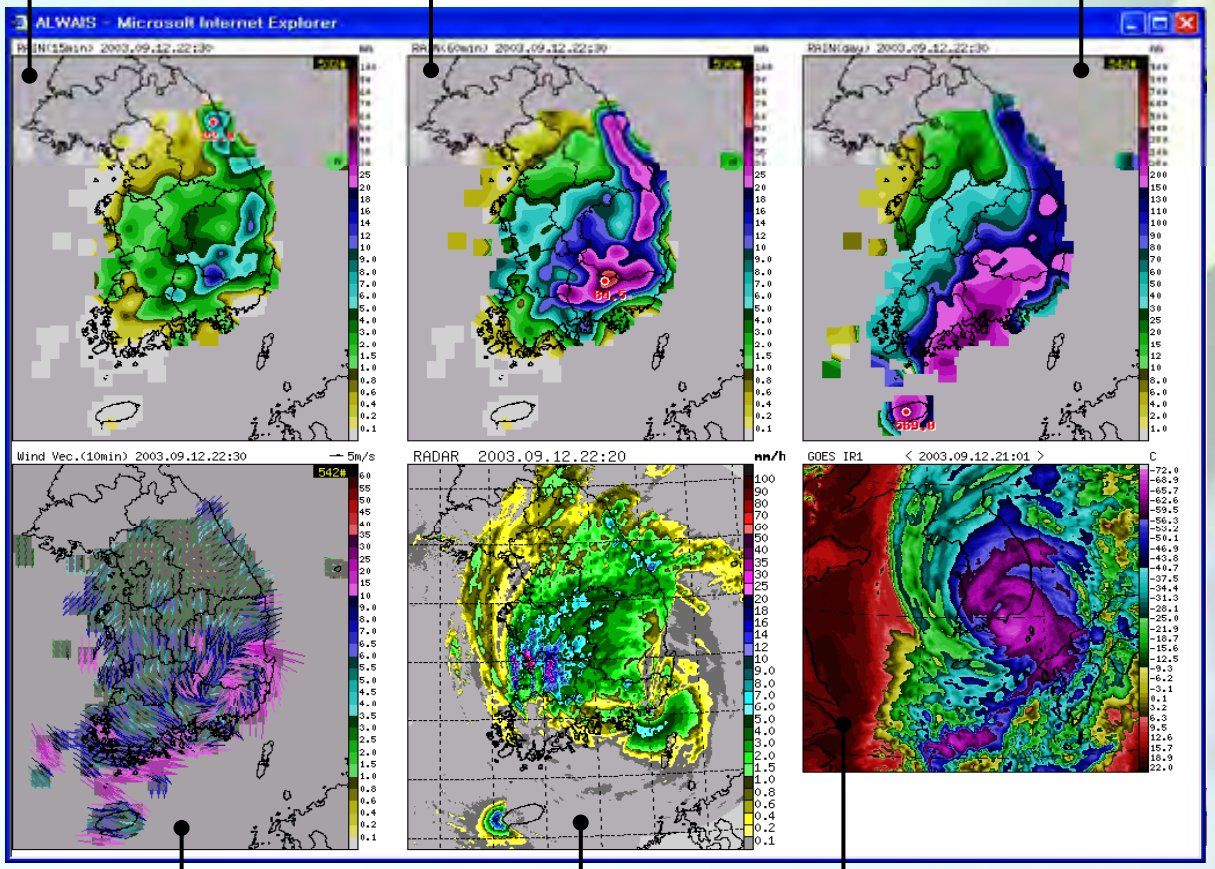
AWS Automatic Local Weather Monitoring

AWS accumulated precipitation for 15 min.

AWS accumulated precipitation for 60 min.

AWS daily precipitation



Wind vector from AWS

Radar

Satellite

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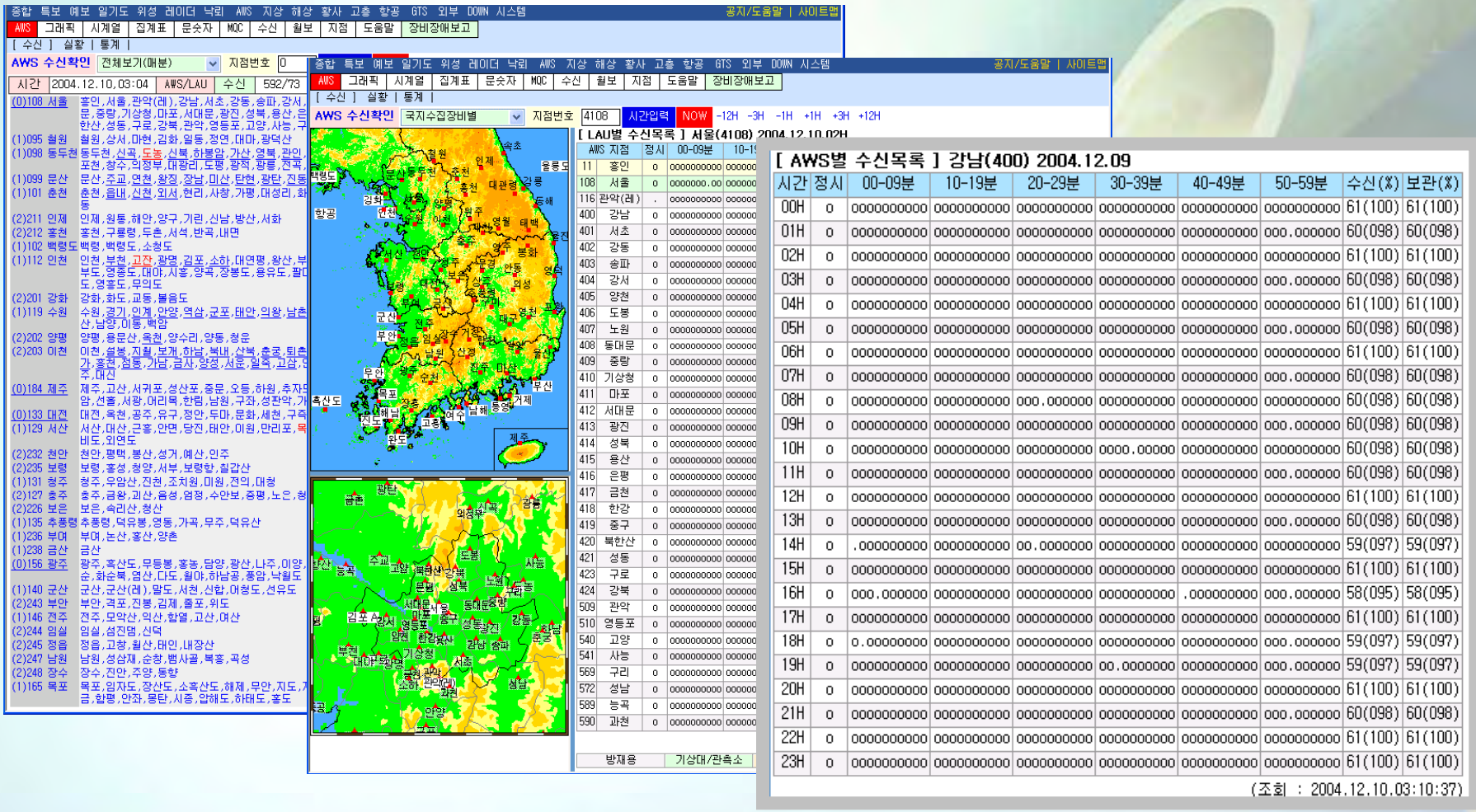
AWS Receiving monitoring



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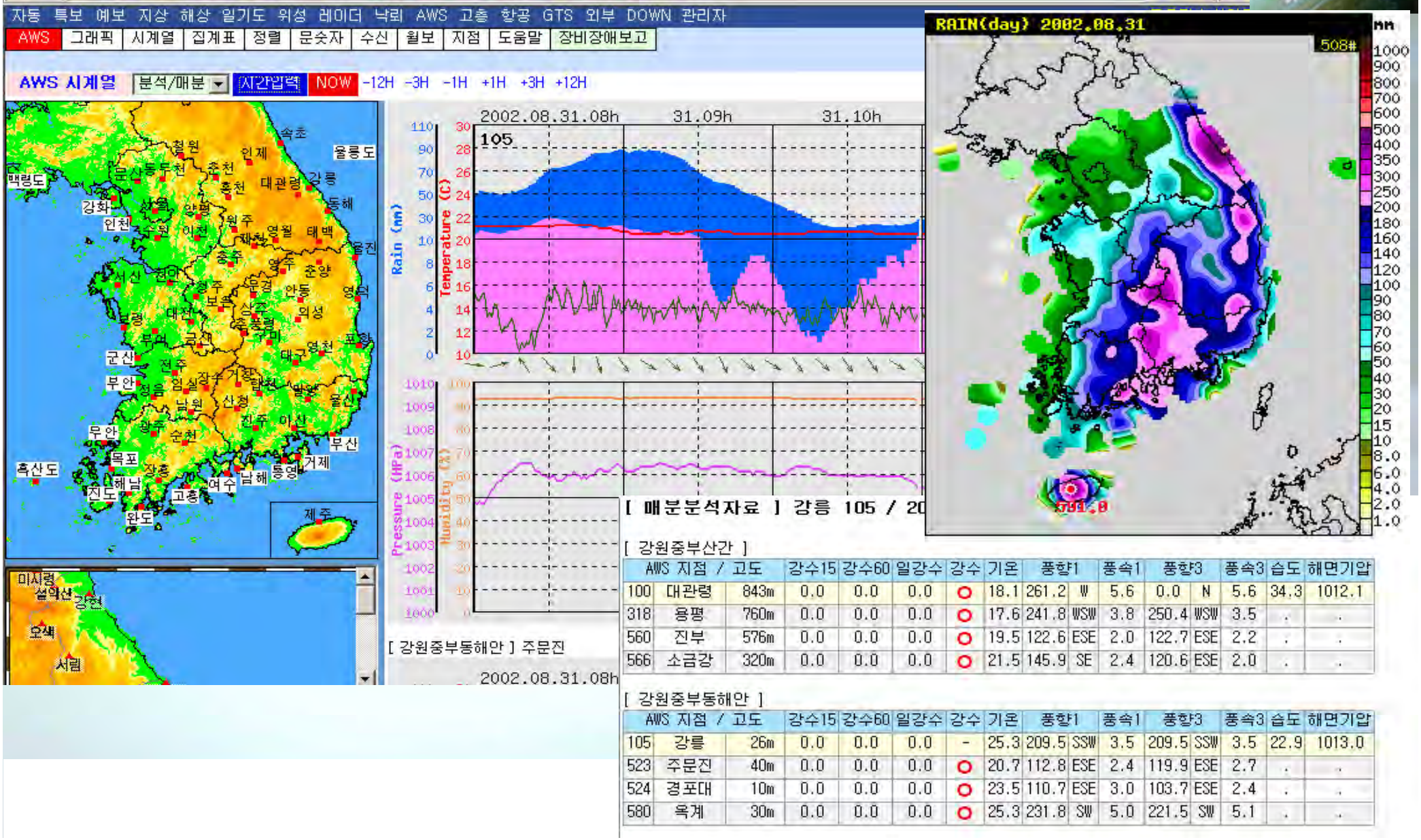
AWS Output



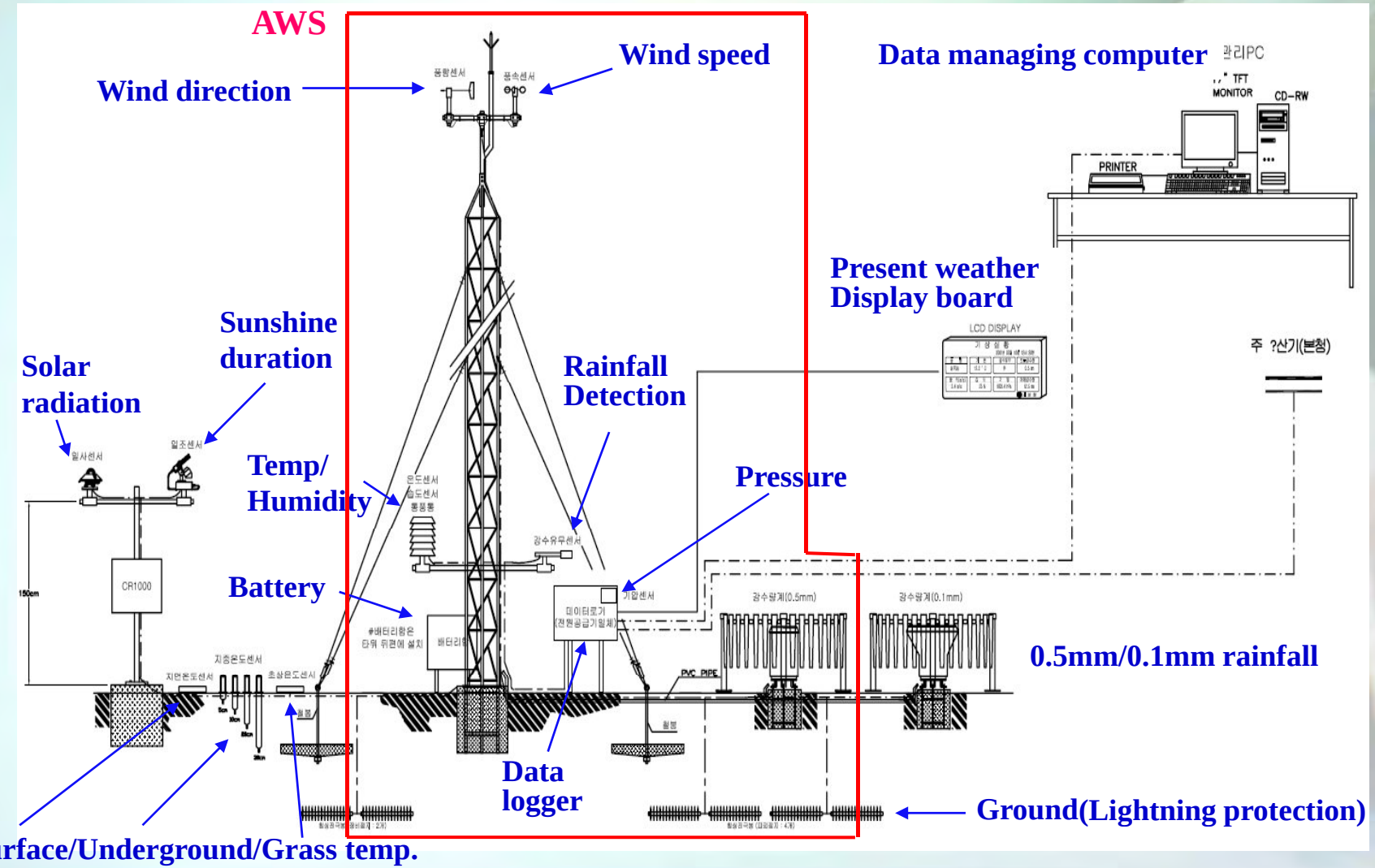
[강원중부산간]

AWS	지점	고도	강수15	강수60	일강수	강수	기온	풍향1		풍속1	풍향3		풍속3	습도	해면기압
100	대관령	843m	0.0	0.0	0.0	O	18.1	261.2	W	5.6	0.0	N	5.6	34.3	1012.1
318	용평	760m	0.0	0.0	0.0	O	17.6	241.8	WSW	3.8	250.4	WSW	3.5	.	.
560	진부	576m	0.0	0.0	0.0	O	19.5	122.6	ESE	2.0	122.7	ESE	2.2	.	.
566	소금강	320m	0.0	0.0	0.0	O	21.5	145.9	SE	2.4	120.6	ESE	2.0	.	.

[강원중부동해안]

AWS	지점	고도	강수15	강수60	일강수	강수	기온	풍향1		풍속1	풍향3		풍속3	습도	해면기압
105	강릉	26m	0.0	0.0	0.0	-	25.3	209.5	SSW	3.5	209.5	SSW	3.5	22.9	1013.0
523	주문진	40m	0.0	0.0	0.0	O	20.7	112.8	ESE	2.4	119.9	ESE	2.7	.	.
524	경포대	10m	0.0	0.0	0.0	O	23.5	110.7	ESE	3.0	103.7	ESE	2.4	.	.
580	옥계	30m	0.0	0.0	0.0	O	25.3	231.8	SW	5.0	221.5	SW	5.1	.	.

ASOS installation diagram



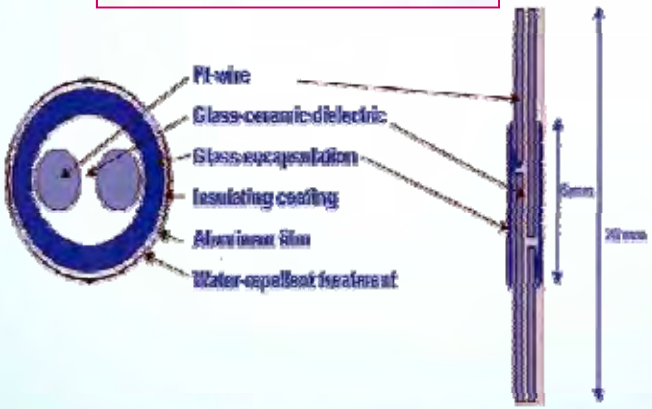
KMA KOREA METEOROLOGICAL ADMINISTRATION

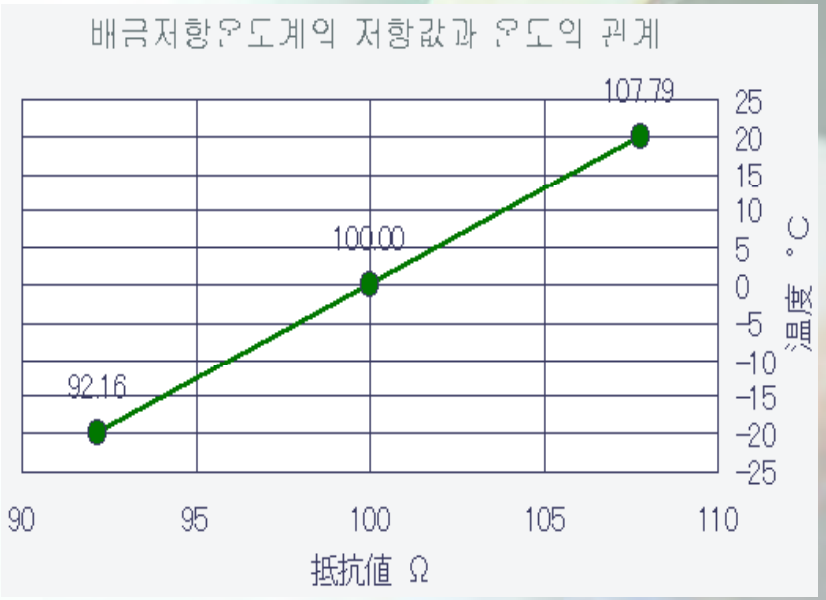
Measurements at KMA automatic weather observational stations

Variable	Automatic Synoptic Observing System (ASOS)	Automatic Weather System (AWS)	Agriculture Automated Observation Systems (AAOS)
Air Temperature	O	O	O (1.5 and 4.0 m)
Cloud Height	Manually Observed		
Cloud Amount	Manually Observed		
Dew Point	Derived from air temperature and relative humidity		Derived at 0.5, 1.5, and 4.0 m
Grass Temperature	O		O
Illumination			O
Pan Evaporation	Manually Observed		
Present Weather	Manually Observed		
Pressure	O	O	
Rainfall	O	O	O
Relative Humidity	O		O (0.5, 1.5 and 4.0 m)
Surface Temperature	O		O
Soil Moisture			O (0.1, 0.2, 0.3, and 0.5 m)
Soil Temperature	O (0.0, 0.05, 0.1, 0.2, 0.3, 0.5, 1.0, 1.5, 3.0, 5.0 m)		O (0.0, 0.05, 0.1, 0.2, 0.3, 0.5, and 1.0 m)
Snow Depth	At 40 sites		
Solar Duration	O		
Solar Radiation	At 22 sites		Global and reflected radiation
Visibility	Manually Observed		
Wetness (Rain Detection)	O	O	
Wind Direction	O	O	O (1.5 and 4.0 m)
Wind Speed and Gust	O	O	O (1.5 and 4.0 m)

AWS Sensors

- Platinum resistance thermometer
  - Depending on the temperature changes in electrical resistance of metals



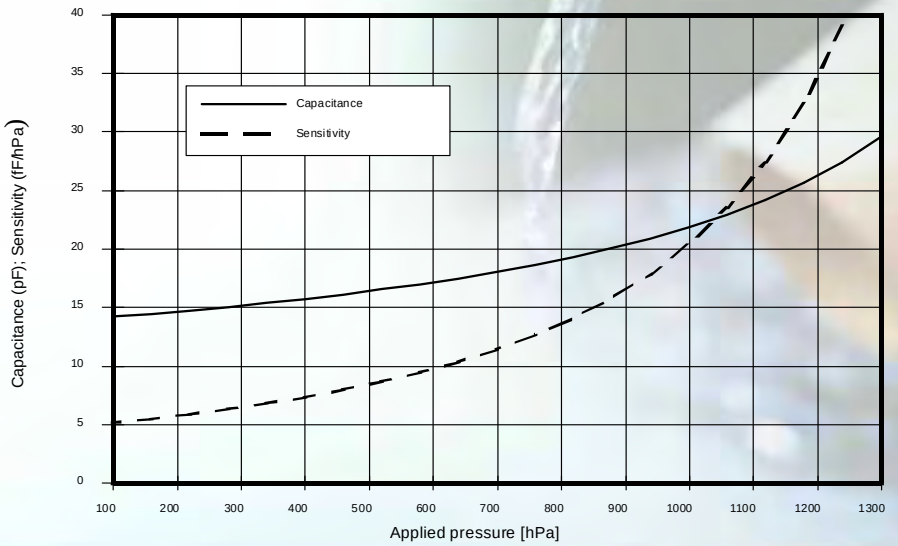


- The international standard platinum resistance characteristics of the sensor resistance : R100/R0 = 1.380

AWS Sensors

❑ Digital Pressure Sensor

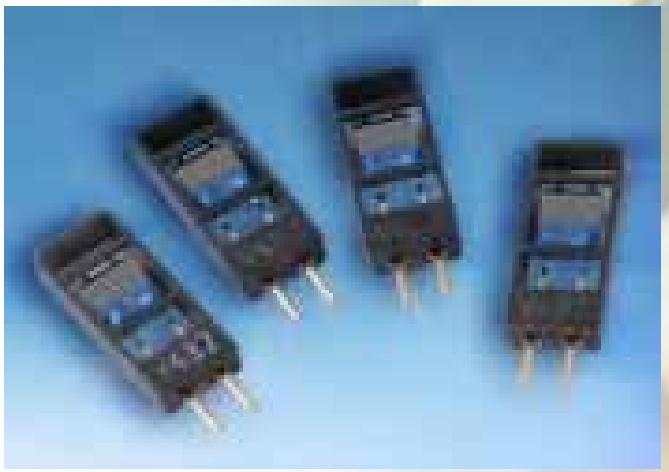
- The measurement principle of the digital barometers is based on an advanced RC oscillator and three reference capacitors against which the capacitive pressure sensor and the capacitive temperature compensation sensor are continuously measured.



AWS Sensors

❑ Digital Humidity Sensor

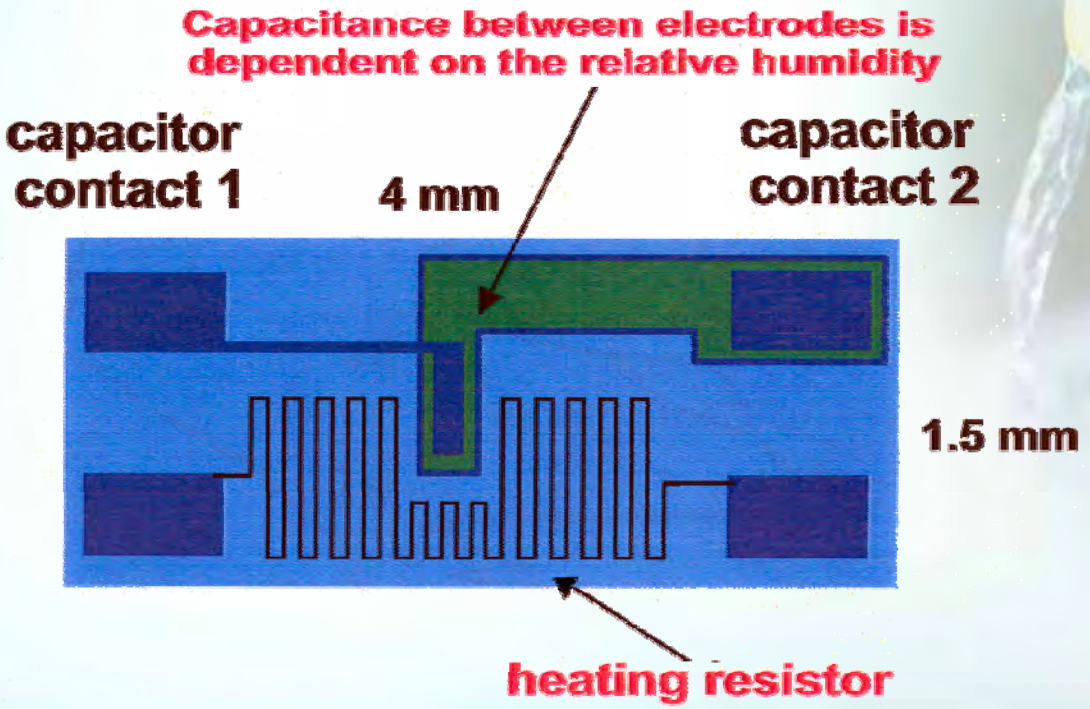
- Electrical resistive and capacitive hygrometer



AWS Sensors

❑ Digital Humidity Sensor

- ❖ Sensor is located at the end of the device, protected by a filter
- ❖ 0-100% relative humidity for the output voltage of 0 to 1V



AWS Sensors

❑ Wind direction Sensor

❖ The internal structure of a variable resistor with a similar structure, but it is possible to rotate 360 degrees, the wind direction is proportional to the voltage (0-10 V) raised

Voltage[DCV]	W/D[^{0}]
0.0	0
2.5	90
7.5	180
10.0	360

AWS Sensors

❑ Wind speed Sensor

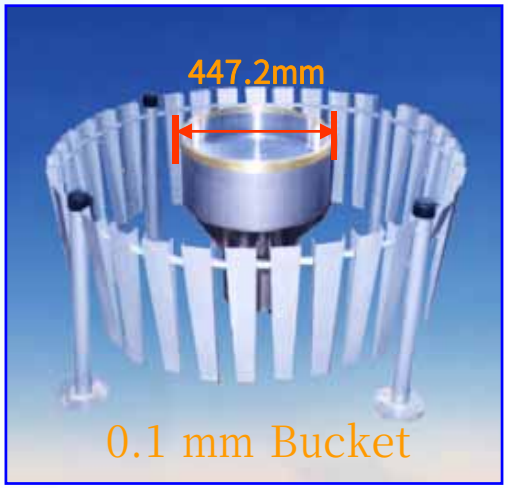
- ❖ Type of the photo chopper.
- ❖ The wind speed is proportional to the frequency raised

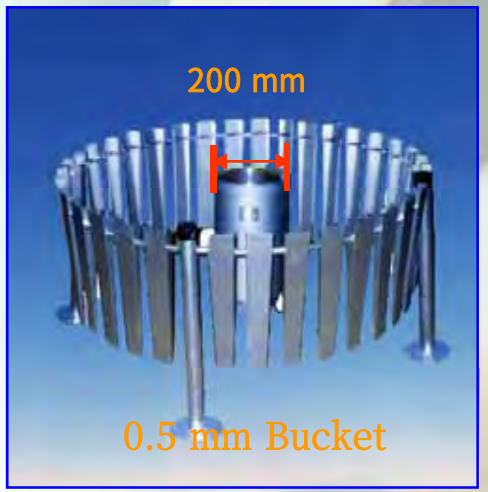
Freq.(Hz)	W/S(m/s)
80	5.0
160	10.0
333	20.0
507	30.0
680	40.0
853	50.0
1027	60.0
1200	70.0

AWS Sensors

❑ Rainfall Gauge

❖ Bucket-type of 0.1mm/0.5mm Unit





❖ The area of 0.1mm/0.5mm Unit

- $(223.6mm)^2$ x 3.14 ≈ 5 x $[(100mm)^2$ x 3.14]

AWS Sensors

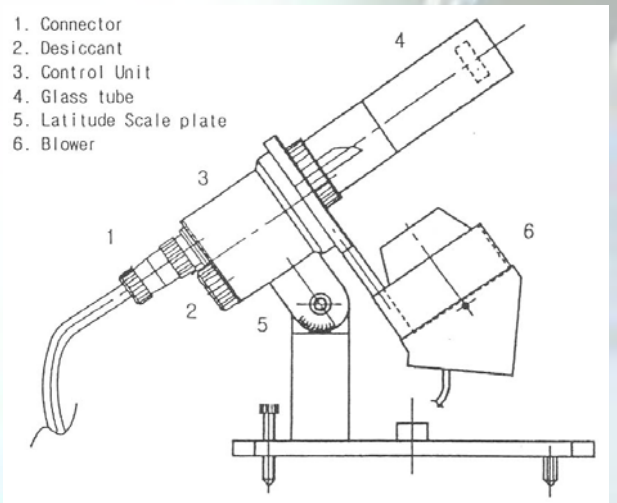
❑ Insolation

❖ Each instrument has a thermopile which has one set of black-coated junctions exposed to solar radiation and the other set buried within the instrument body, which acts as a heatsink. Incoming solar radiation heats the exposed junctions, generating a voltage difference proportional to the irradiance on that surface.

AWS Sensors

❑ Duration of Sunshine

The WMO has defined sunshine duration as the time interval when direct solar radiation exceeds 120W·m^{-2}. The EKO MS-093 Sunshine Duration Meter utilizes a pyroelectric sensor, one type of thermal sensor, that outputs a time differential coefficient processed for reliable measurement of only the direct solar radiation, without being affected by the diffuse radiation, integrated over the period when it exceeds a threshold value of 120W·m^{-2}.



Check List for ASOS Preventive Maintenance

☐ **Station ID : Data-logger Serial No. : Maintenance type: Routine/On demand**

part	element	check points	Result (good○, bad×)	remark
sensor	Wind direction	Checking appearance status & A ball bearing		
	Wind speed	Checking appearance status & A ball bearing		
	Temperature	Checking sensor cleanliness & changing status of temperature data		
	Humidity	Checking sensor cleanliness & changing status of humidity data		
	Shelter	checking cleaning, painting and fixing of shelter		
		Checking fan operating (replace a fan per half-yearly)		
	Pressure	Checking and removing foreign substances on sensor		
		Checking sensor cleanliness & changing status of pressure data		
	Solar radiation /Sunshine duration	Checking cleanliness and condensation on sensor dome and maintaining level		
		Checking status of a moisture absorbent		
		Checking the number of rotations(in sunshine duration sensor(36 second per one time)		
	Precipitation (0.1, 0.5mm)	Checking maintaining level of precipitation sensor		
		Checking sensor cleanliness of precipitation sensor		
		Checking a point of contact in rid switch		
		Test by Measuring cylinder 20 mm	Less than ±1 ㎜	
	Rain detector	Checking working status		
		Checking surface corrosion & cleanliness of a sensor		
Data-logger	Data-logger	Checking working status Of Keypad		
		Checking Data display status		
Acquisition computer	computer	Checking status of data acquisition & working		

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Check List for ASOS Preventive Maintenance

part	element	check points	Result (good○, bad×)	remark
power	Battery	Measuring input voltage(~13 V)	DCV	
		Measuring battery voltage after cut off AC power(12.5~13V)	DCV	
	Power	Measuring input voltage of AC power(~220V)	ACV	
		Checking working status of earth leakage breaker		
	Power supply	Measuring DC voltage(5V, 12V, -12V)	V/ V/ V	
		Checking generation of heat		
		Checking power supply working after cut off AC power		
Additional facilities	Data Monitoring Display	Checking display status of data		
		Checking data change		
	tower, wire, earthing	Checking fixation & corrosion status of additional facilities Measuring earthing resistance(per half-yearly		
		Checking data, power & communication lines		
Lightning protector	Lightning protector	Checking status of serge protector for power line		
		Checking status of serge protector for data line		
The others				

Certifying the checking results.

Date:

Inspector info: company name position name (sign)

Confirmer: agency name position name (sign)

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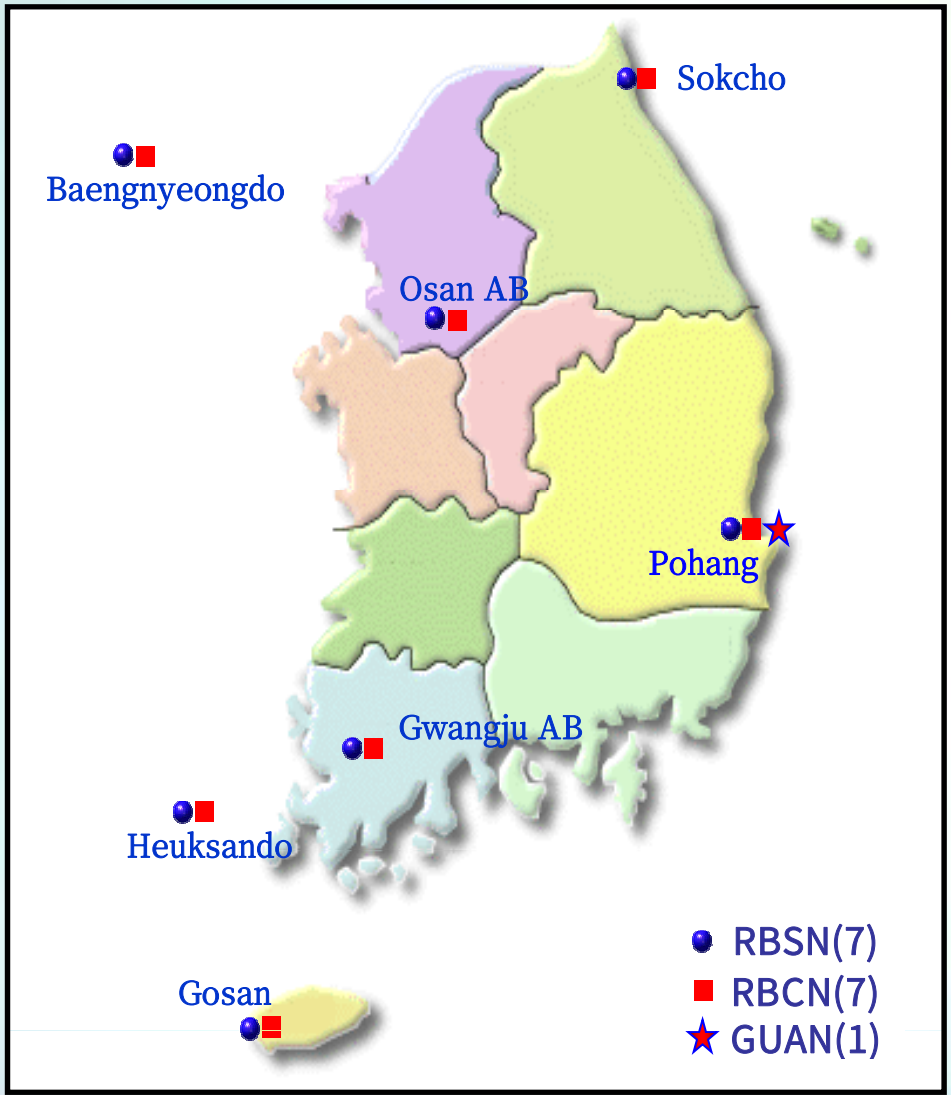
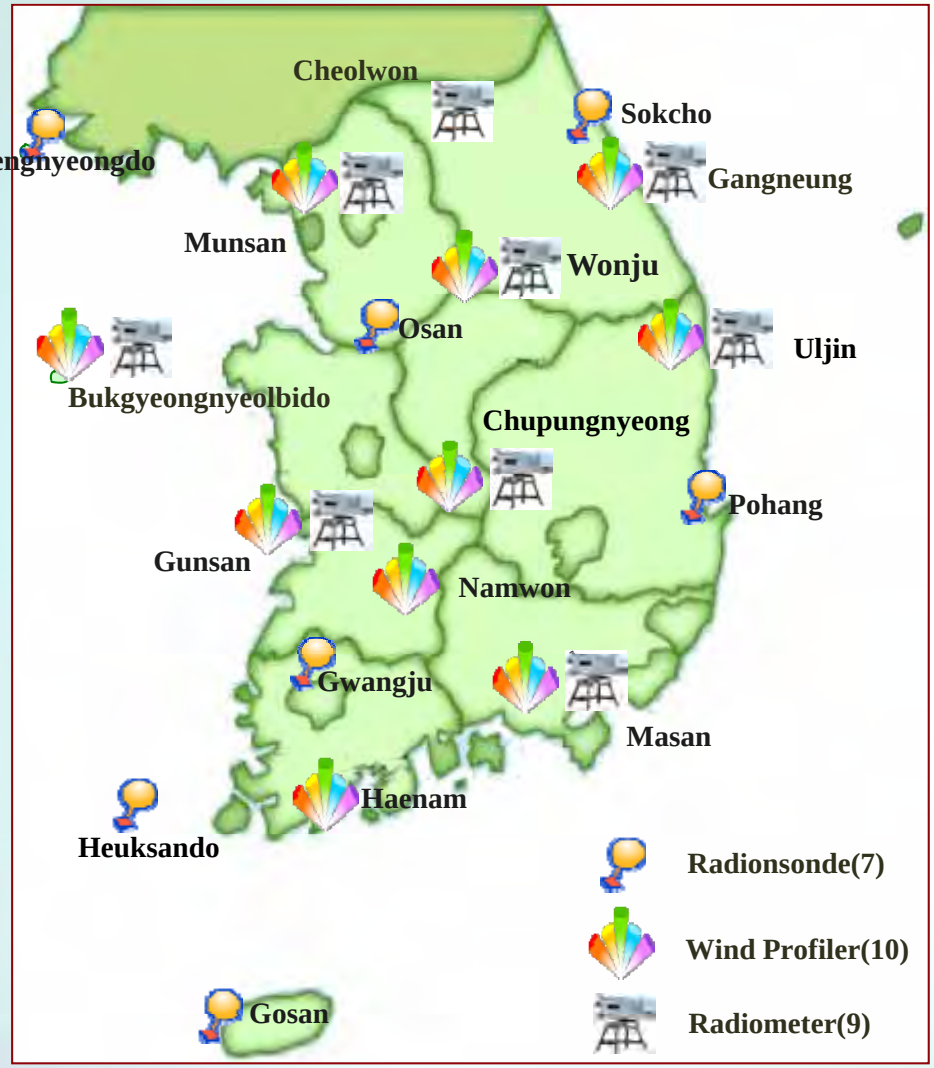
Upper-air Observation



◆ Number of Station

- RBSN : 7
- RBCN : 7
- GSN : 1
- Manned stations : 7

Upper-air Observation



- Radiosonde : 7 sites
- Wind profiler : 10 sites
- Radiometer : 9 sites

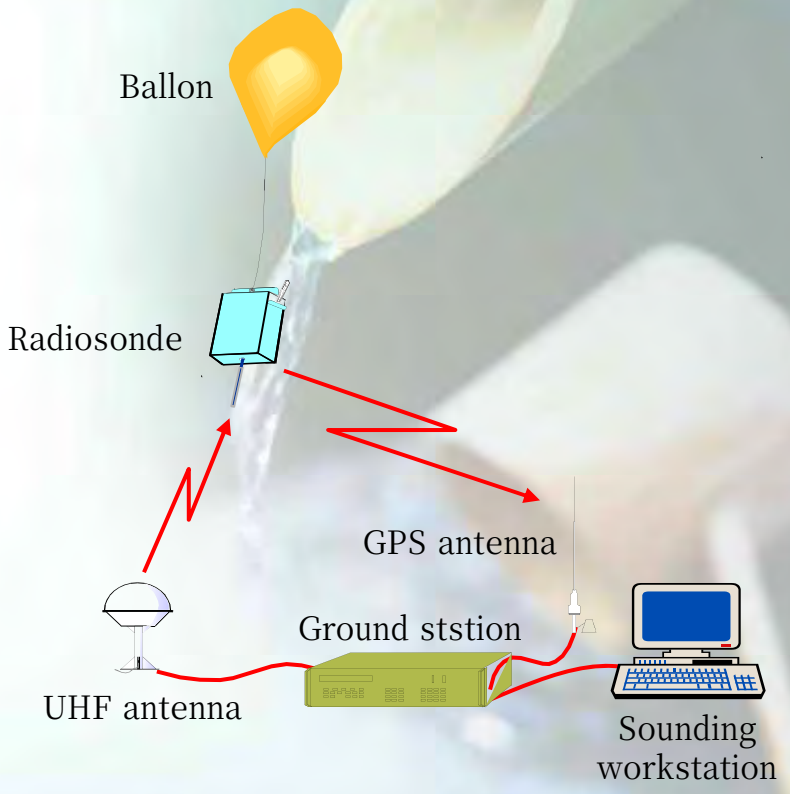
- Resolution : 91km
- Interval : 12h(radiosonde)
  10min(Windprofiler)
  10min(Radiometer)

KMA KOREA METEOROLOGICAL ADMINISTRATION

Upper-air Observation

Radiosonde Observation

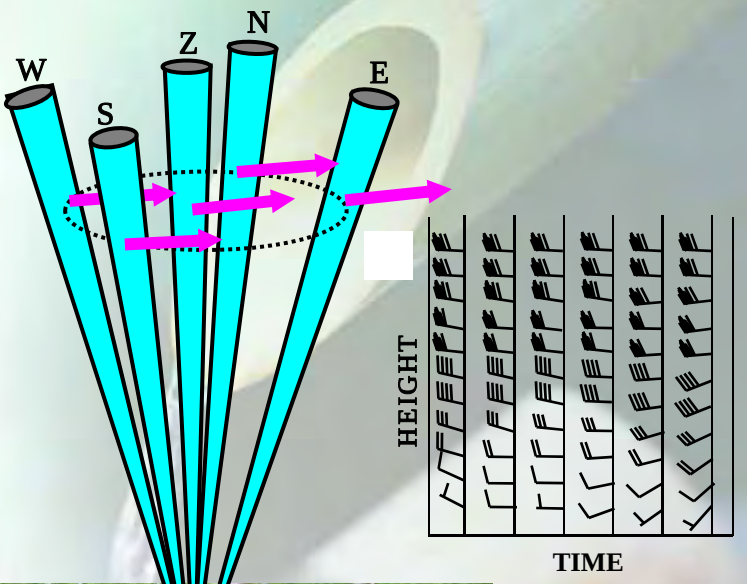
- ❑ 7 Upper-air observation stations
- ❑ Observation times
  - Twice a day (00, 12 UTC) for regular
  - Four times a day (00, 06, 12, 18 UTC) for special during rainy season
- ❑ Observation height
  - ground to 30km(10hPa) or more
- ❑ Observation elements
  - pressure, temperature, humidity, wind speed, wind direction



Upper-air Observation

Wind profiler Observation

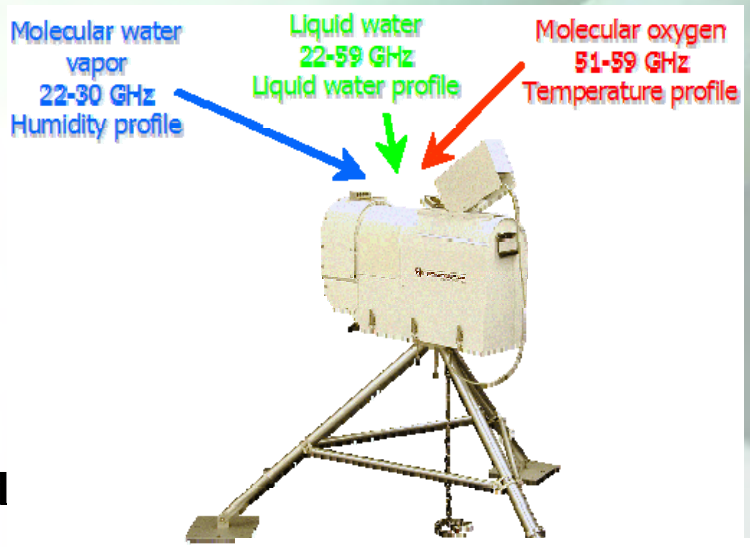
- ❑ Complements of the radiosondes
- ❑ 10 observation stations
- ❑ Specifications
  - Frequency : 1290MHz
  - Height resolution : 50 ~ 200 m
  - Antenna : Dipole Array
  - Range : 100 m ~ 5 km
- ❑ Products
  - Horizontal and vertical wind velocity
  - Intensity of turbulence and precipitation
  - Height of atmospheric boundary level

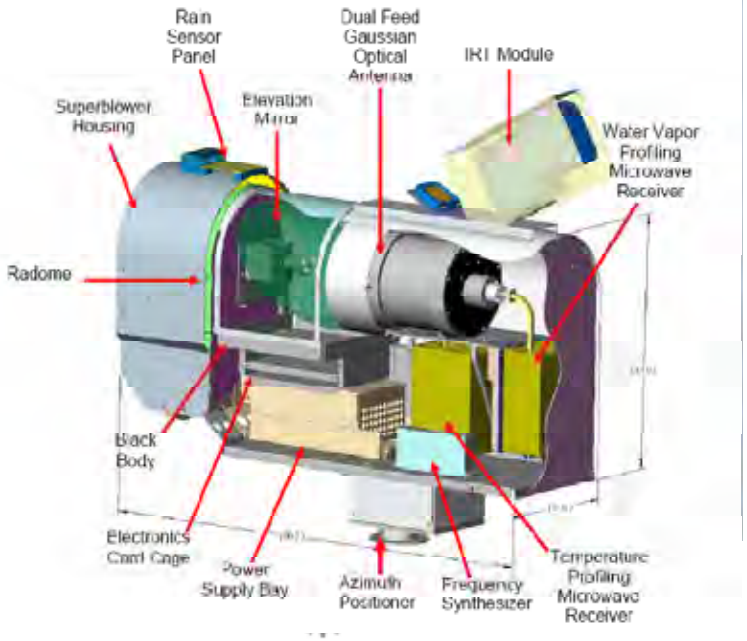


Upper-air Observation

Radiometer Observation

- 9 observation stations
- Specifications
  - Radiometer measures successively the UHF emitted in the air. The measured data are converted to the temperature, humidity, and liquid water amount.
  - Height resolution : 200 m(< 5 km), 400 m
  - Range : 0 m ~ 10 km
- Products
  - Temperature and humidity profile
  - Liquid water profile





Upper-air Observation

❑ Application of Radionsonde data

TTAA

1	76001 47185 99006 09860 32010 00116 07458 30009 92751 01235 29507 85426 03560 32524 70931 11367 29042 50544 26960 27665 40702 38159 27078 30893 52368 26092 25012 50579 27091 20158 50379 25585 15945 52983 27092 10605 56578 26055 88236 54965 26090 77276 26598 41314 31313 46008 82310=
2	76001 47185 99006 09860 32010 00116 07458 30009 92751 01235 29507 85426 03560 32524 70931 11367 29042 50544 26960 27665 40702 38159 27078 30893 52366 26092 25012 50579 27091 20158 50379 25585 15945 52983 27092 10605 56578 26055 88236 54965 26090 77276 26598 41314 31313 46008 82320=

TTBB

1	76008 47185 00006 09860 11005 08260 22899 00915 33867 02161 44811 05962 55756 10306 66727 12358 77121 11567 88702 11866 99562 13767 11494 27760 22461 31150 33368 42564 44321 50163 55286 54965 66262 49177 77244 51178 88215 47780 99101 56979 11100 56578 21212 00006 32010 11935 23510 02960 27510 33942 29010 44920 29006 55863 34026 66831 31025 77615 26593 66111 25649 77105 26587 88100 29955 31313 46008 82310=
2	76008 47185 00006 09860 11005 08260 22899 00915 33867 02161 22461 31150 33368 42564 44321 50163 55286 54965 66262 49177 27510 33942 29010 44920 29006 55863 34026 66831 31025 77615 26593 66111 25649 77105 26587 88100 29955 31313 46008 82310=

TTCC

1	76001 47185 70829 56579 25047 50043 57538 25517 30967 60777 49003 82310=

TTDD

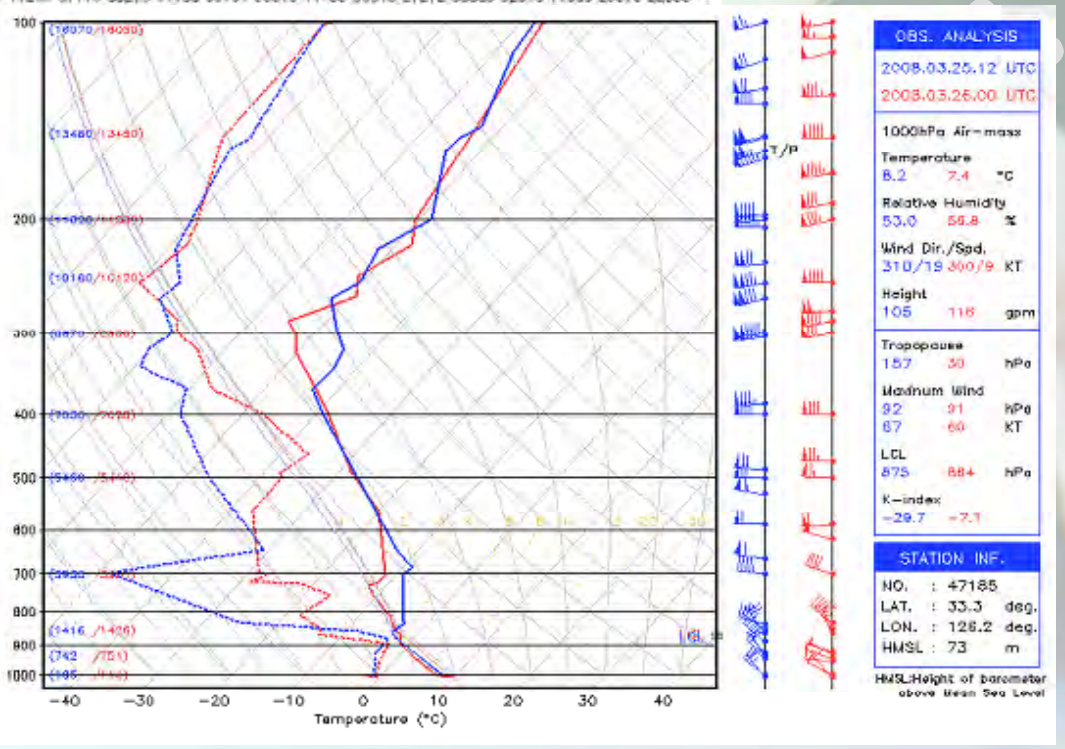
1	76001 47185 11948 59979 22812 57179 33759 60577 44594 55978 59133 60979 44124 51780 55114 43794 56109 45183 77068 45183 24031 66757 22546 77731 23555 88708 23551 99683 24546 11692 23024 99886 27014 11382 29510 22533 00000 33292 76010 44283 17511 33180 13510 44154 00000 55148 31510 66144 18511 77138 06503 66060 14510 77088 16016 88064 22522 99091 22526 11077

PPBB

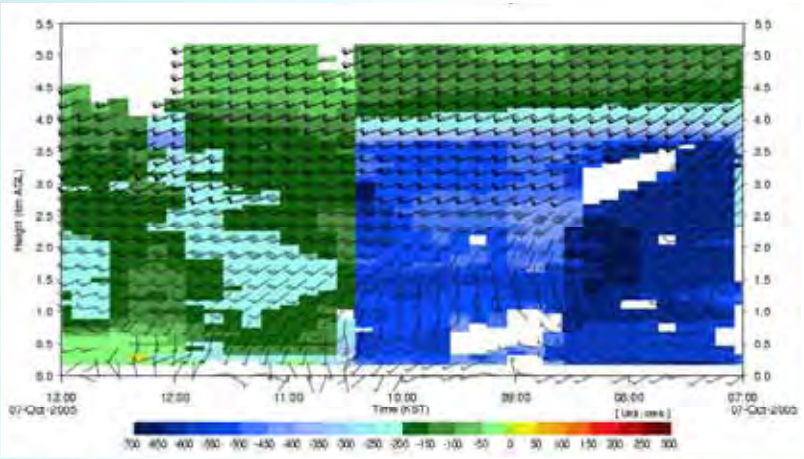
1	76008 47185 90/12 32010 29010 29010 90346 31008 34015 30623 9205/ 27078 26581 9305/ 26084 26584 9405/ 26082 27088 950//
2	76008 47185 90/12 32010 29010 29010 90346 31008 34015 30623 9205/ 27078 26581 9305/ 26084 26584 9405/ 26082 27088 950//

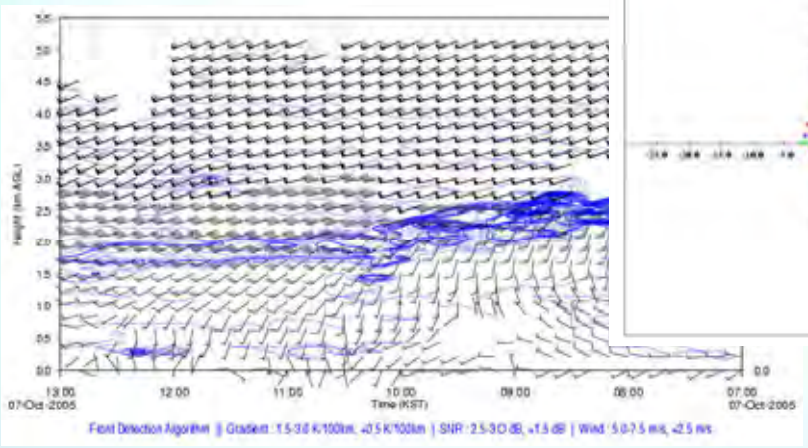
PPDD

1	76008 47185 960// 23555 970// 21525 980// 20510 113// 27012

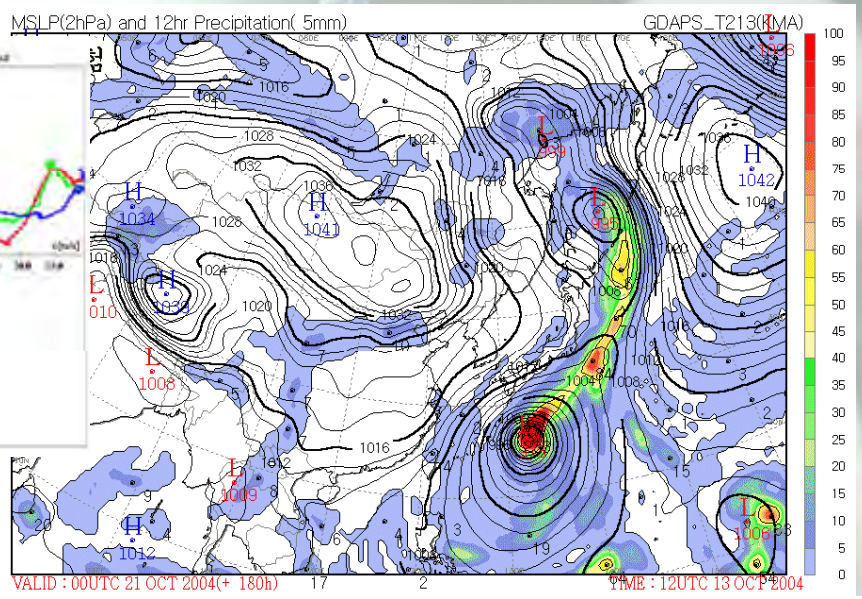


Application for Wind Profiler



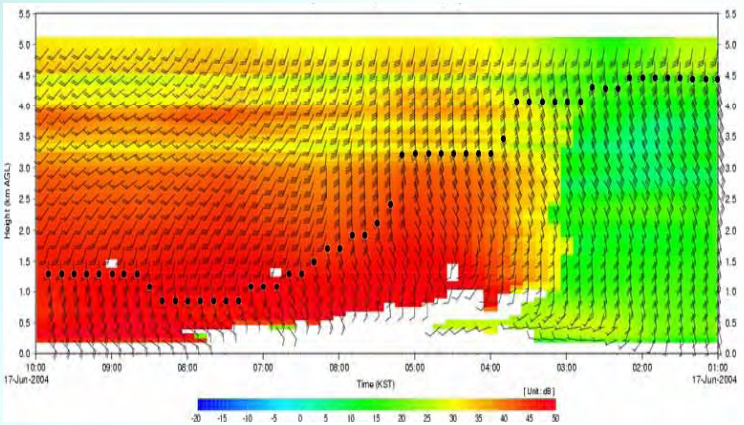


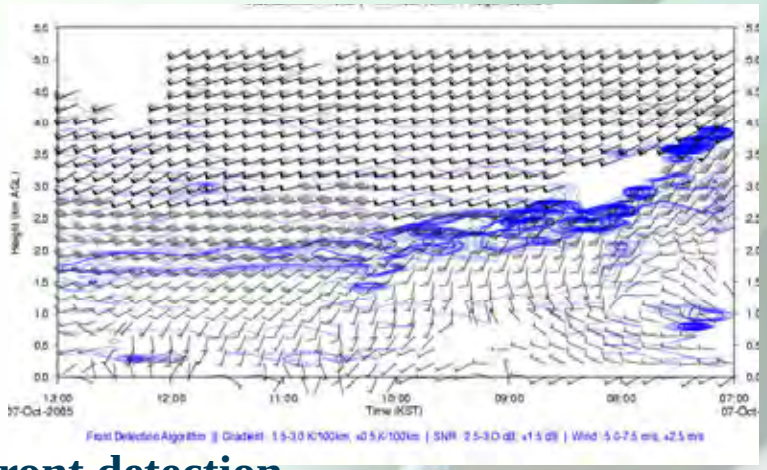
Wind data up to 5 km is collected every 10 minutes through KWPN, is performed QC process and assimilated into the peninsular regional numerical model with 10 km resolution. It improves the prediction accuracy of heavy rain, heavy snow and typhoon track.



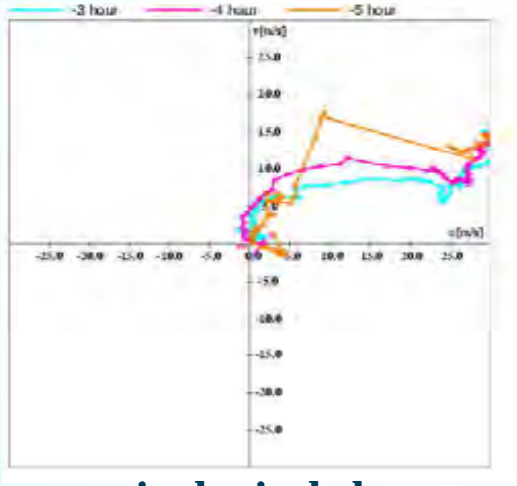
KMA KOREA METEOROLOGICAL ADMINISTRATION

Application for Wind Profiler

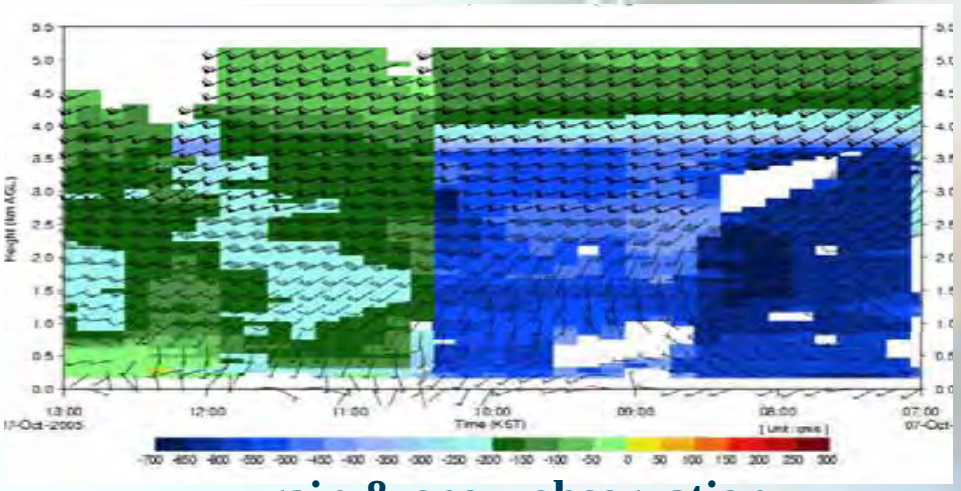




warm & cold front detection



vertical wind shear

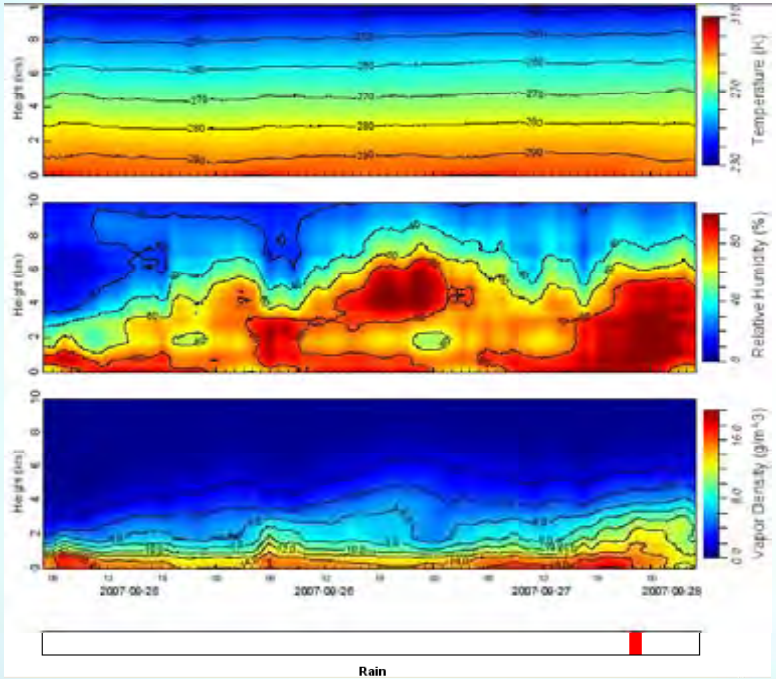


rain & snow observation

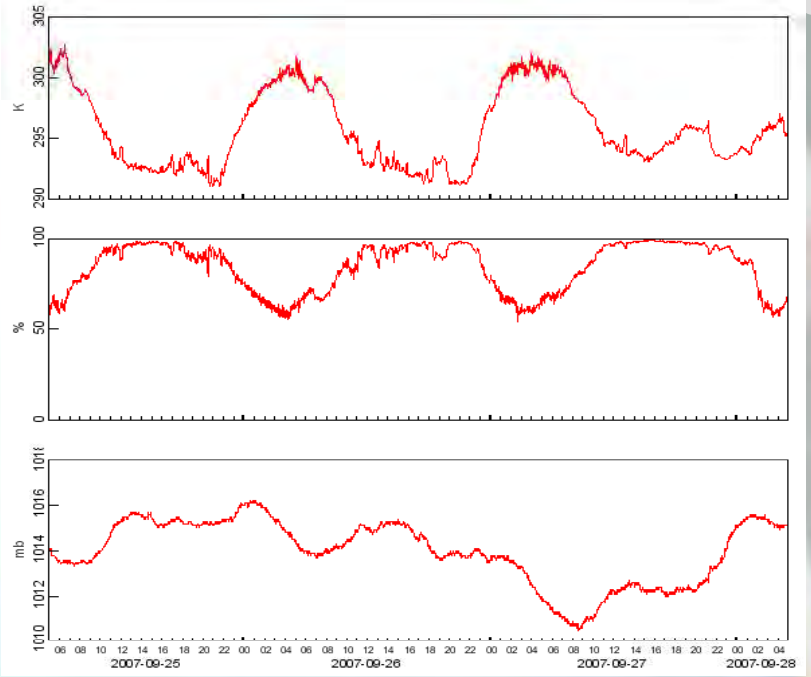
KMA KOREA METEOROLOGICAL ADMINISTRATION

Application for Radiometer

1) The time series of profiles(3D)
: Temperature, Humidity, Vapor density,



2) The time series of profile(2D)
: Brightness temperature,
Precipitable Water Vapor(PWV),
Liquid Water Path (LWP), etc.



KMA KOREA METEOROLOGICAL ADMINISTRATION

KMA Calibration System

❖ Calibration

- When the sensor is installed
- After repaired
- Regularly

· at the laboratory

* Temperature, Pressure, Humidity, Wind direction/speed, Solar duration/radiation, Rain, Evaporation, Data-logger

· at the field (On-site intercomparisons)

* Temperature, Rain, and Wind sensors, etc.

KMA Calibration System

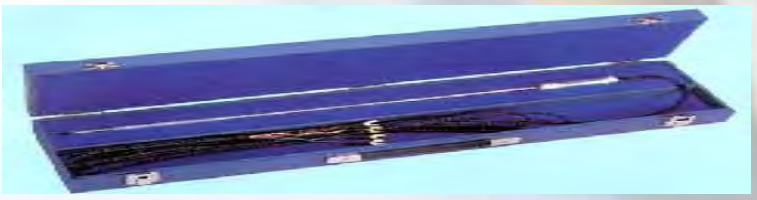
❖ Temperature Calibration

● Equipment

Liquid Bath

Dry Block Calibrator

Thermometry Bridge



High Precision Platinum Resistance Thermometer

KMA Calibration System

❖ Humidity Calibration

● Equipment

Standard Hygrometer

Humidity Calibration Generator

Temperature & Relative Humidity Chamber

KMA Calibration System

❖ Rain / Wind Calibration

● Equipment

Rainfall Calibrator

Wind Tunnel

Standard Meteorological Observation Site - Chupungnyeon

Outlines

- Station : Chupungnyeong
- Location : 36.21999 N, 127.994476 E, 240.9 m AMSL
- Area : 5,345 m^2
- Surroundings : The area surrounding the site consists of mountainous terrain.
- Notable characteristic : Standard Weather Observatory including an experimental facility

Standard Meteorological Observation Site - Chupungnyeon

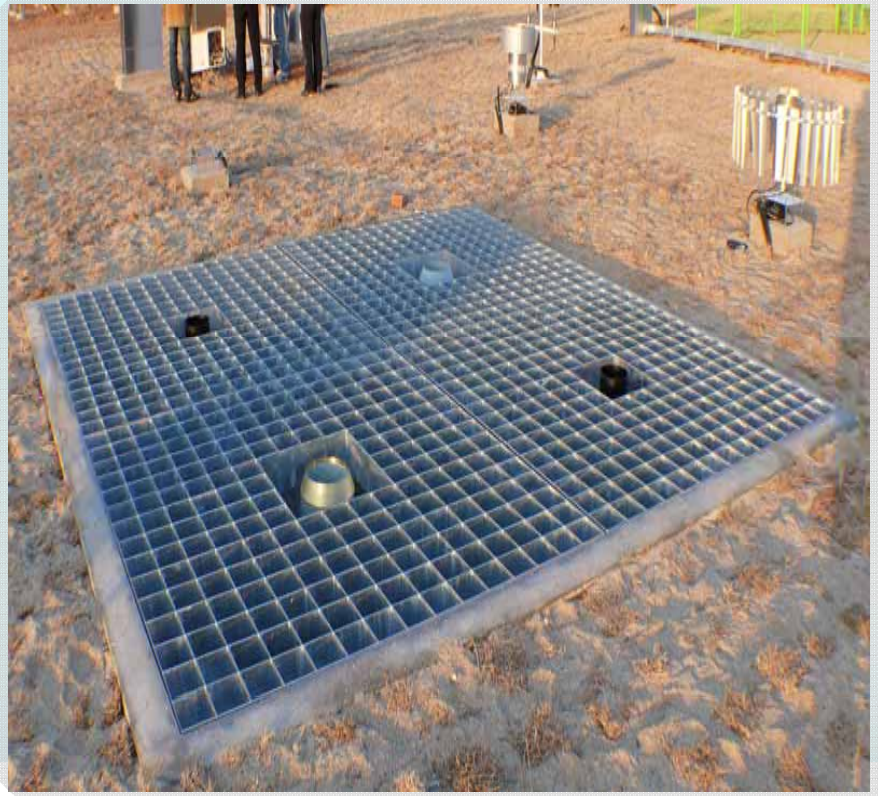
Chupungnyeong was designated Korean Standard Weather Observatory for sensor performance testing and intercomparison observation by KMA in 2008

~ 2007

2008

Standard Meteorological Observation Site - Chupungnyeon

Pit Gauge [Precipitation Reference]



Type Vibrating wire load sensor
Collection area 200 ㎠
Resolution 0.1 mm
Model T200-B(Geonor, Norway)

Precipitation Reference Standard (2 ea)

Type Tipping bucket
Collection area 314 ㎠
Resolution 0.5 mm

Precipitation Working Standard (2 ea)

Standard Meteorological Observation Site - Chupungnyeon

DFIR (Double Fence Inter-comparison Reference)

Type Weight (load cell)
Collection area 200 cm2
Resolution 0.1 mm
Model Pluvio2(OTT, Germany)

Snowfall Reference Standard

Standard Meteorological Observation Site - Chupungnyeon

Radiation Measurement

Type Absolute Pyrheliometer
ISO lebel Primary Standard
Model PMO_6(WRC, Swiss)

Type Thermistor sensor, Pyranometer
ISO lebel Secondary Standard
Model CMP21(Kipp & Zonen, Netherland)

Radiation Reference Standard (2 ea)

Type Thermisor sensor, Pyrheliometer
ISO lebel First Class(CHP1)

Radiation Working Standard

Standard Meteorological Observation Site - Chupungnyeon

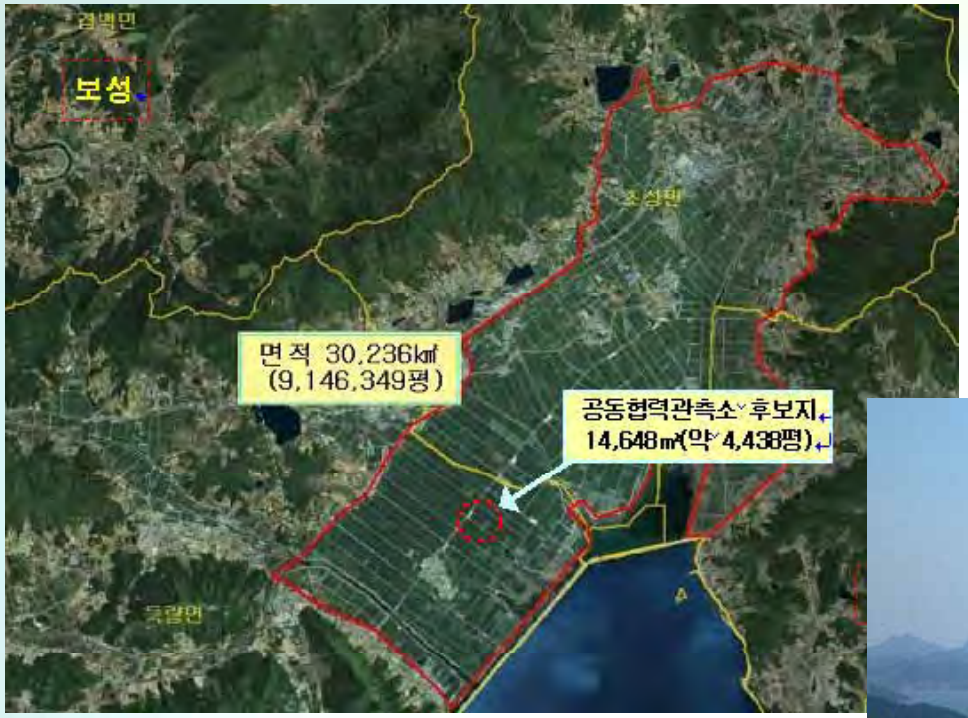
Precipitation windshield performance testing

Standard Meteorological Observation Site - Boseong

Outlines

- Station : Boseong
- Location : 34.7633 N, 127.2123 E, 2.8 m AMSL
- Area : 135,000 m^2
- Surroundings : The site is a flatland surrounded by agricultural land, facing the South Sea
- Notable characteristic : Standard Weather Observatory including an experimental facility

Standard Meteorological Observation Site - Boseong



KMA KOREA METEOROLOGICAL ADMINISTRATION

Standard Meteorological Observation Site - Boseong





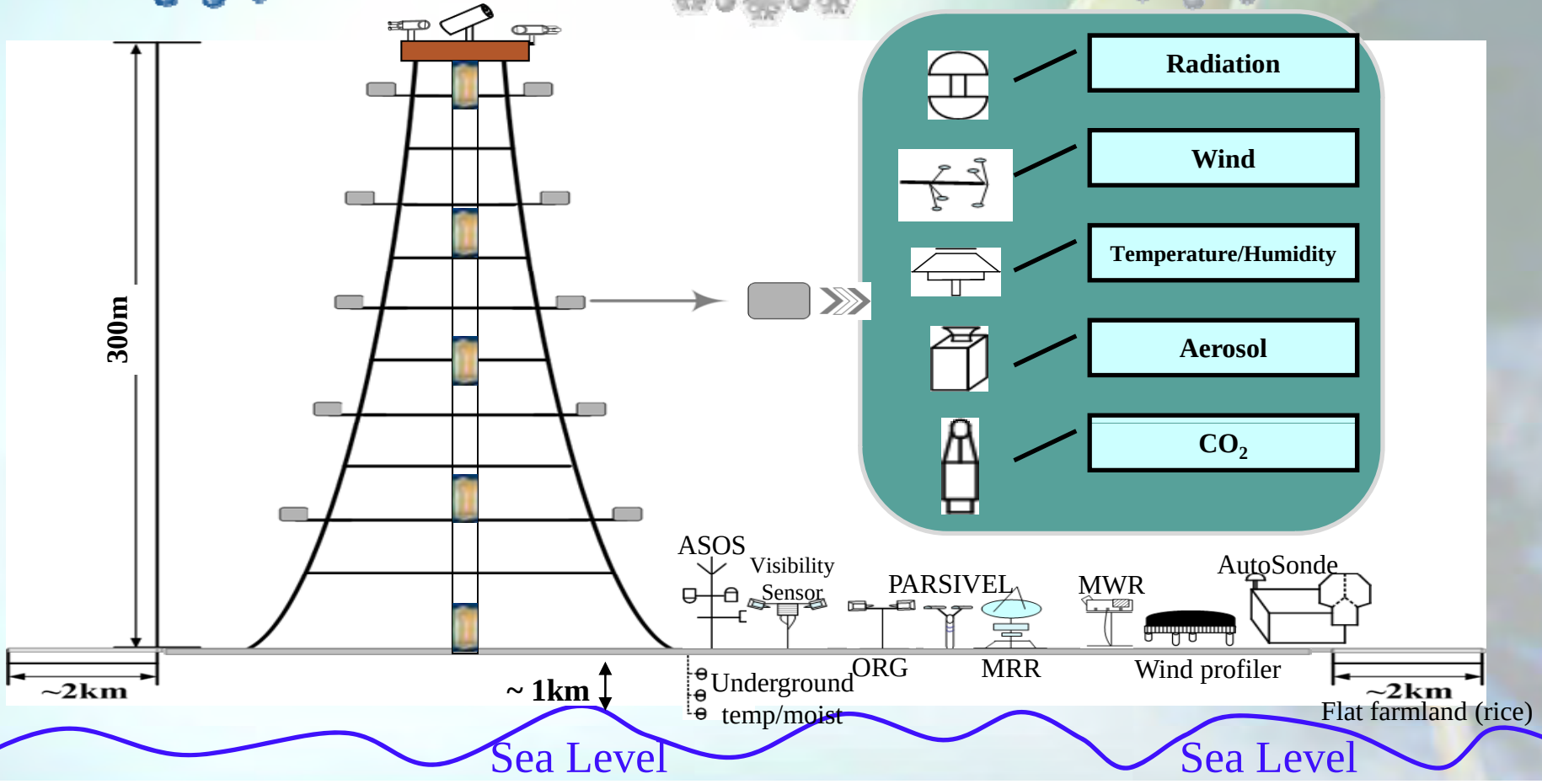


Joint Weather Station

KMA KOREA METEOROLOGICAL ADMINISTRATION

Standard Meteorological Observation Site - Boseong

Tower



KMA KOREA METEOROLOGICAL ADMINISTRATION

Standard Meteorological Observation Site - Boseong

Beijing 300m Tower (IAP: Institute of Atmospheric Physics)
- Flux
- VAL of simulation

Climate Change Element
-Aerosol, Gases

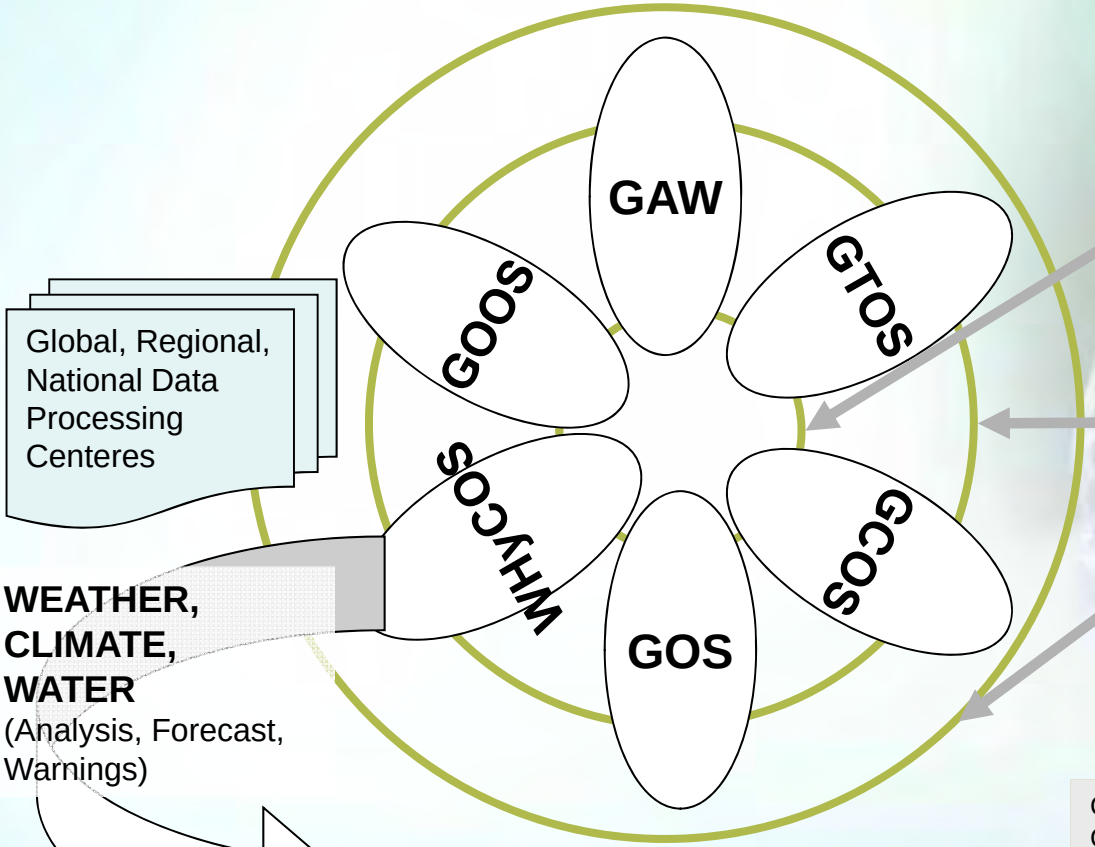
200m Tower (MRI : Meteorological Research Institute)
-Flux (6 lvs.)

Boseong 300m Tower (KMA Plan, 2010~)
- Standard Sounding (Tower)

KMA KOREA METEOROLOGICAL ADMINISTRATION

Current Issue – WIGOS project

The three levels of integration among the WMO-sponsored and co-sponsored observing systems contributing to WIGOS



Standards for measurements (Instruments and methods of observation integration)

Standards for data exchange (WIS data integration)

Standards for end-products (QMF/QA/QC Integration)

GAW : Global Atmosphere Watch
GTOS : Global Terrestrial Observing System
GCOS :Global Climate Observing System
GOS :Global Observing System
WHyCOS : World Hydrological Cycle Observing System
GOOS :Global Ocean Observing System:

Current Issue – WIGOS project

Objective and strategy

□ **Objective**

Integration and co-use of meteorological observational data produced by the various Korean agencies

□ **Strategy**

Step-by-step implementation plan driven by KMA in three areas:

○ **Standardization of observation environment**

Secure representativeness in raw data acquisition stage

○ **Data quality management**

Data quality control through unified data management and control system according to WMO guidance

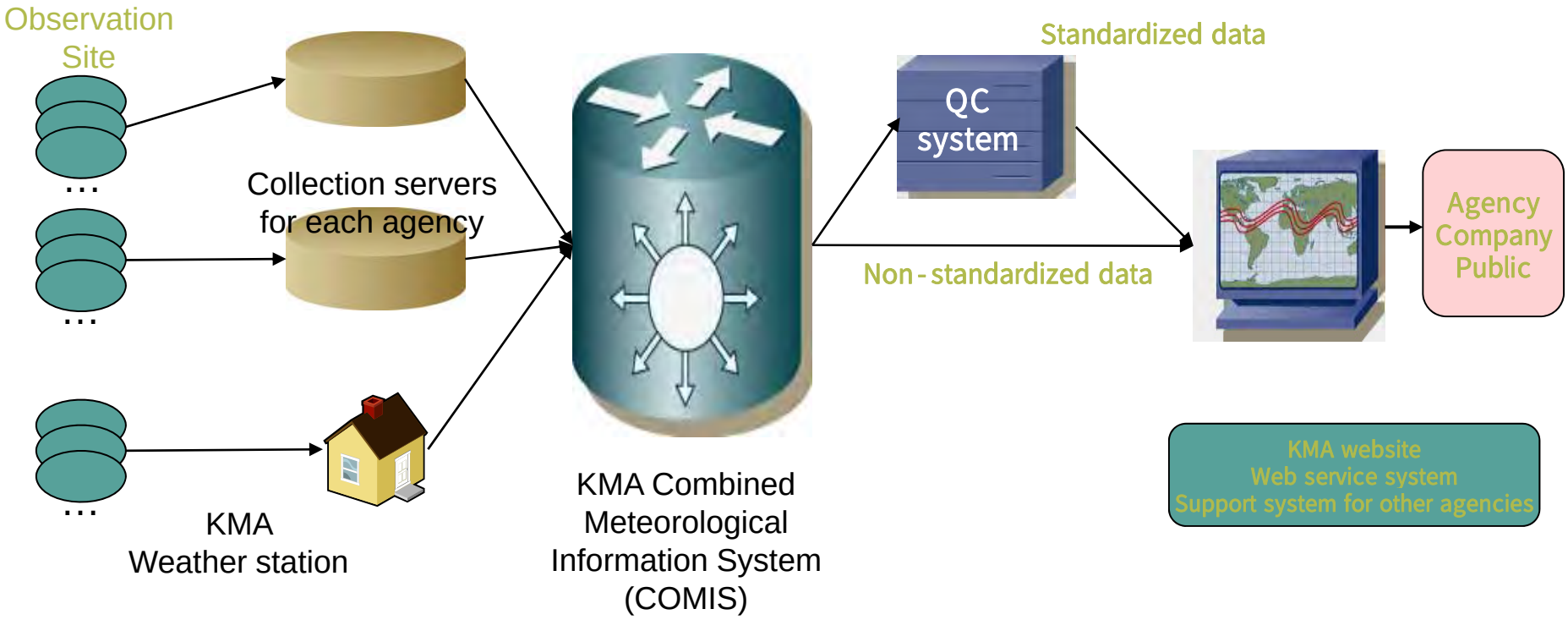
○ **Co-use of observational data**

Data sharing via internet and/or dedicated lines

Current Issue – WIGOS project

Typical meteorological data flow at KMA

Production | Collection | Quality Control | Distribution



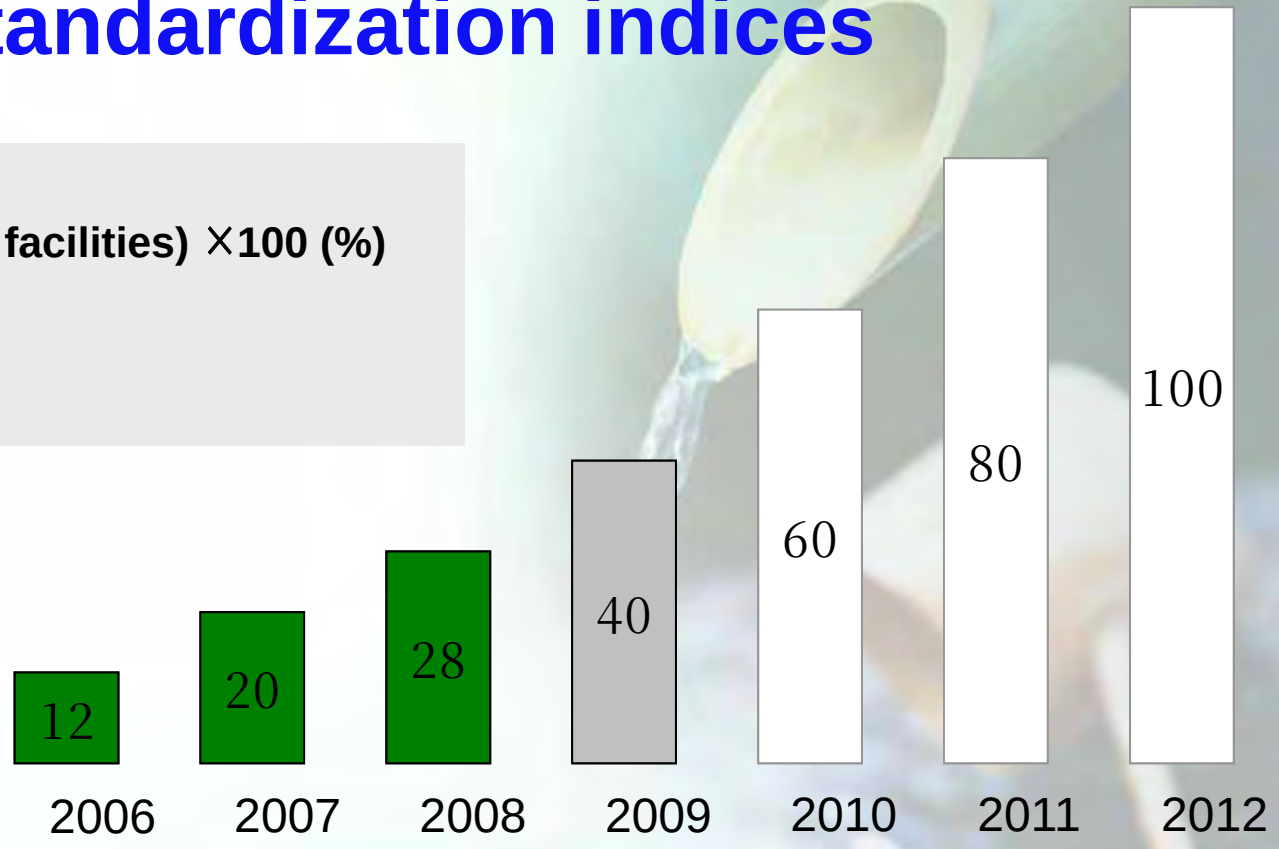
Standards for measurements (Instruments and methods of observation integration)	Standards for end-products (QMF/QA/QC Integration)	Standards for data exchange (WIS data integration)

Current Issue – WIGOS project

Trend of standardization indices

Standardization rate
= (standardized facilities / total facilities) ×100 (%)

Out of 3,658 facilities



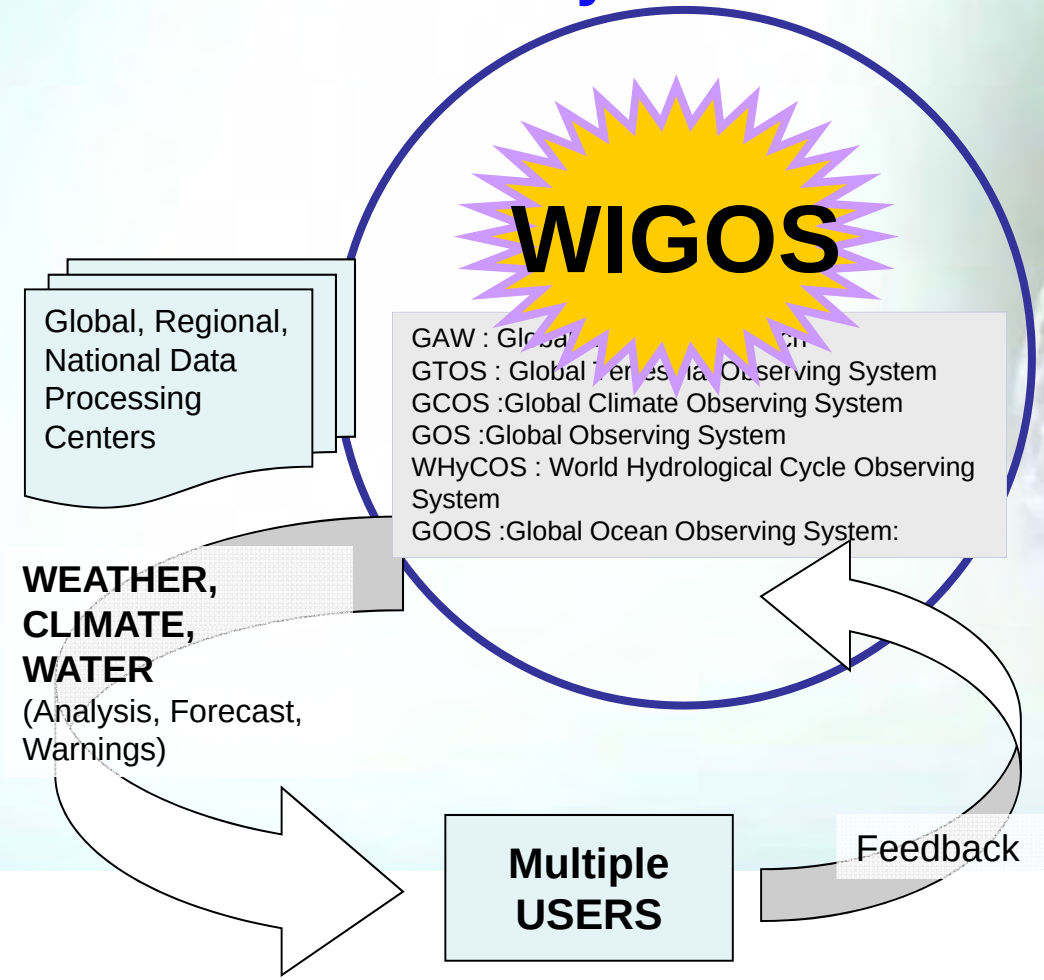
The website of WIGOS DP for on-line demonstration in Korea

- **http://web.kma.go.kr.eng.wigos/ (English)**

KMA KOREA METEOROLOGICAL ADMINISTRATION

Current Issue – WIGOS project

This version of KMA WIGOS is one that integrates KMA's activities in observational policy, action and cooperation with other agencies in the country.



Standards for measurements (Instruments and methods of observation integration)

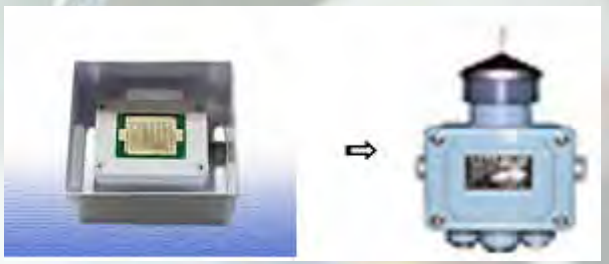
Standards for data exchange (WIS data integration)

Standards for end-products (QMF/QA/QC Integration)

KMA KOREA METEOROLOGICAL ADMINISTRATION

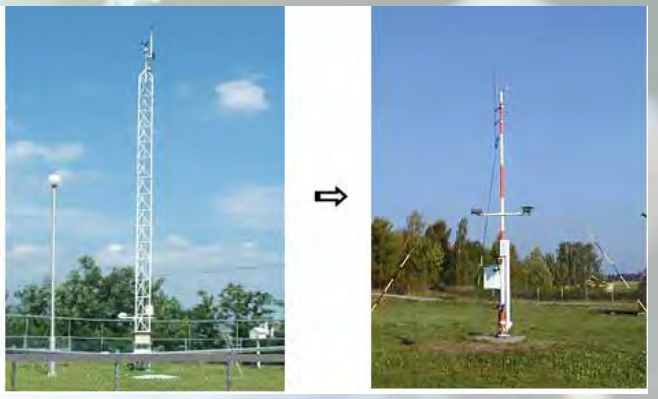
Current Issue – Replacement of Observation

❖ Substitution of the observational type

Element	Substitution	Remark
Precipitation	Bucket gauge → weighing gauge	
Wetness	Heating type → Poister type	
Aspirator	Double pan type → Double circulation type (including tachometer)	

Current Issue – Replacement of Observation

❖ Substitution of the observational type

Element	Substitution	Remark
Wind direction/speed	Propeller and Photo chopper type → Heated ultrasonic type	
Tower	Triangular steel type → One-pole type (mechanical type)	

Current Issue – Replacement of Observation

❖ Automation of the manual observation

Element	Substitution	Remark
Visibility, Present weather	Eye measurement → Forward scattering type	
Cloud height/amount	Eye measurement → Laser type	
Evaporation	Pan evaporation → Calculation with other variables	 ⇓ $ET_{sz} = \frac{0.408\Delta(R_n - G) + \gamma \frac{C_n}{T+273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + C_d u_2)}$

Current Issue – Change of observational environment

- **What is the problem?**
  - Urbanization
  - Climate Change?

- **Some cases**
  - Milyang
  - Cheonju
  - Rooftops AWSs

Current Issue – Change of observational environment

❖ Milyang case

- Recorded the highest temperature in the summer of 2005 in Korea
- The request of Milyang citizen

  * Cause : The construction of large roadways and marts near the Milyang weather station in January 2005
  * Request : The relocation of the station

    Why? Taking dishonor for the hottest city in Korea

    → Not coming to Milyang for tour in the summer

Current Issue – Change of observational environment

❖ Milyang case

- The action of the KMA
  - * Notify the relocation is not allowed due to the continuity of observational data, especially for climatology
  - * Suggest the intercomparison with new temperatures at other places in Milyang.
- Results
  - * The almost similar result! The temperature is the highest!

→ Not only the construction of roadways and marts,
but also the urbanization of the city including climate change

- Then, will we relocate the station to other proper place? If we should do, why?

Current Issue – Change of observational environment

❖ Cheonju case

- The area near the Cheonju station was designated to the new developmental district
- The request of Cheonju citizen

  * The relocation of the station

    Why? Property infringement

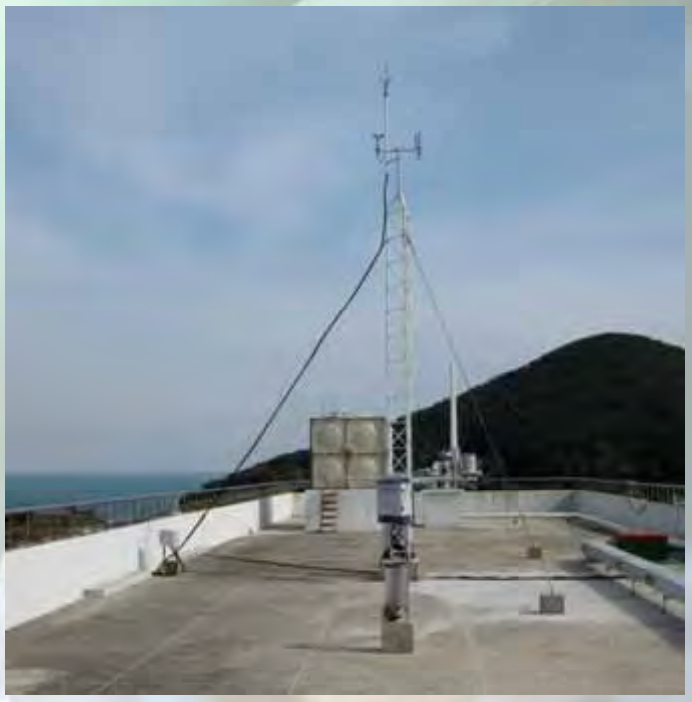
    → No construction of high buildings near the station, because of the protection of the observation, especially wind

  * KMA has gone to efforts to ensure proper siting the station. KMA has sending the document to the local government about the prevention of building developments near the station at the beginning of every year

Current Issue – Change of observational environment

❖ AWSs on rooftops

- In the urban area, some of AWSs are located on rooftops
  * There are some errors on the observational data, especially temperature and humidity



- The KMA plans to relocate them to the surface
  * But there are always problems of budget and getting places

  → How about wind? Is it okay on the rooftop?
  Is there the converting method?
  (Wind on rooftop → Wind at 10 m height above the ground?)

Current Issue – Change of observational environment

- **Relocation of the observation stations**

  - Should the station relocate at outside of city for the synoptic observation?

  *** It is different between urban and synoptic observation**

  - Is it okay to separate automatic and manual observation at different places?

  *** What is the proper distance between the both?**

The Chupungyeong weather stations (40 years ago)

Thank You!

KMA KOREA METEOROLOGICAL ADMINISTRATION