JMA's Country Report

for JMA/WMO Training Workshop on

CALIBRATION AND MAINTENANCE OF METEOROLOGICAL INSTRUMENTS

in RA II (ASIA)

Kazumi KAMIDE

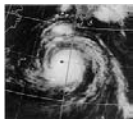
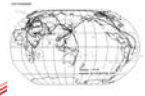
Observations Division
Observations Department
Japan Meteorological Agency (JMA)

Outline

JMA's operational services

Observation is one of the Infrastructures of Meteorological Services

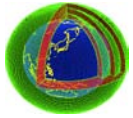
Observations

- Space Based Observation 
- Upper Air Observation 
- Radar Observation 
- Surface Observation 
- Ocean Observation 
- International Data Exchange 

Data Collection

Analysis, Forecast, Application

Computer System for Meteorological Services

Numerical Weather Prediction 

Collection and Dissemination of Meteorological Data 

Local Met. Observatories  

Provision of Data/Products

Other NMHSs

Information Issuance

End User & NMHSs

Products

Warnings, Advisories

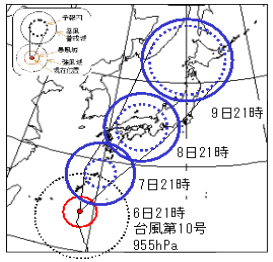
Typhoon Forecast

Weather Forecast

One Week Forecast

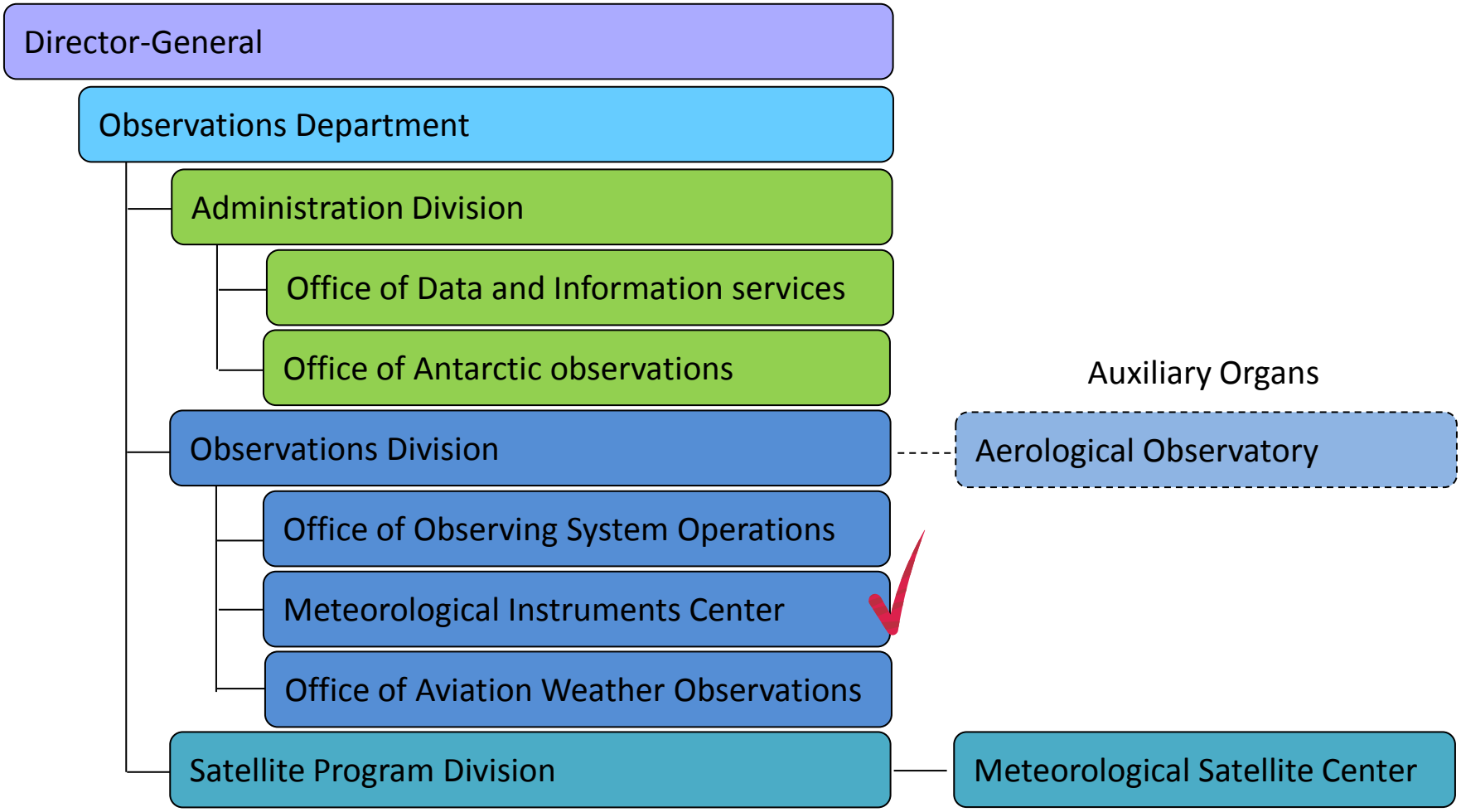
Aeronautical Met. Information

Marine Met. Information



0. Overview of JMA

Organization of Observations Department



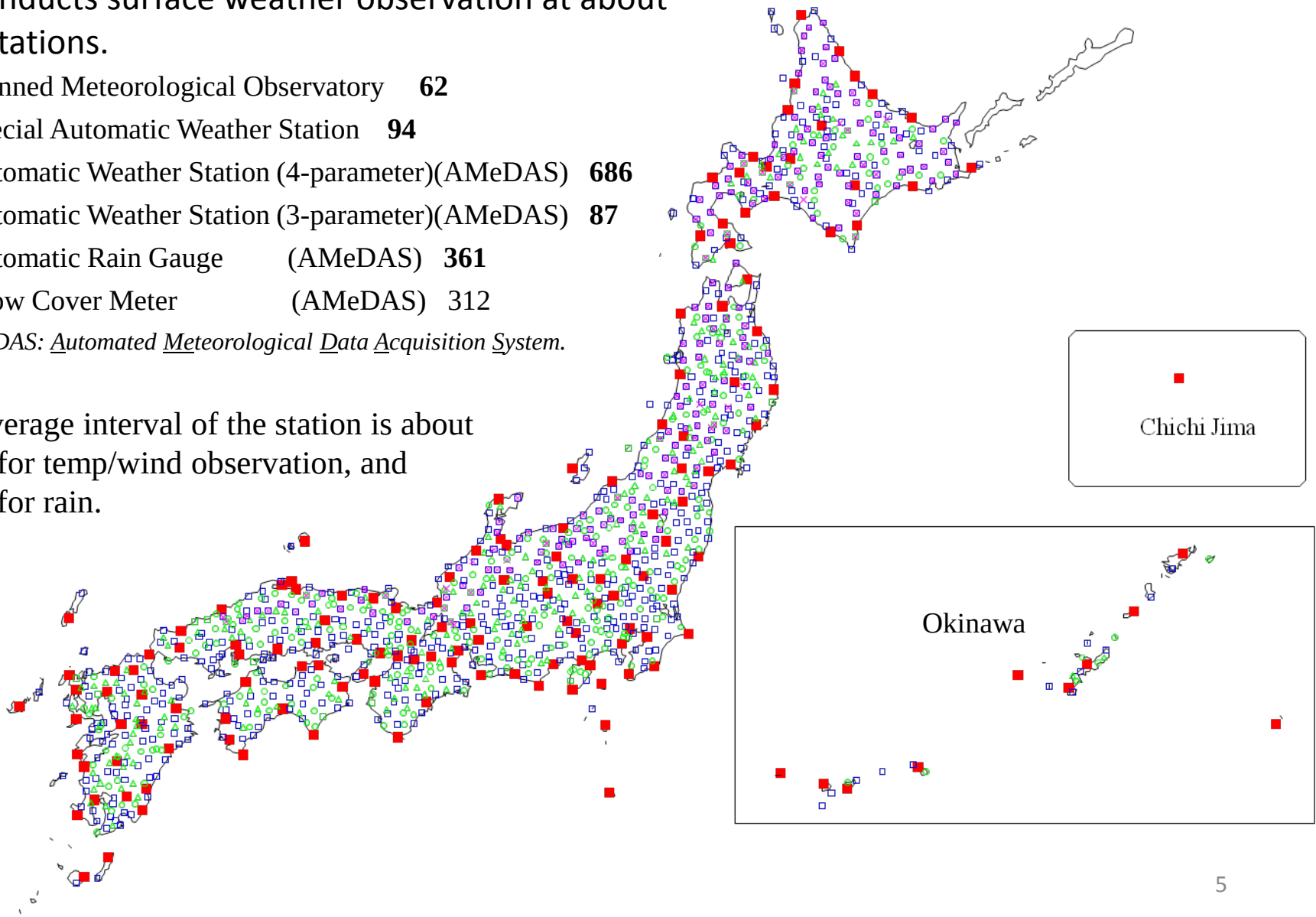
1. Surface observation station

JMA conducts surface weather observation at about 1,300 stations.

- ■ Manned Meteorological Observatory **62**
- Special Automatic Weather Station **94**
- □ Automatic Weather Station (4-parameter)(AMeDAS) **686**
- ■ Automatic Weather Station (3-parameter)(AMeDAS) **87**
- ○ Automatic Rain Gauge (AMeDAS) **361**
- × Snow Cover Meter (AMeDAS) 312

AMeDAS: Automated Meteorological Data Acquisition System.

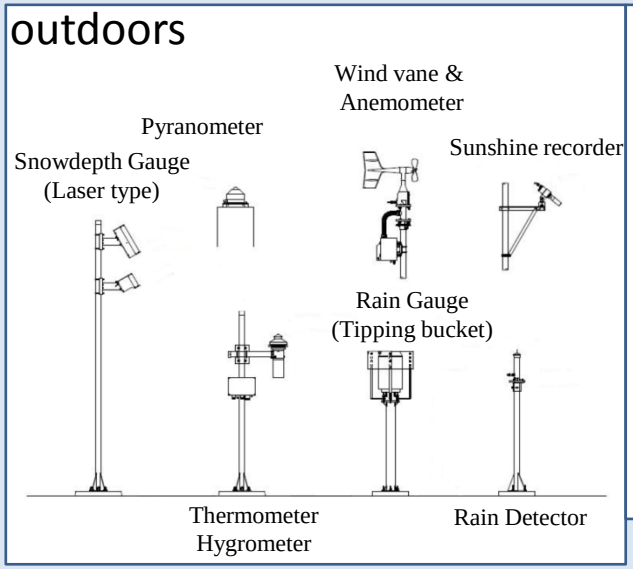
The average interval of the station is about 21km for temp/wind observation, and 17km for rain.

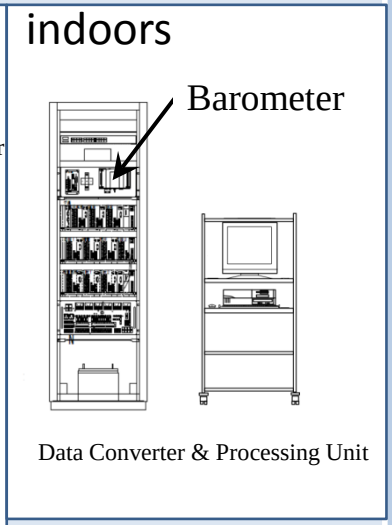


1. Surface observation station

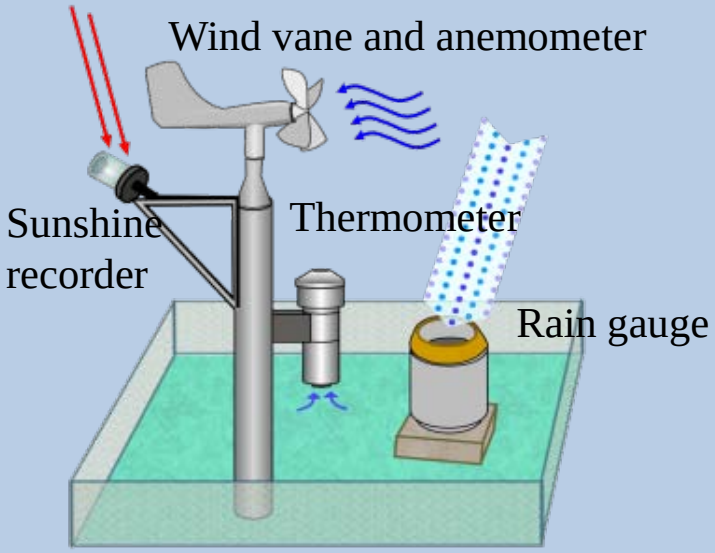
Overview of a surface observation station

Manned Meteorological Observatory / Special Automatic Weather Station





AWS (Automated Meteorological Data Acquisition System)



1. Surface observation station

➢Case examples of troubles and problems in observation stations, and recovery works

Outline of a trouble

- ✓ At an AWS, the vegetation (ivy) had closed the temperature screen (radiation shield, or vent sleeve).
- ✓ For this reason, inside of the temperature screen was filled with heat and extraordinary incorrect high temperature was observed.
- ✓ This temperature was recognized as the highest maximum temperature in September.

Recovery work

- ✓ The staff of the local meteorological observatory went to the AWS, and weeded out the vegetation.
- ✓ Observational data was checked through tracing back to the past, and the temperature for two weeks, when the vegetation influenced temperature observation, was canceled.
- ✓ Check of the environment around the site was carried out at all the stations. (and, Very many costs were spent.)

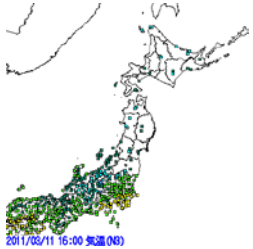
1. Surface observation station

➢Issues and efforts in operation

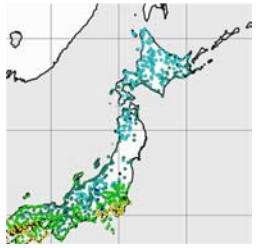
On 11 March 2011, “The 2011 off the Pacific coast of Tohoku Earthquake and Tsunami” happened, and then, surface observation was severely affected due to communications failure and power outage.

before a disaster

Just after a disaster

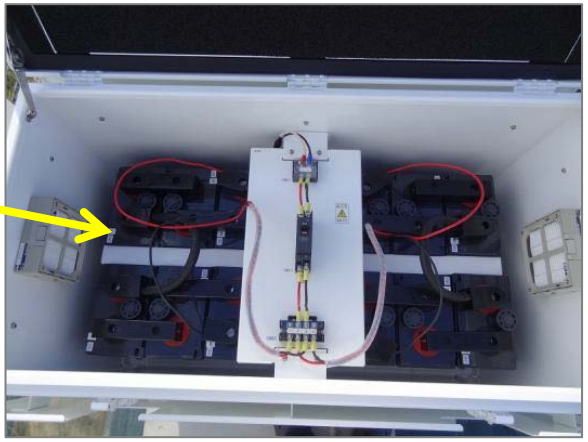


The data of Hokkaido area was recovered after communication recovery. But Tohoku area was not recovered because of missing of data due to power outage.



We increased the battery capacity of AWS on islands in order to continue to observe for about 72 hours even if power failure continues.

Battery box



In Addition, we already set the Solar array panel for special AWS which needs a mass power supply.

2. Instruments in operational use

➢About each meteorological variable

	Picture	Manufacturer and Model	Current status	Interval of maintenance and calibration
Barometer		**<Manned Meteorological Observatory>** PTB330 (Vaisala, Finland) **<Automatic Weather Station>** none	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** none	(i) maintenance Including a verification with standard instruments. **<Manned Meteorological Observatory>** every 1 year **<Automatic Weather Station>** none (ii)calibration none
Radiation Shield (temperature screen)		**<Manned Meteorological Observatory>** JV-280 artificial ventilation Can be installed both thermometer and hygrometer. (ogasawara, Japan) **<Automatic Weather Station>** TV-250 artificial ventilation Can be installed thermometer. (ogasawara, Japan)	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** every 1 year (ii)calibration none

2. Instruments in operational use

➢About each meteorological variable

	Picture	Manufacturer and Model	Current status	Interval of maintenance and calibration
Thermometer		**<Manned Meteorological Observatory>** K5639AJ (yokogawa, Japan) **<Automatic Weather Station>** TS-3011C (yokogawa, Japan)	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance Including a verification with standard instruments. **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** every 1 year (ii)calibration none
Hygrometer		**<Manned Meteorological Observatory>** HMT333 (Vaisala, Finland) **<Automatic Weather Station>** none	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** none	(i)maintenance Including a verification with standard instruments. **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** **none** (ii)calibration none

2. Instruments in operational use

➢About each meteorological variable

	Picture	Manufacturer and Model	Current status	Interval of maintenance and calibration
Wind vane and Anemometer		**<Manned Meteorological Observatory>** WS-JN6 (NEI, Japan) **<Automatic Weather Station>** FF-13 (NEI, Japan)	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** every 1 year (ii)calibration every 5 years
Rain gauge		**<Manned Meteorological Observatory>** WB0015 (yokogawa, Japan) **<Automatic Weather Station>** RT-3 (ogasawara, Japan)	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** every 1 year (ii)calibration every 5 years

2. Instruments in operational use

➢About each meteorological variable

	Picture	Manufacturer and Model	Current status	Interval of maintenance and calibration
Sunshine recorder		**<Manned Meteorological Observatory>** MS-094 (EKO, Japan) **<Automatic Weather Station>** MS-093 (EKO, Japan)	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** every 1 year (ii)calibration every 5 years
Pyranometer		**<Manned Meteorological Observatory>** MS-402F (EKO, Japan) **<Automatic Weather Station>** none	**<Manned Meteorological Observatory>** since 2010 **<Automatic Weather Station>** since 2004	(i)maintenance **<Manned Meteorological Observatory>** every 3 months **<Automatic Weather Station>** **none** (ii)calibration every 5 years

2. Instruments in operational use

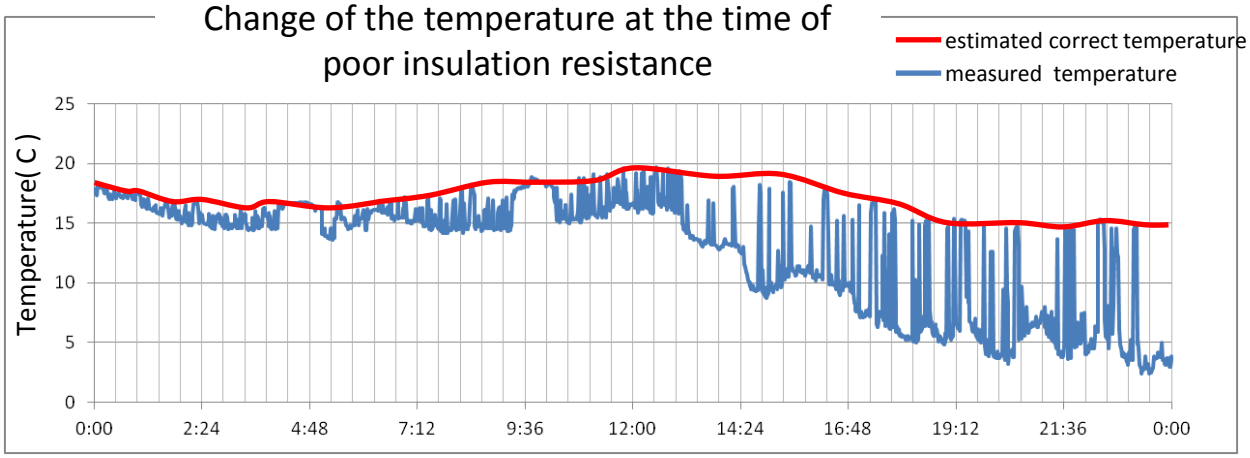
➢Case examples of troubles and problems in instruments, and recovery works

Outline of a trouble

Fluctuation of the observed value of temperature occurred due to the fall of an insulation resistance value (in other words ,“the current leak”) of an electric thermometer.

Year	2005	2006	2007	2008	2009	2010	2011	2012
The number of cases	0	0	1	1	1	7	8	5

While observing in various environments, the fall of an insulation resistance value may occur according to accumulation of the damage by external factors (for example, thunder etc.), or the aged deterioration of the sensor unit of the instrument.



Recovery work

- ✓ The check procedure for temperature was improved so that insulation resistance could be detected when a periodic check at the AWS is conducted.
- ✓ In specifically, the insulation resistance tester was equipped to each Local Meteorological observatory, and the check by staff were strengthened.
- ✓ If there are indications of falling of insulation resistance through the test, the sensor unit will be replaced immediately.

2. Instruments in operational use

➢Issues and efforts in maintenance and calibration

In addition to periodical check, extraordinary check may be required. Although it is necessary to mow vegetation in all stations, many costs are needed to go to the site frequently.

The camera was installed in the observation field so that we could decide effective check schedule for going the site by checking the situation in an observation field periodically with the camera.


25 JUN.


1 JUL


5 JUL


10 JUL


15 JUL


20 JUL


25 JUL


1 AUG


3 AUG


5 AUG

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

Temperature

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard		Platinum resistance Thermometer - NSR-160 (Netsushin, Japan) - Alternating current bridge F-600 (ASL, UK) - Water triple-point cell (0.01℃) - Standard resistor(100Ω)	Periodic calibration to a superior standard	Every year NSR-160 Every 2 years Water triple-point cell Standard resistor (to National Standard or to a standard which is traceable to National Standard)
Working standards	 	Platinum resistance Thermometer -TS-81A (CHINO, Japan) - Alternating current bridge F-250 (ASL, UK)	Periodic calibration to a superior standard	Every1 year (to National Meteorological Standard)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

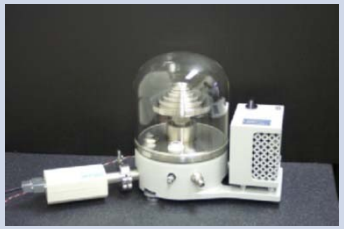
Humidity

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard		Chilled-mirror dewpoint hygrometer -Controller DewStar S-1M (Shinyei technology, Japan) -Sensor DewStar S-2S (Shinyei technology, Japan)	Periodic calibration to a superior standard	Every 1 year (to National Standard)
Working standards	 	Chilled-mirror dewpoint hygrometer -Sensor D-2-SR (General Eastern , USA) -Controller Hygro-M2 (General Eastern, USA)	Periodic calibration to a superior standard	Every 1 year (to National Meteorological Standard)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

Pressure

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard		Air piston gauge AV-02 (Futaba Sokki, Japan)	Periodic calibration to a superior standard	Every 3 years (to National Standard)
Working standards	  	Digital Barometer PTB220 (Vaisala, Finland) RPM4 (DHI, USA) F-452 (Yokogawa, Japan)	Periodic calibration to a superior standard	Every 1 year (to National Meteorological Standard)
Working standards (Traveling standard)	 	Digital Barometer PTB330, PTB220 (Vaisala, Finland)	Periodic calibration to a superior standard	Every 1 year (to Working Standard)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

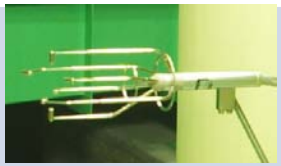
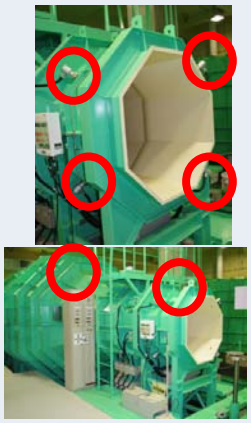
Precipitation

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
Working standards		Burette 1571ml Burette (Yoshino-keisoku, Japan)	Periodic check to a superior standard	Every10 years (to a Working Standard of other calibration laboratory)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

Wind Speed

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard	 	0 ~ 20m/s Ultrasonic anemometer DA-700 (Sonic, Japan) 20 ~ 90m/s Pitot tube F-202(Rika seiki, Japan), Differential pressure gauge MT210(2sets) (YOKOGAWA, Japan)	Periodic calibration to a superior standard	Every 2 years (to National Standard)
Working standards		0 ~ 30m/s Ultrasonic currentmeter DA-470 (Sonic, Japan) 30 ~ 90m/s Differential pressure gauge DPI145 (GEsensingjapan, Japan)	Periodic calibration to a superior standard	Every 1 month (to National Meteorological Standard)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

Solar radiation

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard		Pyranometer CM-21(Kipp & Zonen, Netherlands)	Periodic calibration to a superior standard	Every 1 year (to National Standard)
Working standards	 	Pyranometer CM-21(Kipp & Zonen, Netherlands) MS-801 (EKO, Japan)	Periodic calibration to a superior standard	Every 1 year (to National Standard)

3. Standards and equipments for calibration

➢National meteorological standards, working standards, traveling standards

Sunshine duration

	Picture	Type, Manufacture and Model	Current status	Interval of Calibration to a superior standard
National Meteorological standard		Pyrheliometer CH-1(KIPP & ZONEN, Netherlands)	Periodic calibration to a superior standard	Every 3 years (to National Standard)
Working standards	  	Sunshine recorder Rotating mirror sunshine recorder MS-093A, MS-094 (EKO, Japan) Sunshine recorder on sun-tracker CH-2 (Kipp & Zonen, Netherlands) MS-101D (EKO, Japan)	Periodic calibration to a superior standard	Every 5 years (to National Standard)

3. Standards and equipments for calibration

➢Equipments for Calibration

Chambers for calibrate thermometers

Liquid bath type
Manufacturer: DaiichiKagaku. Inc(Japan)
Model: DHHG-004-AP
Range: -85℃ to +50℃

Air chamber type
Manufacturer: ESPEC Corp.(Japan)
Model: PWL-3KP
Range: -40℃ to +50℃

3. Standards and equipments for calibration

➢Equipments for Calibration

Chambers for calibrate hygrometers

Humidity type
Manufacturer: DaiichiKagaku. Inc(Japan)
Model: DHHG-005-AP
Range: 15% to 95%

Humidity and temperature type
Manufacturer: DaiichiKagaku. Inc(Japan)
Model: DHHG-003-AP
Range:
Humidity: 10% to 95%
Temperature: -10℃ to +50℃

3. Standards and equipments for calibration

➢Equipments for Calibration

Chambers for calibrate barometers

Manufacturer: TOYO KOATSU Co.,Ltd. (Japan)
Model: DHHG-006-TK
Range: 4hPa to 1150hPa

Thank you for your attention.