

발 간 등 록 번 호

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ANNUAL REPORT 2014

KOREA METEOROLOGICAL ADMINISTRATION



KOREA METEOROLOGICAL ADMINISTRATION
2014 ANNUAL REPORT

Watching the Sky Friendly, Serving the People Faithfully





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MESSAGE FROM THE KMA ADMINISTRATOR



Administrator
Korea Meteorological Administration

KO YUNHWA

I am pleased to present to you the 2014 Annual Report of the Korea Meteorological Administration (KMA). Looking back, the year of 2014 began with a record-breaking heavy snowfall in Gangneung City in February. It was the heaviest snowfall event we have experienced in 24 years since 1991, which caused significant inconvenience to the local citizens. We also witnessed some of the abnormal phenomenon such as early high temperature events in Jeju and Gangneung during May and a spout observed inland in June.

The abnormal weather events and large-scale disasters caused by climate change have become a new risky factor in terms of

national security and competitiveness. In this regard, the KMA extended the duration of its medium-range, short-range, and very short-range forecast from 7 to 10 days, 2 to 3 days, and 2 to 3 hours, respectively, with aims to reduce weather-related damages as well as to enhance the convenience for the public, while supporting the prompt decision-making not only for planning for our daily lives but also for a variety of sectors such as energy and agriculture. In case of long-range forecast, furthermore, the type of forecast service has been changed from providing deterministic to probabilistic information.

For the 3-dimensional monitoring of pollutants that trigger climate change around the Korean Peninsula, the KMA launched Ulleungdo-Dokdo Climate Change Monitoring Center which completes the triangular observing system (east, west, and south sea) with those in Anmyeon-do and Jeju-do. The KMA is also expanding its web service of applied information on health, agriculture, and water resources based on the national standard scenario for climate change. The Administration will continue reinforcing its support for the climate change-relevant agencies in preparing the adaption strategies, while exerting efforts to raise the public awareness on climate change.

Thanks to the interests and supports from the public, the meteorological technology such as the numerical prediction and remote-sensing has been steadily improved, and thereby the development of source technology and the establishment of the infrastructure for Korea's own numerical prediction model has been well prepared. The further development of its pilot model is planned to be completed by 2016. Based on this technological capacity, the KMA plans to expand its ODA projects through close cooperation with WMO and KOICA.

As Big Data, weather data serves as a critical base information in decision-making not only for weather forecasts but also for a variety of governmental policies such as water and energy management. The value of weather data glows in almost all disciplines, ranging from disaster prevention, crop and animal husbandry, tourism, transport, environment, national defense, health, to many more industries, influencing individuals, enterprises, and countries. This is why the KMA does not spare any efforts in providing the weather and climate services that can satisfy the public, while protecting and ensuring the safety and happiness of our people. Because it was obvious to make a great contribution in creating economic benefits when leveraging various data that the KMA possesses, many attempts related to Big Data such as predicting demands for electric power and analyzing the correlation between weather and trading agricultural products were made in 2014.

I hope that this annual report will serve as a useful reference not only for the governmental agencies across the globe but also for those who want to know more about and offer advice to the KMA. Thank you.



INTRODUCTION

08 2014 KMA News Highlights

2014 KMA NEWS HIGHLIGHTS

1

East Coast Area Hit by Heaviest and Longest Snowfall in 103 Years (February 6-14)

For nine days in a row, the east coast areas, including Gangneung and Daegwallyeong were hit by a record-breaking snowfall in a century. From February 6 through 14, the amount of snow fell in the area reached as much as 110.0 cm in Gangneung, 83.5 cm in Sokcho, and 74.0 cm in Daegwallyeong in terms of maximum snow depth. In particular, the city of Gangneung saw the longest number of days with snowfall since related records were first kept in 1911, and experienced the largest scale of snowfall event in 45 years, breaking the previous record of maximum snow depth of 109.7 cm in 1969.

This heavy snowfall event was caused by a blocking effect, a large-scale pattern in the atmospheric pressure field, effectively blocking migratory cyclones. The cold and dry anticyclone in the north blocked by this blocking high collided with the warm and wet cyclone passing in the south, creating easterly wind with abundant moisture. When this easterly wind hit the Taebaek Mountains, ascending air current occurred, generating heavy snow cloud over the area.

Heavy snowfall in the east coast area of Korea



2

KMA and NIER Opened Forecast Center for Yellow Dust and Fine Particles (February 14)

With the public's growing interest in health, the importance and need for forecasting pollutants, such as yellow dust and fine particles, are increasing in recent days. Accordingly, the Korea Meteorological Administration (KMA) and the Ministry of Environment (ME) have jointly launched the Environmental-Meteorological Forecast Center in KMA, to provide accurate and reliable forecasts of yellow dust and fine particles by systematically deploying a workforce and technology from both organizations. The opening ceremony of the Forecast Center was held on January 14 2014, attended by Administrator of KMA, Vice Minister of ME and President of the National Institute of Environmental Research (NIER).

Previously Asian dust forecasts and fine-dust forecasts have been managed by KMA and NIER, respectively. However, integrating yellow dust and fine particle forecasts has been recognized as an important task, since meteorological analysis is also essential in predicting fine particle concentrations, and both have in common as particulates. The new center is also expected to serve as a foundation for promoting technical exchange between KMA and ME and providing quality service to citizens.

The Opening ceremony of the Environmental-Meteorological Forecast Center on Feb. 14, 2014



3

NIMR Moved to Seogwipo Innovation City, Jeju (March 4)

The National Institute of Meteorological Research (NIMR), founded in 1978, has moved to Jeju Island, opening a new chapter in its history after 36 years in Seoul. From the beginning of the construction to the final move-in, the institute's relocation was possible thanks to great efforts and active engagement of all employees.

180 researchers with office goods equivalent to 50 five-ton trucks were relocated to the four-story new building with four levels of underground, in Seogwipo Innovation City Jeju. Facilities for research and experiment equipped with meteorological observation instruments will also be established on the north side of the building, to help researchers focus more on their work.

Being on an island was regarded as being isolation in the past. But now the move to Jeju Island indicates more opportunities for NIER to make its way into a broader world. Taking this opportunity, the NIER will continue its effort to become a hub for Korea's meteorological science and a national institute communicating with the public.

New office building of NIMR



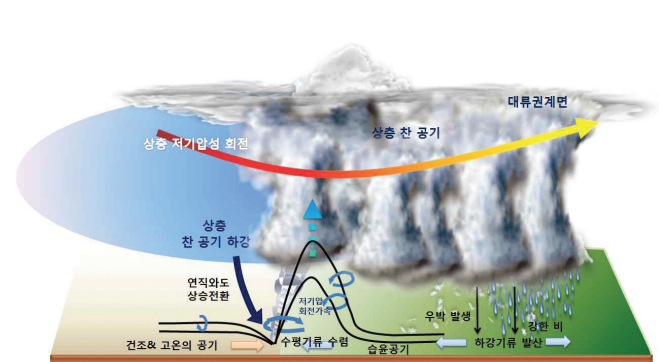
4

Whirlwind Hit Goyang City, Gyeonggi-do, Korea (June 10)

A strong whirlwind, which lasted for 30 minutes on June 10 2014, struck Goyang City in Gyeonggi Province and caused approximately 1.5 billion won worth of damage to 3.9 hectares of 48 greenhouses (estimated by National Emergency Management Agency).

A whirlwind is a weather phenomenon in which an intense vortex of wind swirls dust, debris, sand, and water drops from the water surface. It is called "yong-o-reum" in Korea and "tornado" in America. In Korea, this phenomenon usually occurs over a body of water; the whirlwind struck the city of Goyang this time was exceptionally taken place in the inland area, with property damage.

Diagram of whirlwind formation



5

KMA Administrator Elected as WMO Executive Council Acting Member

Ko Yun-hwa, Administrator of the Korea Meteorological Administration (KMA), was elected as an Executive Council Member of the World Meteorological Organization (WMO) on June 18 2014, at the 66th session of the Executive Council held in Geneva, Switzerland. The session was convened from June 18 to 27 at the WMO's headquarters office. He was chosen to serve a term in a by-election, to fill the vacancy by the retirement of former Administrator Lee Il-soo. His election is recognized as a result of Korea's effort to advance its meteorological technology, and is attributed to trust and support from 191 member countries as well as WMO, which KMA has gained by providing technological development assistance for developing countries.

The 66th Session of the WMO Executive Council



6

Ulleungdo-Dokdo Climate Change Monitoring Center Launched (August 14)

The Korea Meteorological Administration (KMA) officially launched its Ulleungdo-Dokdo Climate Change Monitoring Center in the eastern region of Korea on August 14 2014. Korea has operated two climate observation stations, one from Anmyeondo in the west, and the other from Gosan in the south, since 1996 and 2008, respectively. The Ulleungdo-Dokdo center has added a third to this number. With the opening of the new center, Korea now has a triangular monitoring system for pollutants that trigger climate change around the Peninsula.

The Ulleungdo-Dokdo Center will monitor inflow and outflow of contributing factors of climate change in the Peninsula, originated from Asian continent. The KMA will provide active support so that many countries across the globe can get benefit of using its data, and thereby contributing to making more effective climate change policies.

Ulleungdo-Dokdo Climate Change Monitoring Center



Unmanned Site (Dokdo Component)



7

Korea's First Meteorological Science Museum Opened (November 26)

Korea's first museum dedicated to meteorological science "National Daegu Meteorological Science Museum" had its official opening on November 26. The museum, consisting of three exhibition halls and one 3D theater with 200 content of 53 categories, was established to promote meteorological science and allow visitors to gain eyes-on, hands-on and feels-on experience.

Even though weather is closely related to our daily lives, it is generally not easy for the public to be familiar with meteorological science. In this sense, the museum is intended to help people easily understand the basics of meteorological science so that they could have interest in weather and receive weather-related tips for everyday life, as well as to serve as an education place for children and students to gain hands-on activities.

The Opening Ceremony of National Daegu Meteorological Science Museum (Nov. 26)





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From Cheugugi (raingauge) in the 15th Century to Cheollian (satellite) in the 21st Century

HISTORY

BC 35

THREE KINGDOMS PERIOD

BC 35

First records of weather patterns in 'Samguksagi' (Clouds, 3rd year of the King Dongmyeong of Goguryeo)

633

Installation of Cheomseongdae, the oldest astronomical observatory in the East (2nd year of Queen Seondeok of Silla)



기상	최초 기록
구름(雲氣)	BC 35 고구려 동명성왕 3년
안개(霧異)	34 고구려 동명성왕 4년
천둥(雷震)	16 백제 온조왕 3년
가뭄(旱魃)	15 백제 온조왕 4년
눈(大雪)	6 고구려 유리왕 14년
지진(地震)	AD 2 고구려 유리왕 21년
서리(霜異)	10 백제 온조왕 28년
우박(雹異)	13 백제 온조왕 31년

1023

KORYŌ DYNASTY

Early Koryŏ

Operation of Taebokgam and Taesaguk for acquisition

1023~1275

Taebokgam > Sacheondae > Sacheongam > Gwanhuseo > Sacheongam

1308

Sacheongam & Taesaguk > Merged as Seoungwan (34th year of King Chungnyul)

1441

JOSEON DYNASTY

1441

Invention of the World's first rain gauge (23rd year of King Sejong)

1442

Establishment of a nationwide rainfall observation network (24th year of King Sejong)

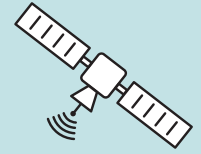
1466

Name change from Seoungwan Gwansanggam (12th year of King Sejo)

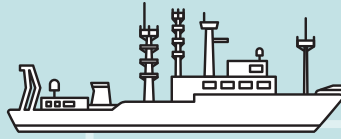
1818

Publication of the meteorological and astronomical book 'Seoungwanji' (18th year of King Sunjo)





1949~



1883



MODERN PERIOD

1883

Establishment of Joseon Maritime Customs (Incheon, Wonsan and Busan) The beginning of modern weather observation (20th year of King Gojong)

1894

Name changes from Gwansanggam > Gwansangguk (Meteorological observation Bureau)

1907

Residency-General Observatory (Incheon) and substations (Busan, Mokpo, Wonsan and Yongampo (Yongchen), Seongjin)
Establishment of meteorological stations (Pyongyang, Daegu, Gyeongseong) by the Korean Empire Government

1910

Take-over of weather services of the Korean Empire Government by the meteorological observatories and stations of the Japanese Government-General of Korea

1945

Weather stations of the Japanese Government-General of Korea changed to Meteorological Observation Bureau (Ministry of Education) of the US army military government in Korea



PRESENT

1949

Establishment of the Central Meteorological Office (CMO)

1956

Commencement of weather Observation by radar

1978

Establishment of the National Institute of Meteorological Research

1982

Name change to Central Weather Stations

1989

Commencement of weather observations at the South Pole Sejong Station

1990

Promotion to the Korea Meteorological Administration

2007

Entry into WMO Executive Council

2008

Establishment of the National Typhoon Center, Commencement of Digital Weather Forecast Services

2009

Enactment of the Weather Industry Promotion Act, Establishment of the National Meteorological Satellite Center and the National Meteorological Super Computer Center

2010

Launch of Cheollian Satellite
Establishment of Weather Radar Center

2011

Service Operation of Meteorological Observing Vessel (Weather 1)

2012

Relocation of the office of Global Information System Center (GISC) to Seoul

2014

Enactment of 「Act on Observation and Warning for Earthquake · Tsunami · Volcano」



Towards the Top

ORGANIZATION

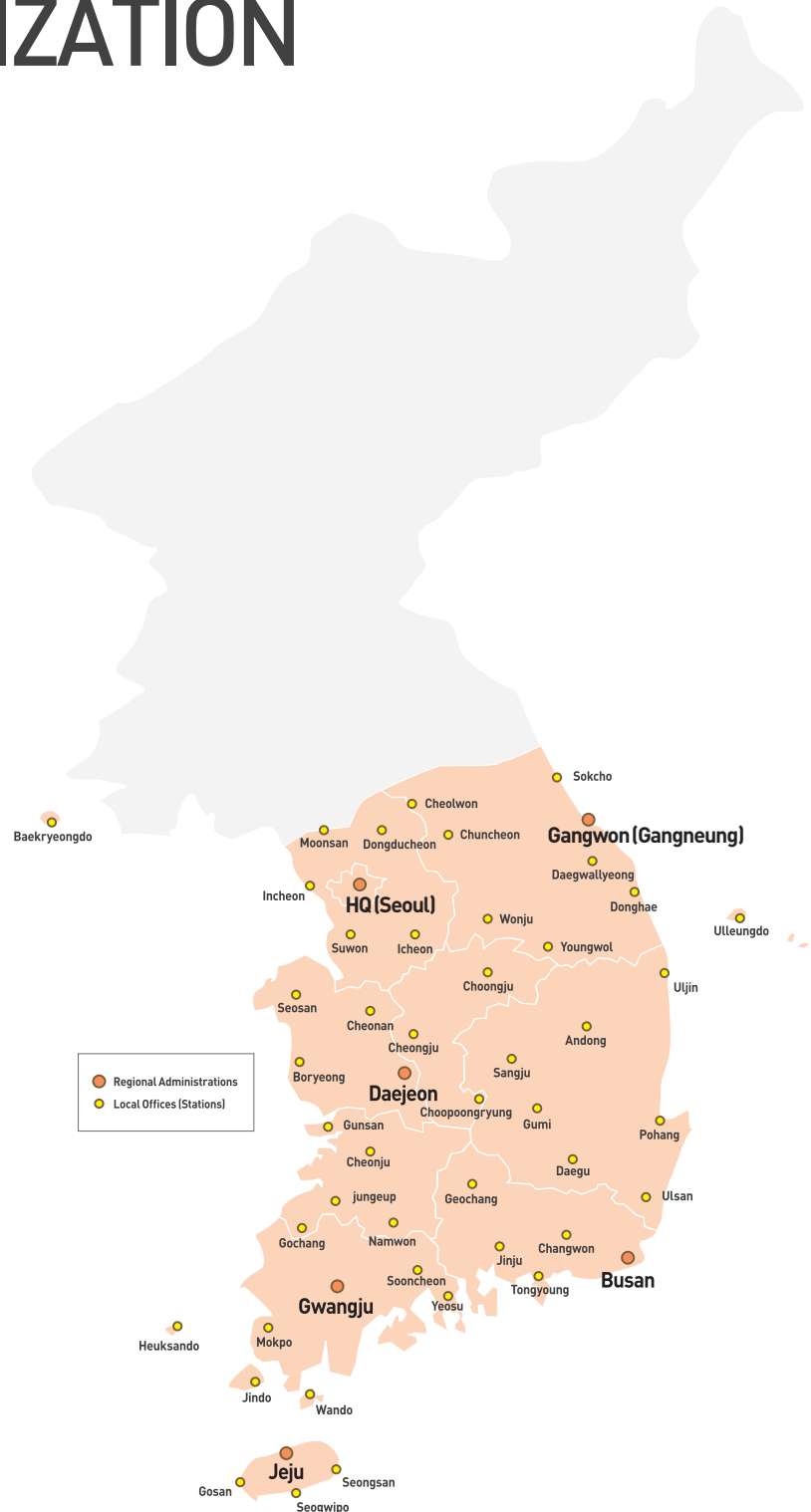
Function & Organization

The Korea Meteorological Administration (KMA) is a central governmental organization of the Republic of Korea under the Ministry of Environment (MOE). Its mission is to observe atmosphere, produce weather and climate information as well as forecasts, while conducting relevant research activities.

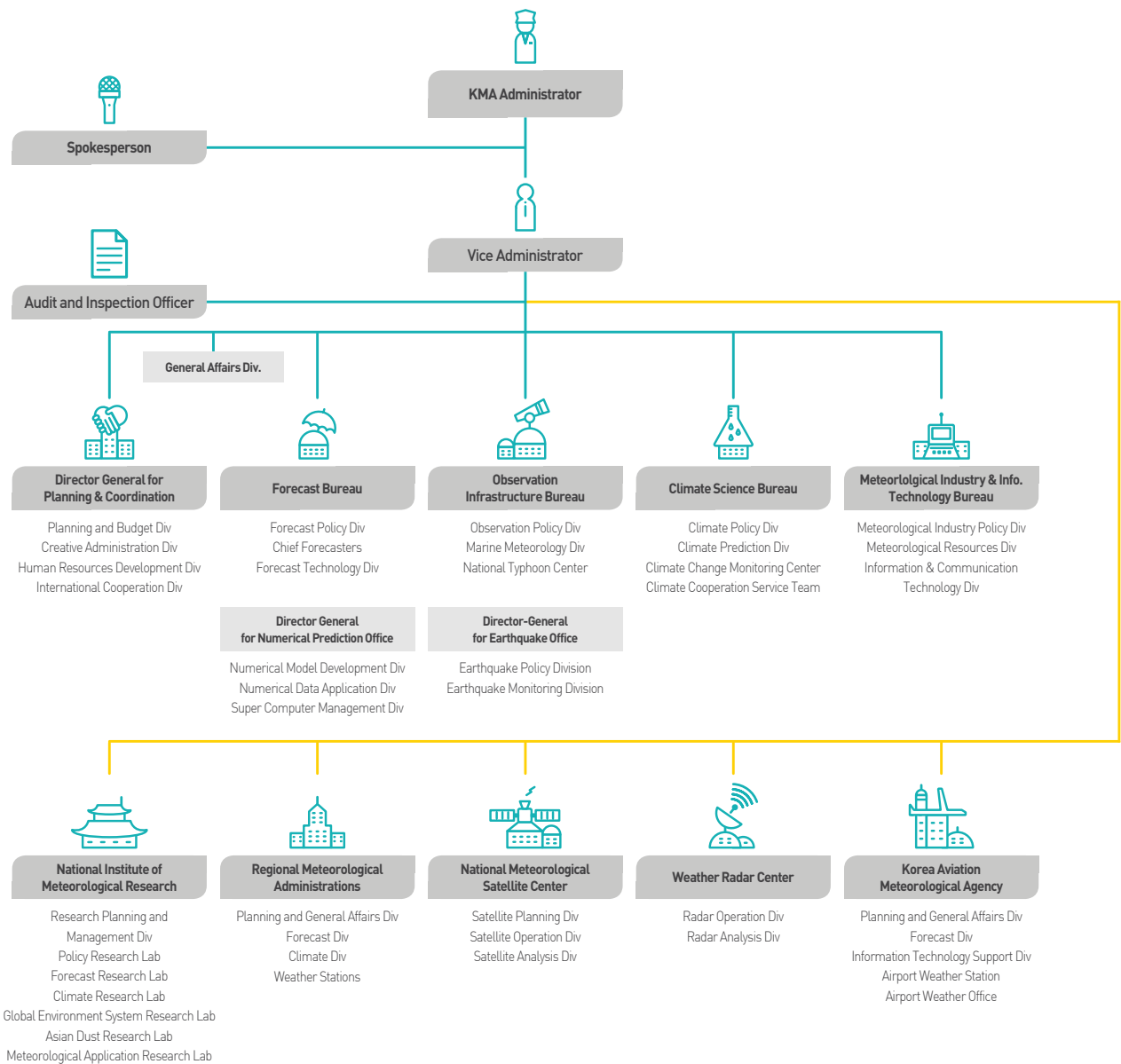
The KMA produces weather forecasts using a wide range of domestic observing data (surface, marine, satellite, radar, etc.) and those collected from countries around the world. With its principle mission of observation and forecast, the KMA is in charge of a variety of tasks, ranging from earthquake, volcanic eruption, climate change, meteorological and climate industry, hydrology to space weather.

In the era of climate change, the KMA is responsible for the national meteorological tasks to protect citizens' lives and properties, create future competitiveness and elevate the national standing in the global society.

The KMA consists of its headquarters in Seoul, five regional administrations in Busan, Gwangju, Gangwon, Daejeon and Jeju, 45 local offices, the National Institute of Meteorological Research (NIMR), the National Meteorological Satellite Center, the Weather Radar Center and the Korea Aviation Meteorological Agency. The KMA is striving for the highest standards to meet the growing demands for more complex and diversified meteorological tasks, while becoming more sophisticated and professional in terms of its human resources and the organizational structure.



Organizational structure



Number of staff members

(As of 2014. 12. 31.)

Category	HQ	NIMR	Regional		NMSC	WRC	KAMA			Total (67)
			Main (5)	Local (45)			Main	Station (4)	Office (8)	
Quota	401	74	213	449	42	33	45	41	28	1,326
Current	398	72	212	441	43	33	45	40	26	1,312

Human resources

As the modern society has rapidly become more globalized as well as knowledge- and information-oriented, the demand for a variety of specialized meteorological services is increasingly on the rise. To sustain qualified workforce for highly advanced meteorological services, the KMA recruited those who have master's and Ph. D degree through a special employment, while hiring Grade 9 public officials in meteorological position to secure working-level workforce additionally. Breaking the newly employed into their tertiary educational background, 3 with Ph. D and 7 with master's degree were hired through a special employment, and 39 Grade 9 public officials were employed through the KMA's open recruitment. As of the end of 2014, there are 457 master's and doctor's degree holders (Ph.D: 117, Master: 340), which accounts for 31.7% of the total number of staff members.

Number of qualified workforce (As of 31 December 2014)

Category	Degree	Year								
		Total	2014	2013	2012	2011	2010	2009	2008	2007
Special Recruitment	Ph. D	33	3	4	4	1	5	4	0	12
	Master	61	7	6	9	5	4	6	1	23
	Bachelor	16	5	0	4	2	2	0	1	2
	Sub-total	110	15	10	17	8	11	10	2	37
Open Recruitment		297	39	38	46	39	30	2	45	58
Total		407	54	48	63	47	41	12	47	95

Number of qualified workforce in each grade

Grade	Ph. D	Master	Bachelor	Diploma or lower	Total
High-ranking officers	8	9	-	-	17
Grade 3~4	34	27	10	5	76
Grade 5	50	79	74	34	237
Grade 6~9	25	223	642	156	1,046
Facility Management	-	2	15	50	67
Total	117	340	741	245	1,443

Financial Status

Budget Overview

The KMA's budget in 2014 is all complied into general accounts. The revenue is KRW 3,467 million, decreased by KRW 3,421 million or 49.7% from that of 2013, while the expenditure is KRW 349,041 million, increased by KRW 30,203 million or 905%, compared to the previous year.

The expenditure is classified into labor costs (KRW 77,547 million, increased by KRW 2,814 million or 3.8% YoY), basic expenditure (KRW 18,582 million, increased by KRW 471 million or 2.6% YoY) and major project costs (KRW 252,912 million, increased by KRW 26,918 million or 11.9% YoY). Those expenses account for 22.2%, 5.3% and 72.5%, respectively.

The major project expenses consist of general projects (KRW 78,791 million, 31.2%), R&D (KRW 119,268 million, 47.2%) and IT (KRW 54,853 million, 21.6%). Meanwhile, the expenses to establish new office buildings were transferred from the general accounts to the National Property Management Fund under the Ministry of Strategy & Finance (MOSF) from 2012, arranging KRW 16,157 million for new office building and staff residence in Ulsan and Cheolwon.

2014 Expenditure Budget for each Program

(unit : KRW million)

Classification	2013 budget (A)	2014 budget (B)	up(Δ)/down (B-A)	up(Δ)/down (B-A/A)
Total	318,837	349,041	30,203	9.5%
1. Weather forecast	41,347	39,073	Δ2,275	Δ5.5%
2. Weather observation	48,165	47,442	Δ722	Δ1.5%
3. Climate change sciences	13,869	13,612	Δ257	Δ1.9%
4. Weather industry information	25,813	27,885	2,072	8.0%
5. Meteorological research	70,031	101,249	31,218	44.6%
6. Performance-based agency operation	11,482	12,893	1,411	12.3%
7. Administrative affairs	108,130	106,887	Δ1,243	Δ1.1%

Financial Contributions to WMO

The proportional contribution of the Republic of Korea to WMO for the year of 2014 was 1.96%, which makes the country the 13th largest contributor among 191 Members.

The assessed contribution for the last 5 years

(Unit : CHF)

Year	2010	2011	2012	2013	2014
Assessment (%)	1,336,430 (2.14)	1,392,635 (2.23)	1,455,075 (2.23)	1,455,075 (2.23)	1,278,900 (1.96)

Besides, the Korean government provided trust funds for a variety of programs and activities in 2014, including for the Voluntary Contribution Program (\$30,000), ESCAP/WMO Typhoon Committee (\$12,000), WMO AMDAR Program (\$4,000), WMO THORPEX Project (\$1,000), IPCC (CHF 127,116), GEO (CHF 73,394), IOC Tsunami Program (\$1,000), and for GFCS (CHF 132,305).

▣ To become a leader in promoting public safety
and national economic growth



INTEGRATED ADMINISTRATION



Vision & Strategy

PROMOTING WEATHER INDUSTRY



INTERNATIONAL COOPERATION



Strategie 1

Upgrade weather services for the well-being of people/to benefit people

- ▶ Build capacities against severe weather events, while improving NWP models and setting up advanced forecasting system
- ▶ Provide local weather services to the public by advancing its delivery system

Strategie 2

Utilize climate and weather information to make the society more prosperous

- ▶ Support strategies to adapt and respond to climate change, while producing high-quality information on climate change science
- ▶ Enhance availability of climate data with integrated management, while improving its service system
- ▶ Develop strategic products for weather services, while implementing technology transfer & equipment localization

Strategie 3

Strengthen weather services for the decision-making process to make the country more resilient

- ▶ Establish an early warning system for earthquakes and a response system against volcanic eruption crisis
- ▶ Extend forecasting period, while subdividing forecasting districts
- ▶ Create social and economic benefits by integrating weather information with non-meteorological factors

Strategie 4

Promote global partnership for co-existence

- ▶ Promote differentiated weather cooperation between Seoul and Pyeongyang
- ▶ Strengthen KMA's roles within international organizations, while supporting developing countries
- ▶ Establish weather economic community among South Korea, China and Japan and global weather cooperation system

Strategie 5

Lay the foundation to carry out meteorological tasks for the future

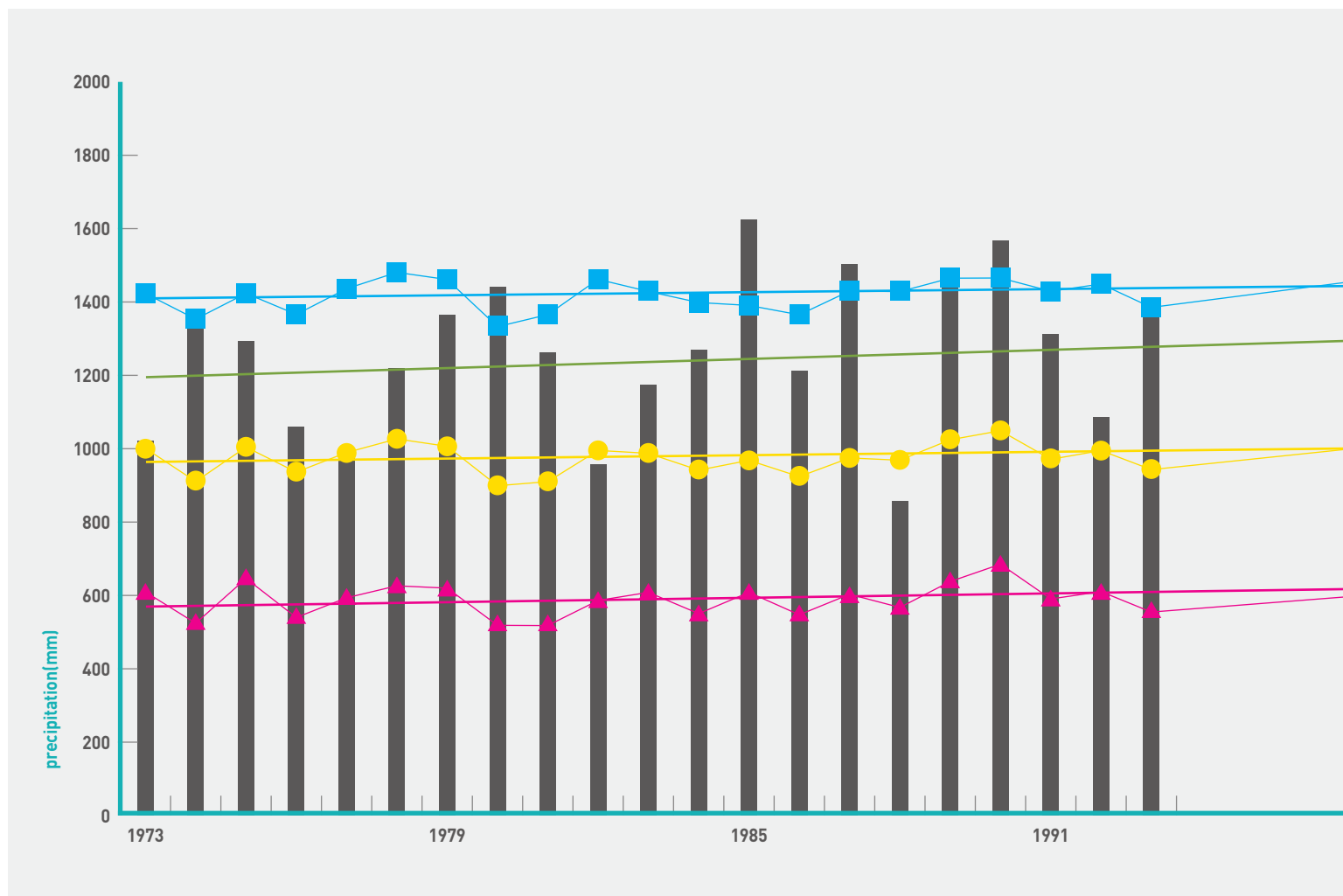
- ▶ Develop Korea's own NWP models, while acquiring world-class NWP technology
- ▶ Establish stereographic weather observation network based on sophisticated equipment
- ▶ Facilitate R&D for enhancing meteorological technology
- ▶ Expand the understanding and the base of meteorological science through distribution of meteorological culture

Timely, Accurate, and Value-added Weather Services

WEATHER TREND IN 2014

Fig. Mean temperature, mean maximum temperature, mean minimum temperature, and mean precipitation (1973-2014)

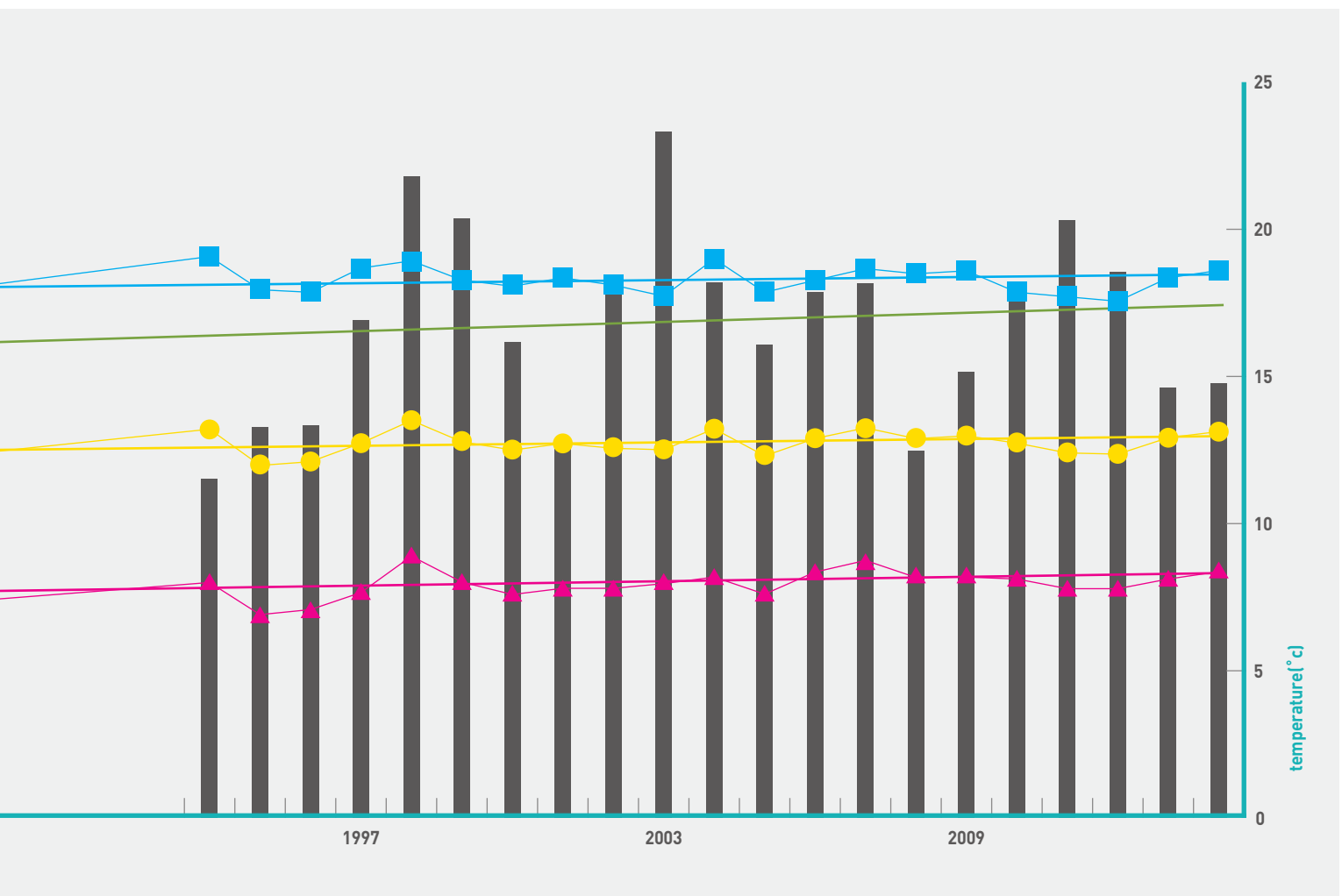
■ precip ● mean temp ■ mean maximum temp ▲ mean minimum temp
 — linear (precip.) — linear (mean temp.) — linear (mean max. temp.) — linear (mean min. temp.)



The annual mean temperature in 2014 was 13.1°C, while mean maximum and minimum temperatures showed 18.6°C and 8.4°C, respectively. Those figures were higher by 0.6°C, 0.5°C, and 0.7°C than those in the normal year. The annual mean precipitation was 1173.5mm which accounted for 89.8% compared to the normal, while the number of days with precipitation was 111.9 days, showing 8.4 days more than the normal value.

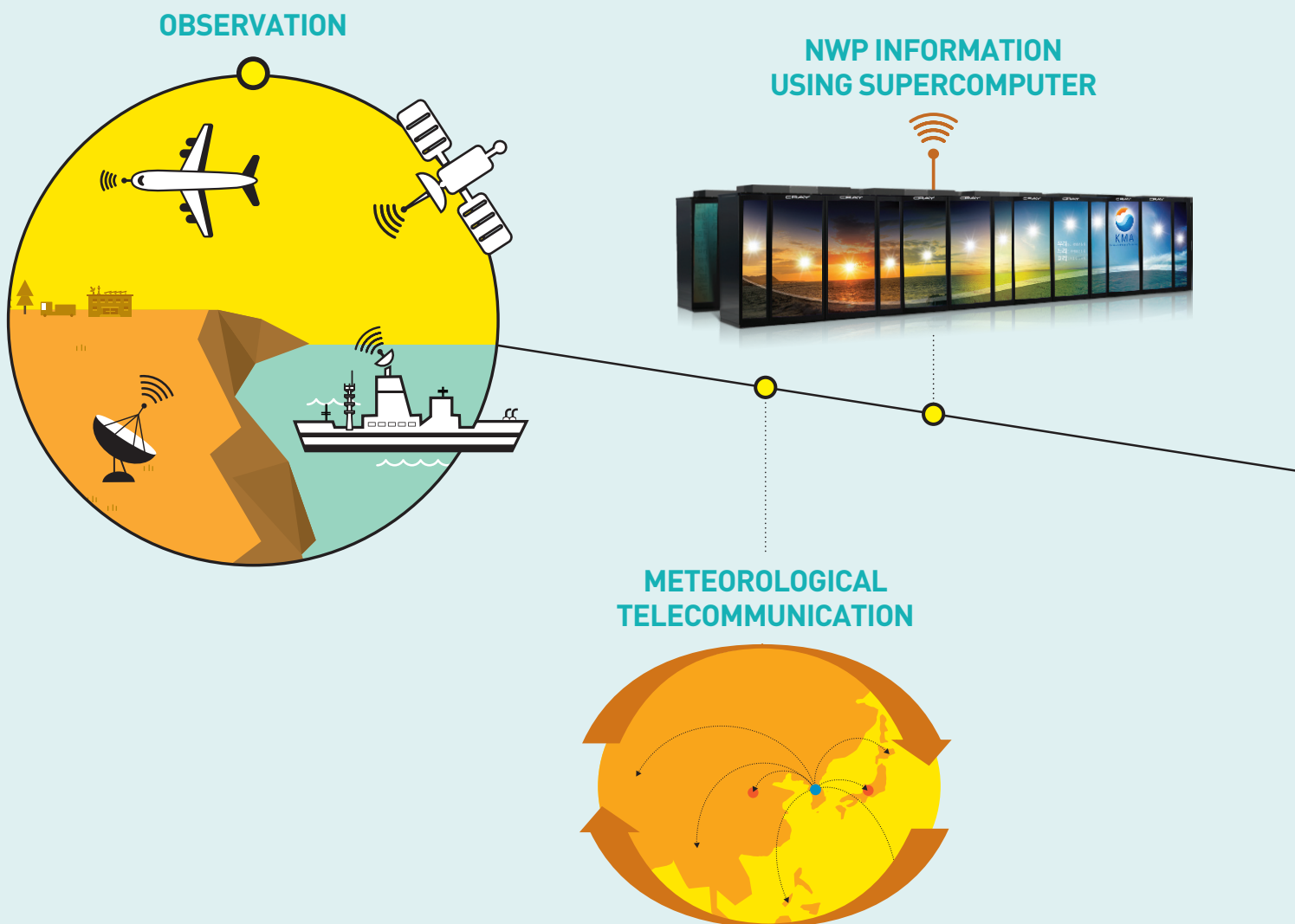
The annual mean, mean maximum, and mean minimum temperatures of Seoul City in 2014 were 13.4°C, 18.3°C, and 9.3°C, respectively, which were higher by 0.9°C, 1.3°C, and 0.7°C than the average. The amount of annual precipitation was 808.8mm (55.8% of average), while the number of days with precipitation was 101 days, showing 7.9 days less than the normal. The number of days with hourly precipitation higher than 30mm was 1 day (average: 3 days).

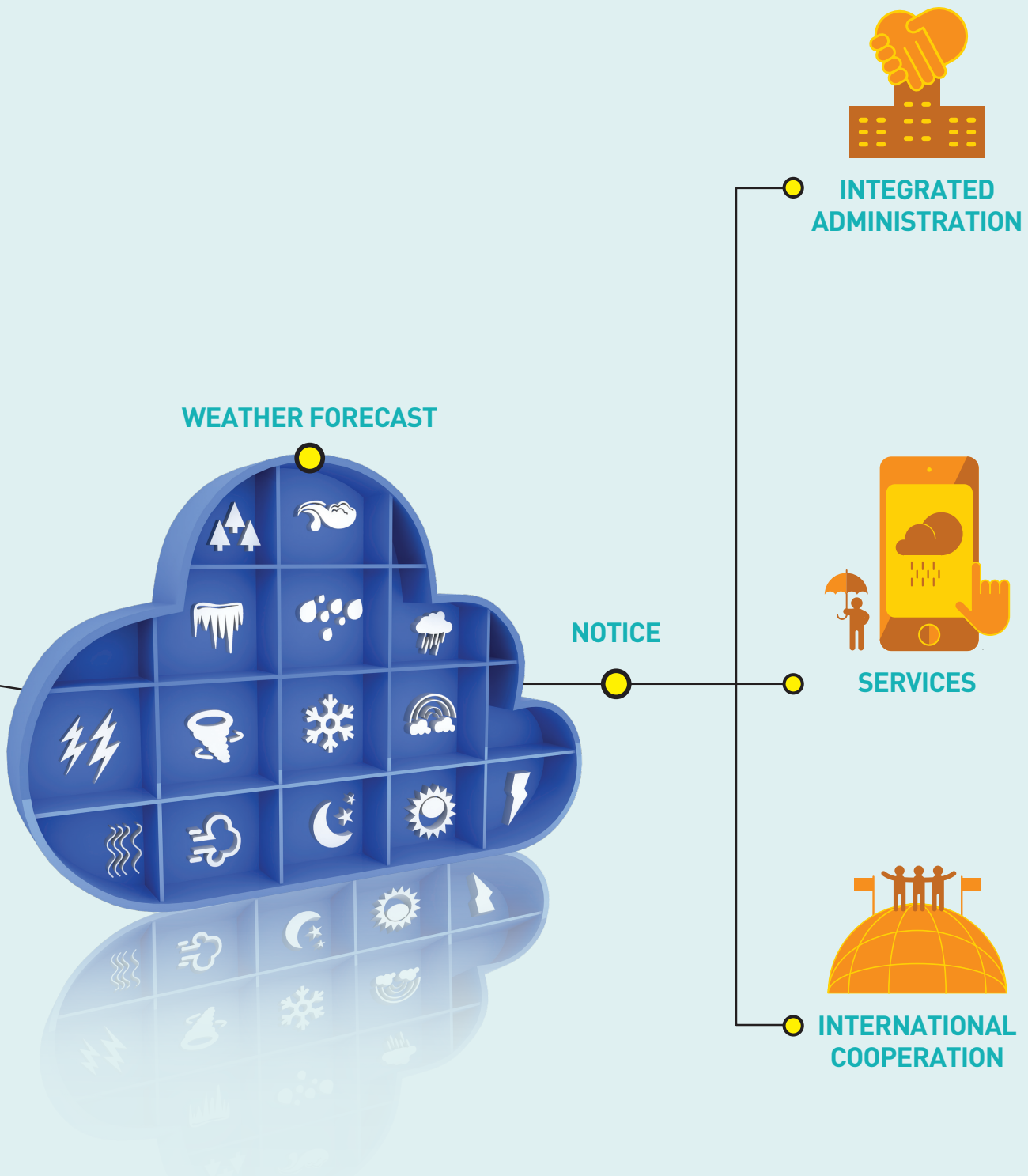
The Jangma period of 2014 lasted for 28 days in the middle part of the country (7.2~7.29, shorter than the normal), 28 days in southern area (7.2~7.29, shorter than the average), and 42 days in Jeju (6.17~7.28, longer than the normal).



Real-time Regional and Global Data Collection·Processing·Distribution via GTS

THE PROCESS OF NATIONAL METEOROLOGICAL SERVICES







APPENDIX

28 International Cooperation Activities of 2014

Multilateral Activities

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30 International Events held in Korea in 2014

INTERNATIONAL COOPERATION ACTIVITIES OF 2014

Multilateral Activities

The 26th Session of the WMO EC Panel of Experts on Education and Training (3.24~3.28, Seoul)



Informal Planning Meeting of the WMO Voluntary Cooperation Programme (3.25~3.27, Seoul)



Training Course on Information and Communication Technologies for Meteorological Services Left : (4.10~5.1, Seoul) Right : (5.29~6.18, Seoul)

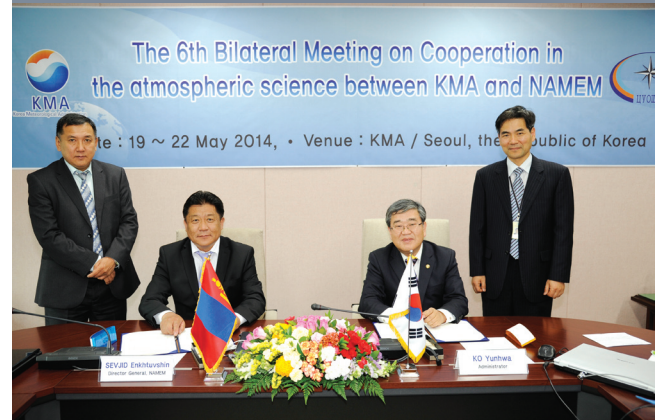


Bilateral Activities

The 4th Meeting between KMA and NOAA (3.17~3.19, Seoul)



The 6th Meeting between KMA and NAMEM (5.19~5.23, Seoul)



The 4th Meeting between KMA and NHMS (8.4~8.8, Hanoi)



The 2nd Meeting between KMA and BMKG (9.16~9.20, Seoul)



The 5th Meeting between KMA and DWD (10.26~10.31, Offenbach)



The 8th Meeting between KMA and Roshydromet (11.11~11.14, Seoul)



INTERNATIONAL EVENTS HELD IN KOREA IN 2014

International Training Course on Weather Forecasting of Operational Meteorologist (10.5~10.25, Seoul)



The 8th International Workshop on Tropical Cyclone together with IWTC-III (12.1~12.10, Jeju)



2014 International Cooperation Workshop (12.15~12.18, Yangyang)





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