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ANNUAL REPORT 2015

KOREA METEOROLOGICAL ADMINISTRATION

Korea Meteorological Administration

2015 ANNUAL REPORT

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Message from the KMA Administrator

It is a great pleasure to release the 2015 Annual Report of the Korea Meteorological Administration (KMA), the compilation of KMA's achievements from last year.

The year 2015 witnessed several abnormal weather events like El Niño across the globe. Korea was no exception, suffering substantial damage from prolonged drought with low precipitation and unusually warm weather during spring and winter.

The drought became serious in the 2nd half of 2014 and lasted until 2015, with total annual precipitation recording 948.2mm, 74% of the average. In particular, the overall rainfall in the middle region of Korea from January through October remained less than half of the historical average. This severely damaged agricultural and other industrial sectors while also triggering emergency water being trucked into drought-affected communities.

The nation also saw abnormally warm weather in May and December and rain spells in November that were frequent enough to be called Autumn *Jangma*, which had a significant adverse effect. In particular, the average temperature for December was the highest on record over the past 30 years. Such high temperatures incurred direct and indirect economic losses in relevant sectors with the cancellation of winter festivals and decreased demand for winter-related products.

To counter these issues, the KMA implemented various measures. These included the establishment of the Meteorological Disaster Prevention Team for systematic drought and hydro-meteorological management and the production of drought monitoring and prediction data. In addition, the scope of our weather information services was further expanded to those who manage vulnerable populations such as the elderly who live alone, disabled people, and babies, thus helping them better cope with the heat wave. As a part of this endeavor, we also provided the heat index for the public.

The durations of the very-short-range and short-range forecasts were also extended from 3 to 4 hours, and 55 to 67 hours, respectively, with the goals of effectively preparing for natural disasters and enhancing the quality of daily life for the public. The changes were made based on findings from our one-year pilot operation and assessment in 2014 to produce and offer official very short-range and short-range weather forecasts, which are now available on KMA's website and smartphone app.

The national weather observation standards set in 2007 were further upgraded through the standardization of most of the weather observation stations and equipment managed by municipalities and other disaster prevention-related organizations, with improved training designed for relevant managers. In addition, the observation network was reinforced to detect early

Watching the Sky Friendly, Serving the People Faithfully

snow cover and fog, which have recently caused tremendous damage. The two dual-polarization doppler radar systems that were installed have substantially improved the detection and accuracy of precipitation types and estimates, thereby minimizing blind spots in observation and increasing efficiency.

In 2015, the KMA newly opened the National Climate Data Center to ensure the effective use of the national climate data archives, while designing and implementing a pathway to create research-quality climate and weather data and thereby support private users and the meteorological industry in Korea. The Open Climate Data Portal was also created to promote free access to weather and climate data.

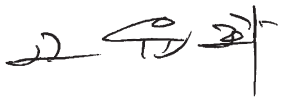
With the emergence of Big Data as one of the recent key trends, the KMA recognized the potential value of weather and climate information produced by each National Meteorological and Hydrological Services on a daily basis as one of the most influential Big Data. We hosted a nationwide Big Data forum, as well as built and operated an online Big Data analytics platform with the aim of combining weather and climate data with those from different fields, spanning from disaster prevention and water resources to tourism, healthcare, and transportation, thus offering new and added-value services.

The KMA was designated as a WMO Regional Training Center (RTC), further broadening our capacity to offer training to developing countries. Under the leadership of the WMO World Calibration Centre for SF_6, which was recognized in 2012, the KMA hosted the 7th Asia-Pacific GAW Workshop on Greenhouse Gases, attesting to our strong commitment to global climate action and efforts to monitor greenhouse gas.

We as the administration pledge to continue to develop meteorological technologies, promote their values, support developing countries to foster their capabilities, and engage in driving the global climate change agenda, thus contributing to the sustainable progress and welfare of the global climate and weather community.

I hope that this annual report will be a useful reference not only for related organizations around the world but also for those who have always shown interest in and support for the KMA.
Thank you.

Administrator
Korea Meteorological Administration
Yunhwa KO



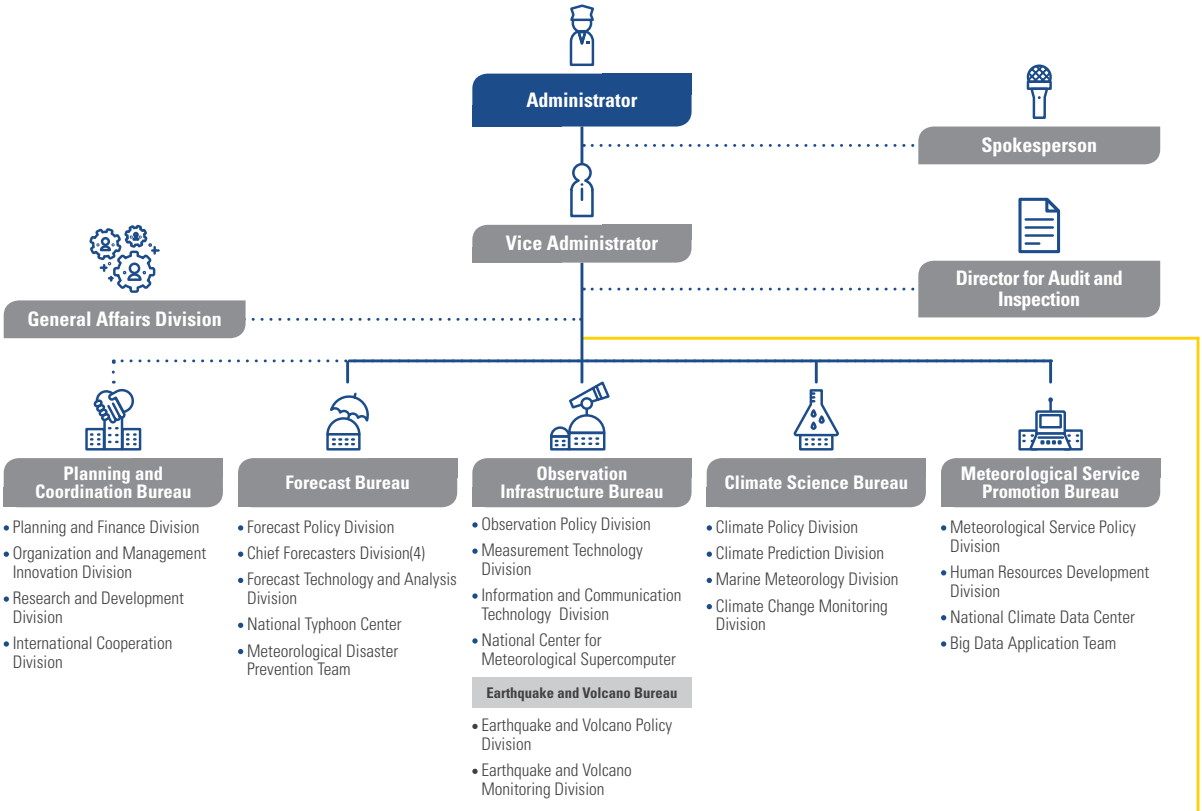
KMA 2015 in Brief

Organizational structure

Human resources

Budget

Organizational structure



▼ Number of staff members

(As of 31 December 2015)

Category	HQ	NIMS	Regional Offices			NMSC	WRC	AMO			Total
			Main (6)	Branch (3)	Station (7)			Main	Office (5)	Station (2)	
Quota	387	151	385	144	49	48	41	51	53	8	1,317
Current	386	151	383	144	50	49	41	50	53	7	1,314

Human Resources

To minimize the impact caused by abnormal weather events which the whole globe is facing now, the demand for a variety of specialized meteorological services is increasingly on the rise. To meet this ever-growing needs, the KMA hired outstanding and experienced personnel through competitive special recruitment, while additionally employing Grade 7 and 9 public officials in meteorological position to fill more working-level workforce. Breaking down the newly employed into their tertiary educational background, 5 with Ph. D and 6 with master's degree were hired through the competitive special recruitment, while 36 and 15 joined the Administration through the KMA's open recruitment for Grade 9 and 7 public officials, respectively. As of the end of 2015, there are total 480 incumbents who hold master's and doctor's degree (Ph.D: 121, Master: 359), which accounts for 32.8% of the total number of staff members of the KMA.

▼ **Number of qualified workforce (As of 31 December 2015)**

Category	Degree	YEAR									
		Total	2015	2014	2013	2012	2011	2010	2009	2008	2007
Special Recruitment	Ph. D	38	5	3	4	4	1	5	4	0	12
	Master	68	7	7	6	9	5	4	6	1	23
	Bachelor	17	1	5		4	2	2	0	1	2
	Sub-total	123	13	15	10	17	8	11	10	2	37
Open Recruitment		351	54	39	38	46	39	30	2	45	58
Total		474	67	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	8	-	-	16
Grade 3~4	37	29	12	6	84
Grade 5	52	90	73	25	240
Grade 6~9	24	231	673	144	1,072
Facility Management	-	1	9	39	49
Total	121	359	767	214	1,461

Budget

The KMA's budget in 2015 was all complied into general accounts. The revenue showed KRW 3,512 million, increased by KRW 4.5 million or 1.3% from that of 2014, while the expenditure was KRW 385,689 million, increased by KRW 36,648 million or 10.5%, compared to the previous year.

The expenditure is classified into labor costs (KRW 81,773 million, increased by KRW 4,226 million or 5.4% YoY), basic expenses (KRW 18,421 million, decreased by KRW 161 million or 0.9% YoY), and major project costs (KRW 285,495 million, increased by KRW 32,58. million or 12.9% YoY). Of the total, these classified costs account for 21.2%, 4.8% and 74.0%, respectively.

The major project expenses consisted of general projects (KRW 89,832 million, 31.5%), R&D (KRW 139,696 million, 48.9%) and IT (KRW 55,967 million, 19.6%). Meanwhile, the budget for constructing new office buildings were transferred from the general accounts to the National Property Management Fund under the auspicious of Ministry of Strategy & Finance (MOSF) from 2012, drawing up KRW 17,519 million for Ulsan, Cheolwon, and Cheongju weather stations.

▼ 2015 Expenditure Budget for each Program

(unit: KRW million, %)

Program Classification	2014 Budget (A)	2015 Budget (B)	Up(Δ)Down (B-A)	Up(Δ)Down(%) (B-A/A)
Total	349,041	385,689	36,648	10.5%
1. Weather forecast	39,073	43,056	3,983	10.2%
2. Weather observation	47,442	52,248	4,806	10.1%
3. Climate change sciences	13,612	13,907	295	2.2%
4. Weather industry information	27,885	29,511	1,626	5.8%
5. Meteorological research	101,249	121,974	20,725	20.5%
6. Performance-based agency	12,893	13,334	441	3.4%
7. International Cooperation, Education and Training, and PR	6,864	7,993	1,129	16.4%
8. Administrative affairs	100,023	103,666	3,643	3.6%

Overview of 2015

KMA News Highlights

Summary of Major Accomplishments

Weather in 2015

KMA News Highlights

Central Region Suffering Severe Drought

Most parts of Korea had low precipitation in 2015. The accumulated precipitation nationwide on average for the year 2015 (from Jan.1 to Dec. 31) was 948.2 mm, which is 359.5 less than the normal of 1307.7 mm or 72 percent of the average recorded in previous years. Seoul and Gyeonggi province had 53 percent of their normal year's precipitation, while Gangwon and North Chungcheong province had 63 to 65 percent of their average precipitation, which are at record low level since 1973.

▼ **The accumulated precipitation & percent of normal precipitation in 2015 by province**

Period \ Province		Seoul · Gyeonggi	Gangwon			North Chung cheong	South Chung cheong	North Jeolla	South Jeolla	North Gyeong sang	South Gyeong sang	Nation wide
			Entire region	Western	Eastern							
Accumulated precipitation (Jan.1-Dec.31)	Precipitation (mm)	709.8	887.4	788.3	1085.7	801.3	809.3	908.5	1238.4	801.0	1235.5	948.2
	Percent of normal (%)	53	65	60	76	63	63	70	88	72	85	72
	Normal (mm)	1336.0	1362.3	1326.8	1433.3	1277.8	1280.6	1293.6	1401.5	1123.4	1430.5	1307.7
Rank of the lowest precipitation (since 1973)		1	1	2	5	1	2	5	17	3	15	3

▲ **Soyang dam flooded area was revealed in 42 years (Jun. 18, by Yonhap News)**

Considering that the rainfall during the summer accounts for 50 to 60 percent of the annual precipitation, the nationwide drought was directly attributable to the lack of rain over the summer, which was only 54 percent of normal.

The central region, in particular, was hit hard by severe drought because during the summer monsoon season, the weakened high pressure ridge in the North Pacific, affected by the El Niño phenomenon, has hindered the formation of a rain front in the central region and the front rather moved down to the southern area.

The above-normal rainfall since November seemed to ease the drought conditions across the country. However, some parts of the nation continue to receive restricted water supply, and water levels at dams and reservoirs are still lower than normal.

To efficiently respond to more frequently occurring and climate-induced droughts, KMA is in preparation for drought forecasts and warnings in collaboration with related government agencies. It will also make continued efforts to predict the possibility of drought several months ahead based on climate prediction data.

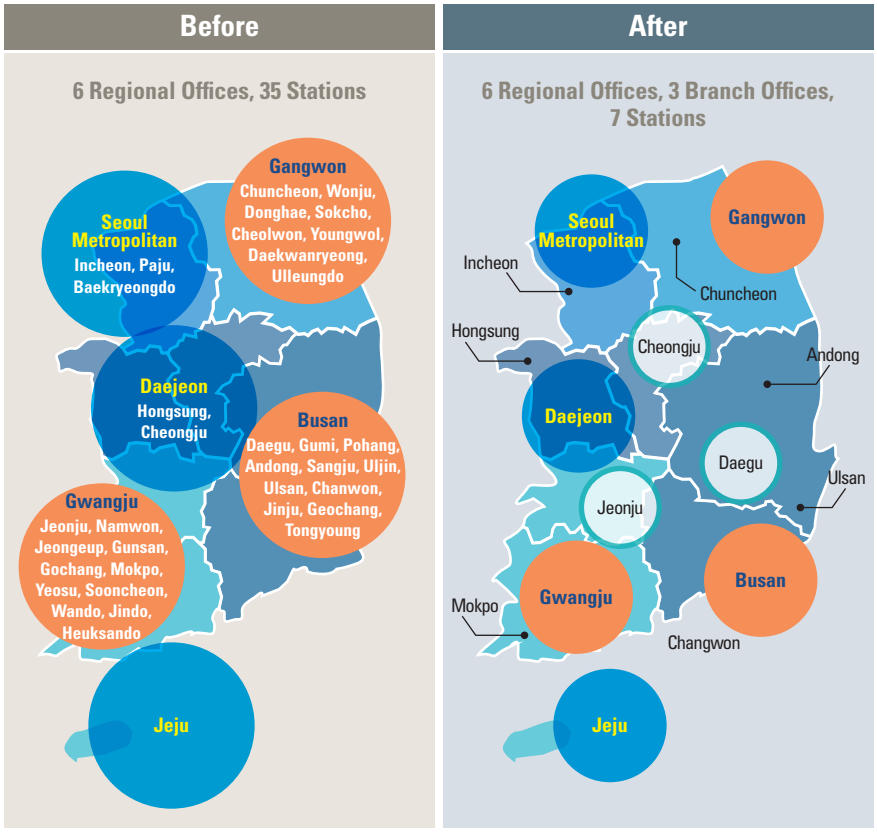
Regional offices reformed

The Korea Meteorological Administration reorganized its office units to improve the efficiency of organizational management: from five regional offices and 45 weather stations to six regional offices, three branch offices, and seven weather stations.

So far both observation and forecast-oriented work, and a complex process of forecasting with three levels of hierarchy (Headquarters → Regional offices → Weather stations), have made it difficult for regional meteorological offices to develop new weather and climate services and have reduced the efficiency in producing forecasts.

Weather stations, in particular, have been criticized for their inadequacy to respond to severe weather events since only one inexperienced low-ranking official was responsible for digital forecasts in each station.

To address these issues, the reorganization was focused on streamlining the forecast process, from three to two levels (Headquarters → Regional offices & Branch offices) and reinforcing customized weather and climate services to respective regions in order to respond to climate change in a more systematic manner.



45 weather stations nationwide have been reorganized into Seoul Metropolitan Office, three branch offices (Daegu, Jeonju, and Cheongju), and seven weather stations, to place one meteorological office for each metropolitan city and province. This allows regional and branch offices to become more responsible for forecasting so that forecasts can be generated from a broader range of areas. The restructuring has also retained the existing weather stations in metropolitan cities and province, where do not have regional or branch meteorological offices, to make regional collaboration on regional disaster prevention more smooth and efficient.

◀ Before and after the reorganization

Hoesung Lee elected as the Chair of IPCC

Hoesung Lee of the Republic of Korea was named as the 6th Chair of the Intergovernmental Panel on Climate Change (IPCC) on October 7, 2015, which is recognized as the world's most reliable body on climate change research. Dr. Lee is a professor at Korea University and served as one of the IPCC's vice-chairs.

The IPCC is an international organization founded in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP). Currently, it has 195 members and focuses on scientific research on climate change. The IPCC Assessment Reports produced by scientists from different countries provide scientific information on climate change, analysis of socioeconomic impacts of climate change, and climate change mitigation strategy, serving as a scientific basis for the negotiation of the UN Framework Convention on Climate Change.

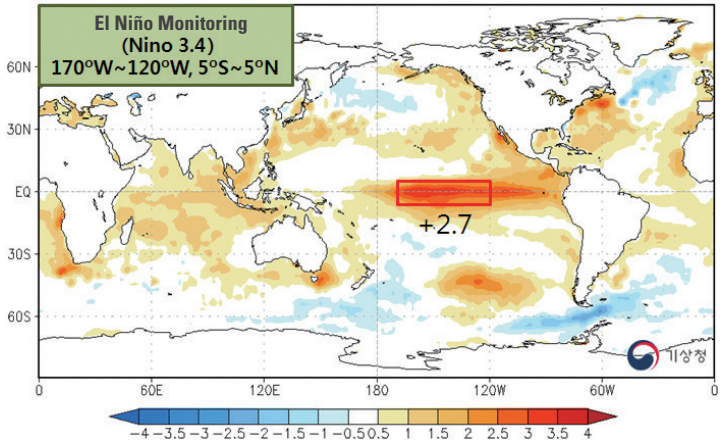
After his candidacy for the IPCC chairmanship was determined at a foreign economic minister's meeting in 2014, KMA formed an organizing committee to develop chairmanship campaign strategies to support Dr. Lee's candidacy for the IPCC Chair, in collaboration with the Ministry of Foreign Affairs and the Ministry of Environment. In addition, the Administration actively assisted his campaign by setting up a task force team (TFT supporting candidacy for the IPCC chairmanship) within the organization.

The new leader, Dr. Lee will be in charge of drawing up the Sixth Assessment Report (AR6) for around the next seven years. His election to the IPCC chair shows that Korea's efforts to mitigate climate change are highly recognized by the international community. Dr. Lee's IPCC chairmanship is expected to solidify Korea's position in the international community under the new climate change regime, as well as serving as a driving force in carrying out climate change policy in Korea.

The strongest El Niño in 18 years

El Niño is a climatic event that occurs when sea surface temperatures ranging from the tropical central Pacific to the coast of South America continue to be warmer than normal. When an El Niño occurs, ocean temperatures become warmer than average, resulting in a massive amount of heat to be released to the atmosphere. As the heat moves around the globe by atmospheric motions, it causes a variety of meteorological disasters.

According to the criteria for El Niño by the Korea Meteorological Administration, this year's El Niño has commenced since June, 2014. At that time, though sea surface temperatures in the tropical central and eastern Pacific were not too warm, the El Niño has become stronger since February 2015, reaching its peak in November and December, 2015. The current El Niño is about as strong as the 1997-1998 El Niño, which was the strongest since 1950.



▲ Global sea surface temperature anomalies during the winter 2015-16

During the year of El Niño, winter temperature in Korea is higher than normal and precipitation tends to be above normal. The occurrence of El Niño, however, does not mean it has consistent impacts on Korea because the location of warm waters and a period of the development and demise of El Niño are different for each El Niño event. For example, during the strongest ever El Niño in 1997 and 1998, Korea was warm and had a lot of rain in winter. On the other hand, when another powerful El Niño took place in 1982 and 1983, Korea had more cold days with less precipitation. In case of the 2015 El Niño, which is neck-and-neck with record-setting event of 1997-1998, Korea experienced the higher number of warm days with slightly more precipitation during the 2015-2016 winter.

The one of the strongest El Niño on record in 18 years has caused various extreme weather events around the world. India, Australia, and Indonesia suffered from a record-breaking heat wave and forest fire, and California in the U.S. was hit by heavy rain in June which is normally a dry season.

The Supercomputer facilitates data quality improvement

Improving the quality of meteorological information is vital to take preemptive measures against rapidly changing climate change and localized severe weather, improve benefits for people, and promote socio-economic values. Research found out that there are three factors impacting on the accuracy of weather forecasts: performance of NWP model (40%), quality of observation data (32%), and forecasters' capability. Among others, a key to enhancing NWP model performance and data quality is performance of a supercomputer.

Against this backdrop, the Korea Meteorological Administration has successfully introduced the 4th supercomputer to set up advanced supercomputing environment, which has theoretical performance of 5,800 TF (the amount of data requiring 5 billion people to perform for a year can be calculated in one second), 7.7 times faster than the previous supercomputer-3.

Since March 2016 KMA has started using the supercomputer-4 as a main system for operational numerical weather forecasting, and from June 2016 it will be running the high resolution Global Data Assimilation and Prediction System (GDAPS) (17km), local ensemble prediction model (3km), and long-term prediction model (Glosea5) for operational use. In addition, the Administration plans to develop national standard climate change scenario (globe: 60km/integration of 8,000 years) to produce scientific, quantitative, and objective data required for national policy-making (on carbon emissions, etc.) and make use of the scenario for a Korean version of NWP model.

The 4th supercomputer is expected to play a big part in improving proactive response to severe weather and quantitative precipitation forecasts, as well as contributing to invigorating and advancing national research on atmospheric science through the expansion of computer resources in external organizations including universities with atmospheric science programs.

▲ History of meteorological supercomputers in KMA

One stop service portal for weather data opened

"Open Weather Data Portal (data.kma.go.kr)" started its official operations for related organizations on July 16 and for the general public on August 26. As part of a new vision for government policy called "Government 3.0", which places emphasis on openness and sharing government-owned data, this portal provides all the weather related data produced and managed by the Korea Meteorological Administration in one place. Before the opening of this portal, it was difficult for users to know where to turn for reliable information because users had to visit different websites for different types of data. Besides, the data formats were not unified either. To address such issues, the online data archive that improved the ease of access of reliable weather data was created.

The Open Weather Data Portal offers various weather data, such as temperature, precipitation, wind direction and wind speed, in the standard format of CSV files, with descriptions. The data archived in the portal can be downloaded for free, and its open format allows users to use the data on any applications. As a result, over the last three months, the number of weather data provided by the portal was 16 times higher than in the previous year, showing the portal has encouraged private sector to use weather data.

The purpose of this portal is to open up public weather data to the public in an accessible, easy to understand, and easy to use way, under the Government 3.0 initiative. The release, sharing, and utilization of public data owned by the government are expected to create new industries and jobs, generating economic values.

▲ 'Accessible, Understandable, and Usable' Open Weather Data Portal

Cloud-Based Meteorological Information System for Disaster Prevention

The Korea Meteorological Administration (KMA) has built a knowledge-based advanced forecast system for forecasters since 2010. Since 2014 the Administration has set its goal to spread the use of the system in society in order to enable different organizations utilizing weather data to make use of KMA's advanced severe weather monitoring and analysis techniques without additional costs.

In line with this goal, KMA has established a cloud-based meteorological information portal system for disaster prevention and started its official operation since May 15, 2015. This system now has expanded to academia, research institutions and private companies. The number of subscribers during the year of 2015 was 19,670 from 513 organizations. The average number of daily visitors to the system recorded 683,586. In particular, the visits made by Air force, Navy, and other national defense-related agencies were high.

The existing disaster prevention information system was a single web portal service, operated separately from KMA's internal system, whereas this cloud-based information system includes severe weather monitoring and integrated weather analysis service. The new system is also designed to share the meteorological data which is the same as in the KMA internal system, laying a foundation for sharing various meteorological data with external organizations.

The could-based meteorological information system for disaster prevention was implemented as part of the performance management task of "Government 3.0 Citizens Policy Design Group". The system has reflected feedback and opinions from citizens which were raised in the process of service improvement and distribution, and in particular, it was highly recognized as a best practice as being awarded for excellence in the 2015 Digital Government Contest.

With government departments jointly using and sharing this meteorological information portal system, which is integrated with the latest advanced meteorological and IT technology, KMA aims to reinforce disaster management and establish a foundation for joint response to disasters in order to contribute to preventing Korea from meteorological disasters. The Administration also plans to constantly receive feedback from users to improve the system, providing more advanced services.

Summary of Major Accomplishments

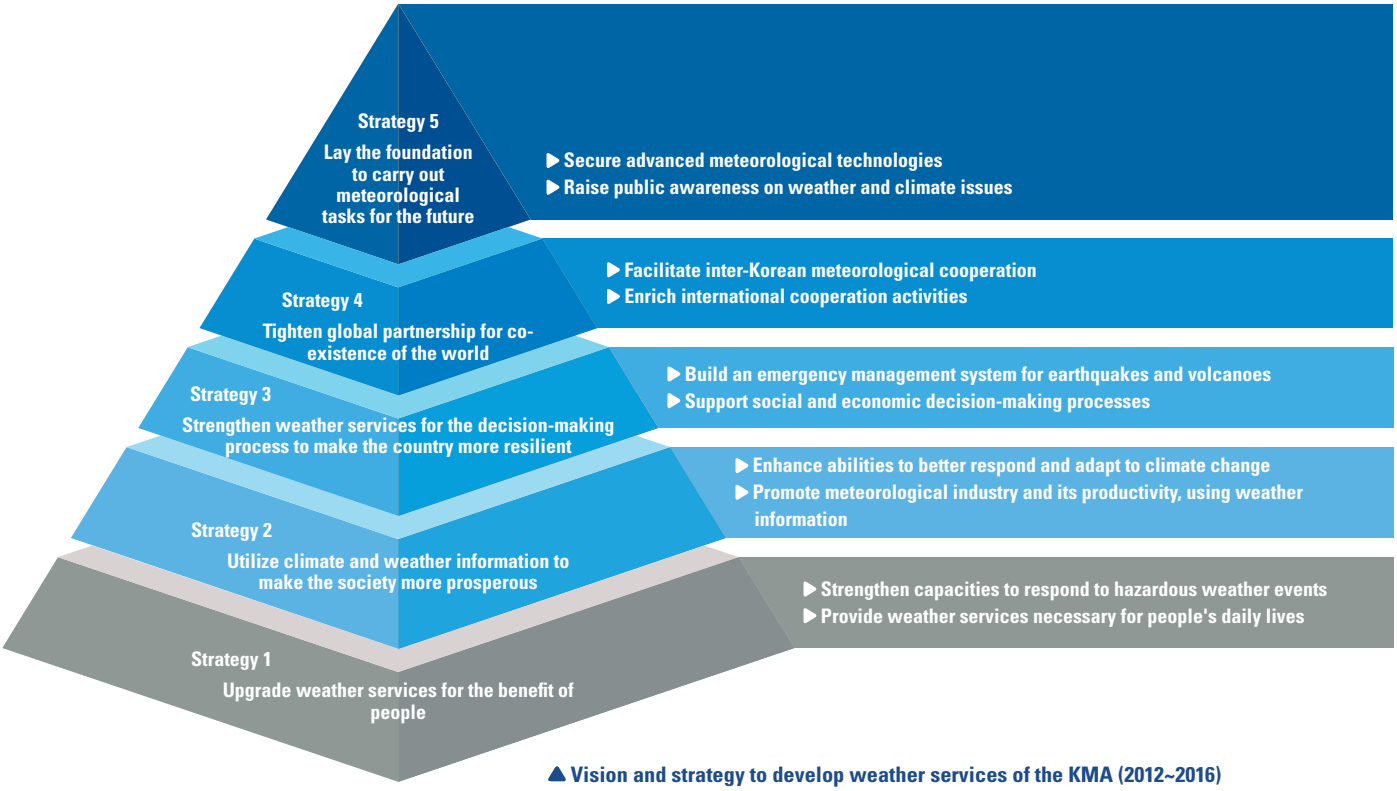
To become ready for the growing social and economic demands, the Korea Meteorological Administration (KMA) established a plan to advance its meteorological services during the period from 2012 to 2016. Based on this plan, it has been implementing the 5 strategies to achieve the 3 goals such as to take preemptive measures in responding to national agenda, to enhance the meteorological infrastructure while securing cutting-edge technologies, and to build the global weather and climate community.

Vision

To ensure public safety and national economic growth by adding values to weather and climate services

Goals

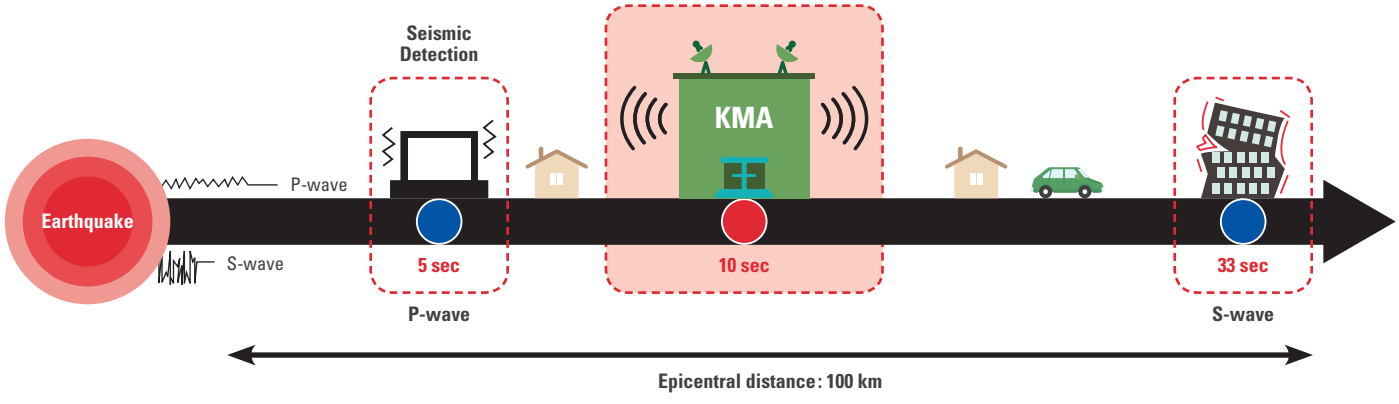
- ▶ Respond proactively to national agenda
- ▶ Secure cutting-edge meteorological technologies, while enhancing relevant infrastructure
- ▶ Reinforce global weather and climate networks



▲ Vision and strategy to develop weather services of the KMA (2012~2016)

In 2015, the KMA focused on improving its capability to deal with severe weather events, building the foundation to create values of weather and climate information, enhancing its support for the social and economic decision-making process, and increasing transparency and efficiency of its administrative functions under the catchphrase of 'Weather and Climate Big Data that Creates Economic Values & Meterological Services Shared with Private Partners'.

First, it consolidated some of the local weather stations to centralize the dispersed forecasting functions, while extending the length of its forecasts from 3 to 4 hours for the very short-range and from 2 to 3 days for short-range. It also began early warning services for earthquakes which provides the information within 50 seconds when an earthquake with the magnitude of 5.0 or more occurs. Additionally, trial operations of fog warnings based on the cooperation with the related agencies were initiated from March. The duration of predictions for the environmental phenomenon including haze and yellow dust were extended up to 3 days. By establishing the Disaster Prevention Information System based on the cloud computing, cooperative frameworks among relevant agencies were further upgraded. Meanwhile, the newly introduced 4th supercomputer shortened the time taken to operate and produce high-resolution numerical models and the model outputs. The precipitation has been better detected thanks to the installation of the two dual polarization radars. The surface and marine observing network was gradually reinforced to minimize the observation gaps across the country.



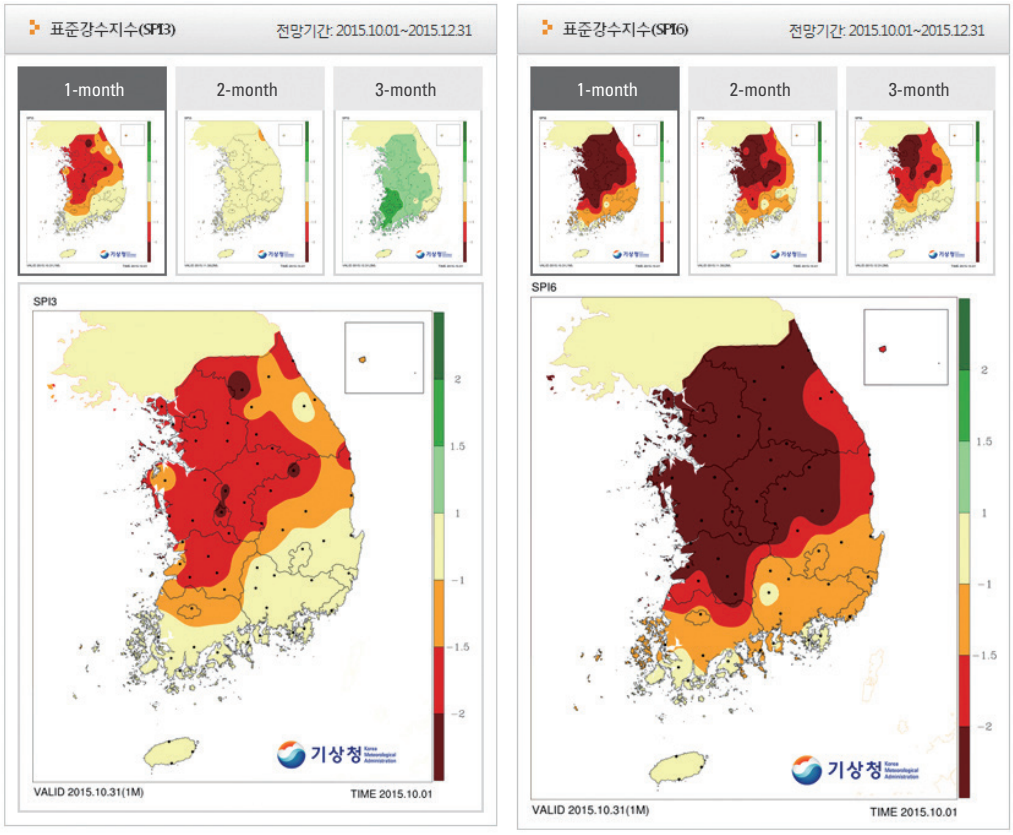
▲ Early Warning Services for Earthquakes

▲ The 4th Supercomputer

The KMA used every endeavor to help the meteorological industry in terms of setting up a new business in this field and their productization of NWP outputs into customer-specific services by transferring meteorological technologies to private sectors, whilst consistently developing localization technologies for meteorological equipments. The Administration also exerted efforts to open the door to enter the external markets of meteorological industry by dispatching investigation teams consisting of those from both public and private sectors to the outside world to build a foundation to support the exportation. Expanding the practical bilateral cooperation with developing countries was also a focus area of the KMA in 2015. It built the Weather and Climate Big Data Analysis Platform and opened for the public sector first, while operating the Open Weather Data Portal (https://data.kma.go.kr) and thereby to widen the big data services as well as the public usage of weather data. Meanwhile, the election of Dr. Hoesung LEE as the Chairperson of the IPCC served as a new driving force to lead the international policy related to climate change.

To support the social and economic decision-making process, it strengthened its assistance for the preparedness towards the hydro-meteorological disasters such as droughts and floods by providing drought outlooks and hydro-meteorological prediction information on the areas of Han River to the other governmental agencies. The roadmap to build a capacity on long-range forecasts with the aim of vitalizing the applications of long-range forecast information to the

social, economic, and industrial sectors. Through this, the KMA plans to increase the accuracy of its long-range forecasts up to 50% by 2020. To improve the weather services closely related to the public health, the KMA provides SNS service with the daily weather information to the government officials in charge of taking care of the vulnerable. The KMA also helped the successful management of the international sports events such as Universiade Gwangju 2015 by providing specific weather information for the game venues and established a plan to assist Pyeongchang Winter Olympic Games 2018 with the installation of observing equipments.



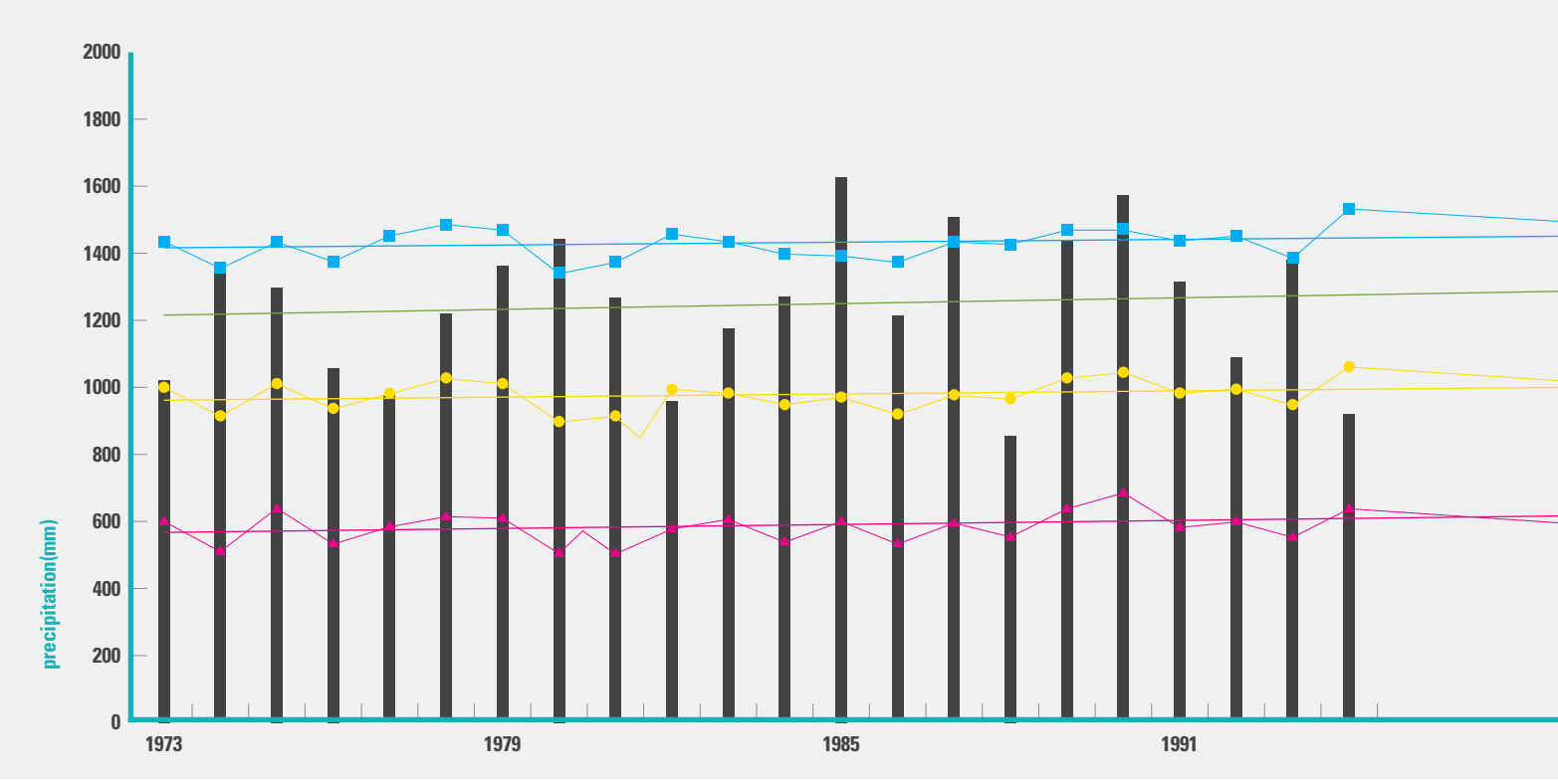
▲ 1-month and 3-month Draught Outlooks

Weather in 2015

The annual mean temperature in 2015 was 13.4℃ with the mean maximum and minimum temperatures showing 18.8℃ and 8.7℃, respectively. Those figures were higher by 0.9℃, 0.7℃, and 1.0℃ than those in the normal year. The annual and the mean minimum temperatures had ranked the second highest figures since 1973. The annual mean precipitation was 948.6 mm which accounted for 72.1% compared to the normal, while the number of days with precipitation was 112.8 days, showing 9.3 days more than the normal value. This annual mean precipitation had been the 3rd lowest record since 1973.

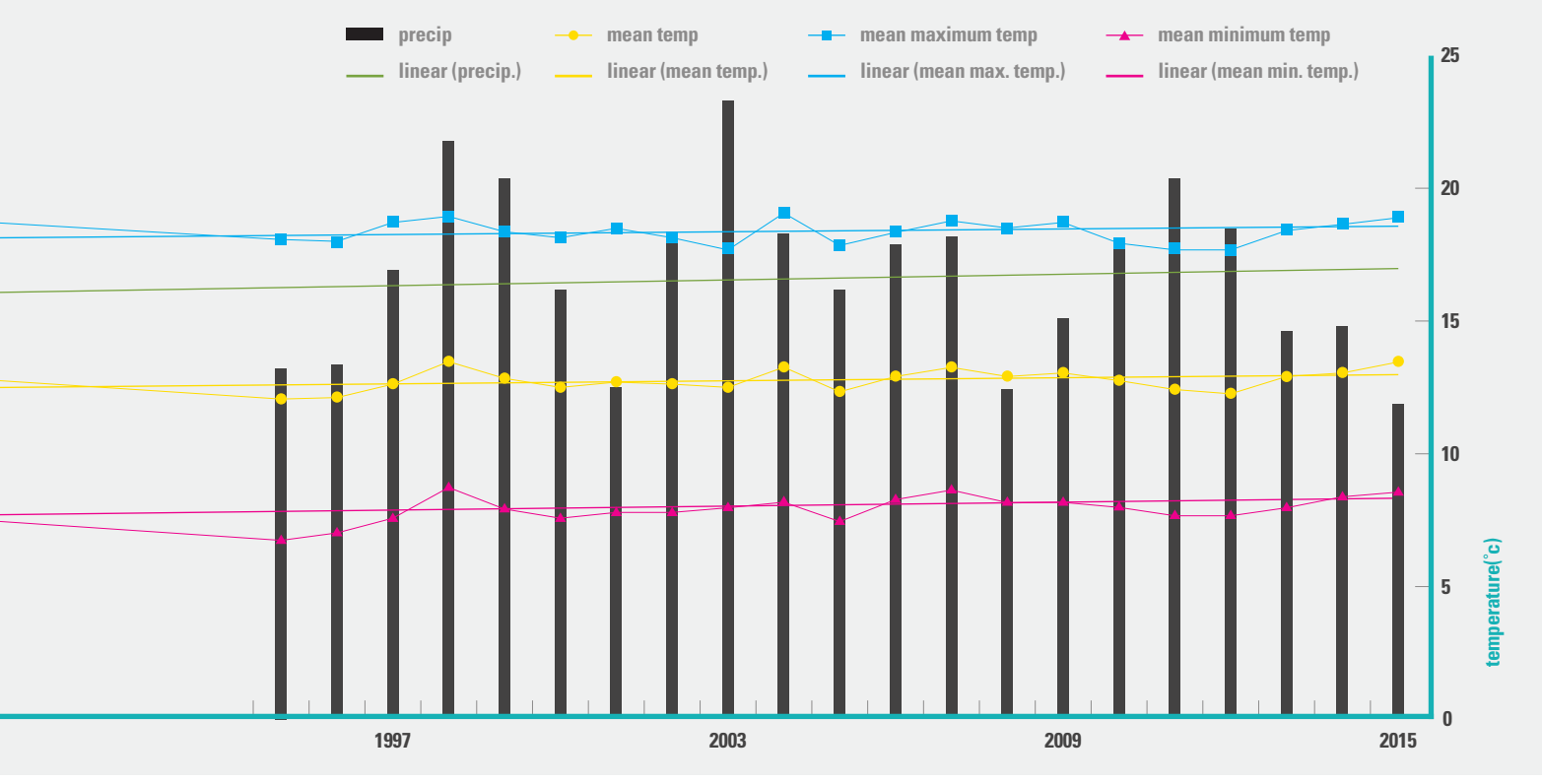
The annual mean, mean maximum, and mean minimum temperatures of Seoul in 2015 were 13.6℃, 18.7℃, and 9.3℃, respectively, which were higher by 1.1℃, 1.7℃, and 0.7℃ than the average. The annual mean maximum temperature of the city was the highest figure since 1908. The amount of annual precipitation was 792.1mm (54.6% of average), while the number of days with precipitation was 104, showing 4.9 days less than the normal.

▼ **Mean temperature, mean maximum temperature, mean minimum temperature, and mean precipitation (1973-2015)**



The Jangma (Korean monsoon system) period of 2015 lasted for 35 days in the middle part of the country (6.25.~7.29., longer than the normal), 36 days in southern area (6.24.~7.29., longer than the normal), and 30 days in Jeju (6.24.~7.23., shorter than the normal). The average precipitation across the country during the Jangma season for the last 30 years (1981~2010) showed 356.1 mm with the 17.1 days of precipitation, whereas that of 2015 showed 240.1 mm with the 17.5 days of precipitation.

When considering the long-term trend, it can be said that the annual mean temperatures of Seoul and the country as a whole have gradually increased. In particular, the annual mean minimum temperatures show relatively higher rise.



Key Activities of 2015

Weather Forecast

Observation

Climate

Data Services

Earthquake

International Cooperation

International Education and Training

Weather Forecast

Extended Period for Very Short-Range and Short-Range Forecasts

Extending the forecast period was suggested in 2011 with the aim of contributing to improving the convenience in everyday life of the public. To this end, the KMA established a Task-force Team to investigate relevant technologies to extend the period of short-term forecasts in 2013. and in 2014, the detailed plan was set up to provide the weather forecasting services that meet the ever growing public needs on the high quality weather information.

The trial services with the extended digital forecasts from 2 to 3 days were provided from March 2014 for one year. The result showed that the accuracy on the precipitation forecasts out to 67 hours was 91.4%, demonstrating that the high quality of forecast was maintained as the precipitation forecast out to 55 hours showed 91.5% in terms of its accuracy.

After 1 year of test operations, thus, the KMA began its regular services with the short-range forecast made for a time period up to 67 hours (previously up to 55 hours) and the very short-range forecast up to 4 hours (previously up to 3 hours) from 31 March 2015.

▼ **Very short and short-range forecasts**

		Previously	Current
Very short-range forecast		+3h	+4h
Short-range forecast	period	+55h	+67h
	overall condition	today & tomorrow	today, tomorrow & the day after tomorrow
	text	• 5:00: today & tomorrow • 11:00, 17:00, 23:00 : today & tomorrow morning of the day after tomorrow (~12:00)	• 05:00, 111:00, 17:00, 23:00: today, tomorrow & the day after tomorrow (~24:00)

▼ Very short-range forecast

(Note : current weather / very short-range forecast / Additional forecast)

time / issuing time	04	05	06	07	08	09	10	11	12
05:30	5:00	6:00	7:00	8:00	9:00				
06:30		6:00							
07:30			7:00						
08:30				8:00	9:00	10:00	11:00	12:00	
09:30					9:00				
10:30						10:00			
11:30							11:00		
12:30								12:00	

▼ Very short-range forecast

(Note : short-range forecast / Additional forecast)

	Date	Today								Tomorrow								The day after tomorrow							
	hour / issue	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
Digital	5:00																					◎	◎	◎	◎
	8:00																					◎	◎	◎	◎
	11:00																					◎	◎	◎	◎
	14:00																					◎	◎	◎	◎
	17:00																								
	20:00																								
	23:00																								
	2:00																								
Text	5:00	Morning				Afternoon				Morning				Afternoon				Morning ◎				Afternoon ◎			
	11:00					Afternoon				Morning				Afternoon				Morning				Afternoon ◎			
	17:00					Afternoon				Morning				Afternoon				Morning				Afternoon ◎			
	23:00					Afternoon				Morning				Afternoon				Morning				Afternoon ◎			

Observation

Weather Observation Standardization

Since 2007, the KMA has been carrying out a project to standardize the weather observation across the country by improving the observing environment and avoiding duplicated installations of the same equipments and thereby to increase the accuracy of the observation data as well as its collaborative applications. Through training, and workshops, the KMA supports the 27 public agencies which conduct observations, so that they can diagnose their level of standardization and comply the related laws and regulations.

To obtain and maintain the best suitable observing environment, the KMA secured additional land to build standardized observing sites, while upgrading 506 among 572 sites to the highest level of standardization at the end of 2015.

In 2015, several meetings such as 'Weather Observation Standardization Committee' and 'Weather Observation Standardization Working Committee' were held to come up with more reasonable collaborative frameworks.

The Administration formed a Help Desk consisting of 27 staff members to instruct technologies related to observation standardization and to promote the utilization of the joint application system. In particular, it analyzed and solved the problems with telecommunication system and data processing to collect more data from other observing agencies including municipal governments in 2015.

In addition, the KMA held the 'Help Desk Workshop on Weather Observation Standardization' twice in March and December to raise awareness on the standardization with several other workshops to discuss how to share observing data and to increase the data quality, which ultimately contributed to the increased cooperation among related agencies in terms of high quality data sharing.

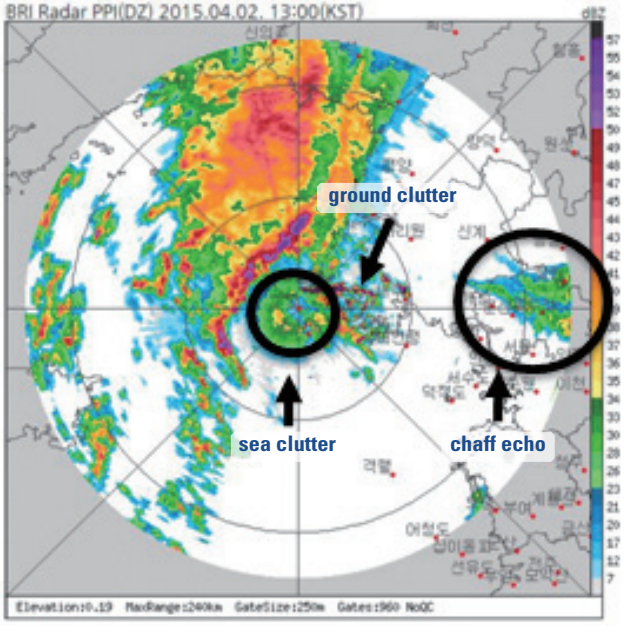
Development of Application Technologies of Dual Polarization Radars based on multi-agency cooperation

For rapid detection and prediction of High Impact Weather events, the Weather Radar Center (WRC) of the KMA plans to upgrade its conventional doppler radar system to dual polarization radars from 2014 to 2019, while carrying out a R&D project to develop the application technologies of the dual polarization radars (data processing, precipitation estimation, better determination of types of precipitation, etc.) based on multi-agency cooperation. The year of 2015 was the research phase to secure source technologies of dual polarization radars.

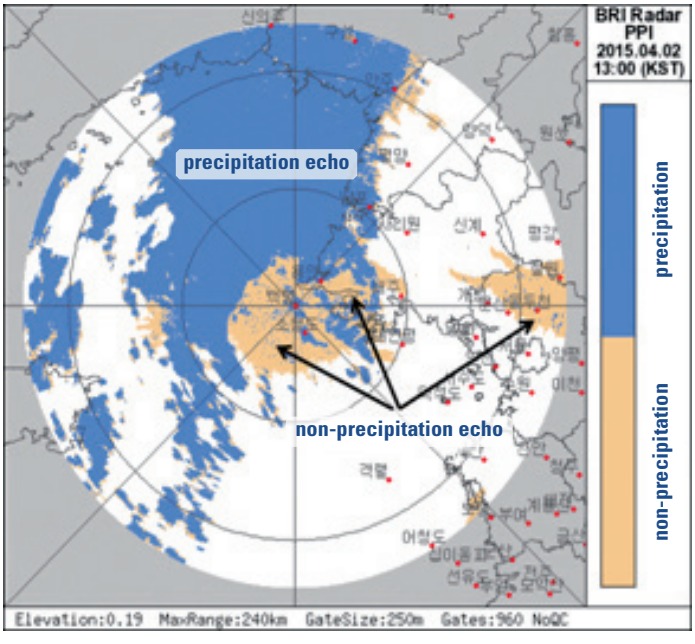
There were 3 specific goals in terms of the dual polarization radar technology development during 2015, including the development of data processing technology, application technology to assist forecasting, and application technology for multi-agency cooperation.

First, the WRC developed the best suitable data processing technology for each radar site using fuzzy algorithms, while conducting researches on the identification of types of precipitation and (non) precipitation echoes, the analysis of cases with bright bands, and the development of 7 algorithms to distinguish between rain and snow considering the characteristics of the Korean precipitation.

To assist forecasters, it analyzed the data from the verification equipment of radar test site in Jincheon and the characteristics of the Korean precipitation using the result of the analysis. It also improved and verified the technology to estimate the amount of precipitation using the radars, while developing a simulator for local forecasting models.



▲ Provision of reflectivity image of radar (DZ) in Baekryeongdo

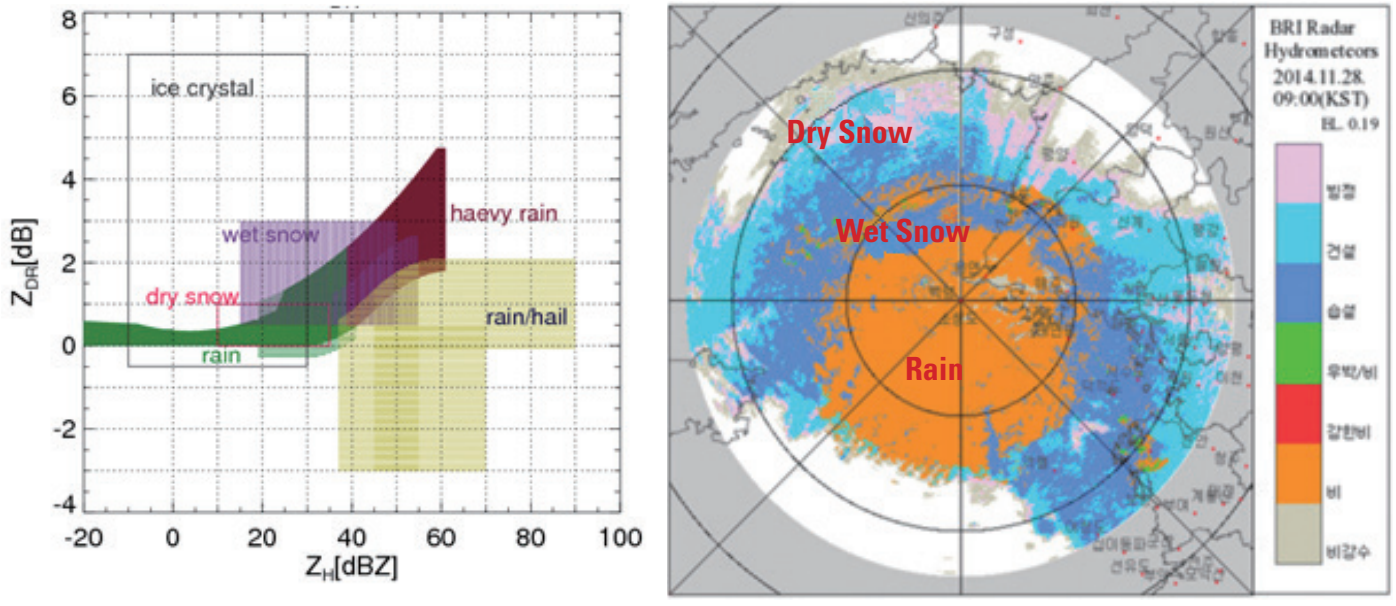


▲ Precipitation and non-precipitation echoes (Baekryeongdo radar)

To develop the application technologies that can be used across the governmental agencies, the WRC conducted intensive observation and analysis using the data from the test-bed radar in Yongin, developed data processing technologies of raw signals (I/Q), reproduced the gridded precipitation data based on radar (2006-2009) with the establishment of its DB, verified the reproduced precipitation estimates, and developed the algorithm to eliminate non-meteorological echoes using satellite data and parameters of the dual polarization radars.

The WRC hosted the 'International Conference on Weather Forecast and Hydrological Applications of Radar' in Jeju island from 4 to 6 November 2015 with the aim of sharing research outcomes of many experts from in and out of the country and of increasing the radar analysis technology. This conference contained lectures and presentations regarding the application research on the dual polarization radars, national radar operations and data applications, quality management, and the research on hydrological applications of radars.

In addition, it organized and provided a timely training on how to analyze the images from dual polarization radars for the forecasters to equip them with relevant knowledge and up-to-date technologies before they went through the disaster prevention period during summer and winder in 2015.



▲ Characteristics of Types of Precipitation in Korea

Climate

IPCC

As a focal point for IPCC of the Republic of Korea, the KMA plays a key role in coordinating international and domestic cooperation relevant to IPCC activities. It published a Korean version of AR 5 of IPCC (7 May 2015) and thereby to contribute to the expanded applications of climate change science information in the country, while assisting the Korean candidate to the post of the 6th Chairperson of the IPCC with the aim of enhancing the country's contribution to the global issues of climate change. As a result, Dr. Hoesung Lee become the first-ever Korean expert elected as the Chairperson of the IPCC. Dr. Lee will supervise the drafting and publishing procedures of the AR 6 tentatively until 2022.

Meanwhile, the KMA has been consistently making financial contributions to the IPCC since 2006 in the form of trust fund.

▼ **IPCC Trust Fund by the KMA**

(Unit: Million Won)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Amount	30	30	60	40	120	144	134	144	147	147

GFCS

The KMA was presented at the Management Committee meeting of the IBCS (Intergovernmental Board on Climate Services) held in Geneva, Switzerland in October 2015 to discuss the process of monitoring and evaluation of the implementation of GFCS as well as its resource mobilization plan.

The KMA, furthermore, has been supporting the GFCS funded project to build the climate prediction and analysis system in East African countries by providing GFCS Trust Fund every year since 2013. The fund offered in 2013 and 2014 were used for Rwanda and Uganda, respectively with the one made in 2015 was used for Djibouti. It is expected that such aid made by the KMA will contribute to the active implementation of GFCS in global scale, while helping enhance the climate services in the East African region.

▼ **GFCS Trust Fund by the KMA**

(Unit: Million Won)

Year	2013	2014	2015
Amount	150	153	153
Beneficiary	Rwanda	Uganda	Djibouti

GEO

The KMA serves as the Secretariat of GEO in the Republic of Korea, playing key roles as a focal point and to support policy-making relevant to GEOSS. In 2015, it hosted a workshop to discuss directions for a new strategic plan for the next 10 years with related agencies (26 June).

It was re-elected as a member of Executive Committee representing the Asia-Oceanian region at the 12th GEO Plenary Session and Ministerial Summit held in Mexico from 11 to 13 November 2015. It also expanded its participation in the GEO activities by designating two experts to the Programme Board of the Group.

The KMA has been consistently making financial contributions to the GEO since 2006 in the form of trust fund.

▼ **GEO Trust Fund by the KMA**

(Unit: Million Won)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Amount	85	82	83	84	84	84	78	84	85	85

WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble

The KMA has been operating WMO's Lead Centre for Long-Range Forecast Multi-Model Ensemble (LC-LRFMME) since 2009. The Role of WMO LC-LRFMME is to standardize the data from the 12 Global Producing Centers (GPC) around the world, while providing a variety of climate prediction data produced by applying multi-model ensemble methods to the members of the WMO, Regional Climate Centers (RCC) and the Regional Climate Outlook Forums (RCOF).

In 2015, it provided web-based prediction data from the 12 GPCs and its own multi-model ensemble data to WMO members on a monthly basis and tailor-made prediction data to several RCOFs.

Furthermore, as the importance of the sub-seasonal to seasonal scale of climate prediction services has been growing recently, it offered climate prediction data for testing the Global Seasonal Climate Updates (GSCU). It also established a testing system for sub-seasonal to seasonal scale of multi-model ensemble predictions.

Report on Abnormal Climate in 2015

The KMA jointly working with the Office for Government Policy Coordination issued a 「Report on Abnormal Climate in 2015」 completed under the participation of total 17 relevant agencies[1] (15 January 2016). This report investigated the actual situation and reason for the abnormal climate across the globe and the Korean Peninsula of 2015 with the impact of the phenomenon on the country's industry such as agriculture, transport and forestry as well as its future plan to respond to them.

The Republic of Korea witnessed a variety of abnormal climate events including abnormally high temperature, droughts, intensive heavy rainfall and heat waves during the year of 2015. Due to the abnormal temperature in May, it recorded the highest average temperature since 1973, while the average precipitation during the Jangma period (24 June ~ 29 July) showed only 73% of the normal. The annual average precipitation across the country was also only 72% of the normal, showing the 3rd lowest rainfall since 1973.

The damage caused by the abnormal climate events were intensified in every corner of the society. Total 1,056 people suffered from heat-related illness, killing 11 people as well as 2,533 domestic animals from 857 farms. The agricultural products from almost all regions except for some part of the northern area were affected by the drought between May and September, while a power generator stopped with wild fires and limited water supplies in some areas due to the lack of precipitation.

1) Office for Government Policy Coordination, Ministry for Food, Agriculture, Forestry and Fisheries, Ministry of Trade, Industry and Energy, Ministry of Environment, Ministry of Land, Infrastructure and Transport, Ministry of Public Safety and Security, Ministry of Food and Drug Safety, Rural Development Administration, Korea Meteorological Administration, National Institute of Agricultural Sciences, National Institute of Environmental Research, National Fisheries Research and Development Institute, Korea Hydrographic and Oceanographic Administration, Korea Forest Research Institute, Korea Energy Economics Institute, Korea Environment Institute, and Korea Research Institute for Human Settlements

WMO World Calibration Center for SF_6

Sulfur hexafluoride (SF_6), one of the main greenhouse gases which the Kyoto Protocol covers emissions, is observed by 55 stations of 20 countries participating in WMO Global Atmosphere Watch Programme. The KMA has been observing SF_6 from 2007 and began to operate 「WMO World Calibration Center for SF_6 ($WCC\text{-}SF_6$)」 by signing the agreement for cooperation with the WMO in October 2012.

The $WCC\text{-}SF_6$ maintains observation standards, regularly hosts international experiments for comparisons and analyses, and provides trainings on the analysis technology with the aim of disseminating SF_6 observation technology to the GAW stations around the world.

In 2015, the KMA published 'Analytical Methods for Atmospheric SF_6 Using GC-μECD' as a WMO report (WMO GAW Report No. 222), while transferred the observation technology to India and the Republic of South Africa. Also, two Korean scientists were designated as GAW Scientific Advisory Group members.

At the 7th Asia-Pacific GAW Workshop on Greenhouse Gases held in Jeju island, approximately 60 climate monitoring experts from 11 countries and 7 domestic organizations attended and shared their activities and technologies, especially the SF_6 observing technologies for those from SF_6 observing stations.

The KMA will continue strengthening its international cooperation networks to expand its support to the GAW stations, while planning to build a regional education/training center on greenhouse gases.

Data Services

Big Data Applications in Weather and Climate Services

The KMA launched the 'Big Data Application Team' on 22 January 2015 to vitalize and enhance the foundation for the big data application services which began in 2014. It laid a foundation for the Weather and Climate Big Data Forum, a collaborative framework, which the government, public sector, academia, and private sector participate in. Based on the identified topics by the Forum, the KMA carries out the R&D projects on weather and climate big data application services that can be used in many sectors such as transport, health, and disaster prevention. In particular, it is developing the technologies to produce IoT based rainfall information and severe weather information of each road, using the rainfall sensor for vehicles as well as existing CCTVs installed for safety of roads. It also develops the technology to predict the potential risks of traffic accidents depending on weather conditions. It is expected that the information produced through such technologies developed will contribute to reducing the traffic accidents, thus to increasing the convenience of the public.

In addition, it carried out a trial project to build a business model in the sectors with high potential such as agriculture and tourism so that the outcome of the R&D projects could turn into the operational services. In particular, it developed a service to predict the productivity of major vegetables based on the impact of weather upon their growth period under the collaboration with the Korea Agro-Fisheries Trade Corporation and the Korea Rural Economic Institute. It plans to transfer such technology to related agencies so that it can be used in controlling the supply and demand and predicting the time for the shipment of agricultural products.

The KMA increased the accessibility and usability of the weather and climate big data by building its analysis platform. This platform provides cloud computing based infrastructure services to collect, store, process and analyze data from other sectors. This was opened for the public sector in November, 2015 and then will be fully opened to the private sector by 2016. It is expected that the economic value will be created with the expanded meteorological industry through the weather and climate big data platform.

Public Access to Weather Data

The Republic of Korea opened public data owned by the government for the increased data uses by the public and private sectors, thus to contribute to improving the quality of life of the citizens and to developing the national economy.
The KMA began open data portal services (data.kma.go.kr) which provide accessible, usable, and easy to understand weather and climate data. The KMA has a plan to fully open total 97 kinds of weather and climate data by 2017.

The KMA began to offer total 8 types of data, including synoptic, disaster prevention, marine weather, and upper-air observations with the data on the observing sites, which were downloaded about 75,000 times in just 4 months, demonstrating high interest in many users.
The access to the data was highly improved as the users could directly download the data they want without going through the off-line official procedures.

As of December 2015, total 50 data sets such as those from numerical models, satellites and radars as well as climate statistics were opened with the metadata so that anyone can easily get the relevant information and understand the data. The KMA also laid the foundation for the one-stop-service which allows users download all KMA data once they visit the data portal by linking this with the open API.

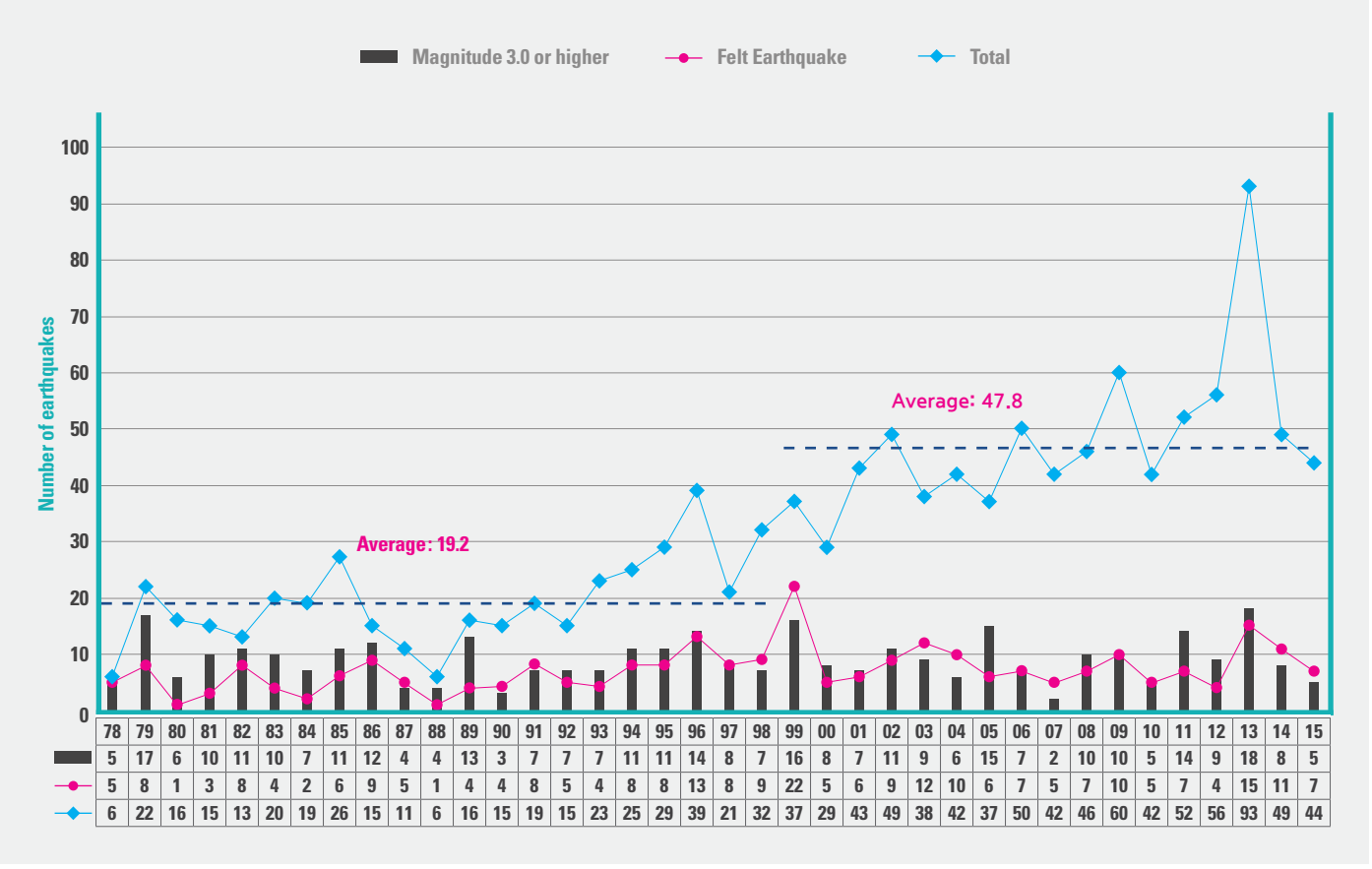
Earthquake

Earthquakes in Korea

In 2015, total 44 earthquakes with the magnitude of 2.0 or more were detected, showing less frequency than the annual average number of earthquakes occurred between 1999 and 2014 (47.8).

The earthquakes with the magnitude of 3.0 or more occurred 5 times in 2015 less than the normal (9.7), while the number of felt earthquakes was 7 less than the normal (8.8) too.

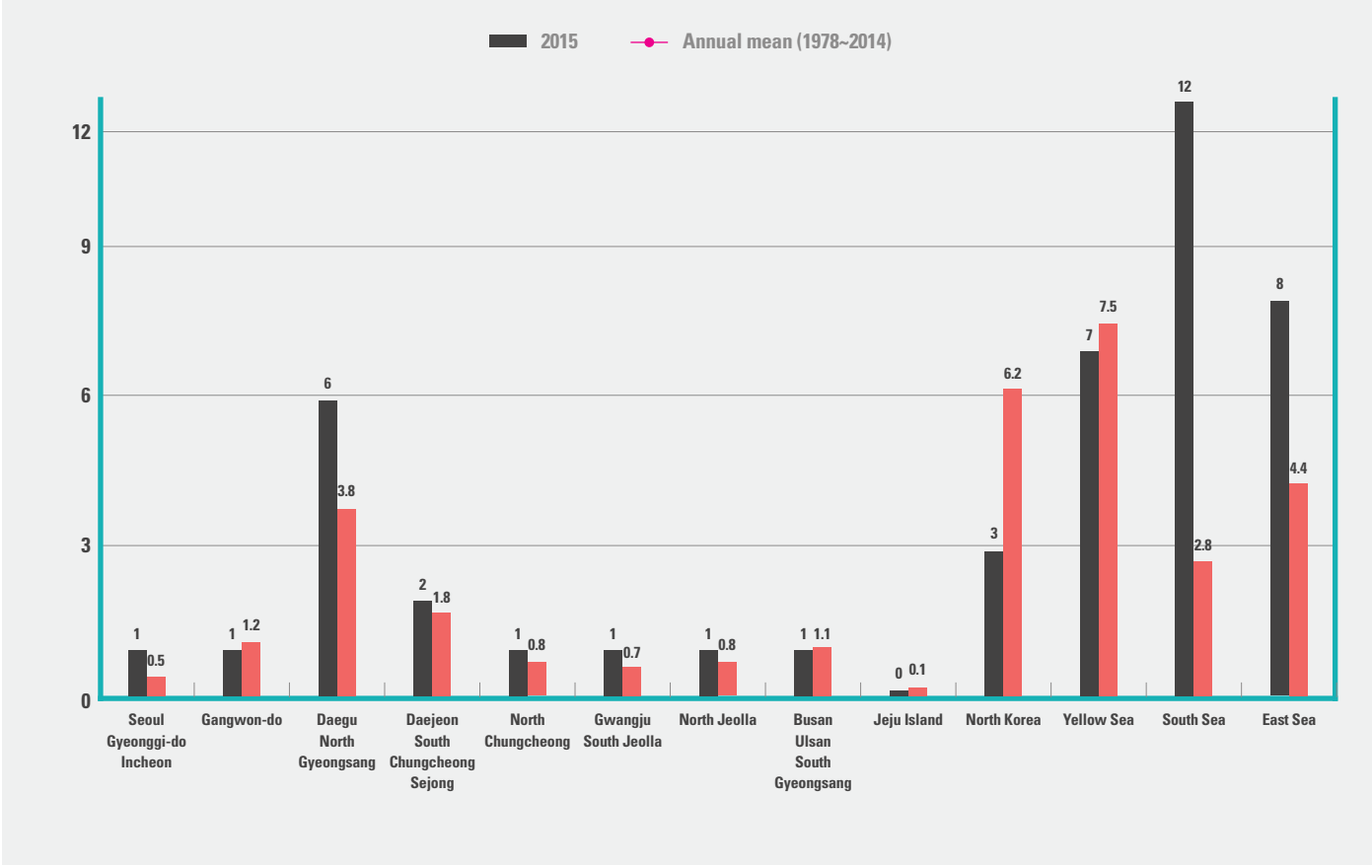
▼ Number of earthquakes in each year (1978~2015)



	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Magnitude 3.0 or higher	5	17	6	10	11	10	7	11	12	4	4	13	3	7	7	7	11	11	14	8	7	16	8	7	11	9	6	15	7	2	10	10	5	14	9	18	8	5
Felt Earthquake	5	8	1	3	8	4	2	6	9	5	1	4	4	8	5	4	8	8	13	8	9	22	5	6	9	12	10	6	7	5	7	10	5	7	4	15	11	7
Total	6	22	16	15	13	20	19	26	15	11	6	16	15	19	15	23	25	29	39	21	32	37	29	43	49	38	42	37	50	42	46	60	42	52	56	93	49	44

The strongest earthquakes in Korea in 2015 showed the magnitude of 3.9 at the location of 9 km away from the north part of the city of Iksan on 22 December 2015. Due to this quake, buildings were shaking (Intensity Ⅲ) in the region with weak vibrations across the country (Intensity Ⅰ ~ Ⅱ). Fortunately, no damages were reported.

▼ Earthquakes detected in each region during 2015



Early Warning Services for Earthquakes

As the Act on Observations and Warnings for Earthquakes, Tsunami, and Volcanoes was enacted from 22 January 2015, the Early Warning Services for Earthquakes, which began together with the Act, aims to provide the information within 50 seconds after detecting the event.

The information on the Iksan earthquake was spread in about 29 seconds after its occurrence.

The Early Warning Services for Earthquakes are disseminated to the related agencies through fax, e-mail, text message, and computer notification, while to the public the information is delivered through the Ministry of Science, ICT and Future Planning, Ministry of Public Safety and Security, and media. It was also successfully tested whether the earthquake information was well displayed through the TV subtitle to the public.

International Cooperation

The 17th Session of the World Meteorological Congress

The Republic of Korea sent total 16 government representatives with Dr. Yunhwa KO, the Administrator of the KMA and the PR of the Republic of Korea with WMO, as a head of the delegation to the 17th Session of the World Meteorological Congress held in CICG, Geneva, Switzerland from 25 May to 12 June 2015.

One of the remarkable outcome of this Congress was the re-election of Dr. KO as a member of Executive Council. With the election of the EC member this time, the KMA has maintained the position for 3 consecutive times since 2007. This could be seen as an evidence that the KMA has raised its status based on its active participation in the global community and trust diplomacy. Dr. Ko will serve as the member of the EC until 2019.

KMA's designation as a Regional Training Center (RTC) of the WMO is another great achievement. Based on this, the Korea Meteorological Administration could build more systematic framework to share its accumulated expertise, knowledge, technologies, and experiences with the Members of the WMO, while planning to lay a firm foundation for the RTC-Korea to be equipped with specialized traning courses that meet the needs of WMO's education and training policies as well as its priorities.

The scale of assessment of the proportional contributions of the Republic of Korea to WMO in 2015 was 1.96%, which made the country the 13th largest contributor among total 191 members. The table below shows the proportional contributions of the Republic of Korea during the recent 5 years.

▲ MoU ceremony for RTC-Korea between KMA and WMO

▼ ROK's Proportional Contributions for WMO (2011-2015)

(Unit: CHF)

Year	2011	2012	2013	2014	2015
Scale of Assessment (%)	1,392,635 (2.23)	1,455,075 (2.23)	1,455,075 (2.23)	1,278,900 (1.96)	1,278,900 (1.96)

In addition, the Republic of Korea set up and made financial contributions to several trust funds in 2015, including WMO VCP ($30,000), ESCAP/WMO Typhoon Committee Trust Fund ($12,000), WMO AMDAR Trust Fund, WMO THORPEX ($1,000), IPCC (CHF 121,914), GEO ($70,507), IOC Tsunami Programme ($1,000), and GFCS ($127,135).

Mutually Beneficial Collaboration

The KMA had several bilateral meetings in 2015. One of the notable cooperation newly established in 2015 was the MoU made between the KMA and the Presidency of Meteorology and Environment (PME) of Saudi Arabia. This could serve as a momentum to enhance the meteorological cooperation with the countries in Middle East Asia and to expand the opportunities to enter the meteorological industry. It also had regular bilateral meetings with the China Meteorological Administration (CMA), the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), and the Ministry of Earth Sciences (MoES) of India, while sharing recent trend in meteorological technologies and relevant information when the Directors of national weather services of the UK, Ethiopia, and Mongolia visited the KMA.

▲ The 13th Session of the JWG on Cooperation in Meteorology between KMA and CMA

▲ The 3rd Bilateral Meeting between KMA and MoES

▲ MoU signing between KMA and PME

▲ Informal meeting between KMA and Met Office

Official Development Assistance

These are the ODA Projects that the KMA has been working on.

- Modernization of Forecasting and Warning System for Natural Disaster in Vietnam (2014-2016)
- Establishment of Master Plan for the Advancement of National Meteorological System in Myanmar (2015-2016)
- Lao PDR - Communication, Ocean and Meteorological Satellite data reception and processing system (2012-2015 / Working with WMO)
- Climate Data Rescue Project in Uzbekistan (2013-2017 / Working with WMO)
- Modernization of Aviation Meteorological Service in Mongolia (2014-2017 / Working with WMO)
- Enhancing Weather and Climate Service through Severe Weather Forecasting Demonstration Project (SWFDP) Implementation in Western Africa (2015 / Working with WMO)
- Disaster Risk Reduction through Installation of the Meteorological Observation and Early Warning Systems in Ethiopia (2014-2017 / Sponsored by KOICA[2)])

The Republic of Korea also dispatches its senior experts to developing countries to provide advice on the operations and management of meteorological services as well as on relevant skills and technologies under the 'World Friends Korea's Senior Experts Korea' program sponsored by the Ministry of Science, ICT and Future Planning, while being carried out by the National IT Industry Promotion Agency. Since 2010, several experienced experts have been dispatched to the countries such as Vietnam, Mongolia, Kenya, Malaysia, and Uzbekistan. They play a role as a bridge for international cooperation between the NMHSs they are dispatched and the KMA by identifying the needs on the meteorological technologies of the country.

▲ **Ground breaking ceremony for the modernization of forecasting and warning system for natural disaster in Vietnam**

▲ **Kick-off meeting for the establishment of master plan for the advancement of national meteorological system in Myanmar**

2) Korea International Cooperation Agency

International Education & Training

International Training Course on Weather Radar Operations

The KMA offered 'International Training Course on Weather Radar Operations' to the 19 staff members from the 18 NMHSs from Asia and Africa from 10 to 23 May 2015. The objective of this training course was to enhance the capability on radar operations and the data application technologies of those from the developing countries so that they are ready to deal with and respond to severe weather events. The course contained both theories and practices such as observing technologies (radar observation theory, signal processing, features of the system, etc.) and operating technologies (radar operations and maintenance, purchase, installation, etc.). As wether radars play importance roles in early detection of High Impact Weather events, it is expected that this course will greatly contribute to the improved disaster prevention of developing countries. In addition, the KMA is transferring the knowledge on how to build radar infrastructure as well as relevant human network.

International Training Course on Weather Forecasting for Operational Meteorologists

The KMA provided 'International Training Course on Weather Forecasting for Operational Meteorologists' to the 12 forecasters from the 8 NMHSs from Asia and Africa from 7 to 27 June 2015. This course aims to help the forecasters from the developing countries to acquire advanced forecasting technologies so that they can conduct the real-time monitoring and prediction of severe weather events, thus produce rapid and accurate forecasting products. The program covered both theories and practices such as the interpretation of meteorological data (numerical weather forecasting, radar and satellite image analysis, etc.) and weather forecasting services (marine weather, severe weather, etc.). It is expected that this course will greatly contribute to building the capacity of the NMHSs in developing countries in early detection of High Impact Weather events.

Training on Information and Communication Technologies for Meteorological Services (sponsored by KOICA)

The KMA offered 'Training on Information and Communication Technologies (ICT) for Meteorological Services' to the 14 staff members from NMHSs of the Philippines, Bangladesh, and Sri Lanka from 18 October to 7 November 2015. The purpose of this training course is to build a capacity in understanding and operating numerical models for the ICT and NWP personnel. The training program covered both theories and practices such as ICT and NWP (operation of a numerical model, understanding data assimilation and practices, etc.) and ICT and marine forecast (Application of marine weather monitoring to disasters, etc.). It is expected that this course will greatly contribute to the increased understanding and application of numerical model and its data.

Appendix

International Events held in Korea during 2015

International Events held in Korea during 2015

CALMet XI Workshop

▲ CALMet XI Workshop (9.7.~9.11.)

The KMA hosted the 11th CALMet (Computer-Aided Learning and Distance Learning in Meteorology) Workshop from 7 to 11 September 2015. CALMet was established in 1993 with the aim of sharing computer-based education and training in meteorology. The KMA participated in the 10th workshop held in Toulouse, France and proposed that it wanted to be the host country of the 11th meeting, which was then confirmed. At the 11th workshop, approximately 40 experts from the training organizations of 19 countries attended and discussed training and evaluation based on capacity, new teaching strategies, enhancing instructors' capability, and the concept of global campus planned by the WMO. As the KMA was designated as one of the WMO Regional Training Centers (RTCs) in June 2015, it focuses on developing both domestic and international education and training programmes for the future.

The 13th Meeting of the Asia-Pacific Regional OPMET Bulletin Exchange Working Group (ROBEX WG-13) & The 5th Meeting of the Asia-Pacific Meteorological Hazards Task Force (MET/H TF-5)

▲ 2015 ICAO APAC Meetings (3.16.~20.)

The Aviation Meteorological Office (AMO) of the KMA successfully hosted the international conferences on aeronautical meteorology of the International Civil Aviation Organization (ICAO) for the first time since its inception in January, 1959. The meeting was held in the city of Seoul from 16 to 20 March 2015 with approximately 40 delegates from 15 members of the Asia-Pacific region and 3 international organizations. The participants shared the information needed for the safe operations of flights in the regions, while reviewing and analyzing standard procedures. The AMO received an appreciation letter from the Asia-Pacific (APAC) Office of ICAO upon the success of the meetings. In addition, several media showed interests in the events, which helped raise awareness of the importance of the aeronautical meteorology and its international collaboration.

The 1st KMA International Meteorological Satellite Conference

▲ The 1st KMA International Meteorological Satellite Conference (11.16~18.)

The KMA hosted the 1st KMA International Meteorological Satellite Conference jointly with the Electronics and Telecommunications Research Institute in Seoul from 16 to 18 November, 2015. This event was prepared with the aim of exchanging and sharing the global trend of the research and applications of meteorological satellites with the relevant technologies for the successful development of the next geostationary satellite scheduled to be launched in 2018. Approximately 150 experts from a variety of countries and agencies including the USA, European countries, China, Japan, EUMETSAT, WMO, and CGMS participated in the Conference and discussed about data processing algorithms, satellite related policies, how to cooperate on developing space weather payload system and space weather prediction models, calibration and correction technologies of the sensors as well as the socio-economic values of the observation of meteorological satellites and space weather.

The 7th Asia-Pacific GAW Workshop on Greenhouse Gases

▲ The 7th Asia-Pacific GAW Workshop on Greenhouse Gases (10.22.~23.)

At the 7th Asia-Pacific GAW Workshop on Greenhouse Gases held from 22 to 23 October, 2015 in Jeju island, about 60 climate monitoring experts from 11 countries, including Australia, Malaysia, Germany, China, Japan, India, Jordan, Tajikistan, Vietnam, Indonesia, and Costa Rica as well as 7 domestic organizations and universities attended. The participants were informed of the reactive gases in the GAW program through the keynote speech and shared their activities and technologies, especially the SF_6 observing technologies for those from SF_6 observing stations.

The KMA will continue strengthening its international cooperation networks to expand its support to the GAW stations, while planning to build a regional education/training center on greenhouse gases.

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