

Integration and Co-Use of Surface Observation Data Produced by Diverse Domestic Agencies in Korea

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Abstract

As of 2011, about 3,500 observation sites operated by 26 domestic agencies in Korea, which includes KMA's 548 ASOS/AWS sites, are networked based on the Weather Observation Standardization Act (WOSA) enforced on July 2006. A new IT network system that enables the participating agencies to share all the obtained data needs to include data collection module, QA/QC module, and data service module. KMA will establish a new web-based system called "Observation Standard Sharing (OSS)" for data collection and integrated quality control. The OSS system will provide not only meteorological data and related metadata but also data analysis tools for users to support national disaster prevention efforts. The OSS will be stabilized by 2012.

1. Background

An automatic weather station (AWS) is defined as an automated system of traditional weather station at which observations are made and transmitted automatically (WMO, 1992). The observed data are read out or received by a central data acquisition unit at an AWS. The collected data from measuring devices can be processed locally at the AWS or elsewhere, e.g. at the central processor of the network (WMO, 1989).

In recent there are a number of observation sites, AWSs, in Korea which are operated by 26 domestic agencies including KMA. The observation sites, however, were established and operated in their own purposes without unified rules so that there needs to be a rule to keep meteorological requirements which are types, location and composition, frequency, and timing of observations (WMO, 1988; 2003).

One of the WMO WIGOS Demonstration Projects, KMA is to integrate and co-use meteorological observation data produced by diverse domestic agencies by implementing three tasks: 1) Standardization of Observation Environment to set the standard criteria of data at their producing stage; 2) Quality Control of Observation Data to obtain qualified data through standardized quality control; and 3) Co-Use of Observation Data via a web site.

In this paper, we present the current status of weather observation standardization and future plans for the co-use of observed data from domestic agencies in Korea.

2. Weather Observation Standardization Act

Making system to promote national meteorological observation standardization, KMA enforced the Weather Observation Standardization Act (WOSA) on July 2006. The purpose of this Act is to protect the lives and property of citizens from meteorological disasters and, thus, to enhance public welfare by providing for matters necessary for the standardization of weather observations and by

improving the accuracy of weather observations and efficiency in the operation of the equipment for weather observations, and the joint utilization of the data from weather observations.

According to the Act, KMA's roles are: 1) to provide technological support for other observation agencies; 2) to enforce standardization policies; 3) to collect and manage observation metadata; 4) to optimize meteorological observation network; and 5) to implement common use of data via quality control and observation education. Other observation agencies' roles are: 1) to standardize observation equipment and environment; 2) to produce observation data and transmit them to KMA; 3) to purchase, install and maintain meteorological observation equipment; 4) to train observation workforce; and 5) to calibrate observation equipment regularly.

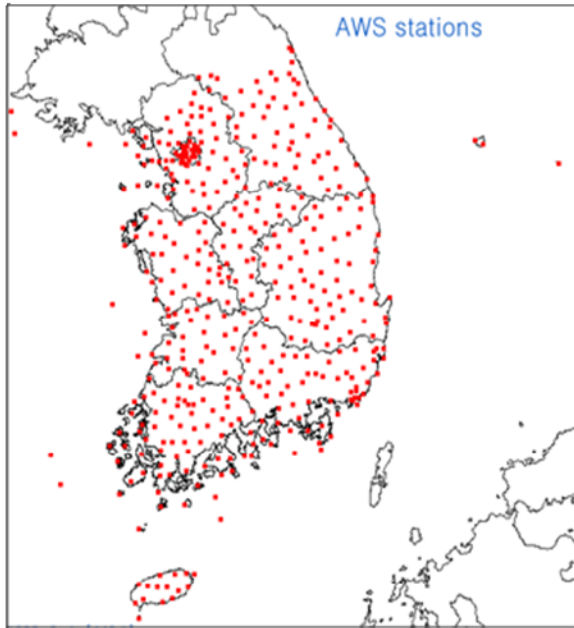
3. Current Status of the Standardization of weather observations

As of 2012, a total of 3,505 observation sites nationwide operated by 26 agencies shown in Table 1, which includes KMA's 548 ASOS/AWS sites, are networked based on the Act. It is noted that many of sites of the agencies other than KMA have only rain gauges and/or wind speed/direction measurement equipment. Distribution of observation sites in both KMA and other agencies is shown in Fig. 1. Since 1990's KMA has been constructing AWSs to monitor severe meso-scale weather phenomena since 1990's so that it has operated total 548 AWS currently which are observing data every minute with horizontal resolution of 15 by 15 km. The data are collected and analyzed in real time. All the AWS data is to be collected and distributed for the co-utilization by KMA (to be finished by 2012) so that spatial resolution of ~5 km will be achieved.

Table 1. Observation agencies participating in weather observation standardization programme.

Observation agencies	
Federal government	Korea Meteorological Administration, Ministry of Environment, Rural Development Administration, Korea Forest Service
Local government	Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon, Chungcheong (2), Jeonla (2), Gyeongsang (2), Jeju
Public agencies	Korea National Park, Korea Rural, Community & Agriculture Corporation, Korea Water Resources Corporation, Korea Railroad Corporation, Korea Expressway Corporation, Korea Electric Power Corporation

(a) 548 AWS (KMA)



(b) 3,505 AWS (Korea)

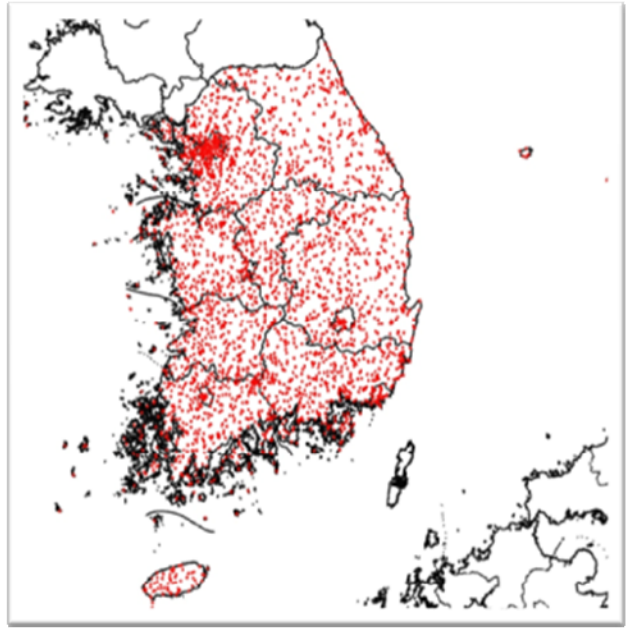


Fig. 1 : Distribution of AWS in (a) KMA and (b) Korea.

In order to evaluate the observation sites, we classified observation environments into five grades in which the *standardization* is defined by top-two grades of faculties which are more than eighty out of a hundred points scored. The current status of standardization is shown in Fig. 2. with a trend of standardization from 2006 to present. It will be planned that the standardization should be complete by 2012.

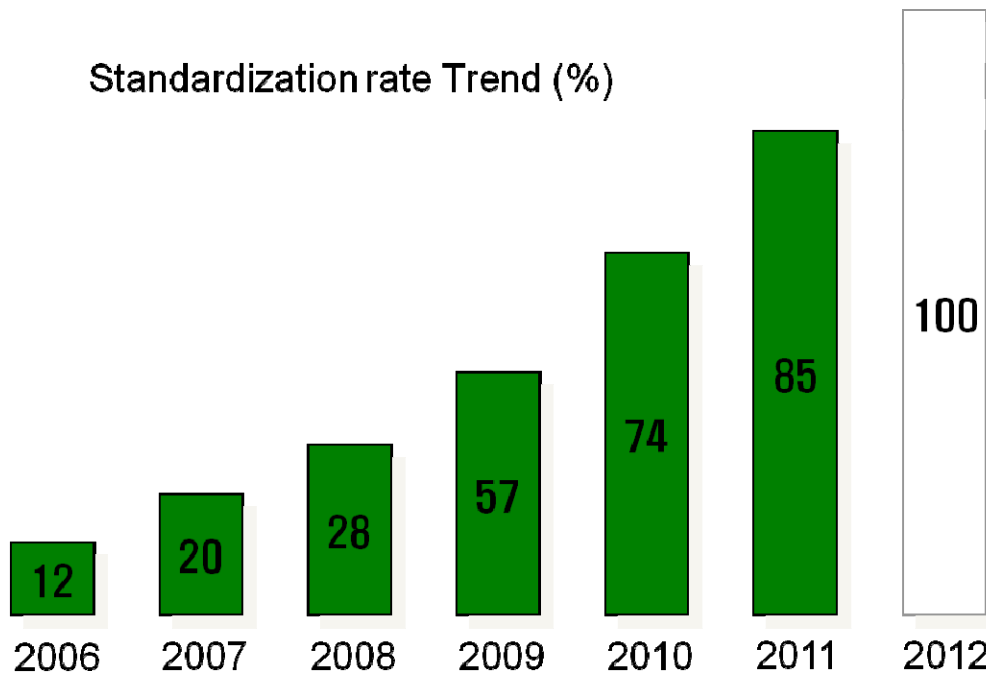


Fig. 2 : Trend of the standardization rate in Korea. Total number of sites is approximately 3,505 which vary each year. The standardization will be complete by 2012.

4. Quality Control of Observation Data

The purpose of quality-control at an AWS is to minimize automatically the number of inaccurate and missing observations by using appropriate hardware and software programs, in which each observation is computed from a reasonably large number of quality-controlled data samples (WMO-No. 8, 2008). However, there is no agreed set of procedures or standards for the various AWS platforms. Such a set of procedures should be developed and documented.

KMA established and upgraded its quality assurance system and plans to apply it to all the Korean sites. KMA's real-time quality control module is used for all the ground-based measurement of 26 agencies, and the data with better quality will be open to the public soon. In the near future, KMA's quality control system will be applied to rawinsonde data, wind profiler data, marine observation data from buoys, and PM10 measurement for Asian dust storms acquired by KMA and other agencies. In order to improve the quality assurance for long-term data, a metadata surveying process was newly introduced, and all the KMA sites were thoroughly reviewed over the past years. This will be applied to other agencies' sites gradually.

5. Co-use of Observation Data

In addition to the improvement of observational environment, it should be constructed a system in which data are collected and analyzed. KMA is constructing a system that a new IT network system that enables the participating agencies to share all the obtained data needs to include data collection module, QA/QC module, and data service module. KMA will establish a new web-based system called "Observation Standard Sharing (OSS)" for data collection and integrated quality control (Fig. 3). The OSS system will provide not only meteorological data and related metadata but also data analysis tools for users to support national disaster prevention efforts. The OSS is currently in the test mode and will be established by the end of 2012.



Fig. 3 : Observation Standard Sharing (OSS) system prepared by KMA. It is a new web-based system established by the end of 2012.

6. Summary

KMA enforced the “Weather Observation Standardization Act” in 2006 to encourage 26 domestic agencies in Korea to join in the standardization of meteorological observation program. About 3,500 observation sites operated by 26 domestic agencies in Korea, including KMA’s 548 AWS sites, are networked based on the Act. A new IT network system that enables the participating agencies to share all the obtained data is constructing with data collection module, QA/QC module, and data service module. Observation Standard Sharing (OSS), a new web-based system, will be established by KMA for data collection and integrated quality control by 2012. It is expected that this system will provide not only meteorological data and related metadata but also data analysis tools for users to support national disaster prevention efforts.

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