

Summary of Inner Mongolia Meteorological Archives

Delong Zhang^{1,2}, Lin Wang^{1,2}, Jingchao Chen^{1,2}, Ying Wang*

¹Meteorological Information Center of Inner Mongolia Autonomous Region, China;

²Meteorological Archives of Inner Mongolia Autonomous Region, China

Abstract: The Meteorological Archives of Inner Mongolia Autonomous Region is the largest professional meteorological archives in the Inner Mongolia region, and it is also the first national meteorological archives to be promoted to a national first-class archive management unit. Inner Mongolia Meteorological Archives now preserves more than 80,000 volumes of meteorological management files, meteorological observation records, meteorological scientific research files, and meteorological infrastructure files, providing the most fundamental support services for the development, research and application of meteorological services.

Keywords: Meteorological archives; Collection records; Informatization

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***Corresponding author:** Ying Wang, nmgwyang@163.com

1 Introduction of the Archives

The Inner Mongolia Autonomous Region Meteorological Archives was founded in 1986. At that time, there were 5 two-level warehouses for paper archives and a usable area of about 800 square meters. Meteorological observations in the Inner Mongolia Autonomous Region have a history of one hundred years. The archives of the collection can be dated back to the 1920s. The earliest records are from Mianduhe and Zhalantun, and there are meteorological compilation data from 1909^[1]. The archives house precious observation data from all 15 meteorological stations before and after liberation, up to more than

80,000 volumes of meteorological records. Since 1993, meteorological departments at all levels have carried out extensive file management upgrades in accordance with the requirements of the executive order of “Measures for the Upgrade of Archives Management of Science and Technology Institutions” jointly issued by the National Archives, the State Science and Technology Commission and the Ministry of Construction. The Inner Mongolia Meteorological Archives is a national meteorological archive. The Inner Mongolia Archives was the first to be promoted to the national first-class archive management unit, and currently there are 8 first-class meteorological archives in China.

2 Facilities

From 2016 to 2017, the original meteorological archives and internal facilities were expanded, upgraded, and revamped through the implementation of “Inner Mongolia Meteorological Science and Technology Archives Standardization Reform (Phase I)” and “Inner Mongolia Meteorological Archives Standardization Arrangement” and other initiatives. The archive warehouse area is 327 square meters, with 555.3m³ of newly built dense shelves, and 160m³ of reconstructed dense shelves. 8 anti-magnetic cabinets were purchased and a machine-readable archive warehouse was newly built. The heating system of the archives was revamped, with warehouses No. 1-4 transformed from water heating to central air conditioning heating system. The warehouse environment monitoring systems such as archive warehouse video monitoring, smoke alarm, temperature and humidity monitoring, and water leakage monitoring, and incorporate warehouse environment safety monitoring were integrated into the comprehensive operation monitoring platform of the

information center to achieve 24-hour remote real-time monitoring.

Currently, the Inner Mongolia Meteorological Archives has 5 paper warehouses and 1 machine-readable archives warehouse. The storage area of the physical meteorological data archives is 1,000 square meters, and the machine-readable data storage area is about 40 square meters, with two reception rooms and reading rooms. In 2019, with the support of the “Meteorological Safeguard Project for the Prevention and Control of Mountain Floods and Geological Disasters”, the Inner Mongolia Autonomous Region Meteorological Archives had completed the functional transformation to realize the zoning layout of archives certification area, inquiry area, reading area, sorting area and storage area.

3 Smart Security and IoT Equipment

In 2019, the equipment of intelligent security system and Internet of Things (IoT) equipment for archive warehouse were completed. Through the intelligent security system, all registered users are allowed to enter the archives gate through facial recognition with single authentication; and users acknowledged as archivist are allowed to enter the archive storage room through facial recognition with second authentication, whereas users with other identities are not allowed to enter. This ensures that only authorized users can enter the corresponding area and strengthen the security of the archives. For different types of meteorological archives, the temperature and humidity monitoring system sets different temperature and humidity adjustment ranges for the gateway, and the relevant adjustment equipment are controlled through the gateway to maintain the temperature and humidity in the archives to meet the requirements for long-term storage.

According to the air quality standards of the archives, the air quality monitoring system sets different upper limits for the gateways for different types of archives, and the relevant air purification equipment are controlled through the gateways to maintain the air quality in the archives to meet the long-term storage requirements.

According to the requirements of the archives preservation environment, the archives shall set up automatic fire alarm and automatic fire extinguishing systems. Through the RFID tag management of ground meteorological observation records and some meteorological scientific research files, the coordinative

work of environmental monitoring equipment in the entire archives has been realized preliminarily.

4 File Entity

In November 2000, the China Meteorological Administration issued the proceedings of the National Meteorological Archives Working Conference, proposing to establish a meteorological archives management system compatible with the meteorological business system, and transform the previous four-level meteorological archives management system (i.e. country, province (region, city), region, and county) to two-level system consisting of just national and provincial (regional, municipal) level. The adjustment of the archive storage system realizes the centralized storage of original meteorological archives, which is conducive to the safety and integrity of the archives, the sharing and use of archive information, bring the functions of national and regional meteorological archives into play, and saving a large amount of national funds.

After adjustment, archives are no longer set up at the district and county levels, but archives are still reserved for storing short-term meteorological files and as a temporary storage place before the files are handed in. The meteorological record archives currently kept by the Inner Mongolia Meteorological Archives include: meteorological business management archives, meteorological observation record archives, meteorological scientific research archives and meteorological infrastructure archives etc., with more than 80,000 volumes, and 415 machine-readable archive CDs. In order to ensure the safety of meteorological archives, the Autonomous Region Meteorological Archives established a remote backup library in Wuhai Meteorological Bureau. In September 2013, the Wuhai Archives remote backup library was

Table 1. The Archives Status of the Inner Mongolia Autonomous Region Meteorological Archives

Serial No.	Category	Amount
1	Meteorological Business Management Files	56 Volumes
2	Meteorological Observation Record Files	62672 Volumes
3	Meteorological Scientific Research Files	226 Volumes
4	Meteorological Infrastructure Files	94 Volumes
5	CD Files	362 Discs

officially in operation. The backup library covers an area of 38 square meters and stores a total of 304 data discs, consisting of the original observation data of the ground national station, regional station, sandstorm station, severe weather radar cases data, the whole-area ground report scan image data, and the reference basic station precipitation self-recording paper scan image data.

5 File Informatization

Beginning in 2006, under the support of the “Meteorological Monitoring and Disaster Early Warning Project” of the China Meteorological Administration, “Climate Change Response Decision Support System Project”, “Mountain Flood Geological Disaster Prevention Meteorological Safeguard Project” and self-raised funds, 1.161 million sheets of paper consisting of ground reports, self-recording sheets, high-altitude reports, and agrometeorological reports etc. had been digitally scanned, totalling 4.5T. The input and extraction of image data has been gradually carried out, with 988,000 sheets being completed. Currently, the monthly ground report, the annual ground report for 15 periods of maximum precipitation, the entries of pressure wind records of specific layers from the high-altitude observation station, and the extraction of self-recording precipitation sheets have been completed, with data totalling 695.13M. The progress of informatization is detailed in Table 2.

6 Archive Collection Filing

With the popularization of automatic observation stations and the improvement of observation methods, meteorological archives have gradually shifted from paper-based archives to electronic-based archive management. Since 2013, the Inner Mongolia Meteorological Archives has gradually built a regional infrastructure resource pool to provide basic environmental support for meteorological archives. Beginning in 2012, all meteorological observation data were uploaded to the Autonomous Region Meteorological Bureau through the communication transmission system in real-time, including various types of data such as ground, high altitude, agrometeorological, and radiation etc (Table 3). Stations upload data in real-time (about 30GB per day), with archived electronic data from sister cities, historical datasets, datasets issued by the National Bureau, and compiled data, etc., totalling about 10TB, all of which are archived online in text form. The newly archived meteorological data every year is about 14T.。

7 Conclusions

Inner Mongolia Meteorological Archives is gradually completing the construction of digital weather archives. By then, the Meteorological Archives will make full use of the development results of meteorological informatization to integrate the hardware and data resources of the archives system into the infrastructure

Table 2. The Informatization Status of the Inner Mongolia Autonomous Region Meteorological Archives

Serial No.	Category	Image	Entry	Dataset
1	Monthly Reports before year 2000	100%	100%	Image/Entries Datasets
2	Annual Reports before year 2000	100%	0%	Image Datasets
3	Monthly and Annual Reports of Withdrawn Stations	100%	0%	Image Datasets
4	Precipitation Self-Recording Sheets	100%	100%	Image/Entries Datasets
5	Ground Wind Self-Recording Sheets	100%	5.9%	Image Datasets
6	Humidity Self-Recording Sheets	100%	0%	Image Datasets
7	Atmospheric Pressure Self-Recording Sheets	100%	0%	Image Datasets
8	Raw Observations Logbooks	0%	0%	
9	Reports after year 2000	0%	0%	
10	High Altitude Observation Records Sheets	100%	100%	Image/Entries Datasets
11	Agrometeorological Observation Record Sheets	17%	17%	Image/Soil Moisture Entries Datasets

Table 3. Inner Mongolia Autonomous Region Meteorological Archives Collection and Filing Type List

Serial No.	Filing Type	Area	Online	Archive
1	Ground Data	This Province	3 years	Permanent
2	High Altitude Data	This Province	3 years	Permanent
3	Radiation Data	This Province	3 years	Permanent
4	Ecological and Agrometeorological Data	This Province	3 years	Permanent
5	Meteorological Disaster Data	This Province	3 years	Permanent
6	Weather Radar Data	This Province	3 years	Permanent
7	Meteorological Station Historical Data	This Province	3 years	Permanent
8	Environmental Meteorological Data	This Province	3 years	Permanent
9	Numerical Analysis Forecast Products	This Province	3 years	Permanent
10	Meteorological Service Products	This Province	3 years	Permanent
11	Other Data	This Province	-	Permanent

and data resource pool. The real-time monitoring system will centralize display and control of the library information and provide it to users uniformly, realizing the unified management of resources and integration with the existing system. Through smart security, temperature, humidity, smoke, air quality, water leakage and other smart monitoring equipment, the environmental safety of the archives is ensured. The usage, recording, and accidents of the archives can be traced accurately to ensure the safety of archives. Through advanced technologies such as the IoT and radio frequency identification, the timely, complete and effective filing of physical and electronic files is achieved. The construction of digital meteorological archives helps to ensure the integrity of archive

resources, and is conducive to the effective management and convenient utilization of archive resources. By providing users with services and applications based on basic meteorological archives information as a form of service, the management and service capabilities of meteorological archives are improved, and achieving the sharing of archives information among various provinces through the establishment of a “national-province 1+N model”.

References

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