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THE STRUCTURE AND MISSION OF METEOROLOGICAL AGENCIES IN CHINA

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1. Introduction

Functioning as eyes and ears of their nations, meteorological agencies are of utmost importance in both China and America. Therefore, meteorologists have an interest in the development and improvement of meteorological information and forecasting. As a developed country, America has advanced equipment and rich experience in meteorological information and forecasting. As a country with long history, China has also accumulated a wealth of experience in meteorological information and forecasting, especially in the most recent years. Of course, there is much in the American meteorologists' experiences that our Chinese meteorologists can learn and use.

In China, meteorological information and forecasting agencies have been established at all levels. From the central government down to the provinces, prefectures, and most counties a fairly thorough and organized system carries out both collection of meteorological information and forecasting.

Because of the uneven distribution of precipitation, strong rainstorms and frequent occurrences of flood and drought, the work of meteorological agencies is of the utmost importance in China. They have played a significant role over the years, getting great attention from the government and society.

2. Organization

Figure 1 depicts the organizational structure of meteorological agencies in China. Like the National Weather Service (NWS) in America, our main mission is (1) to provide weather warnings, public forecasts and advisories for all of China, primarily for the protection of life and property and (2) to fulfill China's international meteorological obligations.

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The following is an outline of the basic operational structure in China:

a. National Meteorological Center (NMC)--Provides national weather guidance products and issues advisories to forecast offices at lower levels (especially on numerical analysis and prediction products).

b. Regional Centers--The Regional Centers act as an interface among the NMC, meteorological observatories, and other regional or provincial agencies. Although they are in their developmental stage, their primary functions are:

(1) Regional meteorological communications
(2) To provide regional weather forecasting products, especially on severe weather prediction
(3) To coordinate regional and provincial meteorological data gathering networks
(4) To develop specialized regional meteorological/climatic databases
(5) To operate real-time meteorological and near real-time climate information systems, and
(6) To plan, organize and conduct applied meteorological/climatic research focused on topical issues.

Figure 2 shows the areas of responsibility of the seven Regional Centers.

c. Provincial/prefecture[2] agencies--Cooperate with municipalities to anticipate and conduct weather-related disaster response operations for public safety. Cooperate with the media (newspaper, broadcast, and television) in dissemination of weather forecasts and warnings.

3. Data collection

There are about 2,000 manual weather observation stations in China. The station density varies with a progressive decrease from plain to plateau except in northwestern desert and snowberg zones. The station with the highest elevation, Wudaoliang Station, is 4,464 meters (about 15,620 feet). The establishment of station and daily observation times are determined according to the characteristics of the climate zone, the function (for weather forecasting or monitoring), the importance of the weather information in climatic research or application, and the nature

[2] A "prefecture" is a group of counties.

of geographic conditions. All basic stations observe every hour; most stations observe every six or eight hours. During emergency weather conditions, some stations observe and send a telegram every hour or every half hour.

Every station has observers who, upon getting weather information, immediately send coded telegrams to county, prefecture and provincial authorities through the post and telecommunication departments. At some stations, specific shortwave radio transceivers are installed to increase the speed of information transmission.

Traditional weather information processing and transmission are highly dependent on manpower. By using computers, China has developed a processing system of real-time meteorological information. Real-time receiving and translating of meteorological telegrams are done by CD6250 and PDP-11/44 computers with a PC as the foundation. The system consists of data receiving, processing, storing, retrieving and using.

4. Operations/Applications

In China, the breadth and depth of meteorological operations and services are bounded by science and technological capabilities, as well as communication and computer capabilities.

Although much work remains to be done, China has achieved great progress in weather forecasting capability. In order to improve the quality of weather forecasting and to ensure continued service, our meteorologists have improved the traditional methods through application of new technical and advanced devices. Refinement of previous forecasting methods continues. The main methods of daily forecasting in China are

a. Numerical forecasts (at NMC and some Regional Centers)

b. Statistical forecasts. These include applications of fuzzy mathematics, great circle storm tracks, gray statistics, etc.

c. Statistical interpretation of numerical prediction products. These include PPM (Perfect Prog), MOS (Model Output Statistics), EMOS (Expert MOS), etc.

d. Expert systems. These use computer methods, expert's experience and special data, and integration of decisions for local special weather forecasts.

In addition to daily weather forecasts and services, climate information serves as one of the major weather science applications in China. Climate information is essential if we are to maintain and enhance our economic prosperity and wisely use our natural resources.

The NMC is responsible for the weather data collection, quality control of this information and the archival function which is usually done in published and computer formats. On the other hand, the regional and provincial offices help to provide local access to climate data, and in some instances generate and deliver climate information, through regional/provincial climatologists.

At each Regional Center, a Specialized Institute conducts applied research on regional topics. The Specialized Institute at the Lanzhou Regional Center focuses on drought forecasting and research. Atmospheric scientists chiefly provide three types of information in the management of drought:

a. Climatology and status of droughts

b. Prediction

(1) Will the drought worsen?
(2) When will it terminate?

Skills in the physical prediction of conditions for months, seasons, and years ahead of time are still in the research/experiment stage and exhibit very limited skill. Climate frequency analyses, probability analyses, and climate analogies are based on historical data, etc.

c. Weather modification, in other words, is precipitation enhancement:

Cloud seeding to increase rainfall in convective clouds of the east or to increase snowfall in the western mountains is clearly an emerging technology. Current cloud seeding techniques utilize aircraft that penetrate clouds and leave seeding materials aloft to increase the efficiency of rainfall production.

Cloud seeding depends on availability of suitable clouds, and in most areas droughts are marked by the lack of cloud-rain events. Nevertheless,

there are clouds on some days that are potentially suitable for modification.

Another application of weather modification in China is hail suppression. Cannons with special shells are used to bombard the severe local convection having potential for hail. The result of hail suppression mostly depends on nowcasting which deals with capabilities of real-time data display and measurement technologies.

5. Summary

A thorough and stable system of meteorological agencies has been established. China has made great progress in the field of weather forecasting. However, as a developing country, China is still behind in state-of-the-art technical equipment, especially in information collecting and processing and communications. As a result, we have much to gain from more advanced experiences of other countries. This suggests the great importance of close cooperation between American and Chinese agencies concerned with meteorological information and forecasting.

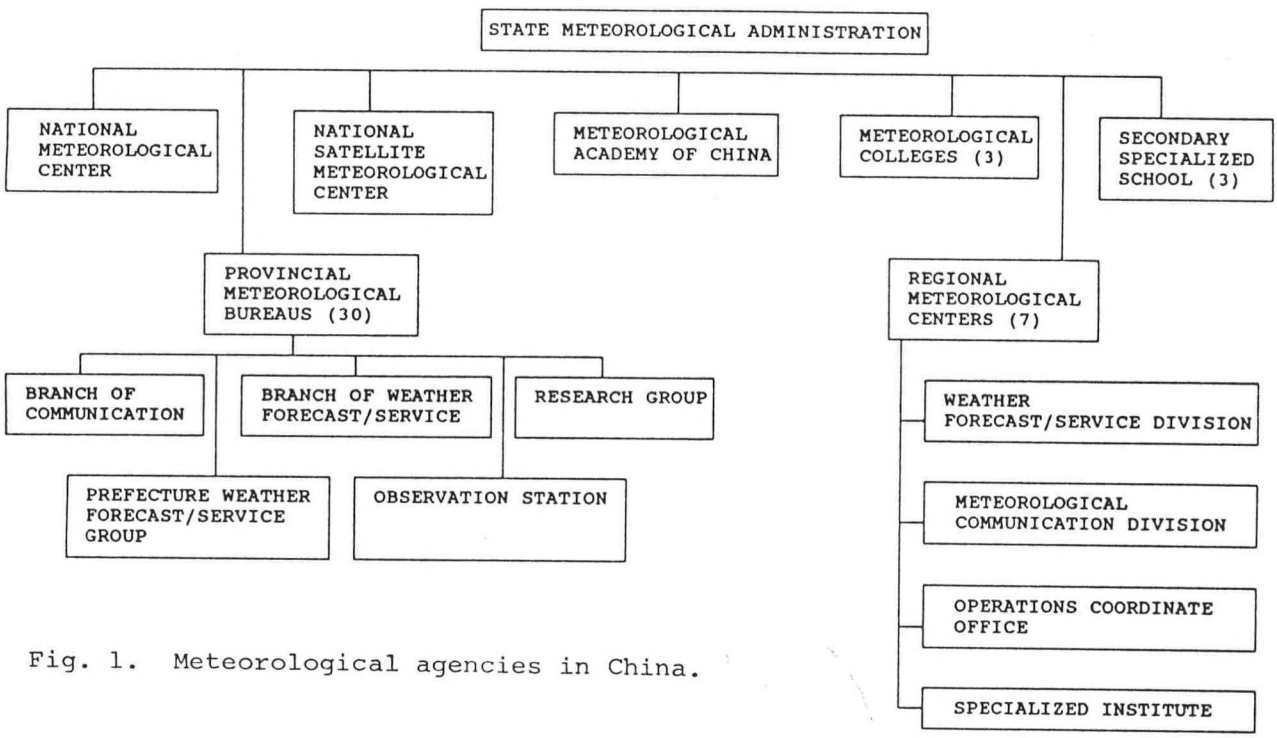

Fig. 1. Meteorological agencies in China.

Fig. 2. Areas of responsibility for the seven Regional Meteorological Centers in China.