

MEXICAN NATIONAL REPORT ON METEOROLOGY AND PHYSICS OF THE ATMOSPHERE (1964-1966)

Ing. Pedro A. Mosiño Alemán
Department of Meteorology
Institute of Geophysics, N.A.U.M.

ABSTRACT

This report is concerned with recent developments in the several meteorological agencies of Mexico. A short review of research being carried out at the National Autonomous University of Mexico is also included.

INTRODUCTION

As this is the first report on Meteorology and Physics of the Atmosphere from Mexico to be presented at a General Assembly of the IUGG, it seems proper to say a few words on the present status of the meteorological networks of this country.

In Mexico there are several governmental agencies, almost independent from each other, devoted to the taking and processing of weather observations. Some of them issue meteorological warnings and forecasts, viz: a) the Mexican Meteorological Service, a department of the Dirección General de Geografía y Meteorología, under the Ministry of Agriculture, which is the oldest and largest organization; b) the Meteorological Service for Civil Aviation, under the Ministry of Communications and Transports; c) the Ministry of Hydraulic Resources; d) the Mexican Air Force Weather Wing, and e) the Federal Commission of Electricity.

Of them, the Mexican Meteorological Service is exclusively entitled by law to issue weather forecasts for the general public: both the Civil and Military Aviation Meteorological Services prepare airways and terminal forecasts for internal usage only. It is then understandable why this report restricts itself to a few highlights, as it would be too lengthy to quote all the happenings that have taken place in all agencies during the last three years.

ENLARGEMENT AND IMPROVEMENT OF METEOROLOGICAL NETWORKS

UPPER AIR STATIONS. The last three years have witnessed an increasing activity in the installation of new radiosonde stations in northern Mexico. A joint project of the Mexican Meteorological Service and the Weather Bureau of the United States of America is an outstanding example of international cooperation in Meteorology between neighboring countries. Salaries are paid and buildings facilitated by the Ministry of Agriculture of Mexico, while equipment and materials as well as training of Mexican personnel is provided by the ESSA. This collaboration began in 1942 and has continued uninterruptedly since then, so that, at present, there are 7 (seven) rawinsonde stations, 4 (four) in southern Mexico and 3 (three) new stations in northern Mexico. It goes without saying that all meteorological organizations on both sides of the international boundary have profited by this arrangement.

The name and location of the stations are as follows (Fig. 1).

RAWINSONDE STATIONS IN SOUTHERN MEXICO

	<i>Lat. N</i>	<i>Long W of Greenwich</i>	<i>Elevation</i>	<i>Number of daily ascents</i>
Mazatlán, Sinaloa	23°11'	106°25'	2.83 m	one
Tacubaya, Federal District	19°24'	99°11'	2,308.0 m	one
Veracruz, Veracruz	19°12'	96°08'	21.0 m	one
Mérida, Yucatán	20°59'	89°38'	11.0 m	two

Note: The station at Tacubaya is presently being relocated at the Mexico City International Airport.

(NEW) RAWINSONDE STATIONS IN NORTHERN MEXICO

	<i>Lat. N</i>	<i>Long W of Greenwich</i>	<i>Elevation</i>	<i>Number of daily ascents</i>
Empalme, Sonora	27°57'	110°48'	12.0 m	two
Chihuahua, Chihuahua	28°38'	106°04'	1,430.0 m	two
Monterrey, Nuevo León	25°55'	100°15'	500.0 m	two

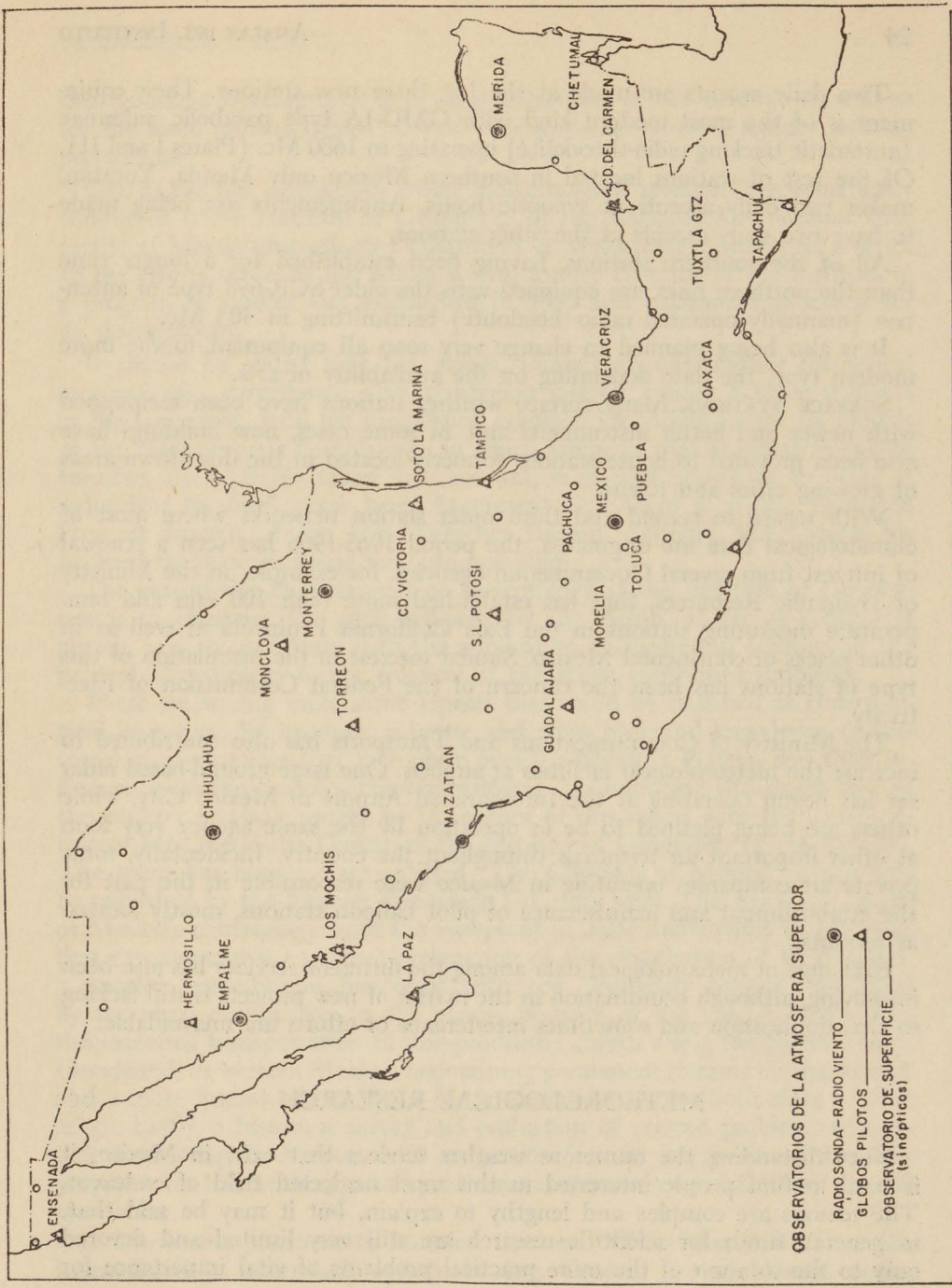


Fig. 1. Distribution of new meteorological observatories in Mexico.

Two daily ascents are made at the last three new stations. Their equipment is of the most modern kind with GMD-1A type parabolic antennae (automatic tracking radio-theodolite) operating in 1680 Mc. (Plates I and II). Of the rest of stations located in southern Mexico only Merida, Yucatan, makes two daily ascents at synoptic hours. Arrangements are being made to have two daily ascents at the other stations.

All of the southern stations, having been established for a longer time than the northern ones, are equipped with the older SCR-658 type of antennae (manually operated radio-theodolite) transmitting in 403 Mc.

It is also being planned to change very soon all equipment to the more modern type, the date depending on the availability of sets.

SURFACE STATIONS. Many surface weather stations have been reequipped with newer and better instruments and, in some cases, new buildings have also been provided to house stations formerly located in the downtown areas of growing cities and towns.

With regard to second and third order station networks where most of climatological data are originated, the period 1965-1966 has seen a renewal of interest from several Governmental agencies, for example, in the Ministry of Hydraulic Resources, that has established more than 100 rain and temperature measuring stations in the Baja California Peninsula as well as in other places of continental Mexico. Similar interest in the installation of this type of stations has been the concern of the Federal Commission of Electricity.

The Ministry of Communications and Transports has also contributed to increase the meteorological facilities at airports. One large ground-based radar set has begun operating at the International Airport in Mexico City, while others are being planned to be in operation by the same agency very soon at other important air terminals throughout the country. Incidentally, some private air companies operating in Mexico were responsible in the past for the establishment and maintenance of pilot balloon stations, mostly located at airports.

Exchange of meteorological data among the different services has also been improving, although coordination in the matter of new projects is still lacking so that duplication and sometimes interference of efforts are unavoidable.

METEOROLOGICAL RESEARCH

Notwithstanding the numerous weather services that exist in Mexico, it is hard to find people interested in this most neglected field of endeavor. The reasons are complex and lengthy to explain, but it may be said that, in general, funds for scientific research are still very limited and devoted only to the solution of the more practical problems of vital importance for

the economic development and industrialization of the country as well as for the more pressing needs of food production to satisfy a rapidly growing population.

One of the few institutions where meteorological research is systematically conducted is the Institute of Geophysics of the National Autonomous University of Mexico through its Department of Meteorology. Mostly as a result of the efforts made by Dr. Julian Adem, former Director of the institution, a program of studies was established in 1962 and equipment procured for its development.

It should be stated that Dr. Adem, himself an outstanding theoretical meteorologist, contributed also to develop interest among Science students in the University, with his stimulating example. Dr. Adem's work on models of the "Hemispheric Circulation" in which latent as well as radiative energy transfers are explicitly taken into account, is so well known as to make it redundant to dwell upon here. At present Dr. Adem is at the Extended Forecast Branch of the U.S. Weather Bureau, Suitland Md., where his brilliant theories are being put into operation.

The aim of the Department of Meteorology at the Institute of Geophysics is to continue the path followed by Dr. Adem, as far as conditions permit, and to contribute with the application of theoretical findings in the field of Meteorology to the solution of the above mentioned problems.

There are among these some aspects that could be classified as climatological in nature, for instance, a better and more profound knowledge of meteorological processes that take place over the Mexican Plateau and their influence upon the complex climatic patterns characterizing this driest part of the country, as those sought by the author of this report with the collaboration of Mrs. Enriqueta García, of the Institute of Geography of the NAUM. The result has been a tract entitled "The Climates of Mexico" which will be published by the Elsevier Publishing Co., very soon. This work is a survey of Mexico's climatology from the viewpoint of basic meteorological processes that can alone give a natural explanation of the distribution of its climates.

Another contribution has dealt with the "humidity tongue" produced by the rapid evaporation in the nearby portions of the Pacific Ocean and the extended transportation of rain-producing clouds along the Sierra Madre Occidental, in western Mexico, maintaining permanent streams on the surface and a more humid climate than in the desertic areas on both sides of that range. Lastly, a historical survey and evaluation of present problems of weather forecasting in Mexico, with suggestions for its improvement was also prepared by the author, who spent several years doing that work for air companies.

It now seems pertinent to mention the new "Climatologic Atlas" of the Lerma-Santiago watershed, written by Ing. Ernesto Jáuregui Ostos, under

the auspices of several agencies of the Mexican Government and the Inter-American Bank for Development. This is an all-inclusive work that will certainly add much to a better knowledge of the climates of one of the most economically important regions of Mexico.

Other lesser studies of the same type are been made at the Institute of Geography of the N.A.U.M., which will show a truer picture of the climatic aspects of atmospheric phenomena as a prerequisite for more theoretical work in Mexico.

EDUCATION AND TRAINING IN METEOROLOGY AND CLIMATOLOGY

In this connection it should be mentioned that only a few schools of subprofessional level offer elementary courses in Meteorology, in this country, except one where courses in Climatology at undergraduate as well as at graduate level are taught.

The oldest school is located at the Mexican Air Force Guadalajara Base, where weather officers (observers and weather forecasters) are trained. The observing course comprises two years of training, mainly in surface weather observations up to, and including, pilot balloon ascents. The forecasters course is taken by observers if after a year of practice in the ranks they wish to return for further training and comprises a one year refresher course in Physics and Mathematics and four years of subprofessional training in weather forecasting. No graduate courses are yet offered.

Next comes the Centro Internacional de Adiestramiento de Aviación Civil, at Mexico City International Airport. This school, an outgrowth of the former ICAO School founded in 1952 by that international agency, offers among many other subjects of training for airway operation officers, a short course of only one and a half years of weather observation including weather codes and diagrams, map plotting and isobaric analysis, so that graduates from this school can become, apart from weather observers, meteorological assistants and map plotters with a little of station inspecting.

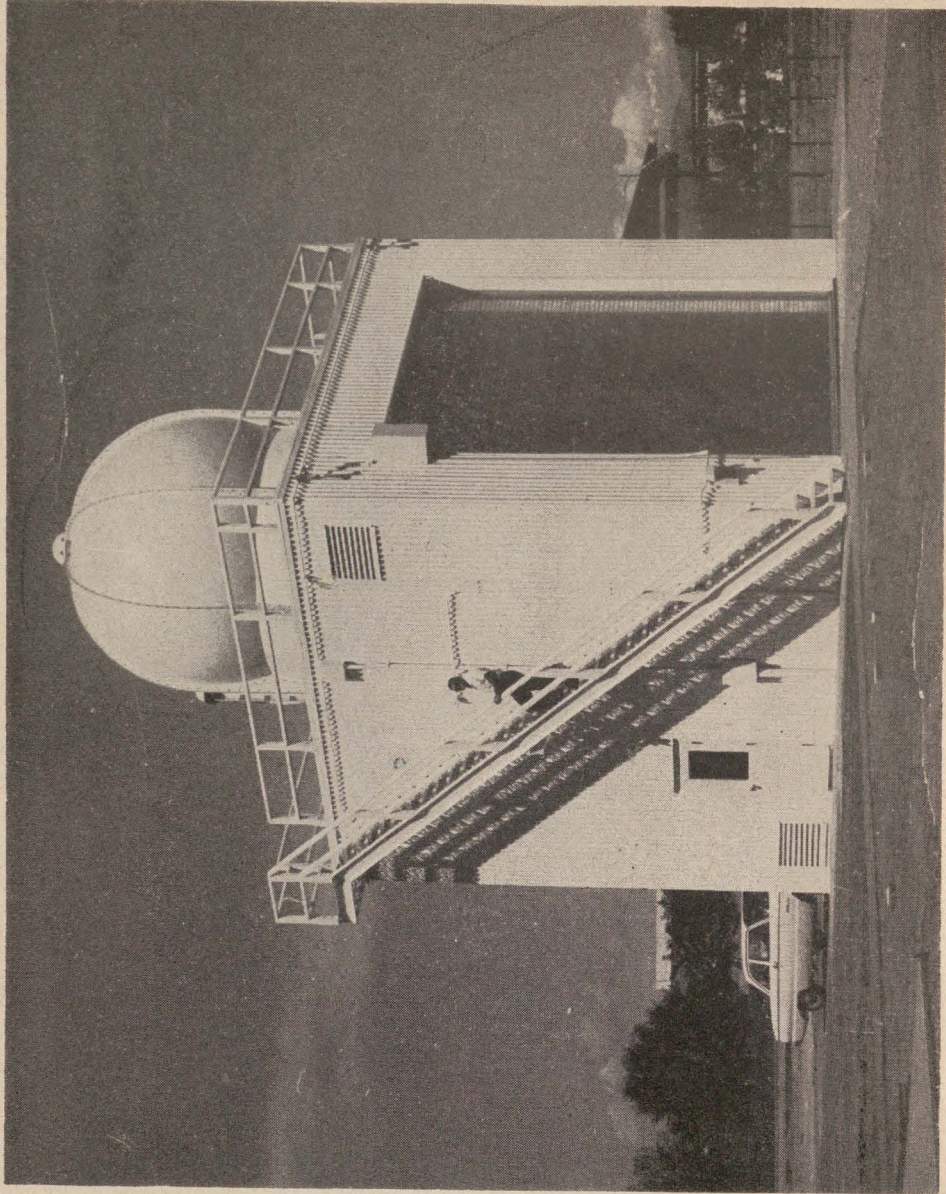
An elementary course in Meteorology is also taught to merchant marine officers at the Escuela Náutica Mercante "Fernando Siliceo", at the port of Veracruz, in eastern Mexico.

Last, but not least, an elementary course in Meteorology and Climatology is given to freshmen and sophomore students at the Escuela Nacional de Agricultura, in Chapingo, Mexico. Also, an advanced course in Climatology is offered to graduate students at the Colegio de Postgraduados (Graduate School) of the Agricultural College, in the same place.

Courses in Meteorology are also offered at the National Autonomous University of Mexico, both at the Schools of Philosophy and Letters and



Typical installation for study of higher atmosphere in Northern Mexico (Chihuahua, Chih.)



Rawin dome and room for radiosonde balloons (Chihuahua, Chih.)

of Sciences, at undergraduate level, for students of Geography in the former, and of Physics and Biology in the latter.

This sad state of affairs in meteorological education can only be attributed to lack of interest of students for the profession as a result of the scant opportunities of well remunerated positions in the weather agencies of this country. Only at the lower ranks of aviation weather observing and climatological networks are there opportunities to be found as a result of demands of more practical nature.

PUBLICATIONS AND PERIODICALS

Even considering the lack of interest in meteorological matters as a whole, climatological pursuits are being sought for as previously mentioned in response to the need for agricultural planning and development of Mexico, and, therefore, a growing interest in Climatology has recently been felt. The result has been the renewal of printing of periodical publications of some value. A list of the principal sources of information is appended as a guide for a better appraisal of the situation of Mexican meteorological and climatological research and studies organized by agencies, institutions and societies that publish such periodicals, giving also their addresses and other indications of practical advantages:

SECRETARÍA DE AGRICULTURA Y FOMENTO

Dirección General de Geografía y Meteorología (Ave. Observatorio 192, México 18, D. F.)

Boletín Anual del Servicio Meteorológico Mexicano, for 1960 and 1961 (Data for the period 1962 through 1964 being in the process of printing).

SECRETARÍA DE RECURSOS HIDRÁULICOS

Dirección General de Hidrometría (Paseo de la Reforma e Ignacio Ramírez, México 1, D. F.)

Boletín Hidrológico N^o 14 (Upper Río Pánuco).

Boletín Hidrológico N^o 15 (Lower Río Pánuco).

Boletín Hidrológico N^o 16 (Middle Mexican West Coast; data to 1959).

Boletín Hidrológico N^o 17 (Southern Mexico, part 1).

Boletín Hidrológico N^o 18 (Southern Mexico, part 2; climatic data).

- Boletín Hidrológico* N° 19 (Lower Río Pánuco watershed; data to 1961).
Boletín Hidrológico N° 20 (Central Gulf and Valleys of Oriental-Libres and El Seco).
Boletín Hidrológico N° 21 (Northeastern Mexico, part 2; data to 1962).
Boletín Hidrológico N° 22 (Northern Mexico, part 2).
Boletín Hidrológico N° 23 (Lerma-Chapala watershed, part 1, data to 1962).
Boletín Hidrológico N° 24 (Lerma-Chapala watershed, part 2, data to 1962).
Boletín Hidrológico N° 25 (Lerma-Chapala watershed, part 3; data to 1962).
Boletín Hidrológico N° 26 (Northeastern Mexico; compendium for Nayarit State; data to 1966).

UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

Instituto de Geofísica (Torre de Ciencias, 3er. piso, Ciudad Universitaria, México 20, D. F.)

Anales del Instituto de Geofísica, UNAM (since 1955).

Monografías del Instituto de Geofísica (since 1959).

Unión Geofísica Mexicana (ibidem).

Geofísica Internacional (since 1961).

Instituto de Geografía (Ciudad Universitaria, México 20, D. F.).

Publicaciones del Instituto de Geografía (since 1965).

(other contributions in collaboration with various agencies contain climatological information).

Instituto de Geología (Ciudad Universitaria, México 20, D. F.).

Boletín del Instituto de Geología (since 1886).

Anales del Instituto de Geología (since 1917).

(both serials include meteorological and climatological information on areas of geologic interest).

ESCUELA NÁUTICA MERCANTE "FERNANDO SILICEO"

Instituto de Meteorología Náutica (Boulevard Ávila Camacho, Veracruz, Ver., México).

Boletín Climático (monthly; since 19).

UNIVERSIDAD DE GUADALAJARA

Instituto de Astronomía y Meteorología (Av. Vallarta N° 2602, Guadalajara, Jal., México).

Información del Instituto de Astronomía y Meteorología (since 19).