

UNITED STATES DEPARTMENT OF COMMERCE

U.S. WEATHER BUREAU

WASHINGTON

July 20, 1959

IN REPLY, PLEASE ADDRESS
CHIEF, U. S. WEATHER BUREAU
WASHINGTON 25, D. C.
AND REFER TO
C-3.1

FILE: 922

MEMO

MEMORANDUM

TO : Area and State Climatologists, Field Aides (HC), Field Aides, WRPCs, River Forecast Centers, River District Offices, and Area Engineers (with copies to Regional Offices for information)

FROM : Office of Climatology

SUBJECT : Climatological Services Memorandum No. 75

GENERAL

1. INFORMAL MINUTES OF THE NATIONAL RESEARCH COUNCIL COMMITTEE ON CLIMATOLOGY ADVISORY TO U. S. WEATHER BUREAU: The Committee held its eighth meeting on June 16 and 17, 1959 at the Office of Climatology in Suitland, Maryland. It was the second meeting of the group at that locality.

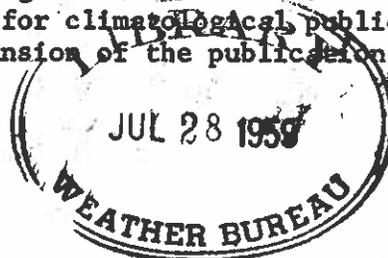
Present were the following members:

- Dr. J. H. Longwell, Chairman - Director, Division of Agricultural Science, University of Missouri
- Dr. P. E. Church - Department of Meteorology and Climatology, University of Washington
- Dr. E. Wendell Hewson - Department of Civil Engineering, University of Michigan
- Dr. William E. Reifsnyder - School of Forestry, Yale University

Dr. George S. Benton, Department of Civil Engineering, Johns Hopkins University, was prevented by other engagements from joining the Committee.

The staff of the Office of Climatology briefed the committee on current projects and plans. As background information Dr. Landsberg provided the members with copies of Climatological Services Memorandums Nos. 72 and 73.

Mr. Schloemer gave a status report on the climatic publications. He informed the committee that their recommendation to separate the storm data from the Climatic Data National Summary had been carried out. A new publication "Storm Data" has been published since January 1959. There was some discussion of the Local Climatological Data Supplement. It seems desirable to add a column on "current weather"; also a rearrangement of the sequence of hours has been requested by users. The small size of the reproduced figures has given concern and the possibility of adding pages was considered. In this connection the whole problem of printing costs for climatological publications came up. This will place a limitation on expansion of the publication program next fiscal year.



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Mr. Lippmann gave a quick summary of the documentation project and showed the committee the pamphlets that have been issued in this series. The committee felt that this is a very worthwhile program.

Mr. McMurray, who was in the Central Office on a visit from NWRC, presented a summary of the IGY data center affairs. The U. S. data for the IGY will be forwarded to the Geneva data center of WMO by September. Exchange with the USSR data center is functioning fairly satisfactorily. One hundred rolls of microfilm have been forwarded by the U. S. and thirty rolls have been received in return. Missing, however, are USSR Arctic upper air data. No IGY data are available for the area of the People's Republic of China. The plotting of IGY surface and 500 mb. charts for the Northern Hemisphere is progressing well. Samples of the pole-to-pole cross sections along the 80th meridian were demonstrated. These will be prepared for every day of the IGY period under a special grant from the National Science Foundation.

Mr. Harshbarger acquainted the committee with the tentative plans for a decennial census of climate. This is to take place at the end of calendar year 1960. It comprises the compilation of new 30-year normals, the reissue of Bulletin W for the period 1951-60, the World Weather Records for the same interval and 10-year summaries of hourly observations. The whole plan depends on the availability of funds which will be requested for the fiscal years 1961 and 1962.

The committee then visited the Domestic Section where Mr. Baldwin demonstrated the production of the Weekly Weather and Crop Bulletin (National Summary). The collection of data, and the writing, editing, and the dissemination of the information was discussed.

Mr. E. C. Thom described the progress of work on the cooling degree day concept. This included a review of the reactions received on publication of the Discomfort Index. These were mostly favorable from engineers and professional people. Adverse criticism was primarily directed not at the concept but at the label. In this connection the committee issued the following statement:

"The committee agrees that the Discomfort Index is based on sound scientific facts and has been clearly demonstrated for more than 30 years that because many deaths occur in summer which are directly traceable to high values of a temperature-humidity combination (Discomfort Index) the public should be informed of the values of the Discomfort Index that occur and may be anticipated, and that because of the relationship of the index to man's health and comfort the name should imply increasing discomfort and hazard with increasing values, we feel that despite the recent criticism the index is appropriately named."

Mr. Ratner showed the committee the completed sections of the Upper Air Climatology of the U. S. and the results of the Sandia Corporation cooperative project. The Civil Defense fall-out studies which are drawing to a close were briefly discussed. The analysis of maximum wind speeds aloft and the plans for an aviation climatology program were presented.

Mr. Bosen summarized the latest information on MIMIC (Multiple Image Micro-camera) and the FOSDIC series. He also discussed the use of the Minnesota Mining & Manufacturing Co. Reader-printer. He also indicated that the IBM 7070 will replace the present 650 computers at NWRC as soon as it becomes available. The committee then visited the shop of the Bureau of the Census where the new parity punch is being built as part of the FOSDIC system. This checking device for the quality of the film is well along in construction and should be ready for testing later this summer.

Mr. Palmer showed the committee his latest analyses of drought conditions and developed his system of assessing climatological drought. He also pointed to his latest attempts to estimate at any instant the probability that a drought had ended. The committee was greatly interested in this attack on the problem and suggested that it might be profitable to extend the scope to include a similar cumulative approach to the problem of forest fire danger.

Mr. Blanc mentioned some of the developments resulting from the meeting of the Agricultural Commission of WMO. He briefly touched on the agrometeorological course at the University of Maryland sponsored by the Weather Bureau and jointly taught by University of Maryland professors and Weather Bureau personnel. The status of purchase of Palmer soil thermometers and the neutron soil moisture meter was discussed. The cooperative Weather Bureau-University of Wisconsin agrometeorological bibliography is finished. The manuscript comprises 300 pages. The committee urged that it be printed as soon as possible.

Mr. Putnins reported on the contract work of the Foreign Area Section. He also indicated the potential of the staff for handling translations of foreign meteorological publications. These comprise capabilities to handle Russian, German, French, Spanish, Portuguese, Italian, Dutch, Scandinavian and Near East languages. Nearly all of this work-force is engaged on reimbursable projects.

Mr. Schallert gave a resume of the work on the Meteorology and Climatology of the Greenland Area. This is under way for the Signal Corps and is an outgrowth of the comprehensive Greenland bibliography of the Foreign Area Section. Particularly challenging are the circulation studies of the area. Handicaps imposed by the lack of data were discussed. Dr. Church indicated that theses by Wilson and Konkell at the University of Washington might be very pertinent to the study.

Mr. Cooperman presented the various publications of the Marine Section and the charts and pilots to which his group is contributing the climatological information. The committee was very complimentary on the timely publication of the climatic information on the St. Lawrence Seaway. A general discussion followed on the summarization of observations taken by vessels on the Great Lakes. High priority should be given to analysis of these data.

Mr. H. C. S. Thom gave the committee a comprehensive view of his work on design data, his new analyses of recurrence intervals, and his statistical procedures for degree day estimates. He also presented his chart on 50-year extreme winds, resulting from his work for the Bureau of Public Roads. The

work on the nth extreme value was also touched upon. The committee expressed the desire that these novel procedures be incorporated into a manual.

In the subsequent executive session the committee discussed, among other things, a letter the chairman had received from Dr. Hewson. As part of the record, this letter follows here:

"Dear Dr. Longwell:

"You may remember that at the New Haven meeting of the Advisory Committee on Climatology I mentioned to you the growing national concern with the problem of urban air pollution and my feeling that our Committee might consider this problem in relation to the work of the Office of Climatology at some future meeting. This feeling was strengthened as a result of my participation in the National Conference on Air Pollution sponsored by the U. S. Public Health Service which was held in Washington last November. Two of the pertinent recommendations adopted by the Plenary Session of the Conference on November 20 are as follows:

'Concerning the effects of meteorology and topography:

2. Systems of meteorological measurement specific to the needs of air pollution investigations are needed. Most of the present meteorological measurements and observations were established to meet the needs of agriculture, aviation, etc., and do not provide the optimum service to air pollution investigations.

6. Recognizing that each community has a limit to the amount of pollution its atmosphere can accept, there is need for more knowledge of the interrelationships between meteorological and topographical factors for the establishment of these limits both for short and long time periods.'

"At New Haven you also indicated that you would be willing to consider a more detailed statement that I offered to prepare for you.

"It seems to me that the problem, from our point of view, falls naturally into several parts:

1) An evaluation of various possible methods of measuring the pertinent meteorological variables with a view to determining those which are most appropriate for use in developing an air pollution climatology on a national basis. This might involve a pilot field experiment for perhaps a year at a suitable site where the most promising instruments would be operated simultaneously and the results compared with measured concentrations of specific contaminants.

2) Next, ways and means might be explored of establishing a measurement program on a national basis, with approved installations in one or two cities initially and gradual expansion thereafter as funds permit.

3) Concurrently with Item 2, provision should be made for adequate analysis of the data obtained so that an air pollution climatology could be developed until it became national in scope. Provision should also be made for research on special problems; for example, where topography introduces unusual complexity in the air pollution climatology.

"If the Office of Climatology did not wish to undertake the pilot field experiment in Item 1 or the special research in Item 3, these might be done on a contract basis with one of the universities or research institutes competent in this area using funds provided by some sponsoring agency such as the National Science Foundation or the Public Health Service.

"I think that the foregoing presents my ideas in sufficient detail for our immediate purposes, and will permit you to evaluate their pertinence in the light of the terms of reference of the Advisory Committee.

"Yours sincerely,

/s/ E. Wendell Hewson
Professor of Meteorology"

The committee endorsed Dr. Hewson's views and urged that his suggestions be included in the plans of the Office of Climatology.

Subsequently the committee met with Dr. F. W. Reichelderfer, Chief of Bureau. He expressed his gratitude to the Chairman and the members of the committee for their willingness to give the Bureau their advice and counsel. He urged the members to present to him at any time collectively or individually their views on the climatological program and service and methods to improve them where needed.

The committee, prior to presentation of a more formal report, indicated to the Chief of Bureau that they considered the following items of primary importance:

1. The funding for the decennial census, which should be pursued as the program of greatest value.
2. The prompt publication of the bibliography on agrometeorology, the climatic charts for mariners, and the historical hurricane tracks.
3. The full implementation of the state climatologist program.
4. The summarization of the ships' observations on the Great Lakes.
5. An increase in climatological research funds, primarily for co-operative projects with the universities.
6. The compilation of a manual of the statistical procedures developed by Mr. H. C. S. Thom.

The committee also gave the Chief a signed copy of their opinion on the "Discomfort Index" (as quoted above).

The committee decided to hold its next meeting at the National Weather Records Center, at Asheville, N. C., probably during the first week of November 1959.

2. REPORT OF TWELFTH ANNUAL NEW ENGLAND AGRICULTURAL-METEOROLOGICAL MEETING, WALTHAM, MASSACHUSETTS, APRIL 17, 1959: This meeting was held at the auditorium of the Waltham Field Station of the University of Massachusetts. Co-chairmen were Dr. C. J. Gilgut of the University of Massachusetts, Amherst, and Dr. Oscar Tenenbaum of the Boston Weather Bureau. They have planned and directed the meetings for several years. The meeting is conducted in two parts, each by one of the co-chairmen. Each chairman introduces the speakers of his group and leads the discussion following a talk. This year's meeting had a more informal tone than previous meetings. Several prepared papers were presented. Much time was devoted to spontaneous discussion of items of keen mutual interest.

The meeting began at 2:10 p.m. with a welcome by Dr. Gilgut. Speakers on his Agricultural panel included Dr. W. D. Whitcomb, E. C. Gasiorkiewicz, Dr. Emil F. Guba, all of the Waltham Field Station; Richard Beattie, Cranberry Experiment Station, East Wareham; C. D. Stevens, Agricultural Estimates Division, Agricultural Marketing Service, USDA; R. L. Armstrong, East Middlesex Mosquito Control Program; and Dr. Gilgut.

Many plant diseases and other agricultural problems relating to weather were described. Dr. Whitcomb used bacterial wilt of sweet corn (Stewart's Disease) as an example. This disease is spread by the corn flea beetle. Survival of beetles depends upon temperature during the previous winter. Excellent correlation of survival with the winter mean temperature has been shown. Whenever the December, January, and February mean temperatures add up to 90° or less, as was the case last winter, there is no survival and no danger of an outbreak of the disease. Time and expense of control measures can be saved this summer. The Weather Bureau State Climatologist in Boston furnishes these temperature values for all stations.

Other Agricultural speakers also outlined relations of weather, including solar radiation, to insect and disease development and control. Spraying of crops is a rather expensive, though necessary, means of control of infestation or infection. Spray frequency, therefore, should be held to the minimum that will do the job.

Other discussions of crop-weather relationships concerned optimum conditions for spraying apples and other fruits; the northward spread of corn earworm from the Gulf of Mexico to this area, and control measures; possible injury from spray chemicals; condition of cranberries in the huge bog area of southeastern Massachusetts and present weather requirements; sunshine hours during the current year as an important factor in the cranberry crop yield the following year; correlation between light intensity and optimum temperature in winter and good harvest of carnations (Massachusetts is the leading state in carnation growing under glass); this year's heavy winterkill of grasses and

plants; influence of weather on parasitic and non-parasitic diseases.

Following a brief intermission, the meeting was resumed with Dr. Oscar Tenenbaum in charge. Speaking on his Weather Bureau panel were G. L. Courville, Worcester, Massachusetts; Robert E. Helbush, Burlington, Vermont; Warren Silverzahn and Dr. A. Boyd Pack, Hartford, Connecticut; Robert E. Lautzenheiser, Hubert Hynes, Henry Lawrence and Dr. Tenebaum, Boston, Mass.

These speakers reported on weather of the past winter and early spring and their possible effect on agriculture and upon agricultural weather services planned or already in operation for this season. These services are designed specifically for farmers and other agriculturists. As an example of this cooperation, Dr. Pack, State Climatologist for Connecticut and Rhode Island, distributes an edited issue of the Weather Bureau's "30-Day Outlook" using terminology and format planned especially for farmers. Past programs of proven benefit to agriculture were also described.

In the question and answer period that followed each talk, grower's weather needs and the Weather Bureau's potential for meeting them were thoroughly discussed. These discussions are the basic purpose of these meetings. They acquaint the Weather Bureau with specific problems of agriculture so that special weather programs can be tailored for maximum benefit to agriculture. They also apprise agriculturists of the services the Weather Bureau can furnish.

This was the 12th Annual Agricultural-Meteorological meeting held in New England. The attendance was 22. An invitation was accepted to hold next year's meeting at the Waltham Field Station once again. The meeting adjourned at 5:20 p.m.

3. NON-PERIODIC ACTIVITY REPORTS: State and Area Climatologists are reminded that we would like to be kept informed of their non-recurring activities by occasional activity reports. These need not be made on a regular basis, but should be made often enough to keep us advised of current developments.

4. QUALIFICATIONS FOR A STATE CLIMATOLOGIST: In order to insure that the climatological program is carried on properly within each State, we have established the position of Weather Bureau State Climatologist.

Since the problems upon which a State Climatologist might be consulted frequently come from either educational institutions or from state or federal agencies and since these are frequently complex, it is imperative that the incumbents be properly qualified. The solution to many of these problems frequently involves statistical treatment of meteorological factors, as well as other factors peculiar to the specific application. For this reason, State Climatologists must have a thorough knowledge of meteorology, as well as a good foundation in statistics.

In almost all cases State Climatologists work closely with an agricultural experiment station located in the State and for this reason there is also a requirement for some background in agricultural experiment station work. With the present utilization of digital computers for the treatment of masses of data, experience in their use is most desirable.

In general, experience in agroclimatology, combined with graduate work in meteorology and statistics, represent very useful prerequisites for the State Climatologist position. In many cases, the university grants the State Climatologist faculty status; this means that the prospective State Climatologist must have the personality and background which would be compatible with such standing. An advanced degree, either masters or doctors, is particularly desirable.

Actually it is not always possible to find ideally qualified personnel, therefore, selections are made from among those with the broadest background, both in experience and in formal education.

5. STATE CLIMATOLOGISTS ACTIVITIES: The following paragraph is included in the program letter for a new State Climatologist as one of his responsibilities:

"Continually survey the area to determine the climatological requirements of industry, commerce and agriculture, and design specific methods of fulfilling these requirements, utilizing the Area Climatologist and the Office of Climatology for assistance when needed."

We would like to have all State Climatologists have at least one such project underway at all times. Work on the project could be in the form of text, charts, tables, diagrams or any combination of these. The end results could be reproduced for local distribution, offered for publication in a Weather Bureau publication, or in any appropriate outside publication.

Following are some suggestions for studies. This list is not comprehensive and the order of items has no significance; also other studies, more appropriate to a particular area, may suggest themselves. A good approach would be to determine a State's most important agricultural and/or industrial activity, and if weather factors are important, make a climatic study of them.

Agriculture

- (1) Spring and fall freeze probabilities over the state.
- (2) Evapotranspiration studies including evapotranspiration estimates as means of scheduling irrigation.
- (3) Climate relations to major agricultural enterprises in the state (e.g., peaches, tobacco, citrus, cattle, poultry, grain or hay-drying). This may be on climate-yield relationships or on spraying, harvesting, frost protection, storage, or marketing problems as affected by weather or climate, or on preparation of crop calendars.
- (4) Drought problems in the state, and effects on agriculture and industrial activities.
- (5) Phenological studies.
- (6) Soil moisture studies.

- (7) Preparation of climatological studies of a specific agricultural region, e.g., Climate of Matanuska Valley.

Housing

- (1) Heating degree estimations (after H. Thom) over the state or for selected towns outside the first order station network.
- (2) Cooling degree day estimations or air conditioning requirement data.

Water Resources

- (1) Rainfall probabilities over the state (e.g., fitting gamma distributions to precipitation data according to Panofsky-Brier "Some Applications of Statistics to Meteorology" (pages 40-45) 1958, Pennsylvania State University, also Monthly Weather Review for April 1958).
- (2) Effects of winter snowfall variation over the state in any one year or from year to year.
- (3) Snowfall threshold probabilities.
- (4) City or area water supply problems (with hydrologic engineer).
- (5) Snow survey problems.

Forecasting

- (1) The application of climatology to forecasting various parameters involved in many of the above items.
- (2) Climatological forecasting aids particularly as applied to a specialized forecasting problem in one locale (MICs and forecasters can advise State Climatologists on such problems).

Other

- (1) Relative humidity estimates over the state.
- (2) Weather notes on tornadoes, hurricanes, hail, high winds, dust storms, etc., over the state.
- (3) Climate of resort areas over the state.
- (4) Climate and avalanches (e.g., snow slides in the Rocky Mountains).
- (5) Special problems imposed by arid or humid climate of the state (this applies only if the state is definitely one or the other).
- (6) Temperature or precipitation variability studies (day to day or year to year). This could include cold and hot spells or wet and dry spells.

(7) Climate and air pollution.

6. CONSISTENCY OF DATA PUBLISHED IN BULLETIN W SUPPLEMENT: The Area Climatologist for the Pacific Area has noted a large number of errors in the Bulletin W Supplement data for Hawaii. Some of these are attributable to punching errors, while others are undoubtedly the result of corrections made in Hawaii, subsequent to shipping the original 1009 forms to the National Weather Records Center.

It is suggested that all State Climatologists run a spot check between Bulletin W Supplement and Climatological Data. Where discrepancies exist, please attempt to determine whether or not the CD data have been changed (corrected). If no corrections have been published or noted, please report the discrepancies to the Office of Climatology.

7. PUBLICATIONS DISTRIBUTED TO STATE AND AREA CLIMATOLOGISTS SINCE CSM NO. 71:

Transpiration and Evapotranspiration as Related to Meteorological Factors, final report U.S.W.B. Contract No. CWB 9295, Iowa State College.

WMO Technical Notes Nos. 25 and 26, Design of Hydrological Networks, Max A. Kohler, and Techniques for Surveying Surface Water Resources, Ray K. Linsely.

Map of Isotachs of Extreme Mile at 30 ft. above Ground. 50-year Mean Recurrence Interval. U.S.W.B.

Decadal Census of Weather Stations - Alabama.

Transpiration and Evapotranspiration as Related to Meteorological Factors, Iowa State College.

Agricultural Horizons, J. G. Harrar (reprinted from the Agronomy Journal Volume 51: 1959).

Climatic Data for Air Conditioning in South Carolina, South Carolina Agricultural Experiment Station.

8. NEW STATE CLIMATOLOGIST: Mr. Marvin Burley of the National Weather Records Center has been selected as Wisconsin State Climatologist, and has entered on duty at Madison.

FOR WRPCs

9. AMENDMENTS TO PROCEDURES: The following amendments have been sent to the Weather Records Processing Centers:

Par. 1009.55294 Amend the paragraph to read as follows:

Prepare and forward to the National Weather Records Center,
Attention: Climatic Analysis Section, the following:

- (a) On or before the 18th of the month, cut-out maps of
 - (1) Average temperatures for selected stations
 - (2) Total precipitation for selected stations
 - (3) Total snowfall for selected stations
 - (4) Departure from long-term mean precipitation for selected stations
- (b) On or before the 25th of the month, the Climatological Data Table (First-Order Station data)
- (c) On or before the end of the month, the original of the Condensed Climatological Summary WB Format 5802. The first carbon copy should be mailed to the Office of Climatology. Corrections should be entered on the second carbon copy and mailed to the NWRC not later than the 15th of second month following the data month.

It will no longer be necessary to send a copy of the Climatological Data Table (old Table II) to the Office of Climatology but a copy of WB Format 5802 should be sent.

Par. 1009.652 In the last line of 5th paragraph on page 15, insert the word "may" between the words "snowpack" and "result".

In the last sentence of 3rd paragraph on page 17, insert the word "annual" between the words "latest" and "issues".

Table of Contents WRPC Procedures for Processing Solar Radiation Data, 1-16-59:

1130.86 Delete "Autographic"
Add: "1130.88 Missing Station Report"

Par. 1130.833: In the last sentence, delete the word "second".

Par. 1130.84, subpara. 4.c: In the last line, change "3-part" to read "2-part".

subpara. 4.d.B: Change entire paragraph to read:
"B. Carbon to originating stations who request it (see Par. 1130.833)."

subpara. 4.d.C: Delete entire paragraph.

Par. 1130.857, subpara. 1: In the last sentence, change "3-part" to read "2-part".

subpara. 3.b. Change entire paragraph to read:
"b. Carbon retain in files as long as needed locally."

subpara. 3.C. Delete entire paragraph.

Par. 1130.858, subpara. 3. In the last sentence, change "Central Office, Attn: C-2.1" to read "NWRC".

Par. 1130.86 In the title of the paragraph, delete "Autographic". Change the first sentence to read: "Forward all pyrheliometer autographic records, Forms 610-8, and punched cards to the NWRC after monthly processing is completed."

Summary of Routing Instructions, WRPC Procedures for Processing Solar Radiation Data, 1-16-59: Make the following changes:

For Tabulation 610-8C: Parts: Change "3" to "2".
 Routing: Delete routing of 1st CC.
 Change "2nd CC" to read "CC".
 Ref. Pars: Change "1130.834" to read "1130.84".

For Tabulation 610-8E: Parts: Change "3" to read "2".
 Routing: Delete routing of 1st CC.
 Change "2nd CC" to read "CC".

For Tabulation 610-8F: Routing: Change routing of original to read:
 "Orig.: to NWRC."
 Ref. Pars.: Change "1130.853 (3)" to read
 "1130.858(3)".

For Autographic Records, Forms 610-8 (without hourly data), etc., delete "(without hourly data)".

Add: 1130.88 Missing Station Report. Upon completion of calendar-month processing of solar radiation data, report to the Central Office, Attn.: O-4.22, the names of the stations that did not furnish solar radiation records for the month. At the same time, report the receipt of records previously reported as missing.

In Paragraph 9999.212 delete the assignment of col. 65 to the punching of triple register data.

Add the following:

9999.2126 Punch the approved network classification into Col. 65 according to the following code:

| <u>Punch</u> | <u>Network</u> | <u>List As</u> |
|--------------|--|----------------|
| 1 | "a" | A |
| 2 | "a" incomplete (thermometers not installed, or data not punched) | A- |
| 3 | "ab" | AB |
| 4 | "ab" incomplete (as 2 above) | AB- |
| 5 | "b" | B |
| 6 | "c" | C |
| 7 | "x" | X |

No punch in Col. 65 will denote no network status. A change in network classification alone will not make it necessary to punch Cols. 70-78 of the old card and commence a new card. Such a change can be regarded as a correction of previously reported data.

Substitute the following for Paragraph 9999.227:

9999.227 Whenever the number of pen-and-ink changes to the latest listing warrants it, and at least once a year, list the History Deck on 3-part "WRPC Card File History Listing" format paper. Enter the date of preparation on the first page of the listing. The original should be retained at the WRPC; the first carbon copy should be forwarded to the NWRC; the second carbon copy should be forwarded to the Office of Climatology.



H. E. Landsberg
Director, Office of Climatology

GUIDE TO CLIMATOLOGICAL SERVICES MEMORANDUM NO. 75

Item No. Page No.

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