INTRODUCTION

This series of Northern Hemisphere Weather Maps covers the general period of World War II and is produced by the United States Weather Bureau in an effort to make available a sequence of published maps, continuous from 1899, of a similar type of analysis to those Northern Hemisphere Weather Maps that have already been completed.[1] Each volume of the series consists of Northern Hemisphere maps for one month, there being one sea-level map and one upper-air constant-pressure-surface (500 millibars) map for each day of the month.

SEA-LEVEL MAPS

DATA

The sea-level maps in this series were prepared from data observed at or near 1230 GMT. In localities where weather observations are taken only once a day, 1230 GMT is the usual time of the observation. Thus the greatest number of data for the entire Northern Hemisphere has been made available. Furthermore, the use of 1230 GMT data provides continuity with other series of Northern Hemisphere Historical Weather Maps.[1] However, because of the difficulty in acquiring data for this particular war period, observations taken within three hours of 1230 GMT in areas of scarce synoptic reports were considered as synoptic and plotted without notation. For plotted observations that were taken more than three hours from 1230 GMT, the time of observation has been indicated in brackets immediately below the plotted data.

Observations were used from every available source. Since at the time of plotting this map series the original teletypewriter and radio collections of reports were not available, it was necessary in some cases to transcribe data from maps which had been prepared on an operational basis at United States military bases during the war. United States and some ocean data were available from U. S. Weather Bureau, Air Force, and Navy original records. Many reports were kindly provided by the meteorological services of other countries, either in punched card or tabular form; and other data were obtained from the published bulletins of other countries. For example, British, Indian, and German (through March 1945) reports were plotted from the published bulletins of those countries, and data for Japan, Korea, and Manchuria were plotted from microfilm of Japanese data tabulations when available.

Where applicable, the International Plotting Code models were used in plotting the maps, but in some instances, because of the great variance in sources of data and elements reported within individual observations, this was not possible. In some cases the relative humidity was plotted in place of the dew point, and in other cases cloud types and/or precipitation types had to be generalized so that they could be plotted in symbolic form.

Station pressures, instead of sea-level pressures, were recorded by some stations in the hemisphere and occasionally, if the station was above 1,000 meters, the pressure was reduced to that level. The latter reports, reduced to sea-level, appear on the maps. Pressures not reduced to sea-level appear enclosed in parentheses.

ANALYSIS

In the analysis of the Northern Hemisphere sea-level charts, all frontal structures with well-established histories were retained until the data showed that frontolysis had taken place. In those cases frontolysis has been shown and the front has been dropped from the maps. Every effort has been made to carry all major frontal systems. Minor fronts were carried on the maps only when the data indicated that a minor front did exist and the resulting weather was significant. Every effort was made to distinguish between a cold front and a polar trough, both over land and over water. Great care was exercised to include all frontal boundaries causing significant weather. However, it is physically beyond the scope of these charts, presented in 24-hour intervals, to indicate in detail each secondary or swiftly re-developed frontal system whose inception, growth, and full development may easily have taken place in the interval between maps. Representation of these features must necessarily be shown, in some cases, as merely an indication of what took place in the interim. These indications have been considered a major part of the analysis and have been represented in the most feasible fashion in accordance with the particular situation being analyzed.

Analysis of the sea-level charts was aided by a careful study of various published national maps of foreign countries, and of intermediate charts prepared by the U. S. Weather Bureau and the U. S. Air Force. Maps prepared operationally at U. S. Air Force bases overseas were also used as an analysis aid; some of those most frequently used were prepared during the war for areas surrounding Bovington, England; Harmon Field, Newfoundland; Churchill, Canada; Poltava, U. S. S. R.; Elmendorf, Alaska; and Hickam Field, Hawaii.

Analyses in tropical areas are necessarily incomplete. In areas of few or no data a reasonable isobaric pattern has been carried for completeness in lieu of entering the mean position of the Intertropical Convergence Zone for that particular time of year. Whenever available data made it possible to determine the position of the Zone of convergence, that position was entered.

Easterly waves, westerly troughs, and shear lines were entered only when the data definitely supported these phenomena and intermediate charts confirmed them.

Instability or squall-lines were entered on the charts when the associated weather warranted them and after close study of intermediate charts, when available.

In areas of relatively sparse data, intermediate charts were carefully studied to obtain the best possible solution. When no intermediate data or charts were available the analysis was extrapolated and interpolated, with careful consideration to continuity, through areas of sparse or totally lacking data in order to give a continuous representation of frontal developments and isobaric patterns. The analysts preparing this series of charts have had considerable experience in Northern Hemisphere analysis and in maintaining continuity in areas of sparse data coverage. In areas of few data, every attempt was made to check the data and the many sources of data for accuracy and representativeness and then to analyze accordingly, with established mean patterns used only as a control factor.

500-MILLIBAR MAPS

The maps for the 500-millibar surface have been included in this series for their value in portraying the upper-air patterns associated with sea-level systems.

DATA

In order to provide continuity with the series of Northern Hemisphere Historical Weather Maps beginning with October 1945,[1] the 500-millibar charts in this series were prepared for 0400 GMT. While the upper-level charts are not synoptic with the sea-level charts published in this series, greater amounts of data were available at 0400 GMT than at 1600 GMT for this particular period.

In the absence of the original collections of data received via radio and teletypewriter, the sources of data were limited to charts prepared operationally by the U. S. Air Force and the U. S. Weather Bureau; data tabulations published in the British Daily Aerological Report, the Indian Daily Weather Report, the German Deutsche Seewarte Taglicher Wetterbericht (through March 1945), and a Japanese aerological data publication. Some data were also furnished by the meteorological services of other countries especially for this series.

Observations taken within three hours of 0400 GMT were considered as synoptic and plotted without notation. If observations taken more than three hours from 0400 GMT were plotted, the time of observation was indicated in brackets immediately below the plotted data. In some instances, where it was possible to ascertain only the day of the observation, the data were plotted within parentheses.

Six kilometer winds were plotted when available with altitudes of winds other than this level noted immediately below the plotted wind.

ANALYSIS

As an aid to the analysis, the 1600 GMT 500-millibar charts as well as 0400 GMT and 1600 GMT constant-level charts prepared by the U. S. Weather Bureau and the U. S. Air Force were carefully studied. 20,000-ft. constant-level charts were also used in the thermal analysis at 500-millibars.

Because of the lack of complete soundings in many areas, computations of constant-pressure-surface height were not as reliable in this series as in the later series of published Northern Hemisphere upper-level charts, but computations of the 500-millibar surface were made in areas of sparse data using known relationships in the atmosphere between sea-level and 500 millibars with the aid of intermediate constant-level charts when available.

In some areas such as the polar and Asian regions, where data of all types were absent, no attempt was made to complete the analysis, and the height contours and isotherms were not extended greatly beyond the limit of the data coverage. In some cases, however, when data were missing over Asia for only one day in a sequence, the analysis was extrapolated and interpolated by estimating trajectory movements using continuity as a prime requisite.

Height contours were drawn as solid lines at intervals of 200 feet. Trough lines were represented by a double solid line. The positions of troughs were drawn to coincide generally with the points of lowest latitude reached by the contour lines or with the points of maximum cyclonic curvature which are associated with definite air mass interactions at sea-level. In many instances of migratory troughs imbedded in a stream flow with a definite northerly or southerly component, the trough lines were indicated as passing through points of maximum curvature, which are not necessarily points of minimum latitude. In some cases, when the advection of cold air appeared to be the most significant change at 500-millibars, the trough identified with a particular surface air mass interaction was shown to be moving out of the points of maximum curvature in the contours. Isotherms at 5°C. intervals were drawn as single dashed lines.

The initial trough line west of 0° longitude on the first day of each month was identified by the letter A at the bottom of the line. Proceeding westward, trough lines were labeled with succeeding letters. Trough lines on the first day of each month were identified with the same troughs on the last day of the preceding month by a letter (or letters) at the top of each line. When a new trough developed from one already established, the prime symbol (′) was used with the identifying letter of the original trough. When two troughs combined to make one, the new trough was labeled with the letters of the two original troughs separated by a + sign. Double letters were used after single alphabetical letters were exhausted. In analyzing the movement of these upper troughs, careful consideration was given to the relation of upper-air and sea-level situations. Surface and upper-air analyses have been closely coordinated, particularly in areas where data were sparse, in order to insure that the final analysis would be the best possible in view of the limited data and would be completely consistent with the surface analysis.

---

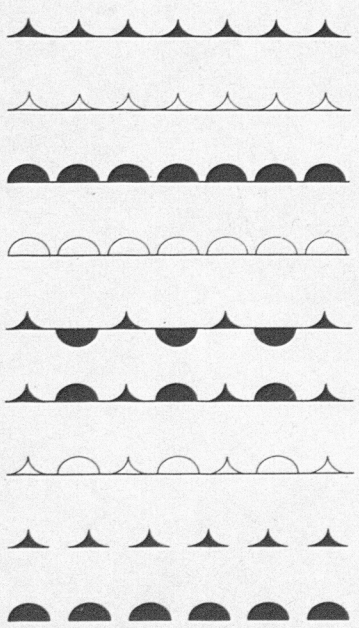
[1] (a) U. S. Weather Bureau, "Daily Synoptic Series Historical Weather Maps, Northern Hemisphere Sea Level", January 1899 to June 1939, inclusive.

(b) Headquarters, Air Weather Service, AAF, "Northern Hemisphere Historical Weather Maps, Sea Level and 500 Millibars", October 1945 to December 1948, inclusive.

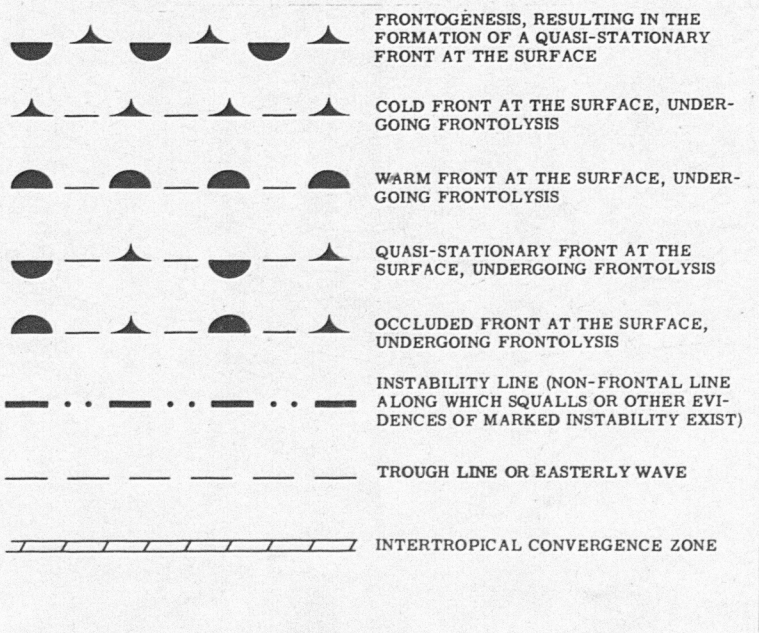
(c) U. S. Weather Bureau, "Daily Series Synoptic Weather Maps Northern Hemisphere Sea Level and 500 Millibar Charts", January 1949 et seq.

LIST OF SYMBOLS USED ON MAPS

SEA-LEVEL MAPS



SEA-LEVEL MAPS



500-MILLIBAR MAPS