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105-14 (105-14B, on Part 2)

CLASSIFICATION GRAPH

EAST PACIFIC SYNOPTIC REGION

JANUARY 1899 — JUNE 1939

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CIT-AAF RESEARCH UNIT
PROJECTS 11 AND 21 A

105-14A-Part 1 as of 65141

TP105-14

65141 811

SUMMER CLASSIFICATION GRAPH
FOR
EAST PACIFIC SYNOPTIC REGION

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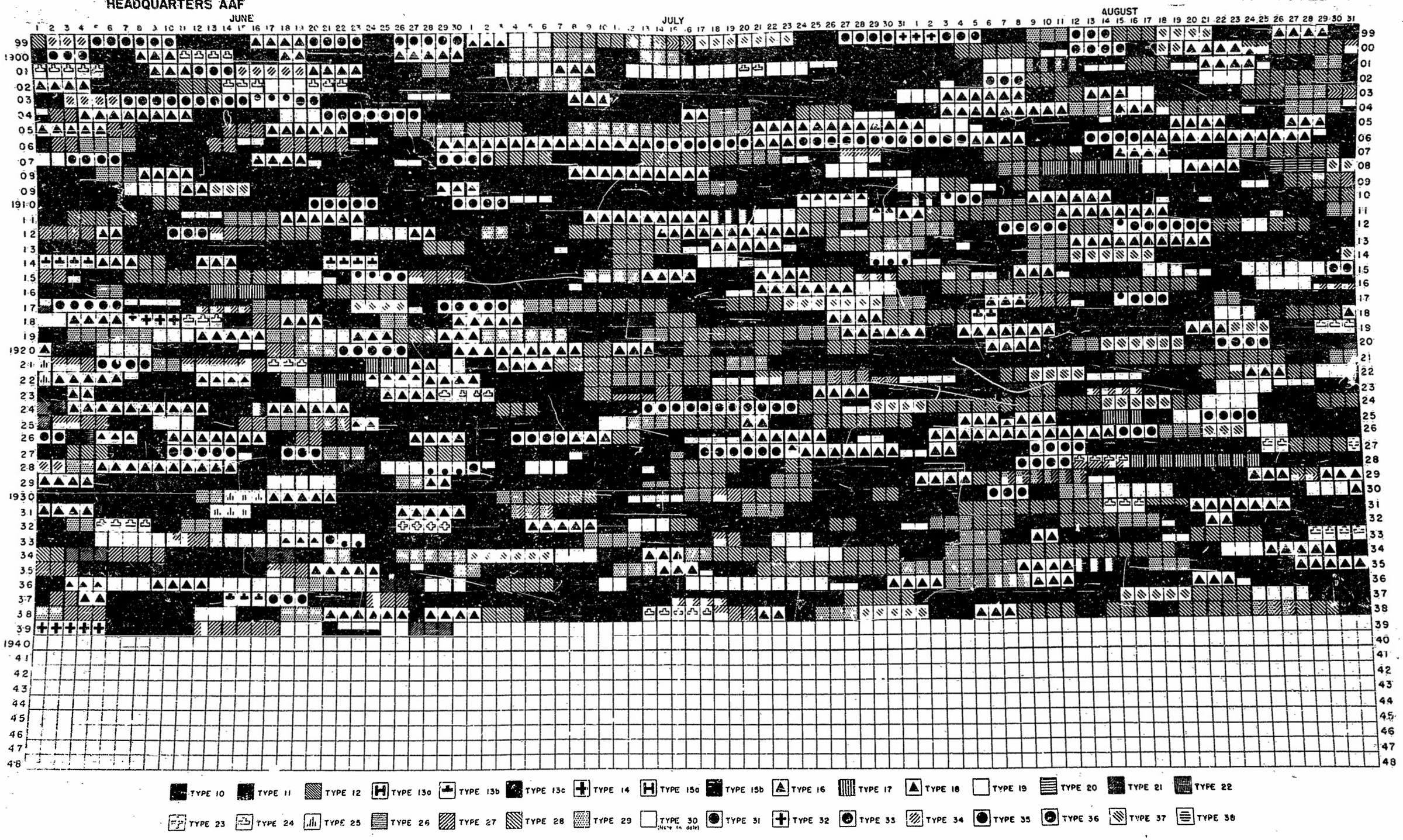

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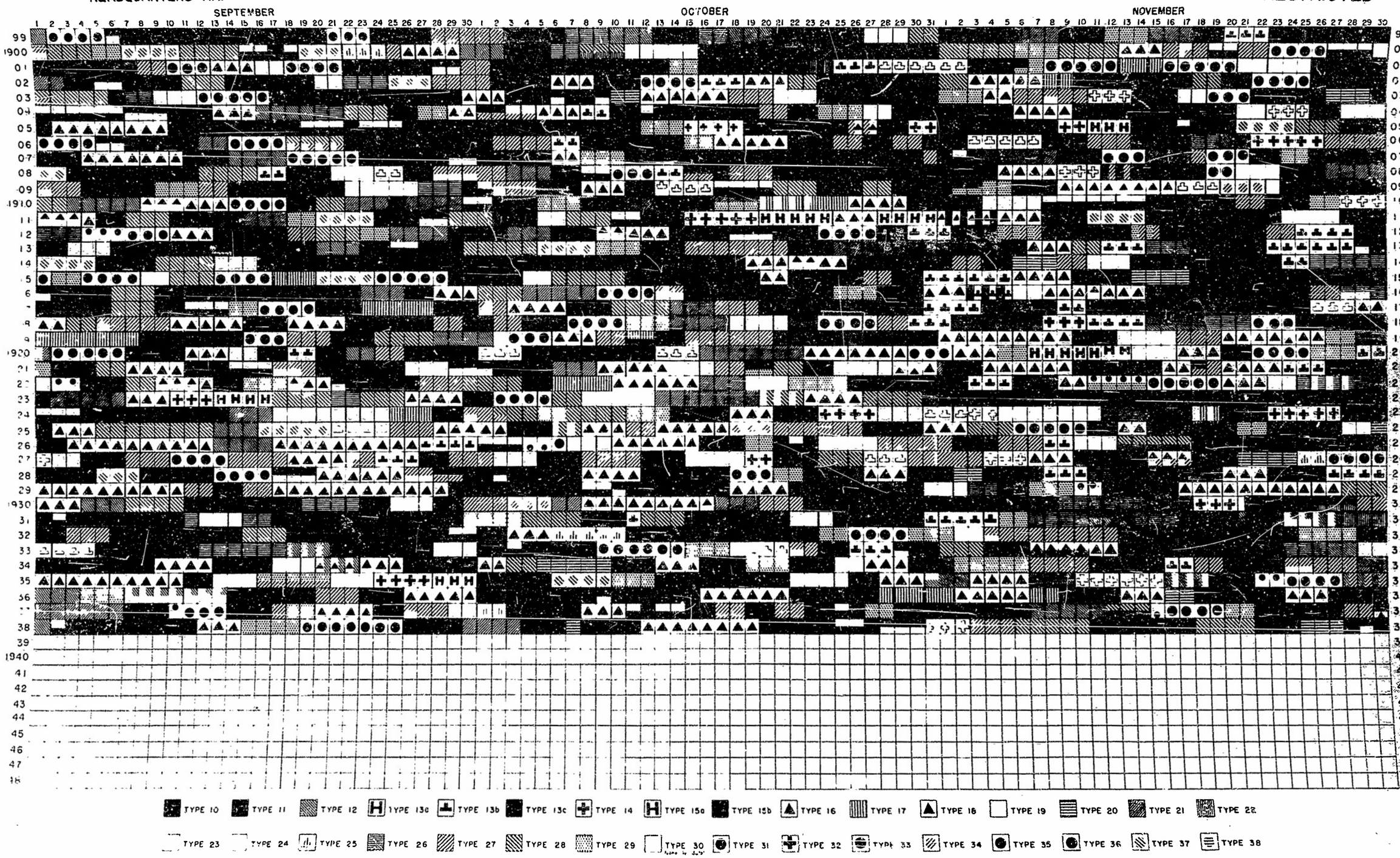

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WINTER CLASSIFICATION GRAPH
FOR
EAST PACIFIC SYNOPTIC REGION

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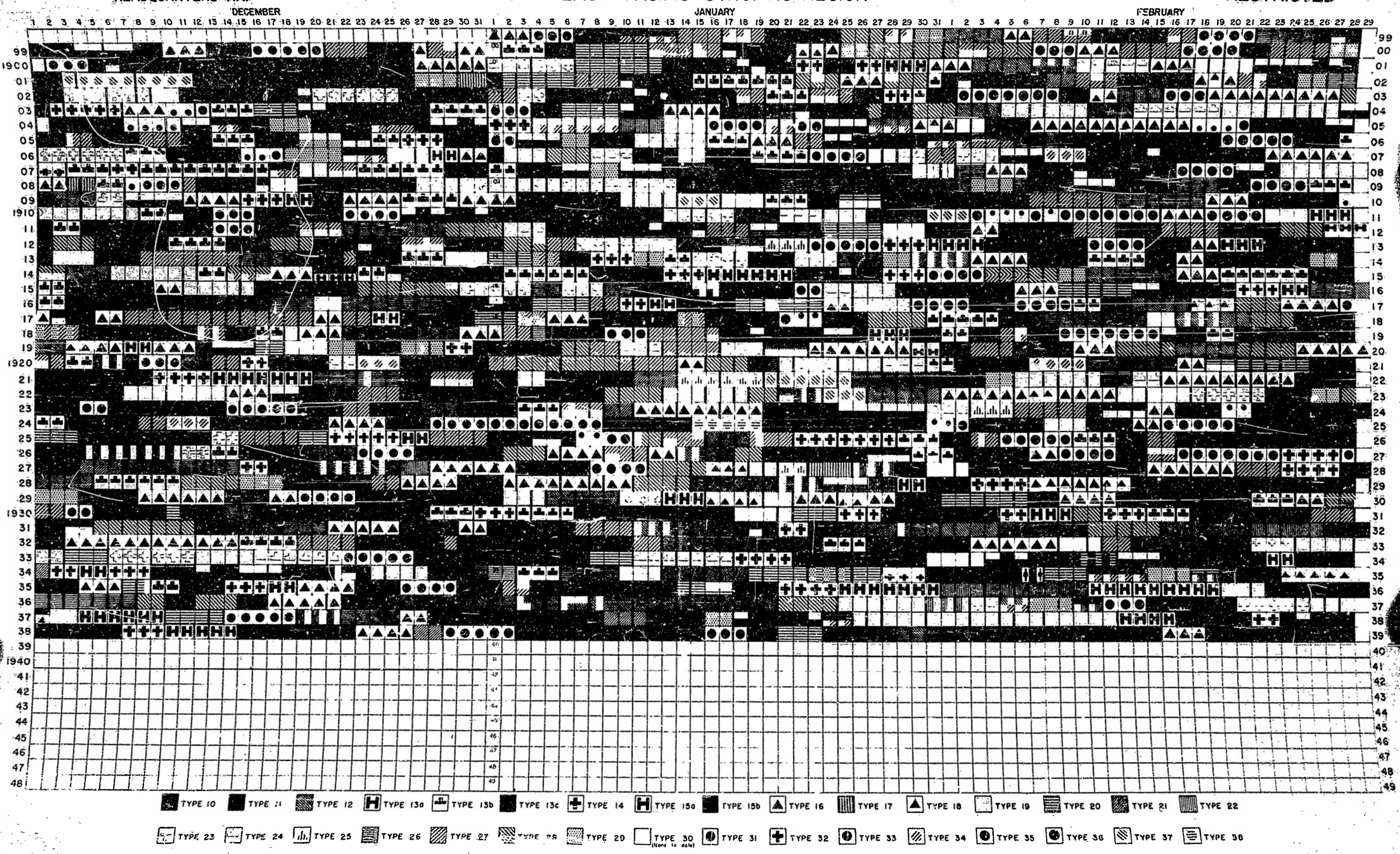

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SPRING CLASSIFICATION GRAPH
FOR
EAST PACIFIC SYNOPTIC REGION

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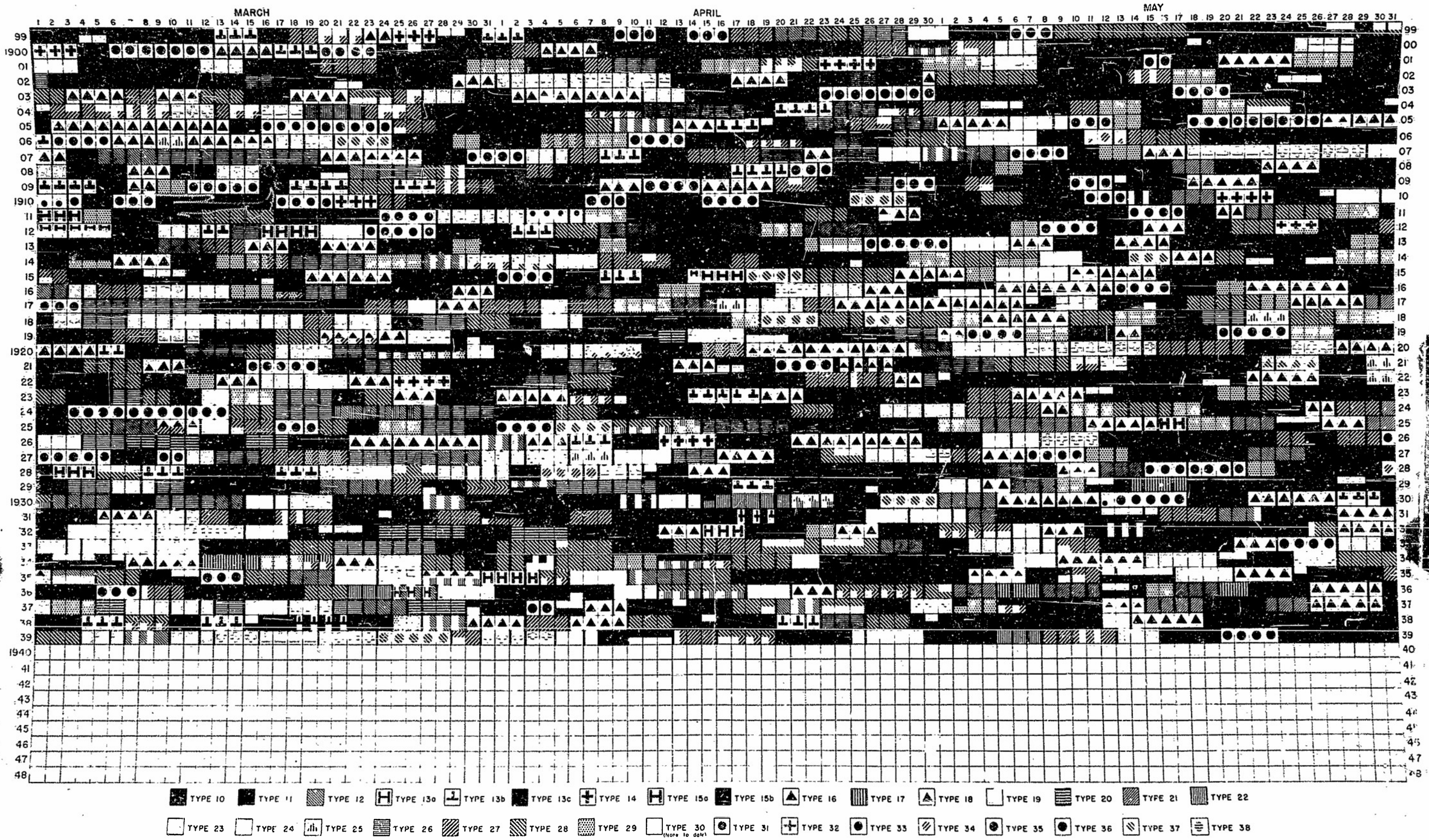

65141

Preparation of a Classification Graph - East Asia - West Pacific Synoptic Region - January 1899 Through June 1939 - Part I

(None)

Rempel, W. H.; Stone, N. C.
California Inst. of Technology, Meteorology Dept., Pasadena
U. S. Air Force, Air Weather Service, Washington, D. C.

R-904

TR-105-14A

June '44 Unclass. U.S. English 74 charts

Progress is reported in the development of a classification graph for the East Asia, West Pacific, and North American synoptic regions. Purpose of the investigation was to develop a reliable and efficient method of analogue selection. Forty years (1899 - 1939) daily synoptic sea-level Northern Hemisphere historical weather maps were used as the source of data. A preliminary investigation revealed the existence of several well-established three-day synoptic sequences that recurred with high frequency. A brief description is given of the principal features of each synoptic weather type for the regions investigated. Preliminary types have been developed for all seasons. All data are shown in composite charts and graphs.

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AMC, WRIGHT FIELD
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AIR WEATHER SERVICE
TECHNICAL REPORT 105-14A

PREPARATION OF A CLASSIFICATION GRAPH EAST PACIFIC SYNOPTIC REGION JANUARY 1899-JUNE 1939 (PART I)

MAY 1945

HEADQUARTERS
AIR WEATHER SERVICE
WASHINGTON, D.C.

Incl 14

Air Weather Service
Report 105-12A

[redacted]

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METEOROLOGY DEPARTMENT

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

JUNE 30, 1944

PREPARATION OF A CLASSIFICATION GRAPH

EAST ASIA - WEST PACIFIC SYNOPTIC REGION

JANUARY 1899 THROUGH JUNE 1939

(Part I)

CIT-AAF RESEARCH UNIT

(Project #1)

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FOREWORD

At the request of the Weather Division, AAF, five additional copies of the East Asia-West Pacific Classification Graphs have been prepared. These seasonal Graphs, along with the accompanying reports, have been numbered, respectively, Sets 5 through 9, and are identical duplicates of the original three sets prepared under the first authorization, except for minor corrections that have been made in the preparation of these new Graphs, and for the addition of an improved protective binding.

Paul E. Ruch
Pasadena, California
September 8, 1944

PREFACE

In the following report, which supplements the seasonal Classification Graphs for the East Asia-West Pacific Synoptic region, the work of CIT-AAF Project No. 1 is summarized for the period from January 1, 1944 to June 30, 1944. Preliminary Classification Graphs for spring, summer, and fall have already been forwarded to the Weather Division, and the Winter Graph accompanies this report.

Professor W. H. Rempel and Professor N. C. Stone who determined the characteristic East Asia-West Pacific Synoptic patterns and directed the preparation of the seasonal Classification Graphs will continue the work of this project in the preparation of Classification Graphs for the East Pacific and the North American Synoptic Regions. First priority will be given to the East Pacific area.

Paul E. Ruch
Pasadena, California
June 30, 1944

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Part II:

VI. CLASSIFICATION GRAPH. (Bound under separate cover accompanying report)

January 1899 through June 1939

I. INTRODUCTION.

A. Problem - to develop a Classification Graph for the East Asia, Pacific, and North America synoptic regions.

Colonel Bassett in a letter of March 16, 1944 indicated that preference should be given to East Asia and the West Pacific for the spring months. This suggestion has been followed.

B. Purpose - to develop a reliable and efficient method of analogue selection.

C. Source of data - forty (40) years daily synoptic sea level Northern Hemisphere historical weather maps.

These analyses are the best available for this particular research problem. General features are in most cases accurate, but details are lacking especially for China and Eastern Siberia. In the majority of cases, fronts extending in a northeast-southwesterly direction from the Bering Sea to the East China Sea are dropped before they enter the East Central China area. More detailed analyses in this region would greatly facilitate the anticipation of a characteristic synoptic development on the day prior to its inception.

It has been impossible to classify all maps for the following reasons: (1) insufficient data, (2) inaccurate data, and (3) poor analyses including lack of continuity in the analyses. It is reasonable to assume that the forty years record would be representative of the most significant weather types, although it is

definitely known that several of the types will be modified slightly before final classification is completed. This may aid in determining at a later date classification of some of the maps that at present are unidentified. In these cases the blocks on the Classification Graph are blank except for symbols representing particular characteristics of the isobaric patterns. Very few corrections have been made in any of the analyses, and only then if extremely poor continuity was evident.

II. DESCRIPTION AND EXPLANATION OF PRELIMINARY WEATHER TYPES DEVELOPED AS A BASIS FOR CLASSIFICATION OF THE EAST ASIA-WEST PACIFIC SYNOPTIC REGION.

In order to determine the significant synoptic characteristics for the East Asia-West Pacific region a preliminary survey was made of several years winter months analyses. This preliminary inspection revealed the existence of several well established three-day synoptic sequences that recurred with high frequency. Accordingly, considerable time and effort have been spent in the development of three-phase Synoptic Weather Types for the East Asia-West Pacific region as a basis for a classification graph of the forty (40) years data. Preliminary types have been developed for all seasons.

A. Brief description of principal features of each type

1. Characteristic trajectories of the low pressure centers of each type.

   In Figure 1 storm tracks are represented for each type. Types 4, 6, and 9 are not included on this chart since no active wave development occurs in the East Asia-West Pacific region. Types 7 and 7a are not included on the trajectory chart because of insufficient space. Refer to page 14 and 15 for trajectories of these two types.

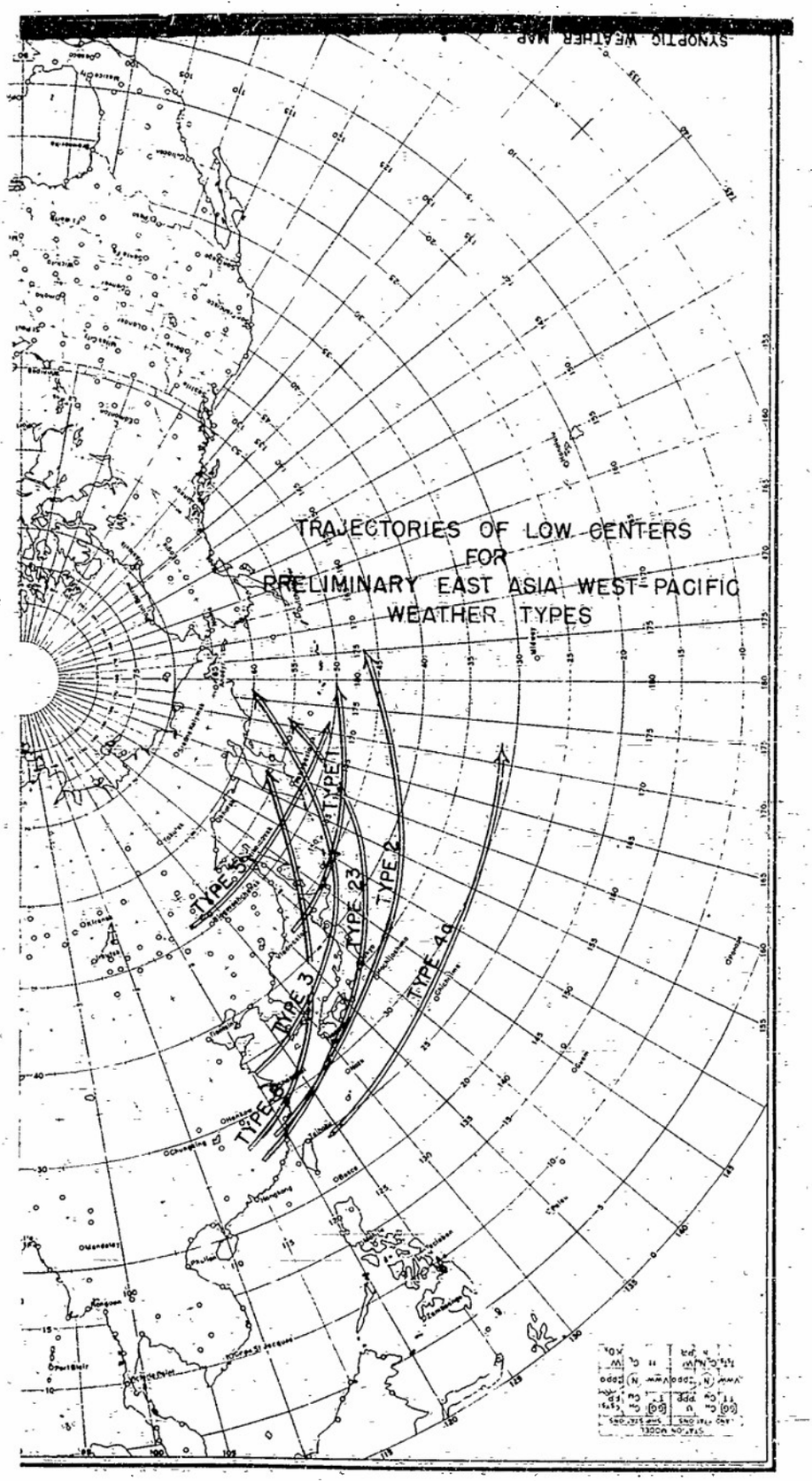
2. Type composite charts

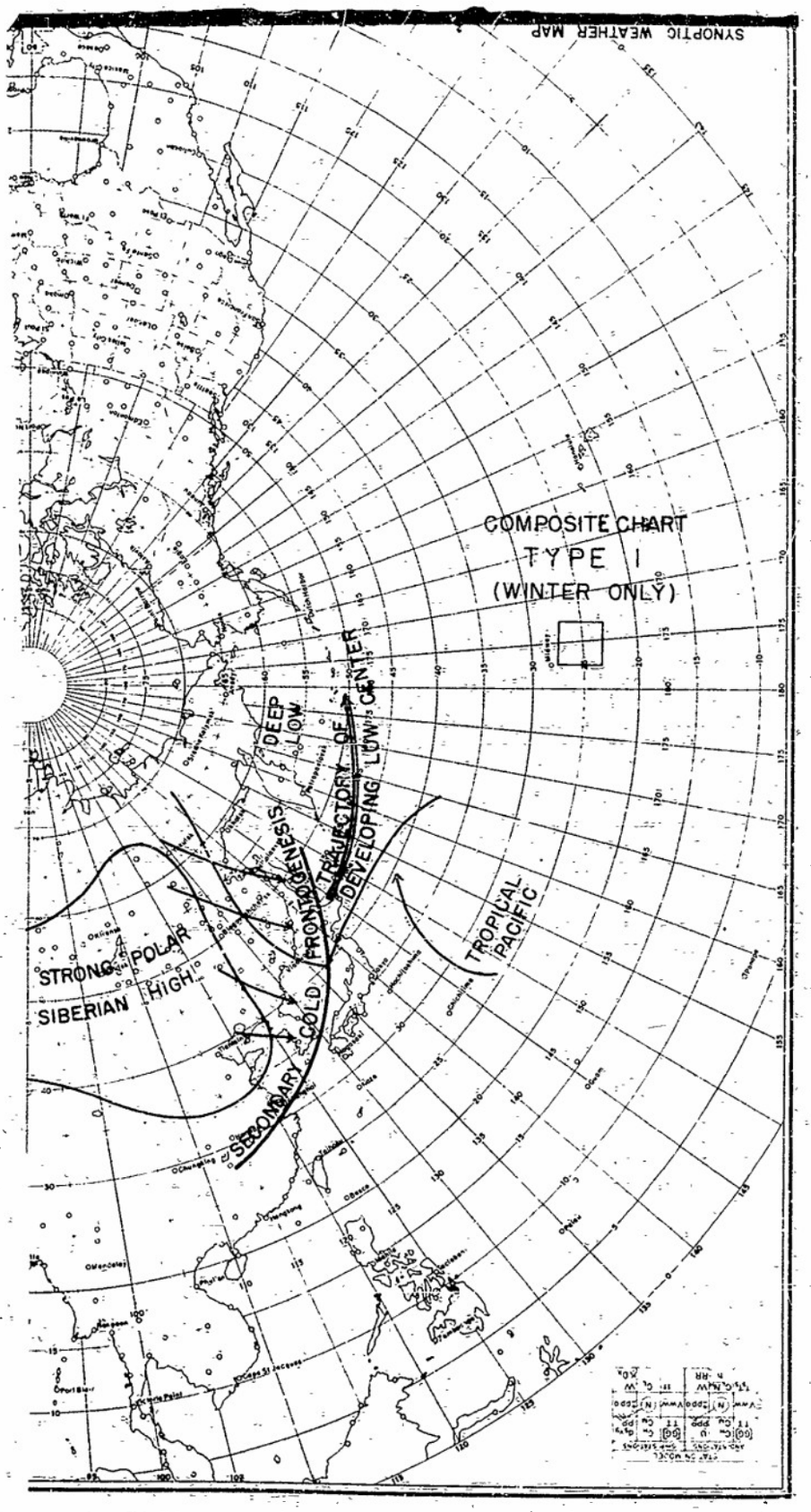
   In the following charts (Figures 2 - 12) the significant features of each type are indicated. Represented in this simplified form are

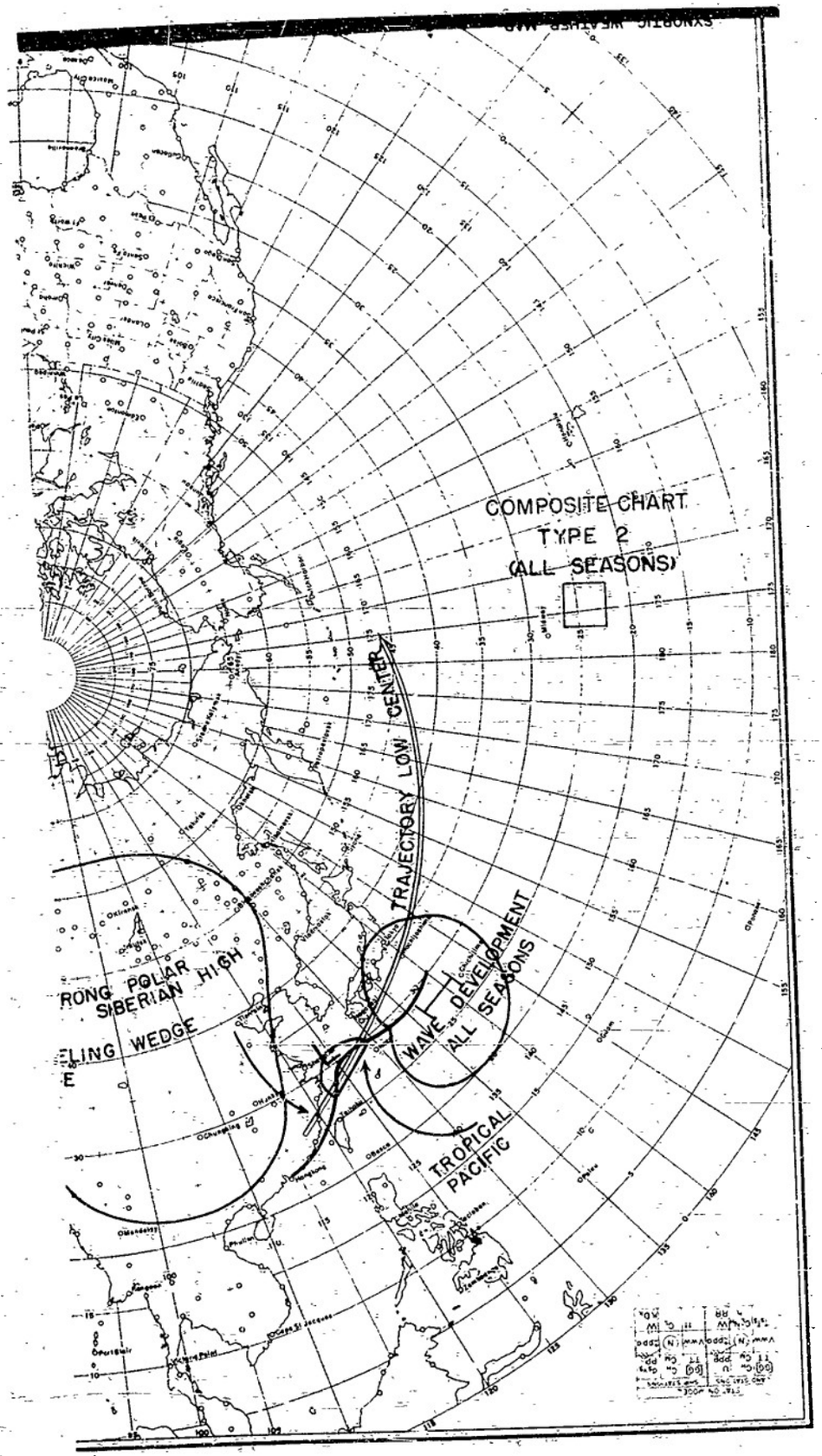
(1) First phase positions of the wave development or frontal zones

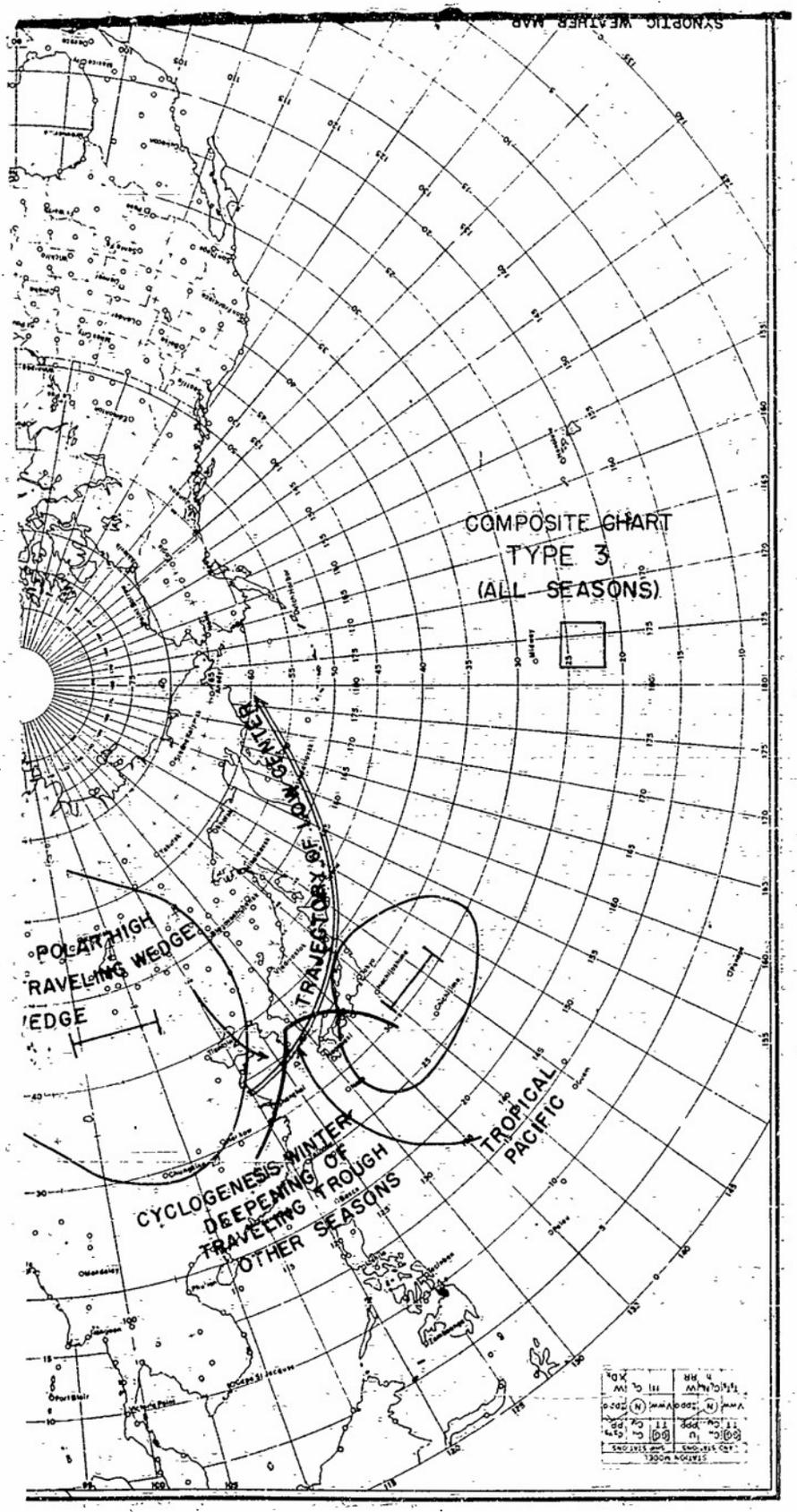
(2) The trajectory of the low centers

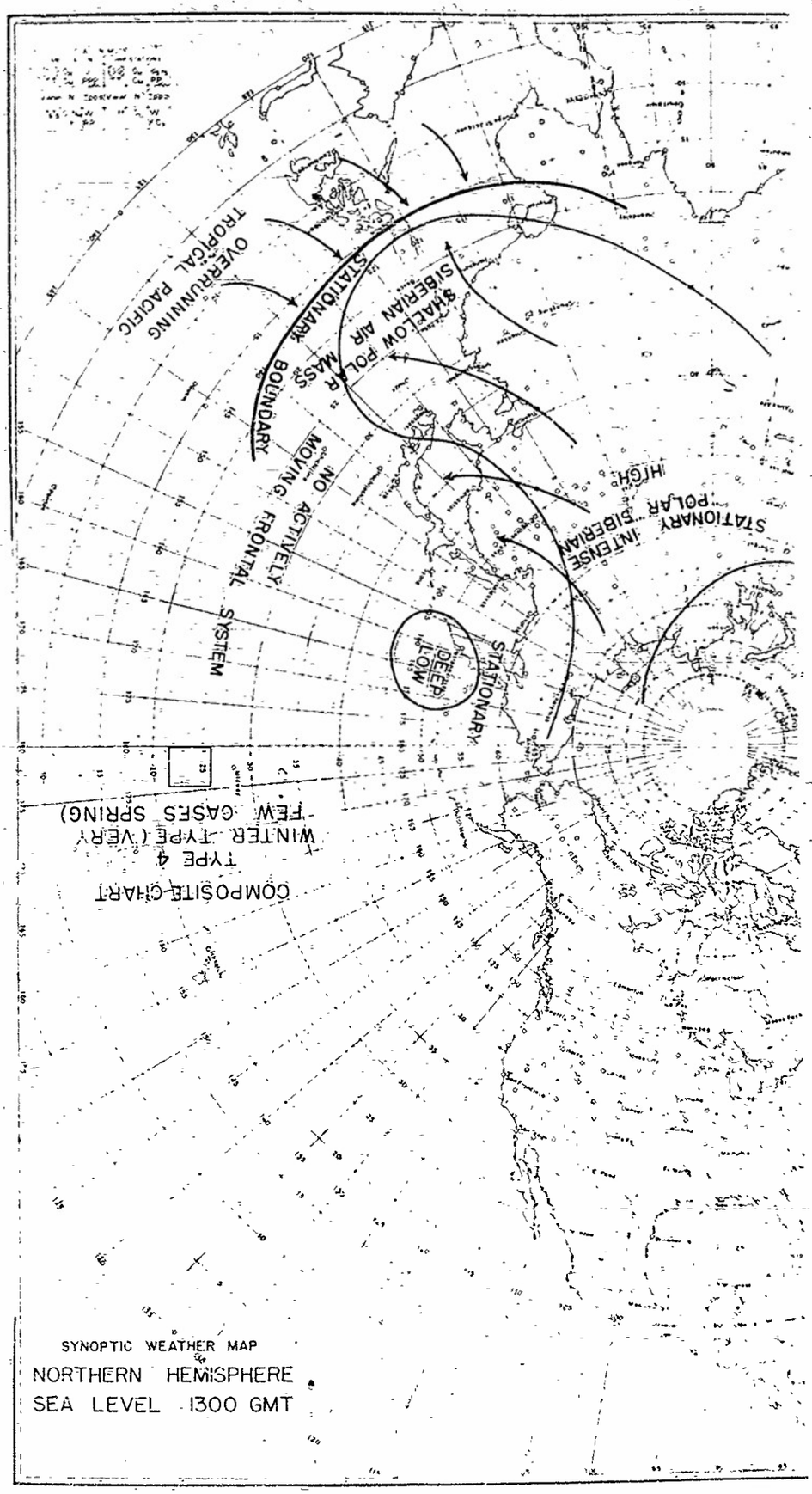
(3) The general stream flow

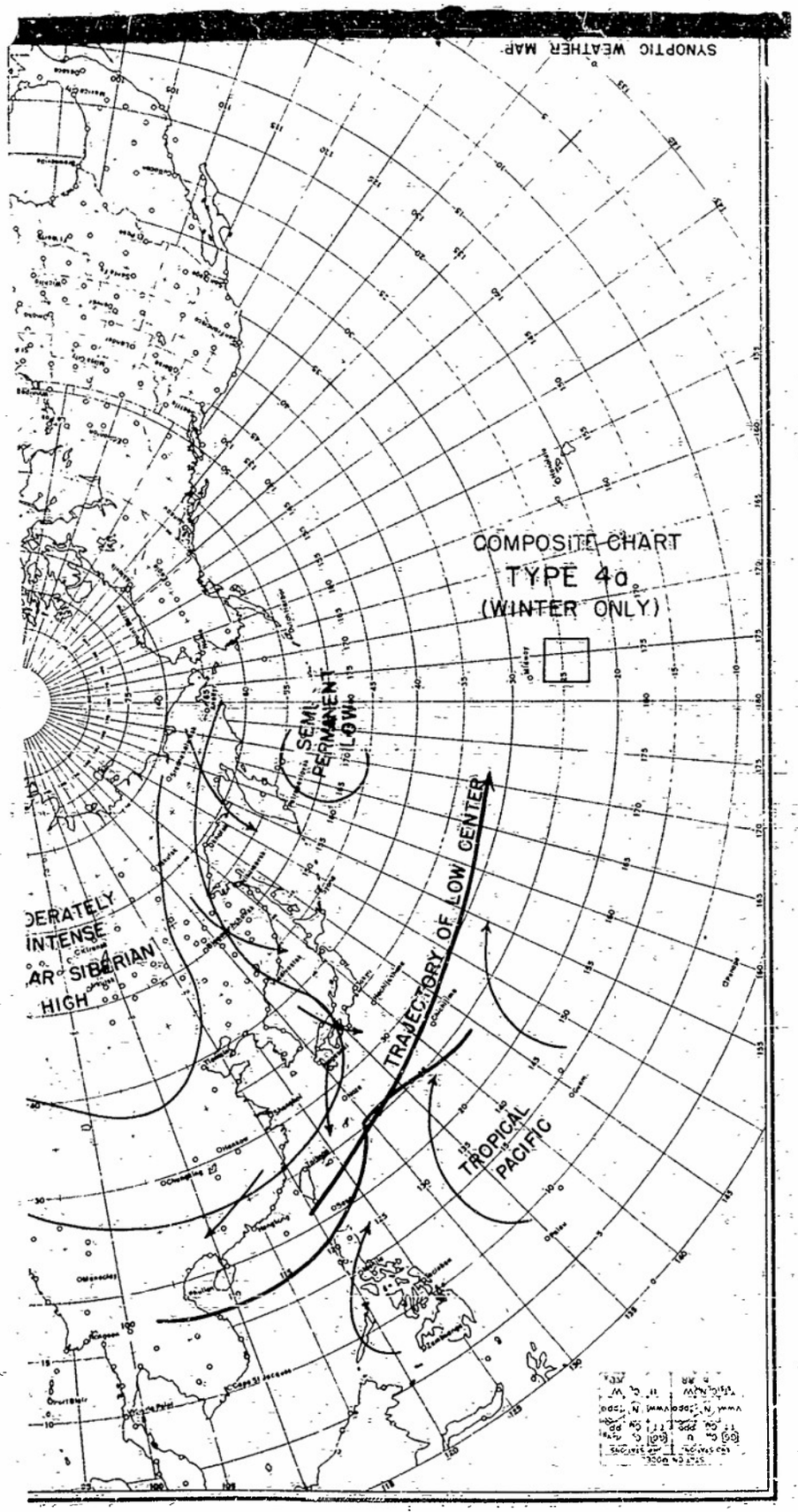

TRAJECTORIES OF LOW CENTERS
FOR
PRELIMINARY EAST ASIA WEST-PACIFIC
WEATHER TYPES
TYPE 5
TYPE 1
TYPE 23
TYPE 2
TYPE 3
TYPE 4a
TYPE 6

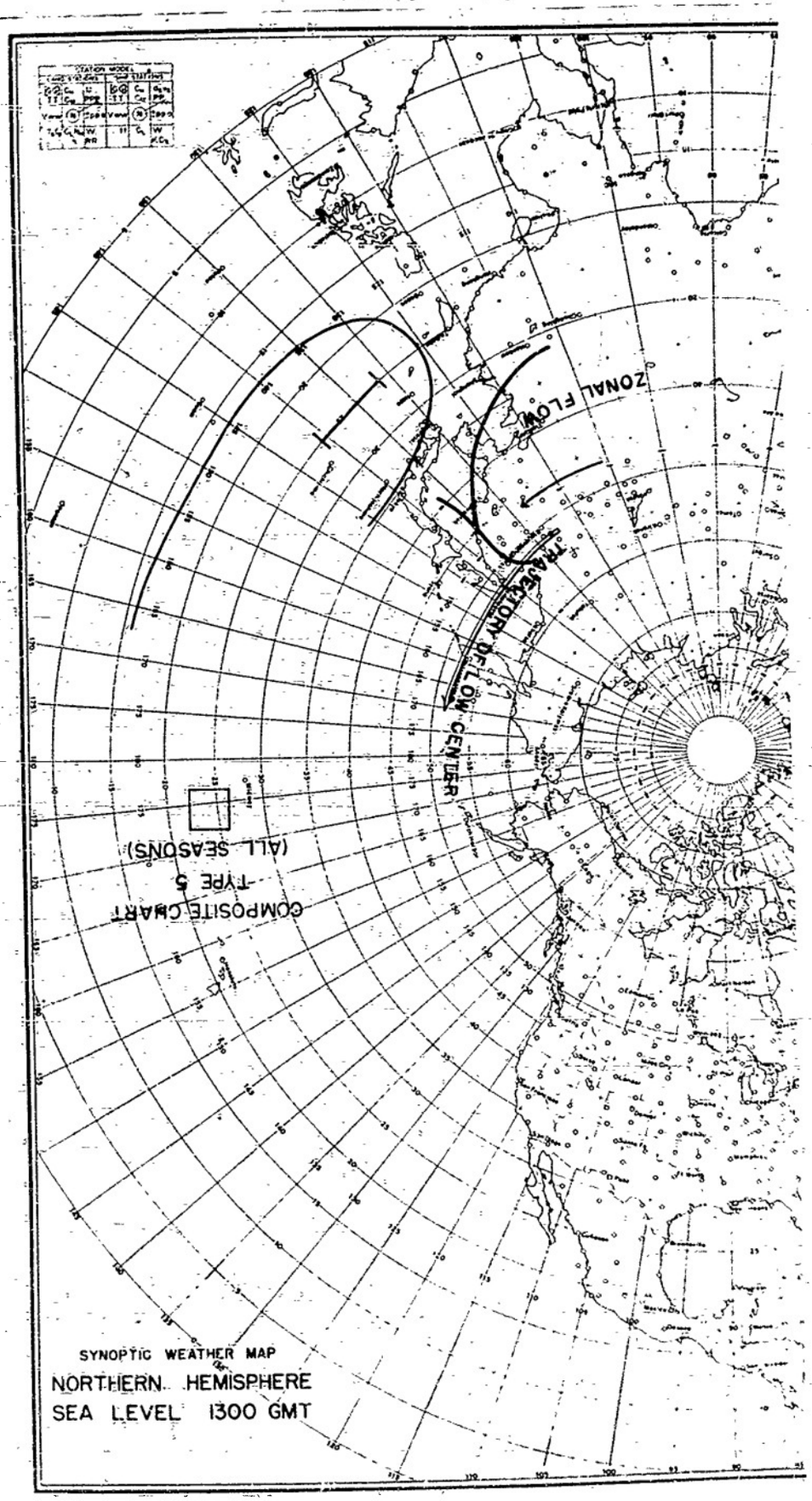

SYNOPTIC WEATHER MAP
COMPOSITE CHART
TYPE I
(WINTER ONLY)
DEEP LOW
TRAJECTORY OF DEVELOPING LOW'S CENTER
FRONTOGENESIS
TROPICAL PACIFIC
STRONG POLAR SIBERIAN HIGH
SECONDARY COLD

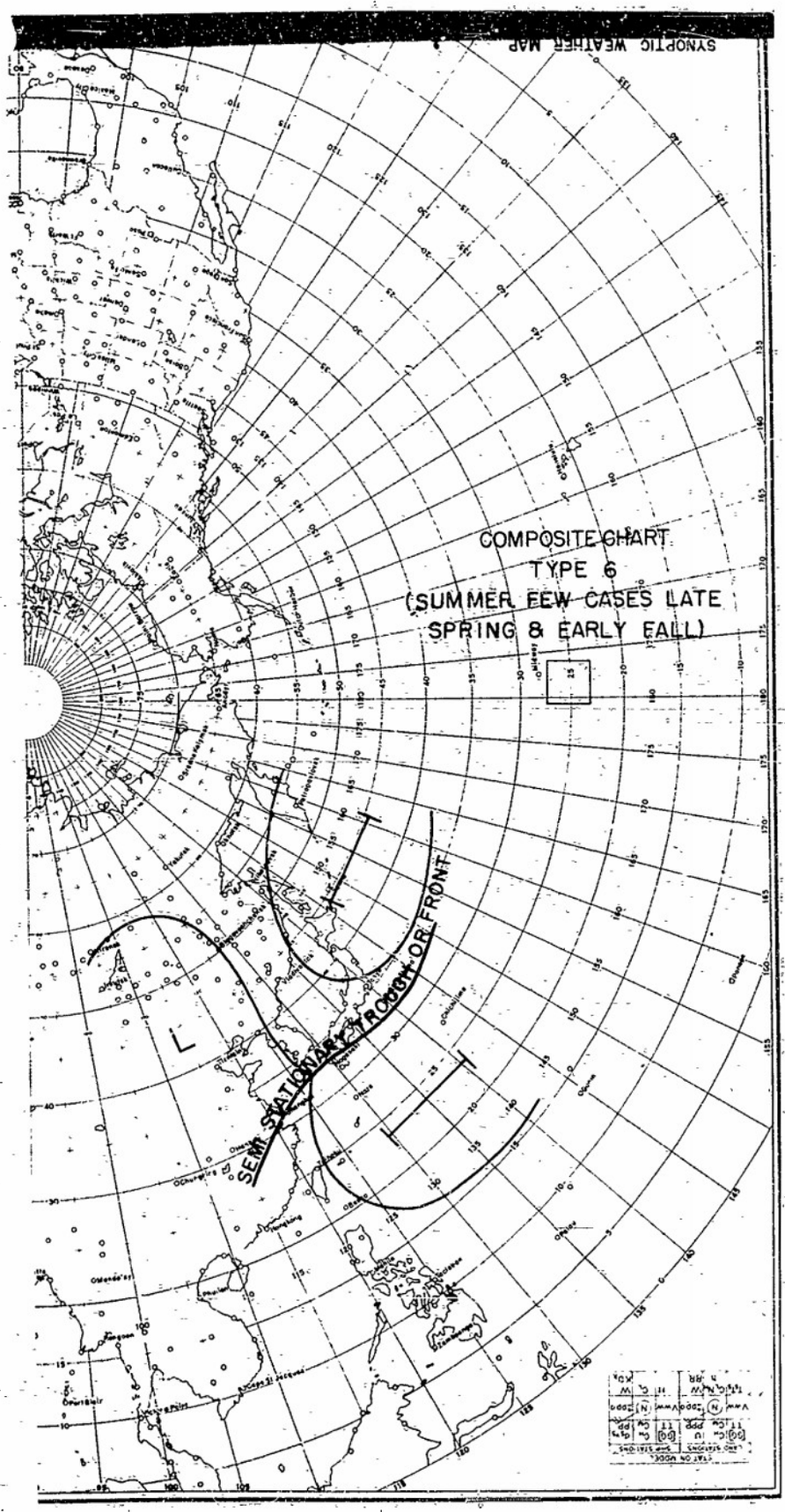

COMPOSITE CHART
TYPE 2
(ALL SEASONS)
TRAJECTORY LOW CENTER
WAVE DEVELOPMENT
ALL SEASONS
TROPICAL
PACIFIC
RONG POLAR
SIBERIAN HIGH
LING WEDGE
E

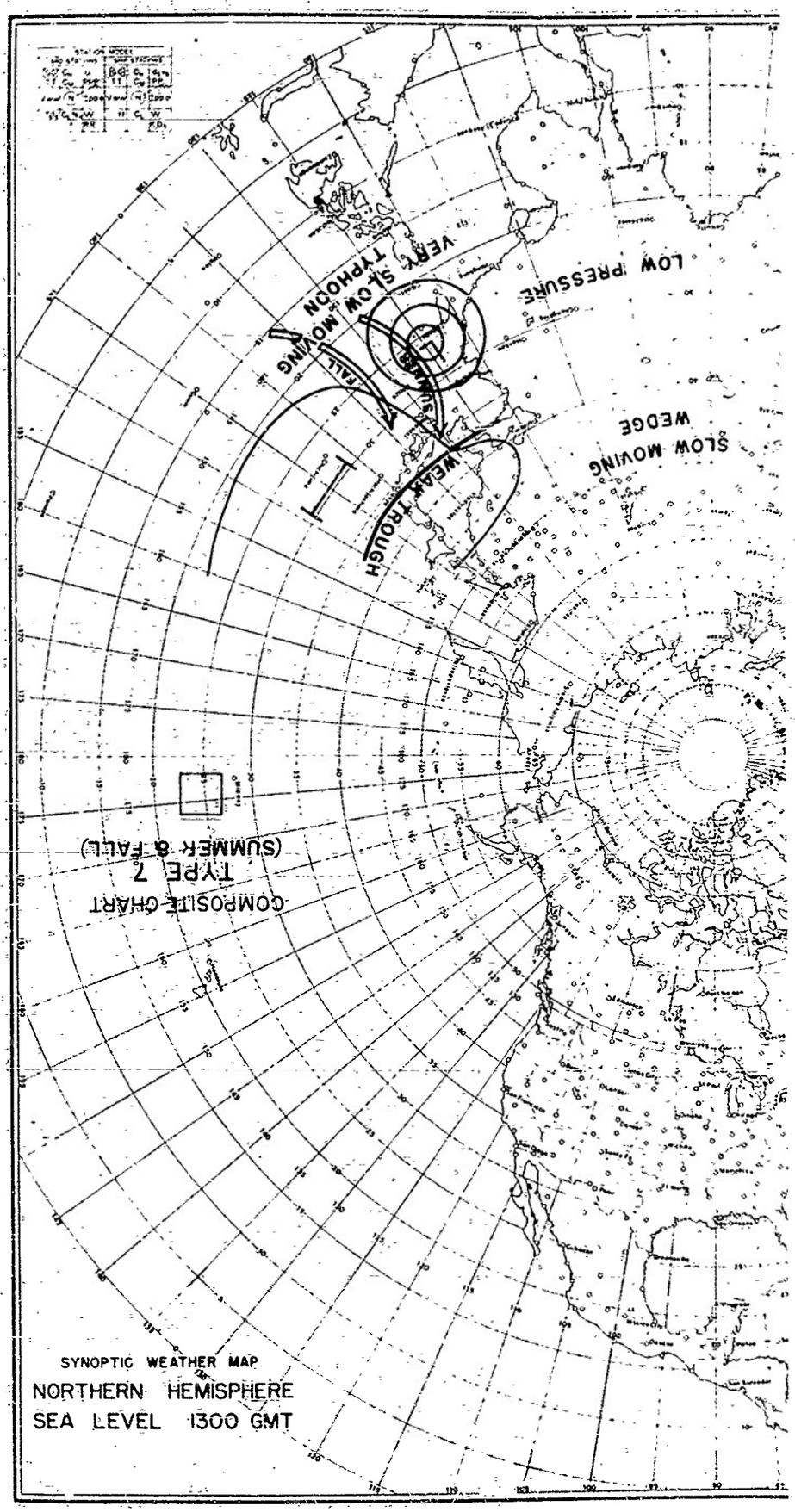

COMPOSITE CHART
TYPE 3
(ALL SEASONS)
TRAJECTORY OF LOW CENTER
POLAR HIGH
TRAVELING WEDGE
EDGE
CYCLOGENESIS WINTER
DEEPENING OF
TRAVELING TROUGH
OTHER SEASONS
TROPICAL
PACIFIC

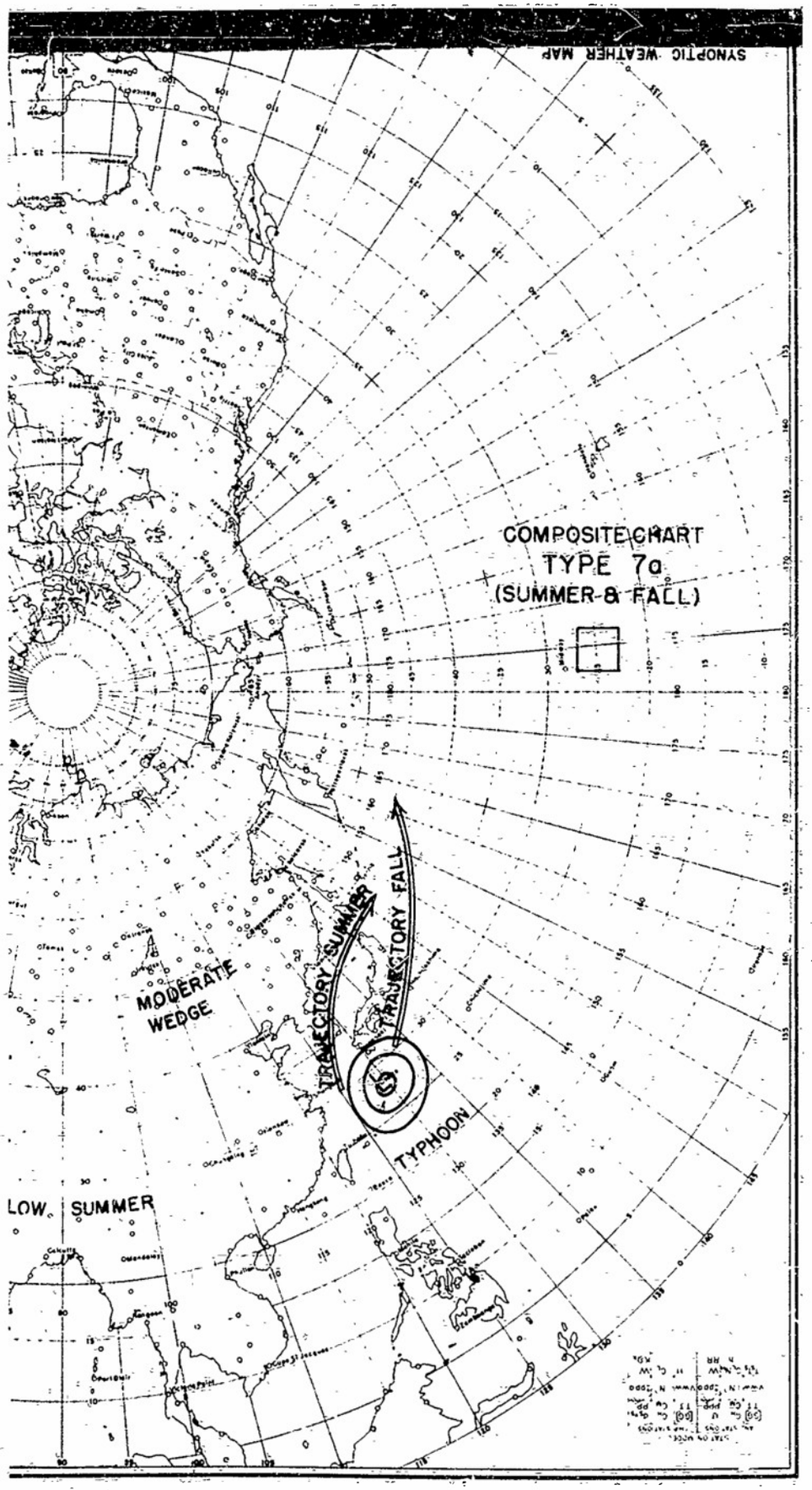

COMPOSITE CHART
TYPE 4
WINTER TYPE (VERY
FEW GASES SPRING)
OVERRUNNING
TROPICAL PACIFIC
STATIONARY
BOUNDARY
SHALLOW POLAR
MASS
SIBERIAN AIR
NO
MOVING
ACTIVELY
FRONTAL
SYSTEM
DEEP
LOW
STATIONARY
INTENSE
SIBERIAN
STATIONARY
POLAR
HIGH
SYNOPTIC WEATHER MAP
NORTHERN HEMISPHERE
SEA LEVEL 1300 GMT

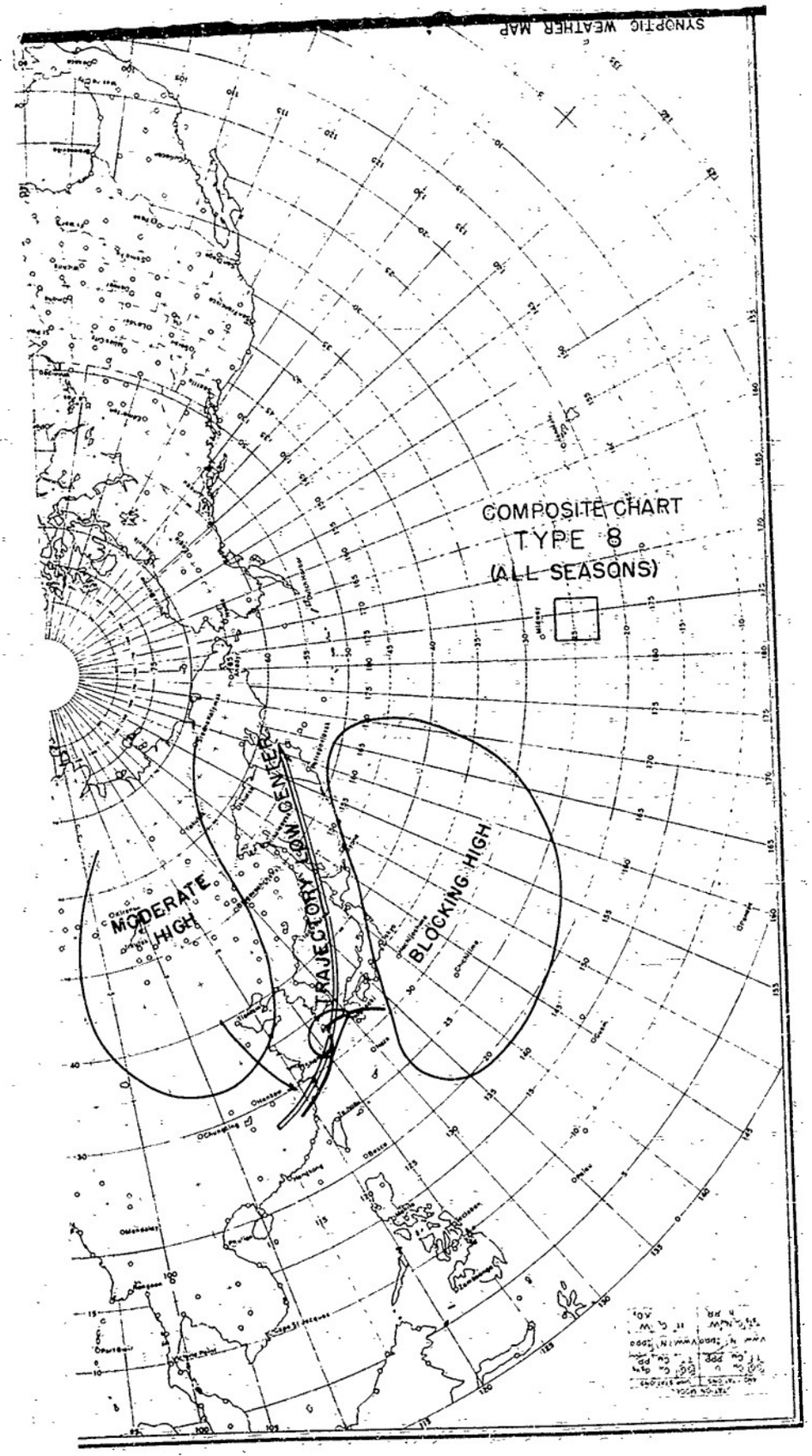

SYNOPTIC WEATHER MAP
COMPOSITE CHART
TYPE 4a
(WINTER ONLY)
SEMI PERMANENT LOW
TRAJECTORY OF LOW CENTER
TROPICAL PACIFIC
SIBERIAN HIGH

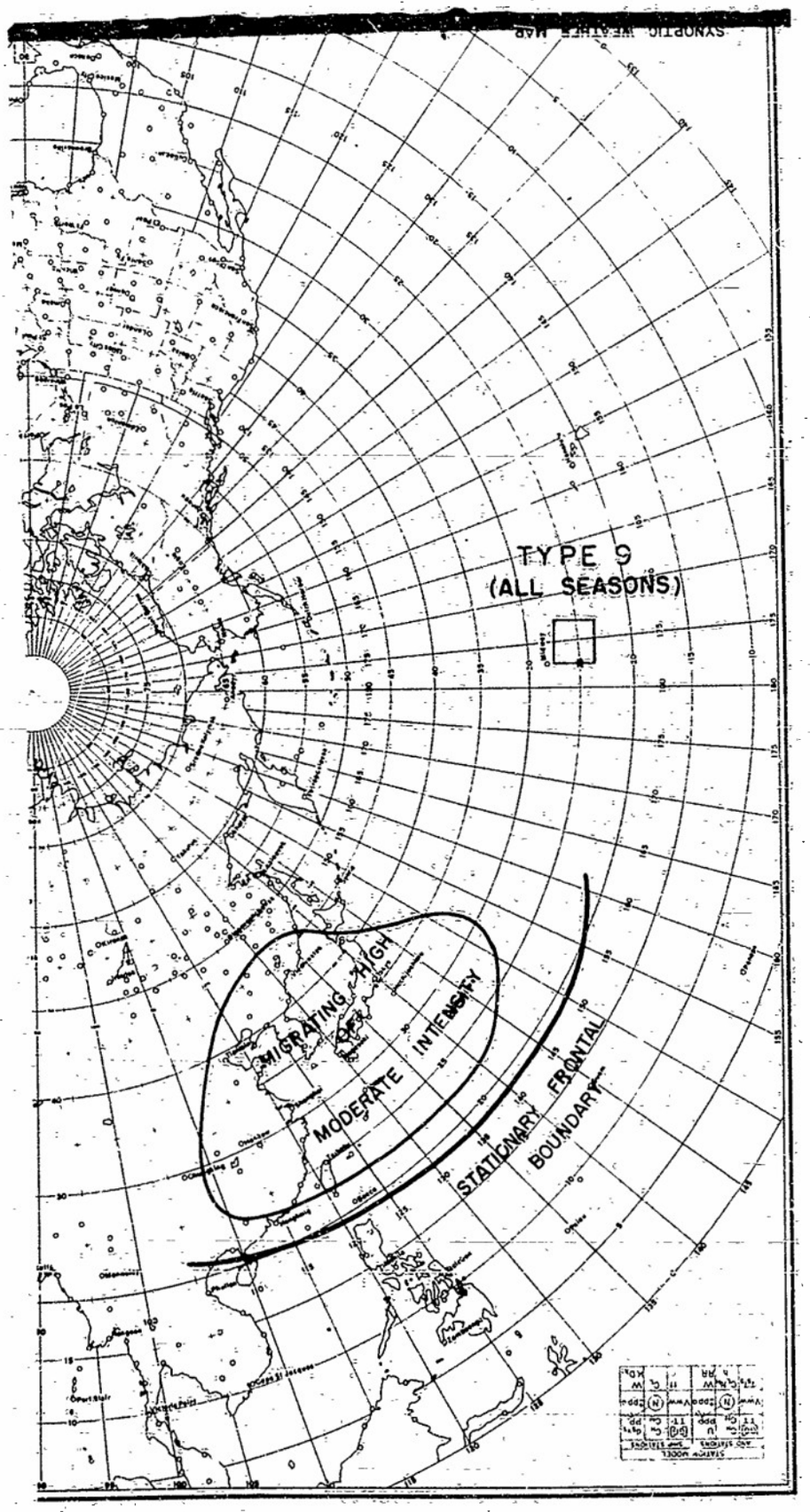

ZONAL FLOW
TRANSITORY LOW CENTER
COMPOSITE CHART
TYPE 5
(ALL SEASONS)
SYNOPTIC WEATHER MAP
NORTHERN HEMISPHERE
SEA LEVEL 1300 GMT


SYNOPTIC WEATHER MAP
COMPOSITE CHART
TYPE 6
(SUMMER FEW CASES LATE
SPRING & EARLY FALL)
SEMI STATIONARY TROUGH OR FRONT
L


COMPOSITE CHART
TYPE 7
(SUMMER & FALL)
SLOW MOVING
WEDGE
LOW PRESSURE
VERY SLOW MOVING
TYPHOON
WEAK TROUGH
FALL
SYNOPTIC WEATHER MAP
NORTHERN HEMISPHERE
SEA LEVEL 1300 GMT


SYNOPTIC WEATHER MAP
COMPOSITE CHART
TYPE 7a
(SUMMER & FALL)
TRAJECTORY SUMMER
TRAJECTORY FALL
MODERATE WEDGE
TYPHOON
LOW SUMMER


SYNOPTIC WEATHER MAP
COMPOSITE CHART
TYPE 8
(ALL SEASONS)
MODERATE HIGH
TRAJECTORY LOW CENTER
BLOCKING HIGH


TYPE 9
(ALL SEASONS)
MIGRATING HIGH
MODERATE INTENSITY
STATIONARY FRONTAL
BOUNDARY

3. EAST ASIA-WEST PACIFIC SYNOPTIC WEATHER TYPES

(Brief explanation and description
with dates of two examples)

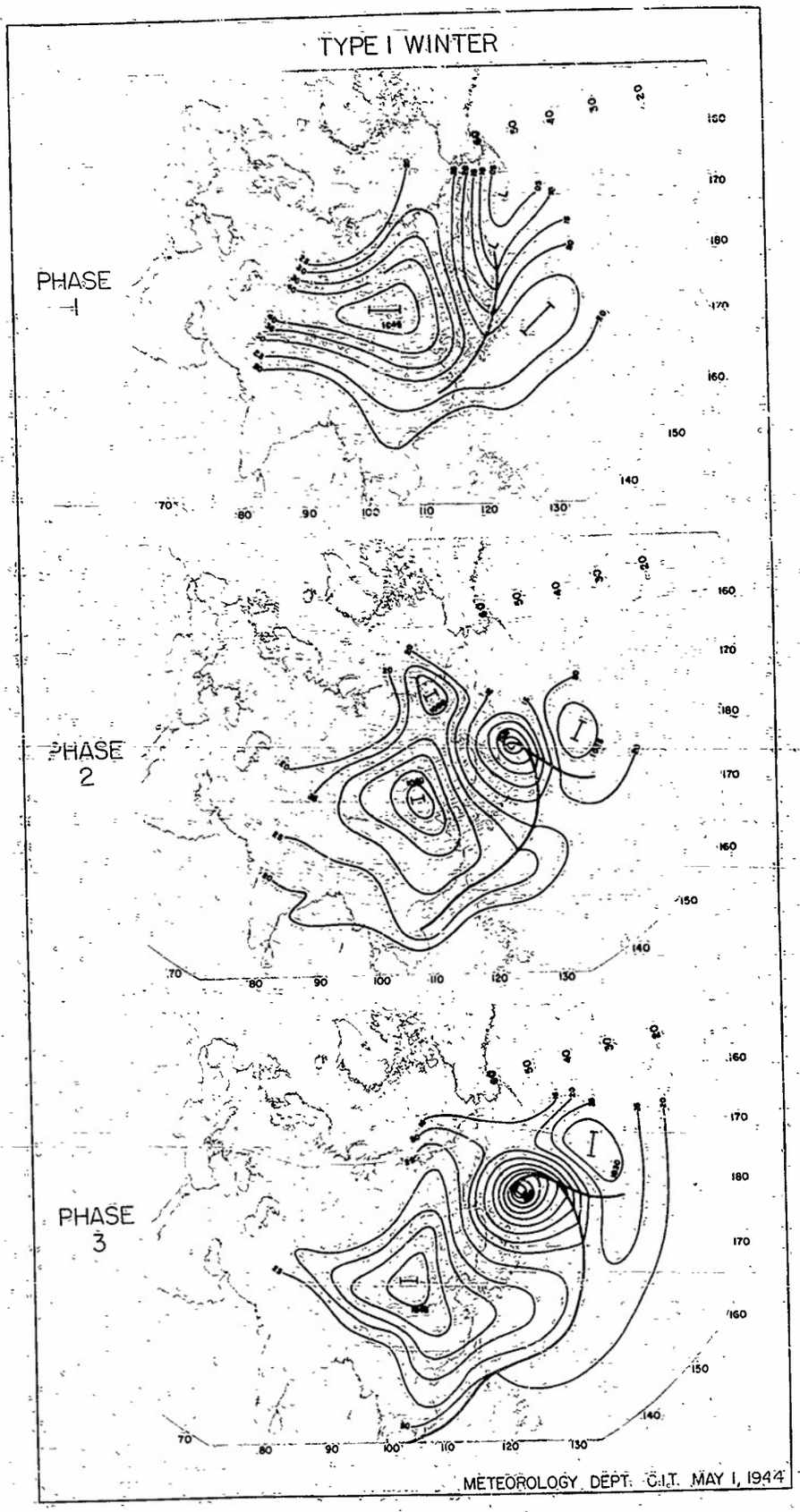
TYPE 1.

Examples: Winter - December 23, 24, 25, 1929

Winter - December 26, 27, 28, 1929

This type was found principally in winter. It can be recognized on phase one by the presence of a Polar Siberian HIGH and the development of a secondary front which lies in a northeast-southwesterly direction in the vicinity of the Sea of Okhotsk and the Sea of Japan. This front continues to move eastward with intensification of the system occurring as tropical air is advected into the cyclonic circulation and ultimately produces a cold front type occlusion.

Trajectory of the low pressure center is approximately west to east. Normally the center of the intense Polar Siberian HIGH is near 50°N. latitude and very little change occurs in the position and pressure during the three phases of the type.


TYPE I WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 2.

Examples: Spring - April 16, 17, 18, 1905

Winter - March 9, 10, 11, 1928

Common to all seasons, this type has a high frequency of occurrence. The wave which develops along the major trough is located in a southerly position and develops as cyclogenesis occurs along the China coast between Hong Kong and Shanghai.

In most cases a very weak boundary in the southern extremity of a cold front becomes stagnant in this area, and as a wedge passes off the coast of China, warm moist air surges northward to the rear of the wedge. Between this tropical air and the continental masses the new wave is formed. By phase one the cyclone is quite well developed with a center located along 135°E. longitude and just to the south of Japan proper. Trajectory of the wave is east-northeastward with a gradual intensification through phase three. In the three phases of this type, the center of the cyclone seldom moves north of 42°.

During the winter season an intense HIGH persists over Siberia with only a small cell breaking off to follow the major trough.

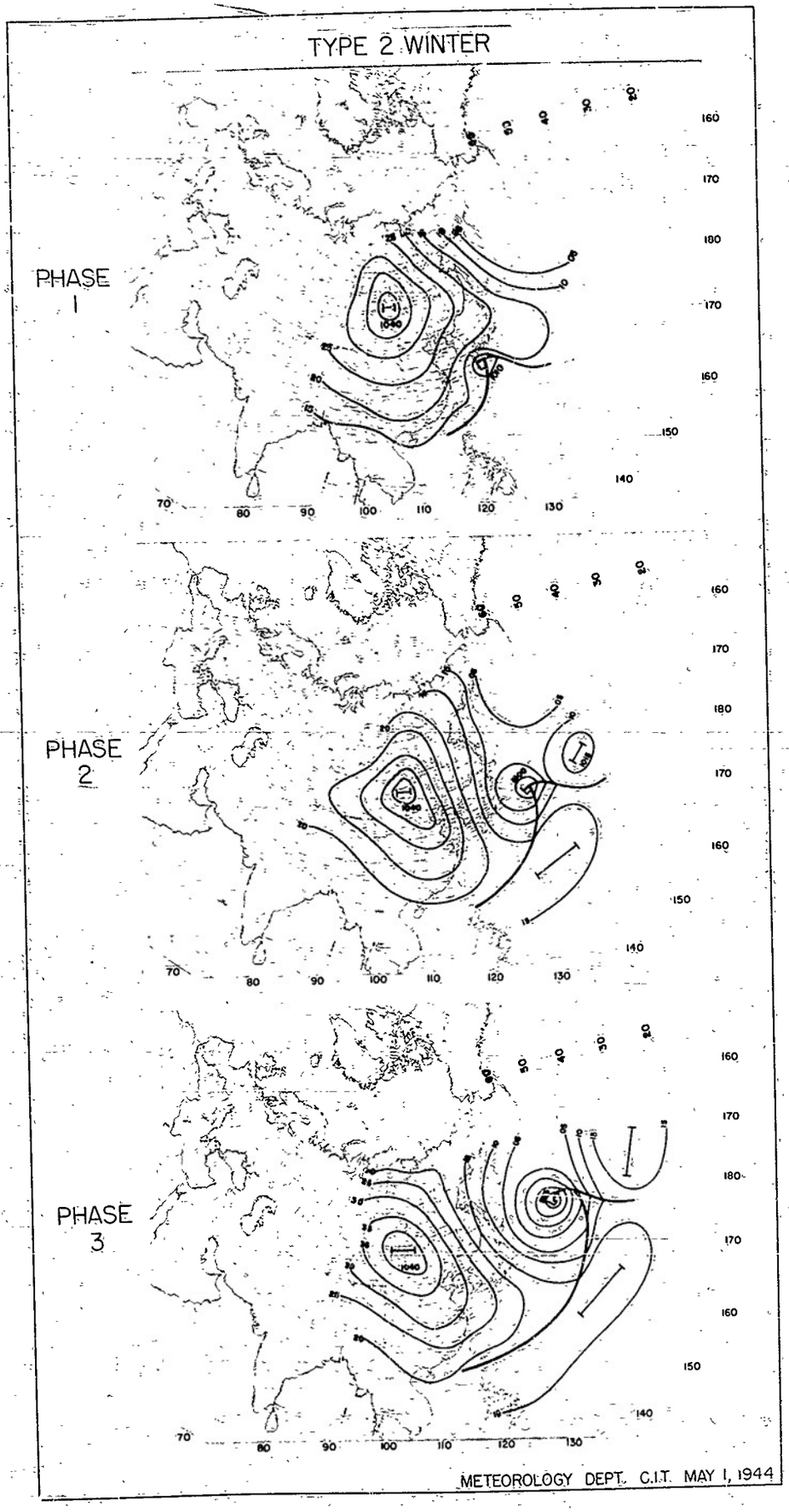
In the spring a moderate migratory HIGH moves off the East Asia coast on phase three.

During the summer season a very weak wedge moves across northern China continuing eastward to the Pacific Ocean. Due to the intense heating of the large land mass of Asia the pressure over India and most of China is lower than the surrounding areas, and in general very weak pressure gradients prevail during late spring, summer, and early fall.

In spring and summer a definite trough extends from east central Siberia south-southwestward into Mongolia and is essentially stationary for three phases.

In fall an active frontal system in this trough migrates offshore by phase three.

TYPE 2 WINTER



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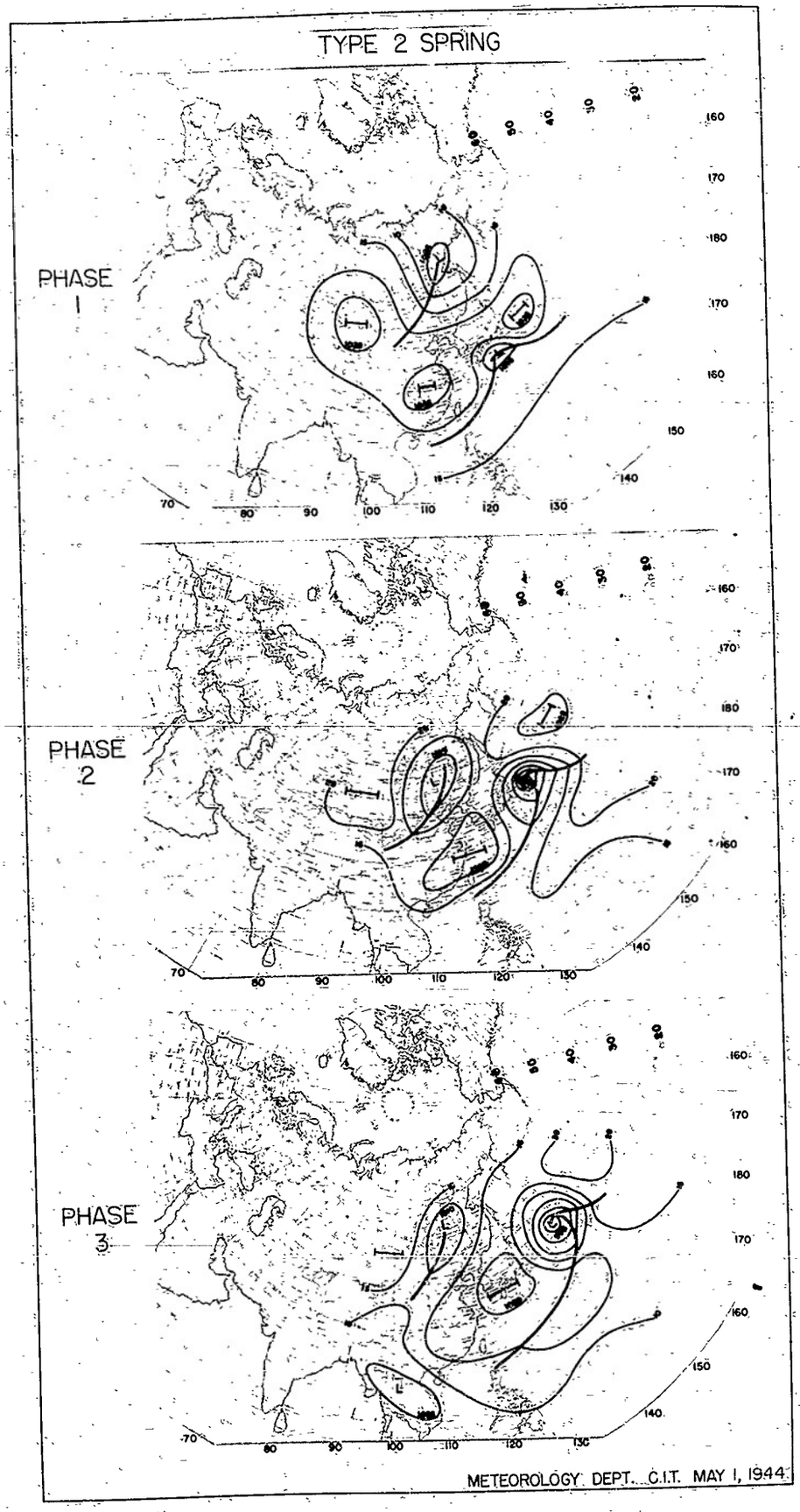
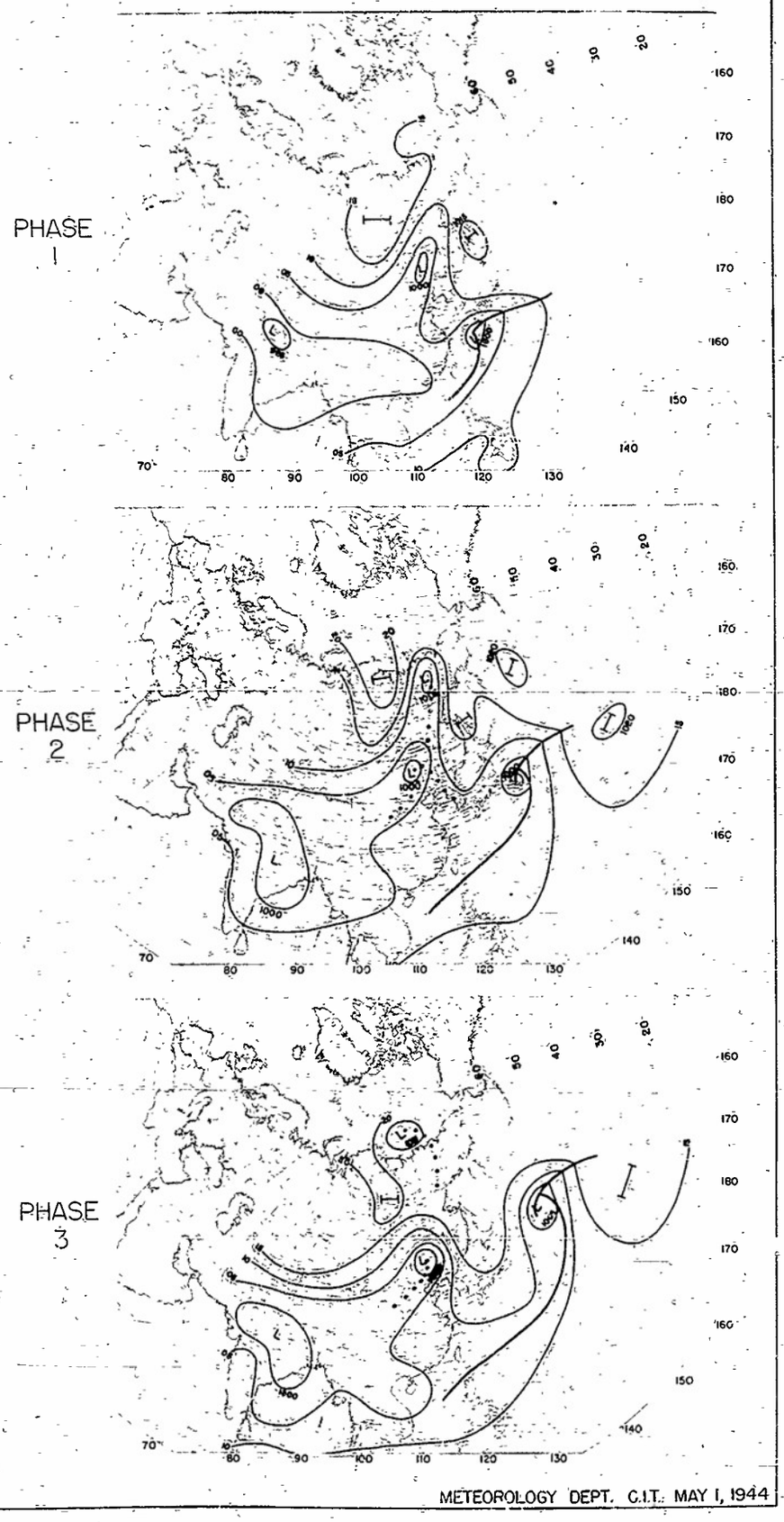
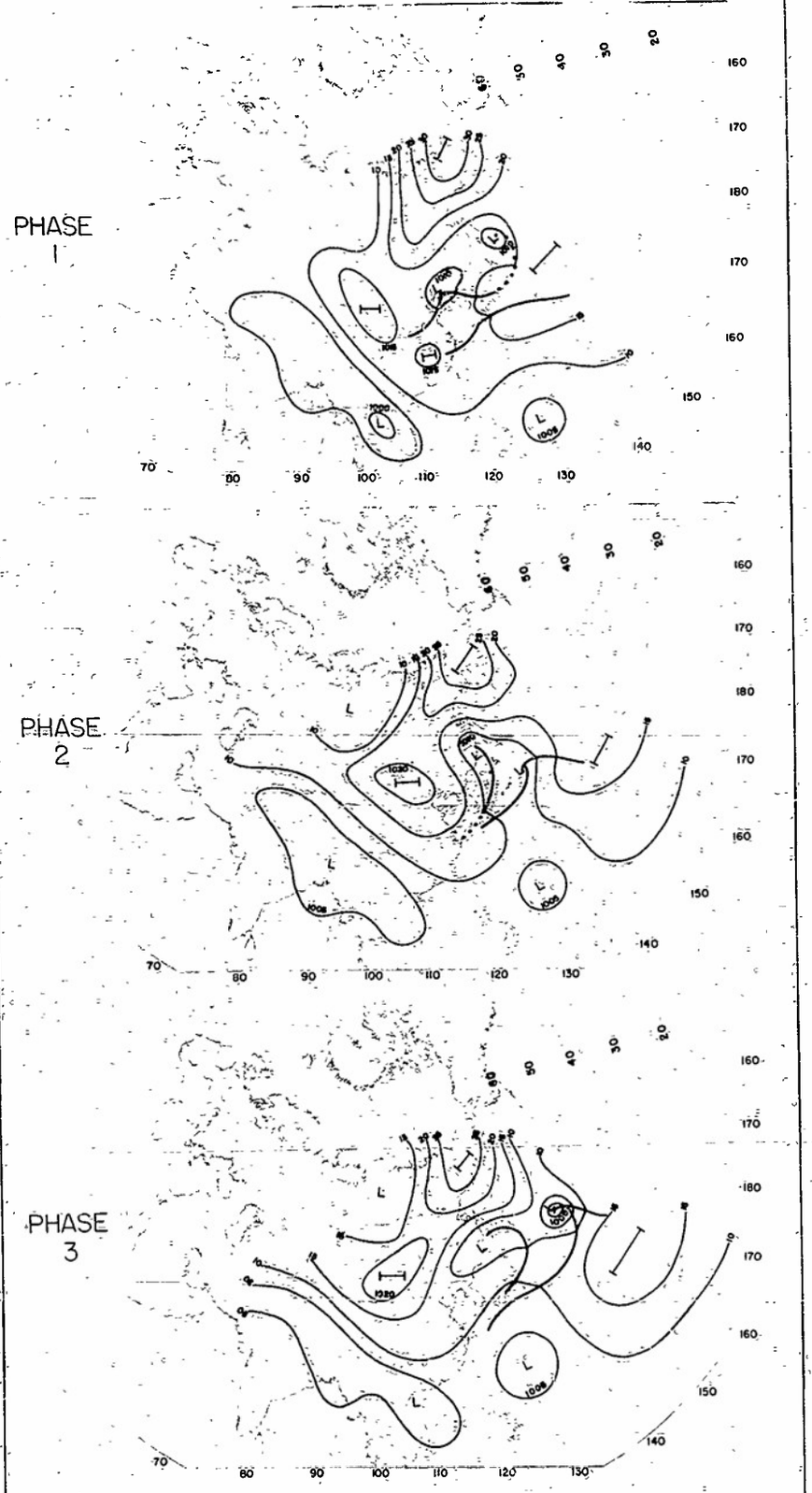

TYPE 2 SPRING
PHASE 1
PHASE 2
PHASE 3
160
170
180
170
160
150
140
70
80
90
100
110
120
130
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 2 SUMMER



METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 2 FALL



METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 23.

Examples: Winter - December 8, 9, 10, 1928

Winter - November 14, 15, 16, 17, 1928

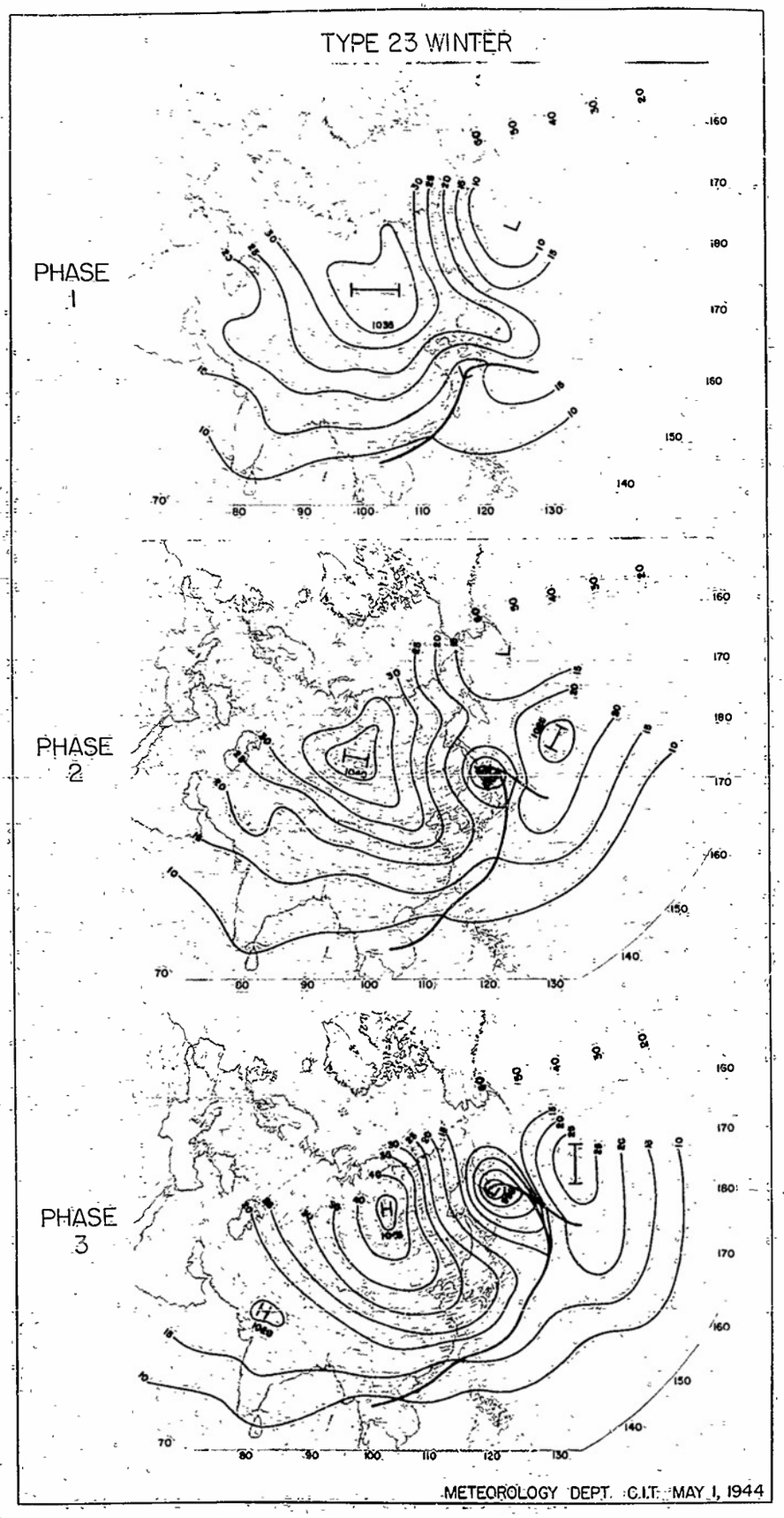
In this type the major wave begins as Type 2 and on the last two phases moves far enough north to be classed as a Type 3. Accordingly, the designation 23 is used to convey this significance. On the first phase the wave is generally found a little below the normal Type 2 position. The wave moves toward the northeast through the three phases with a gradual intensification. By phase two the center is located over central Japan producing general storminess through northern sections, and has moved to southern Kamchatka by phase three.

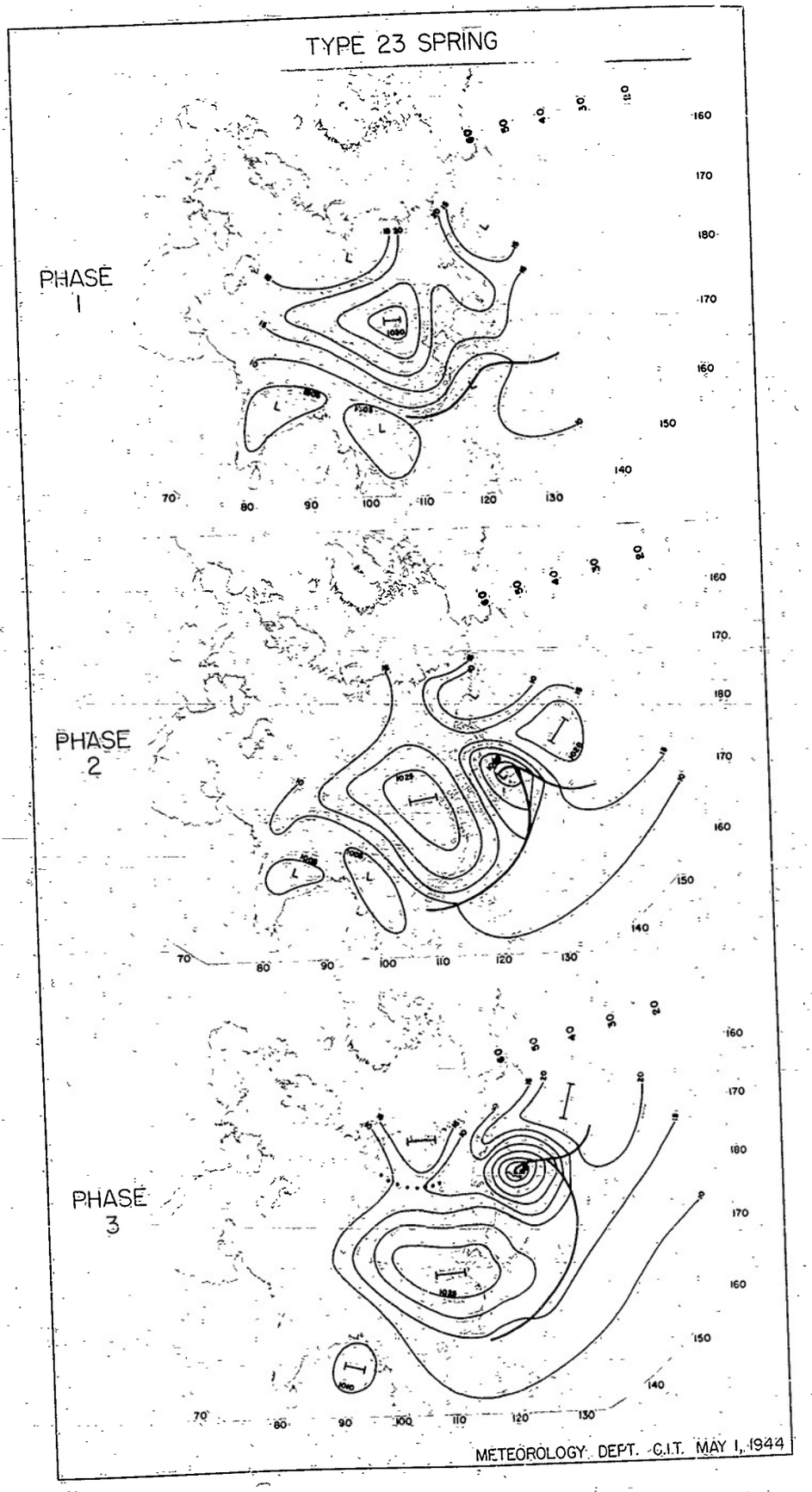
The path of the LOW centers is much the same for all seasons; the principal difference is the intensity of the isobaric patterns over Siberia and China.

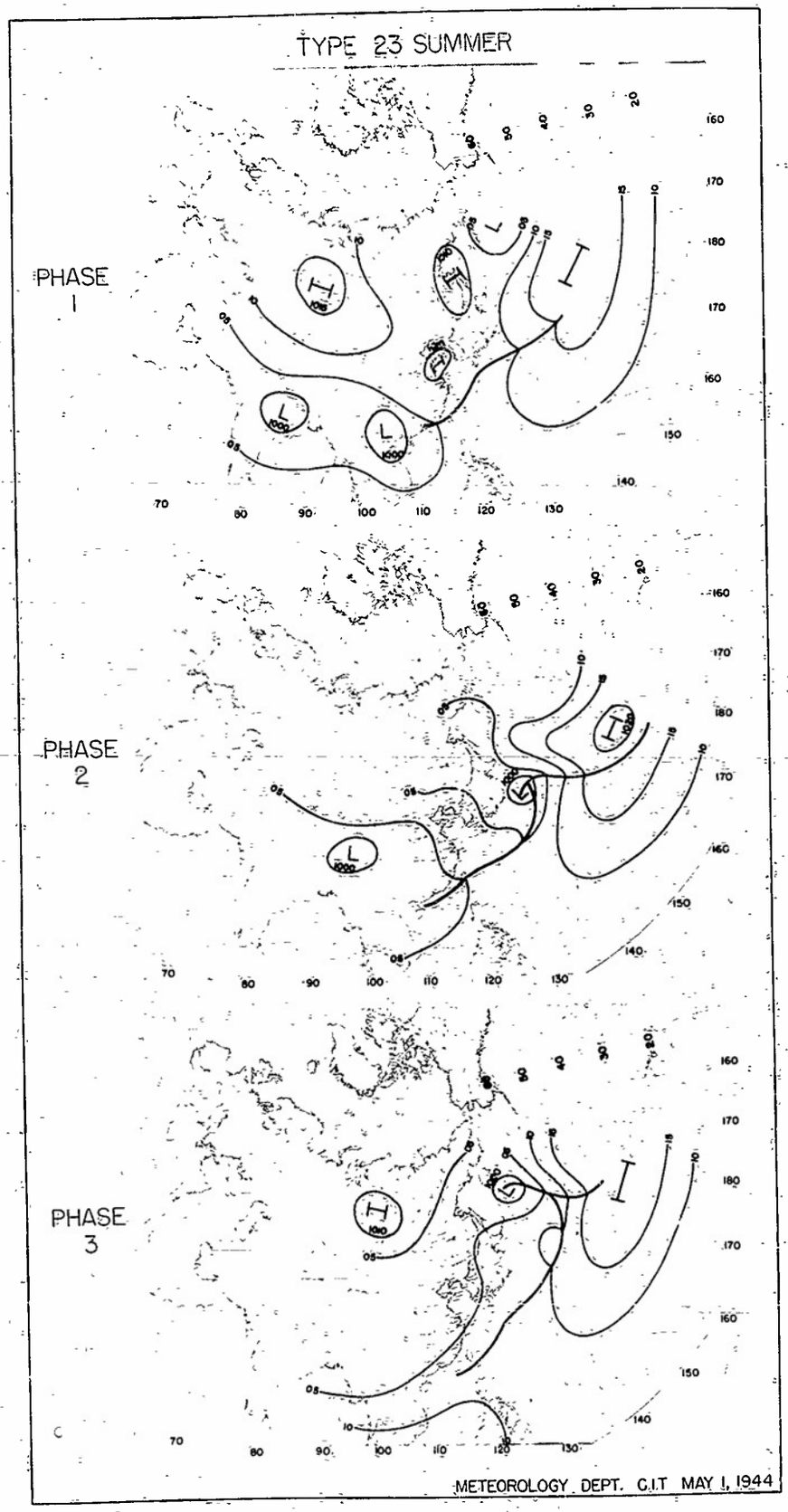
During the winter season an intense Polar Siberian HIGH covers the entire area, rarely shifting much in position and only a small cell follows the major trough.

In spring and fall a moderate migratory HIGH follows the major trough moving off the east coast of China on phase three.

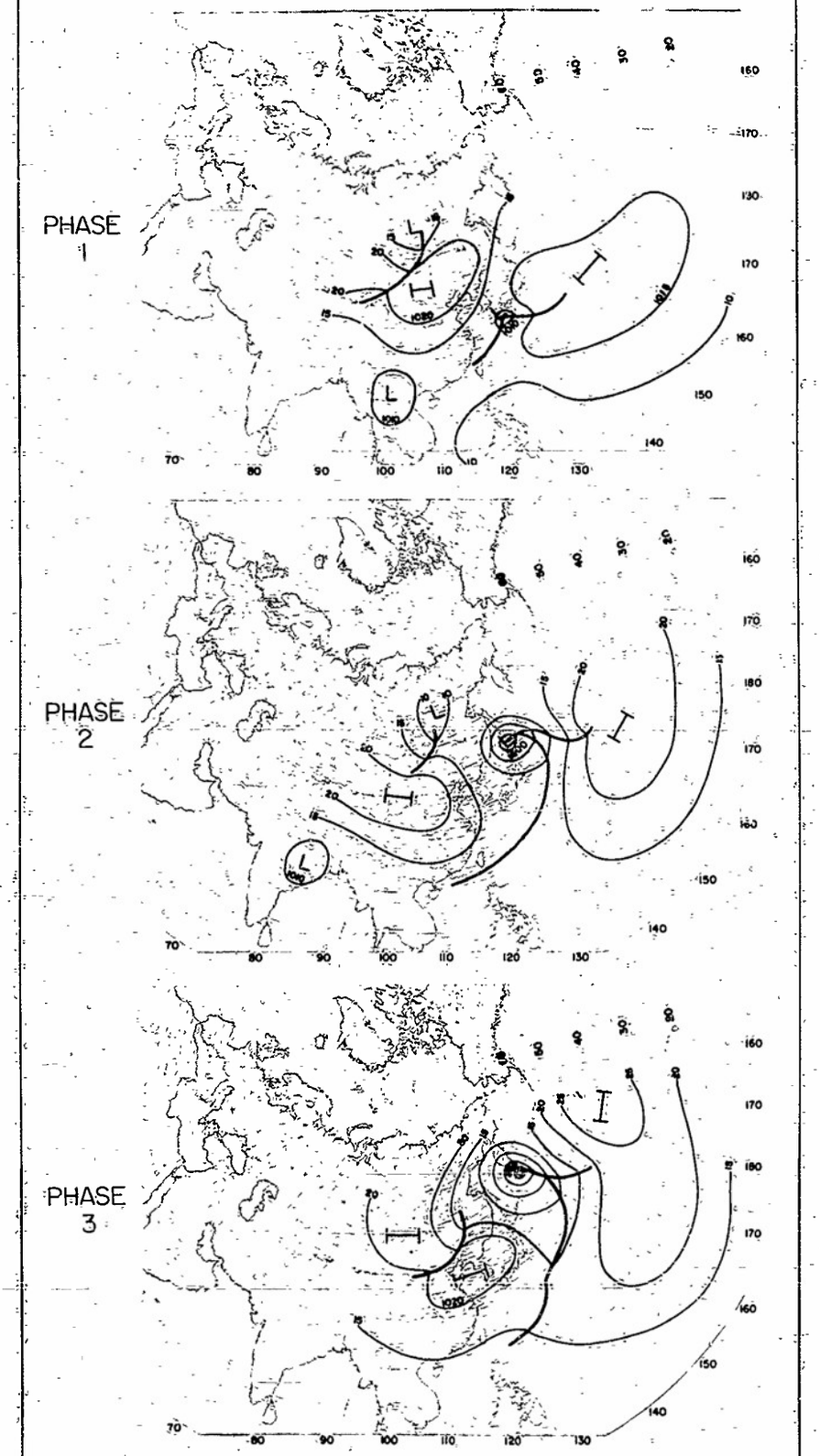
Through the summer the East Asia continent is impressed with a flat pressure field with the thermal LOW well developed and only a weak migrating wedge to the north.


TYPE 23 WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 23 SPRING
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 23 SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T MAY 1, 1944

TYPE 23 FALL



METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 3.

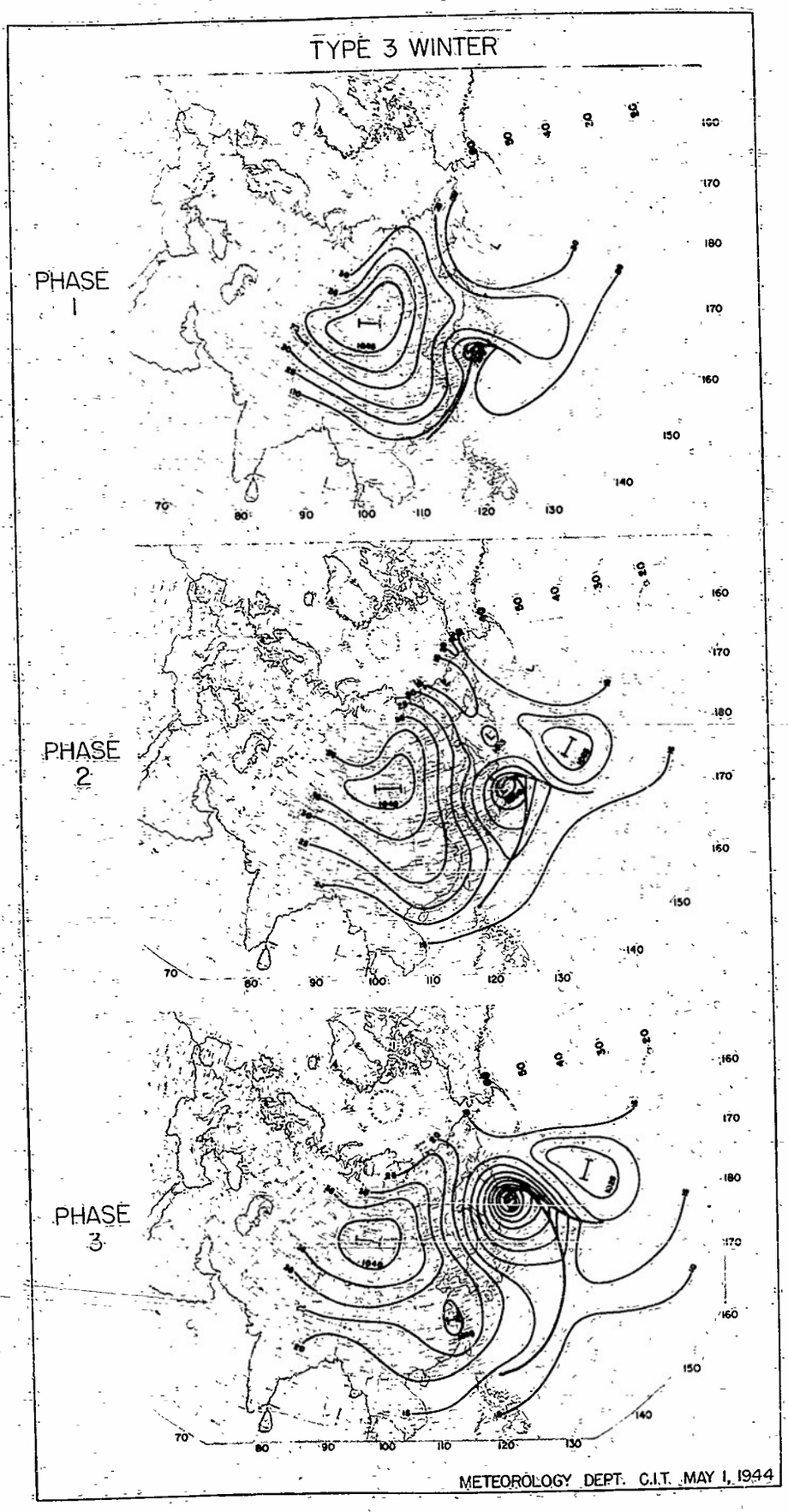
Examples: Spring - April 25, 26, 27, 1925

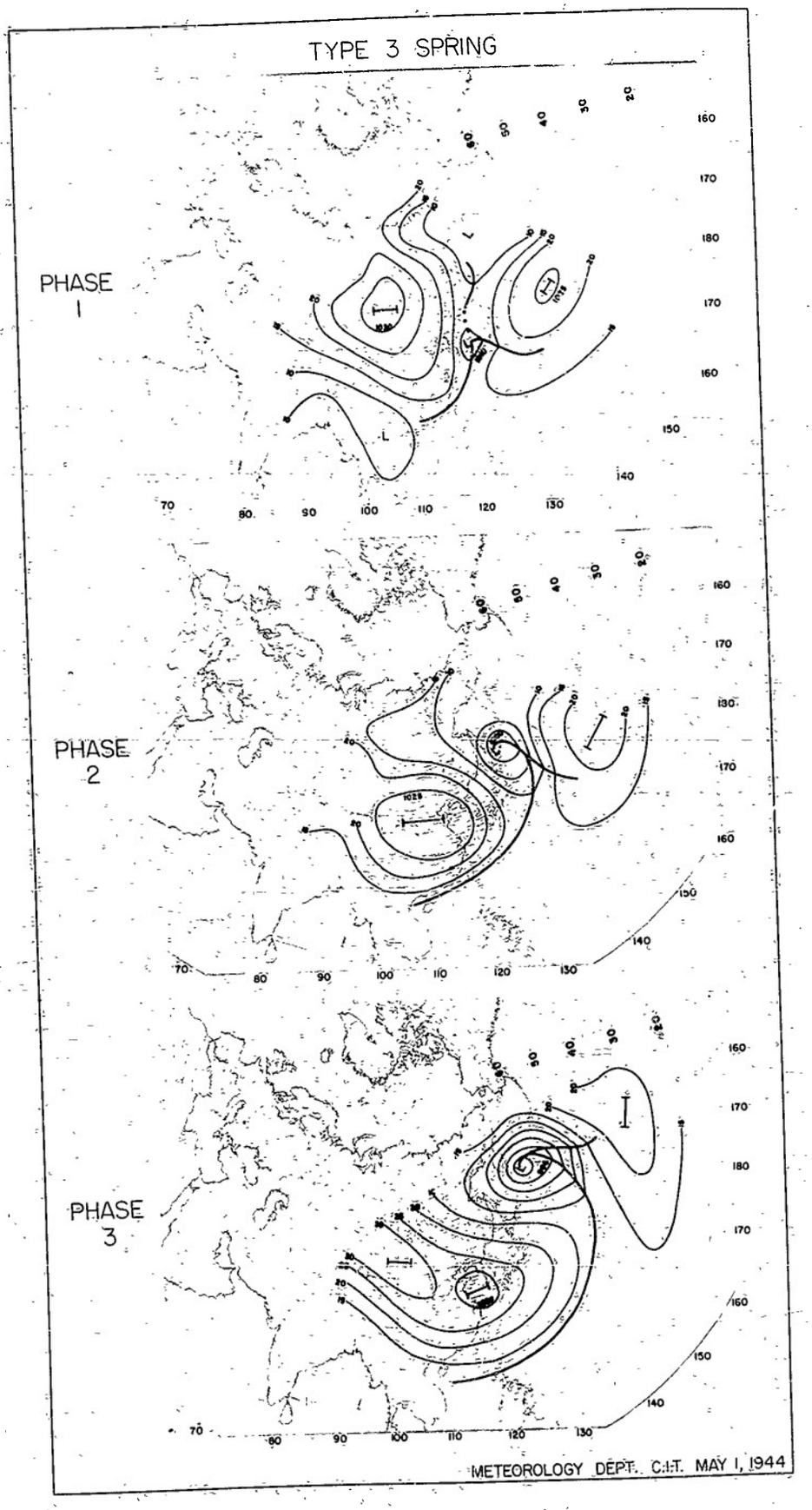
Winter - January 1, 2, 3, 1928

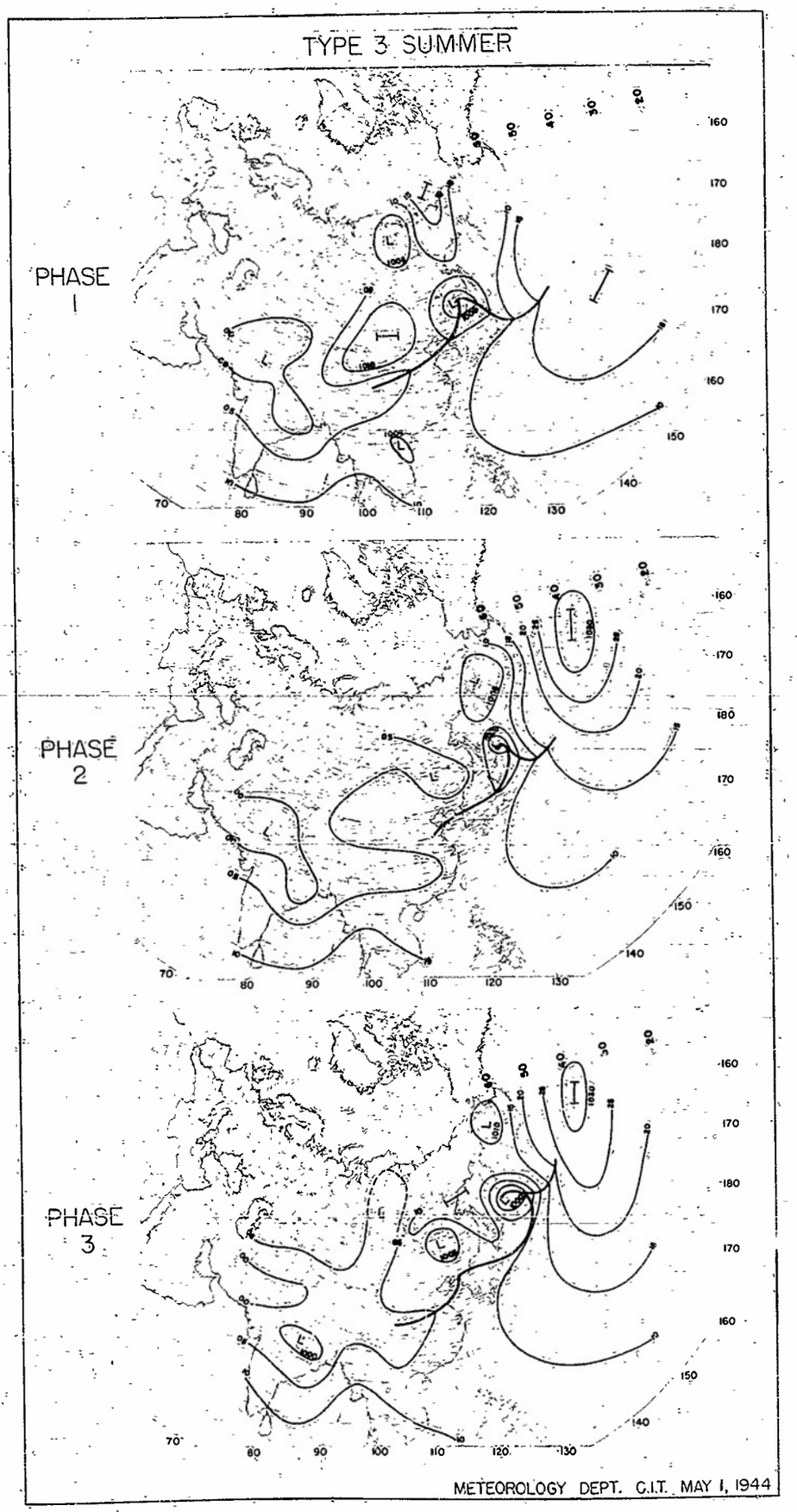
Type 3 is associated with wave development on phase one between southern Japan and the coast of China or in the Sea of Japan. This is generally about 5° to 10° north of Type 2. Preceding the development of the major trough a moderate wedge moves off the central coast of China which is farther north than the wedge associated with Type 2 and about five to ten millibars more intense. Consequently the returning flow of tropical air is much stronger and the resultant intensification more outstanding throughout the three phases. The center of the wave moves toward the northeast reaching a position near the southeast coast of Kamchatka by phase three with a central pressure normally 985 to 990 millibars. The center of the cyclone located this far north seldom moves below the Aleutian Islands.

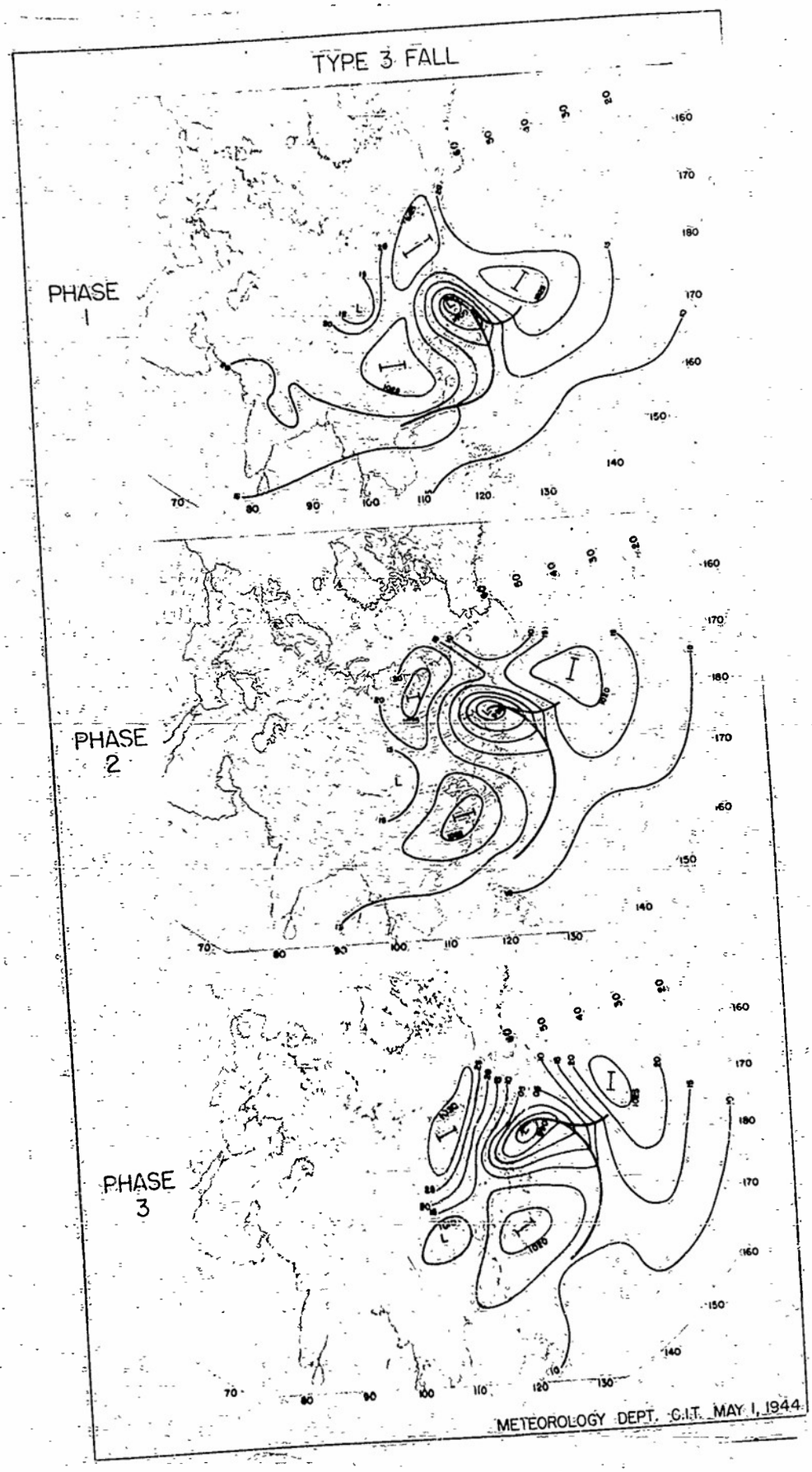
In winter strong pressure gradients are associated with this type. An intense HIGH persists over Siberia and most of China during the three phases of this type. Cold air flows off the entire east coast of Asia. On phase three a cold wedge breaks from the Siberian HIGH to follow the major trough.

Moderate migratory HIGHS follow the major troughs with spring and fall examples. The central isobar is usually about 10 millibars higher in spring than in fall. A weaker migratory wedge is observed well to the north in summer. Pressure gradient is very flat over most of the continent during this season.


TYPE 3 WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 3 SPRING
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 3 SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 3 FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

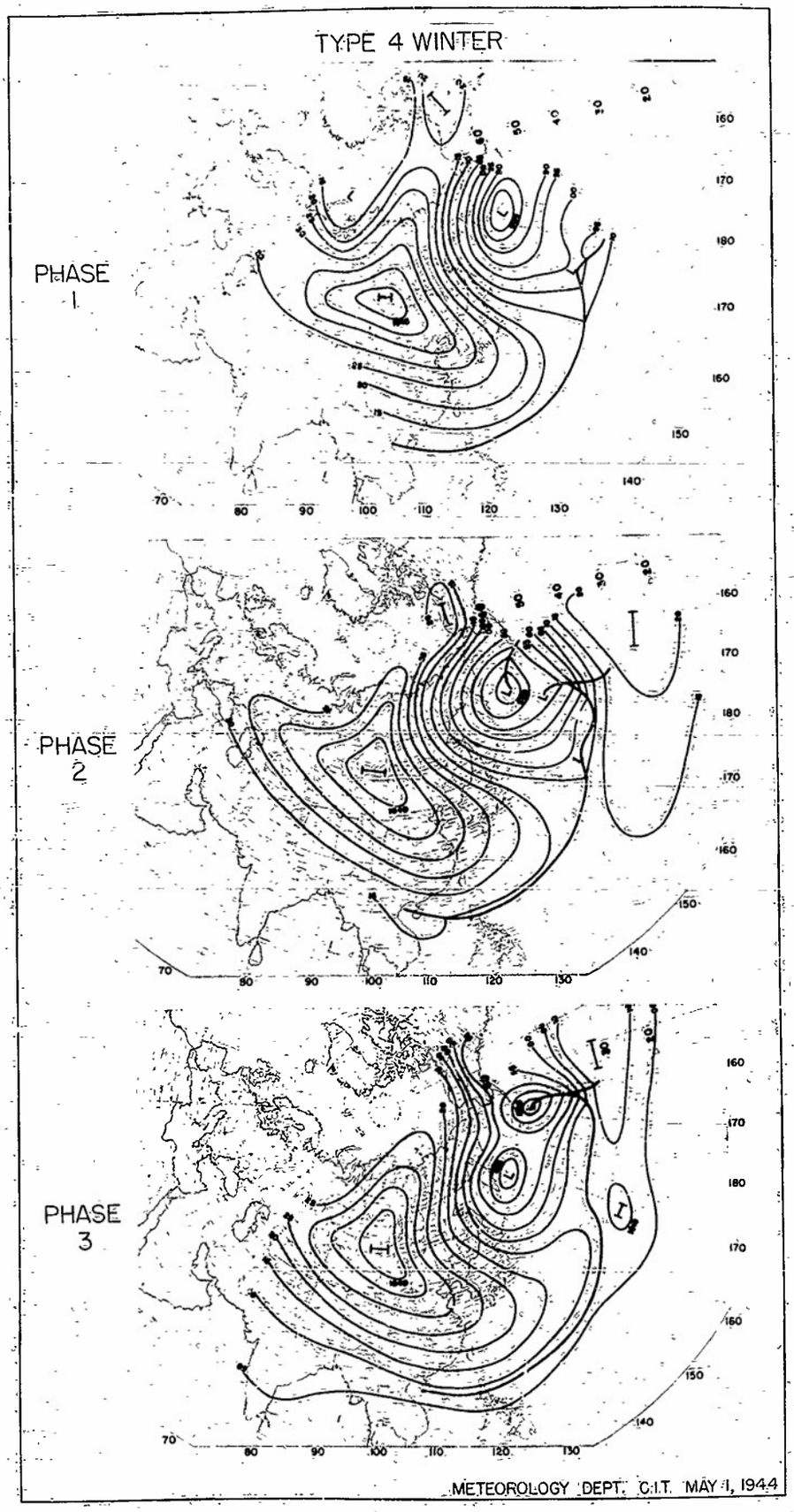
TYPE 4.

Examples: Winter - January 2, 3, 4, 1929

Winter - February 25, 26, 27, 1928

Type 4 is an outstanding example of meridional flow. An intense LOW is centered slightly southeast of southern Kamchatka with no apparent eastward movement of the main active center, although in a few cases a wave developed on the southern periphery and moved eastward. An intense Polar HIGH is centered over Siberia with a strong wedge extending through northeast Siberia and Alaska. Cold air flows out from the entire East Asia continent with the cold air extending a considerable distance offshore from east China southward. This cold air is bounded on the south by a stationary cold front between 15° and 20°N. latitude. Occasionally minor waves run along this frontal zone. The cold air is apparently very shallow with considerable instability in the lower levels over the water.

This type occurs primarily in winter. A few cases have been found in spring and fall but not enough examples are available to prepare an ideal chart.


TYPE 4 WINTER
PHASE 1
PHASE 2
PHASE 3
160
170
180
170
160
150
140
70
80
90
100
110
120
130
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

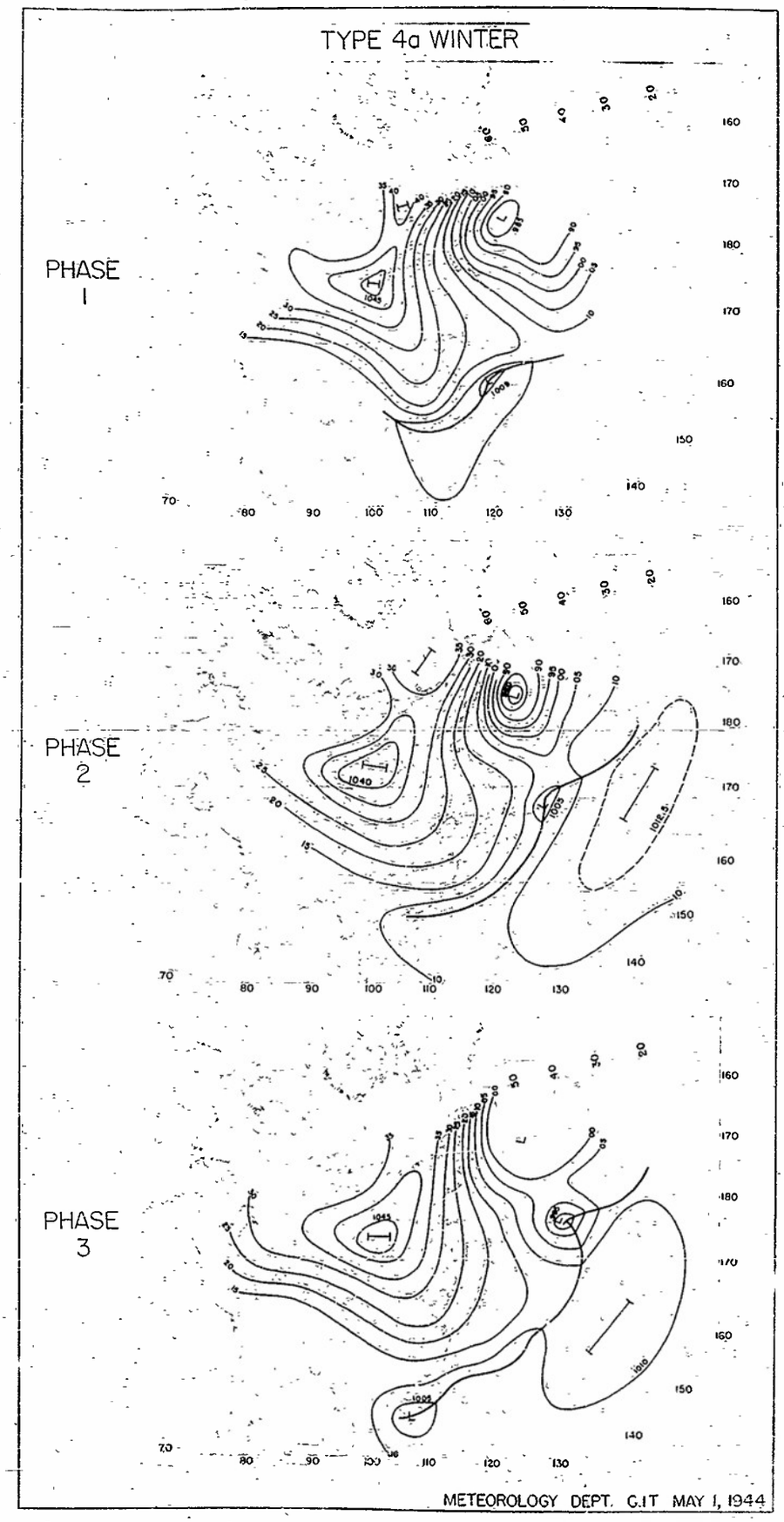
TYPE 4a.

Examples: Winter - February 5, 6, 7, 1929

Winter - January 30, February 1, 2, 1928

The general pattern associated with Type 4a is very similar to Type 4. The flow of cold air off the southeast coast of China does not reach as far south. Along the stationary cold front bounding this Siberian air a minor wave develops moving eastward at a very low latitude. This, except for the southerly position, resembles closely the wave with Type 2. One major point of distinction, however, is that Type 2 develops into an active center and moves east-northeast, but with Type 4a a persistent deep LOW is located just to the southeast of Kamchatka and around the southern periphery of this LOW, the wave travels eastward.

The Polar Siberian HIGH is generally displaced northwest of the Type 4 position. Examples would seldom be found outside of the winter season.


TYPE 4a WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T MAY 1, 1944

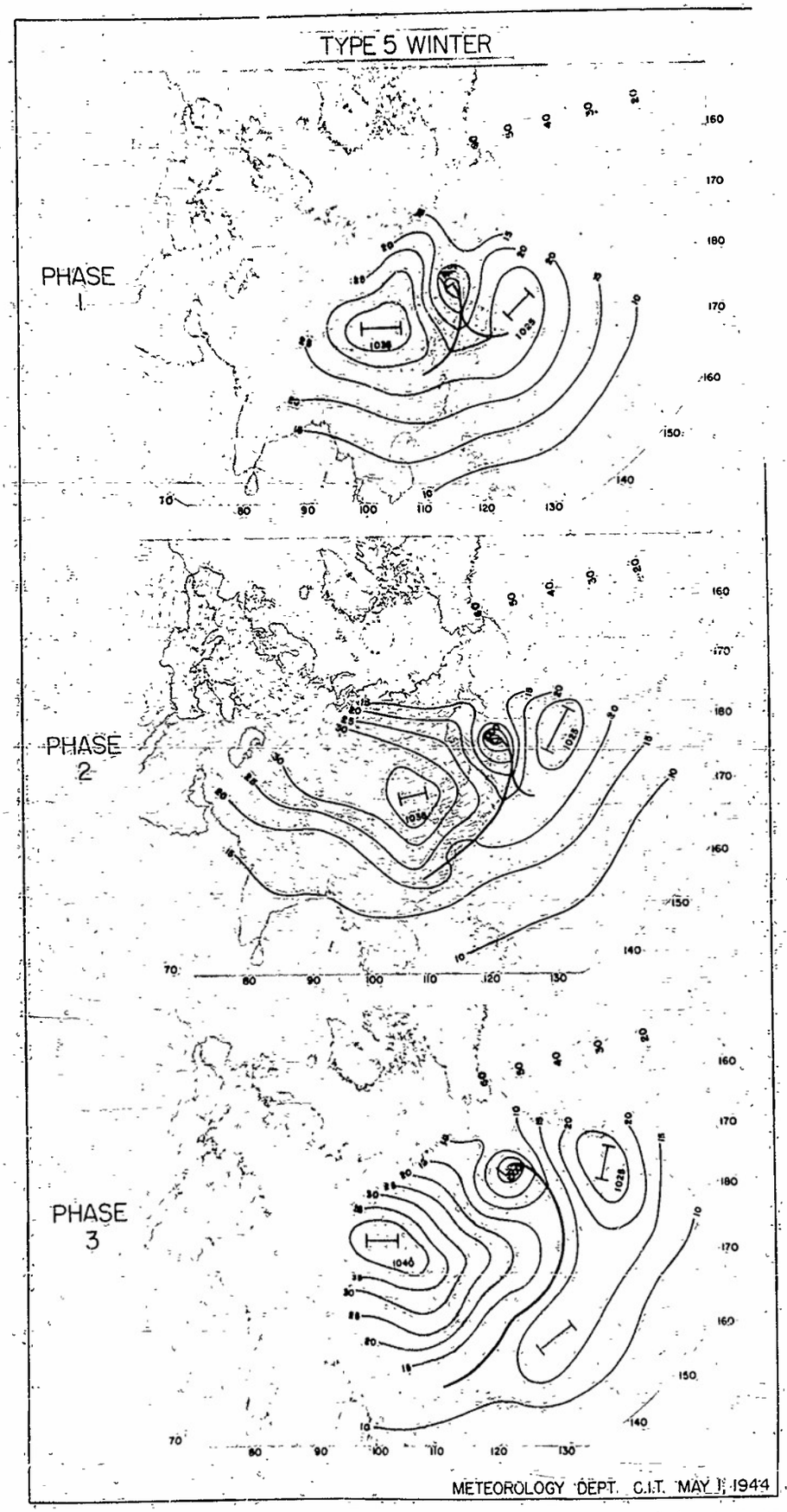
TYPE 5.

Examples: Winter - December 22, 23, 24, 1928

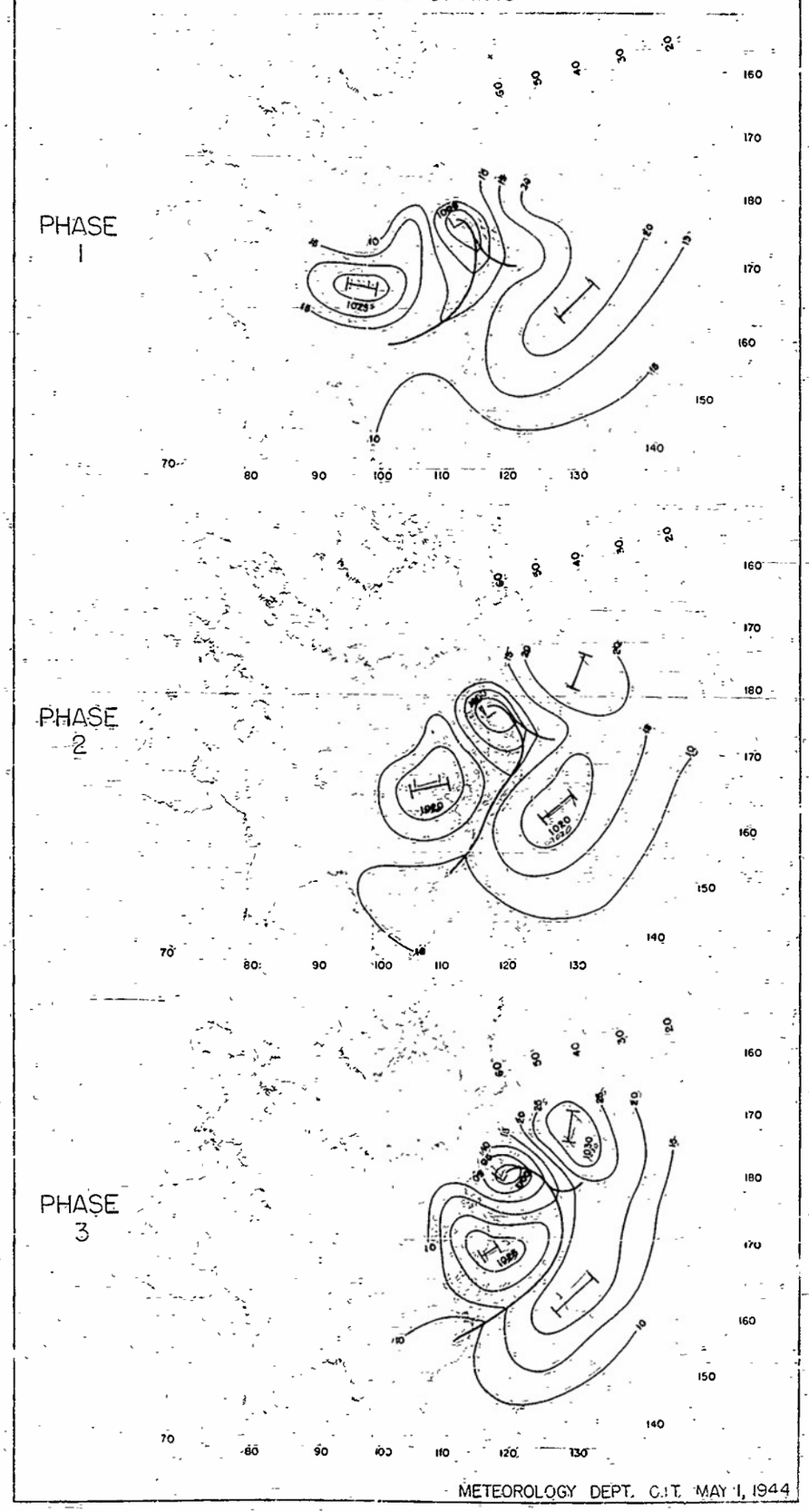
Spring - March 18, 19, 20, 1902

Type 5 occurs throughout the year. Since it is necessary for the surface trough to move eastward out of the interior of central and northern Siberia, normal persistence of the Polar Siberian HIGH in winter reduces the probability of occurrence of Type 5 in this season.

Type 5 is the best example of zonal flow. In summer it will be noted that there is a tendency for stagnation of the frontal wave along the Siberian central coast region from phase one to phase two. In many cases on phase one no warm front is present. Normally, the cyclonic centers are of a light to moderate intensity and move across Siberia into the Bering Sea between 50° and 55°N. latitude.

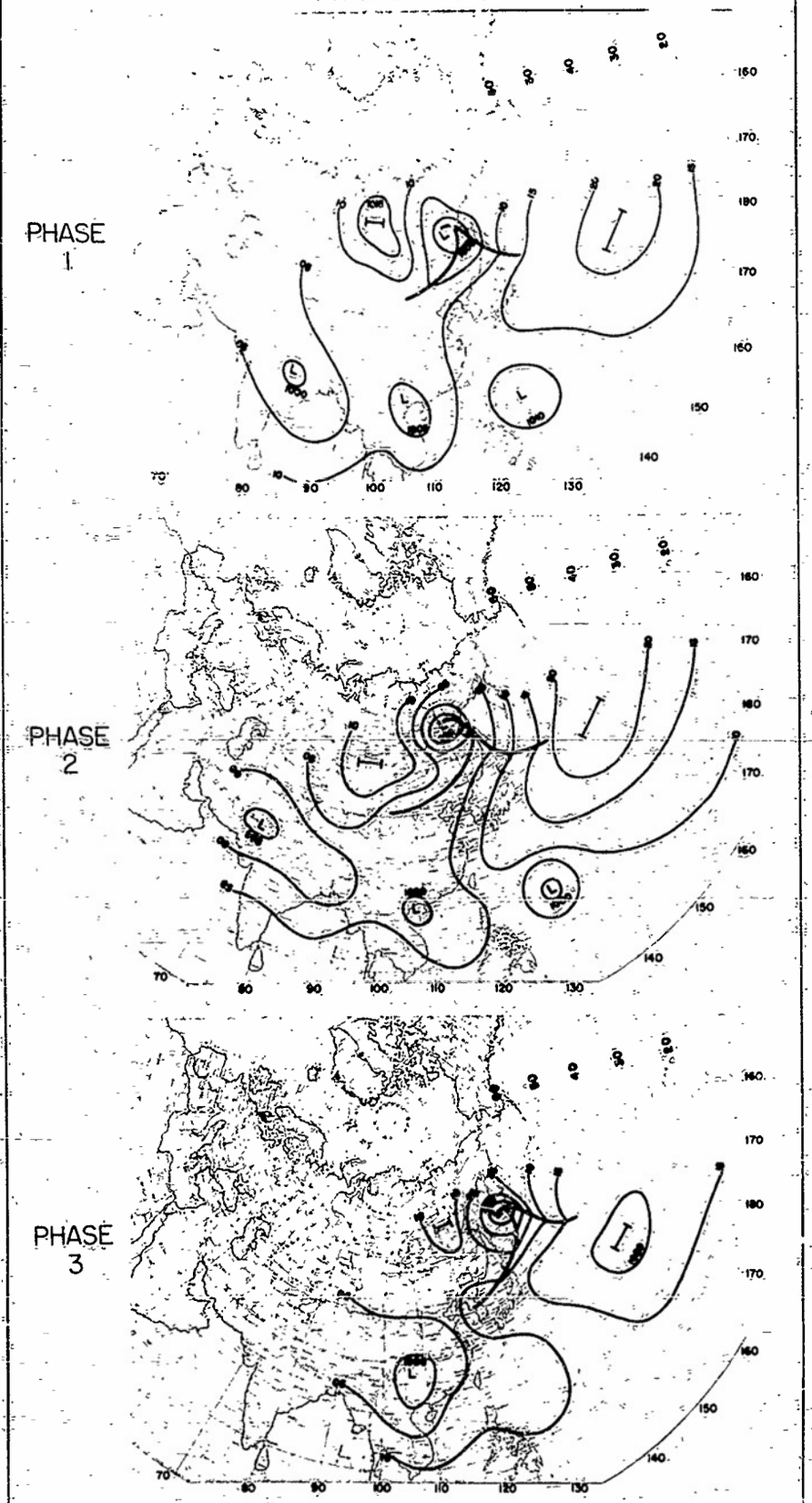

TYPE 5 WINTER
PHASE 1
PHASE 2
PHASE 3
1036
1025
1046
160
170
180
150
140
70
80
90
100
110
120
130
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 5 SPRING

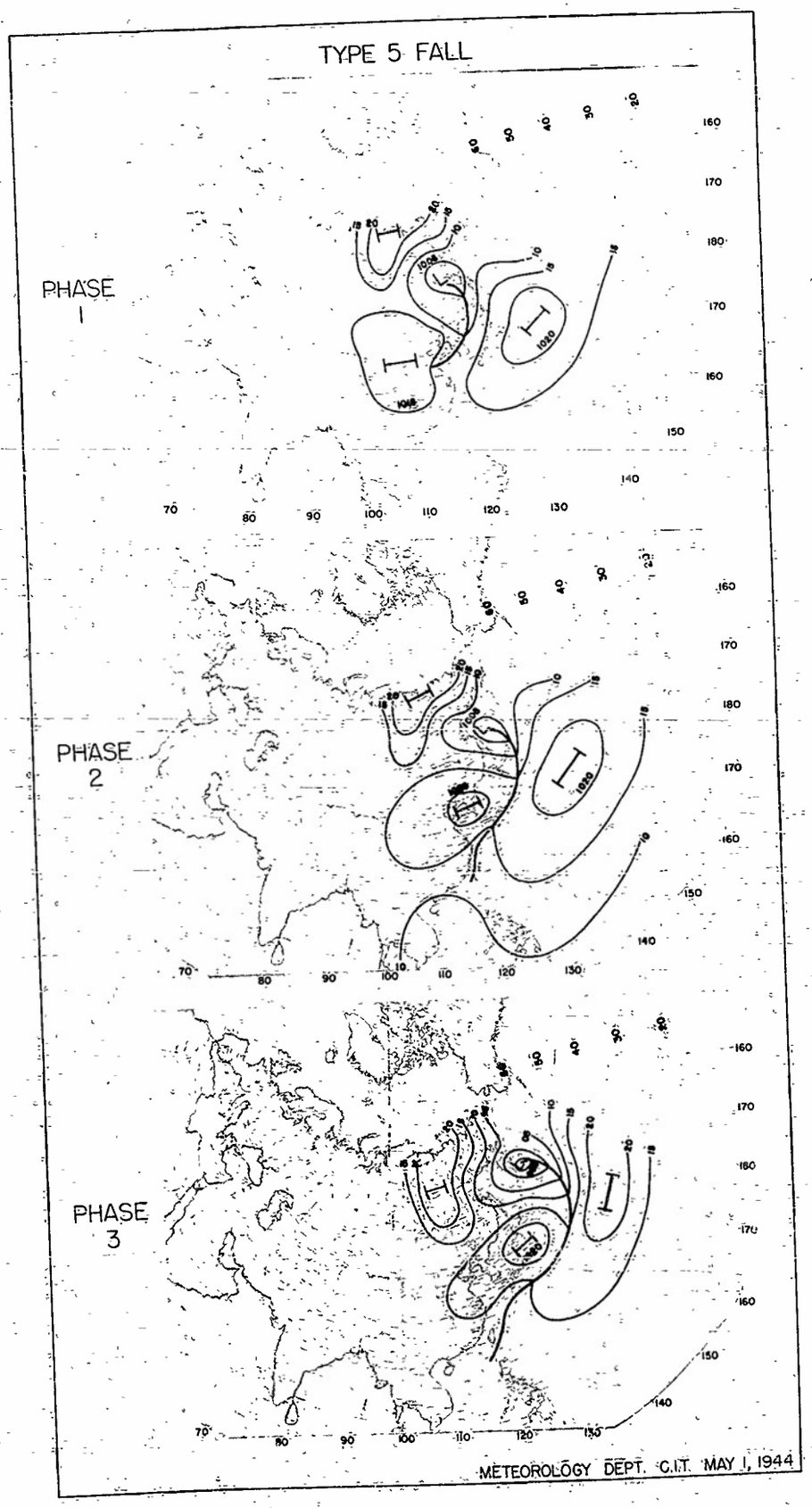


METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 5 SUMMER



METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 5 FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 6.

Examples: Summer - July 21, 22, 23, 1928

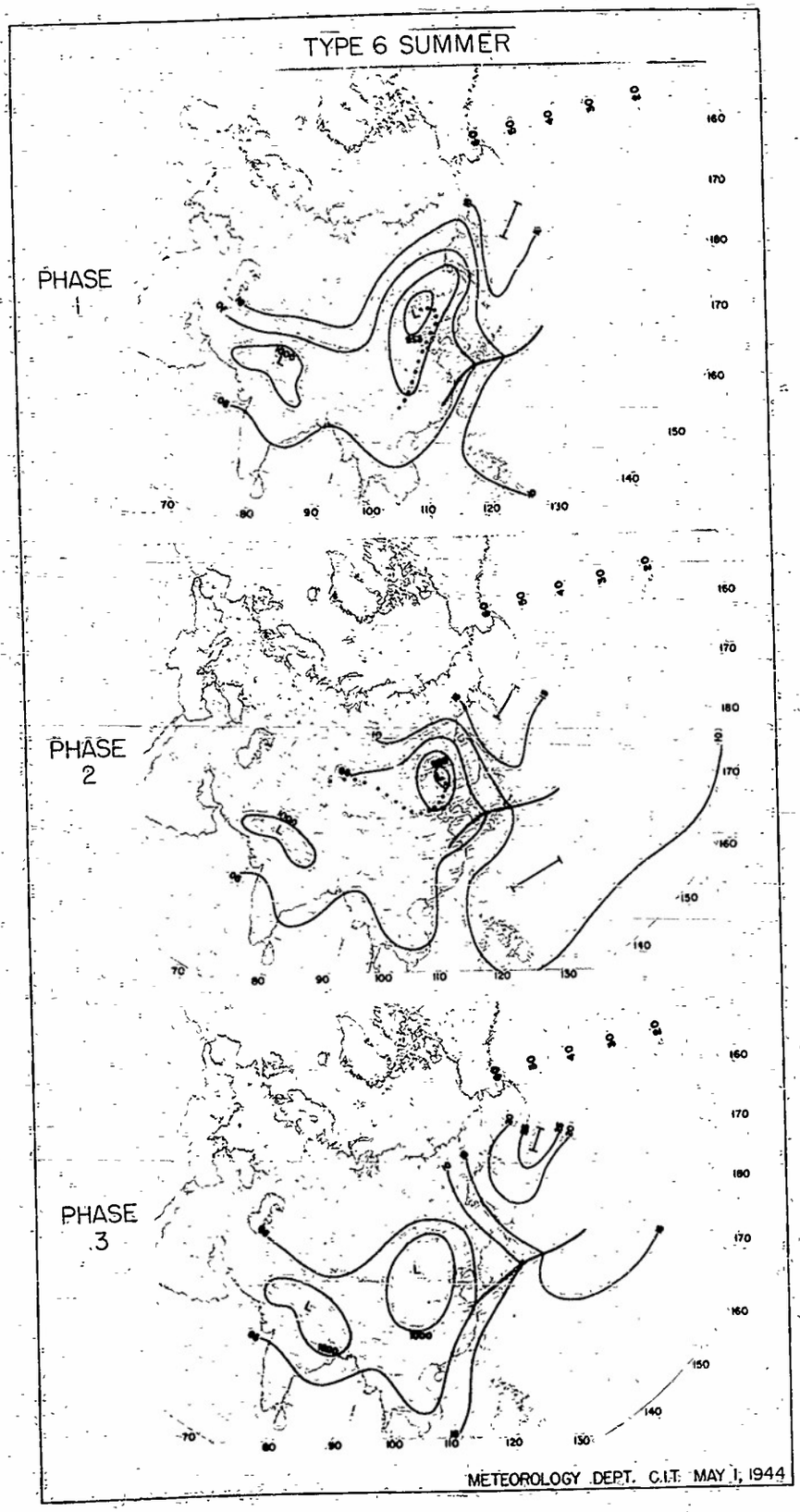
Spring - May 23, 24, 25, 1925

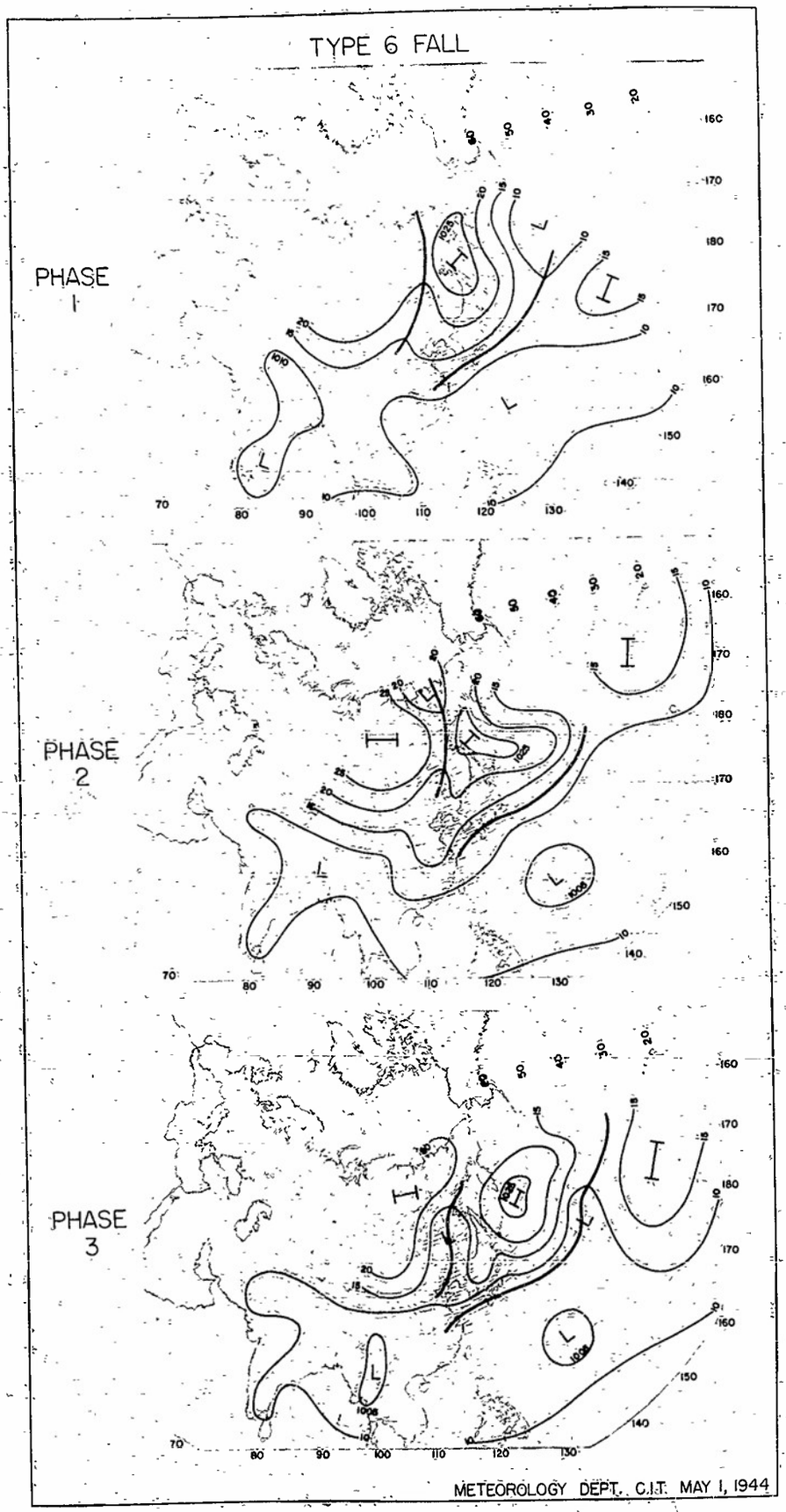
This type occurs principally in summer.

High pressure occupies most of the West Pacific with comparatively low pressure over East Asia. High pressure in the West Pacific is normally marked by centers east of Kamchatka and east or northeast of the Philippine Islands. These centers are separated by an east-west trough between latitudes 30° and 35°N. The circulation is such that considerable equatorial and tropical air reaches the south and central China coast overrunning a semi-permanent stationary front in the east-west trough.

In fall the high pressure wedge or closed cell is slightly more intense than in summer. The low pressure area found in summer over the continent is gradually being replaced by high pressure.

Frequently a wave will develop along the stationary front but in general to the east of 150° to 160°E. longitude.


TYPE 6 SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 6 FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 7.

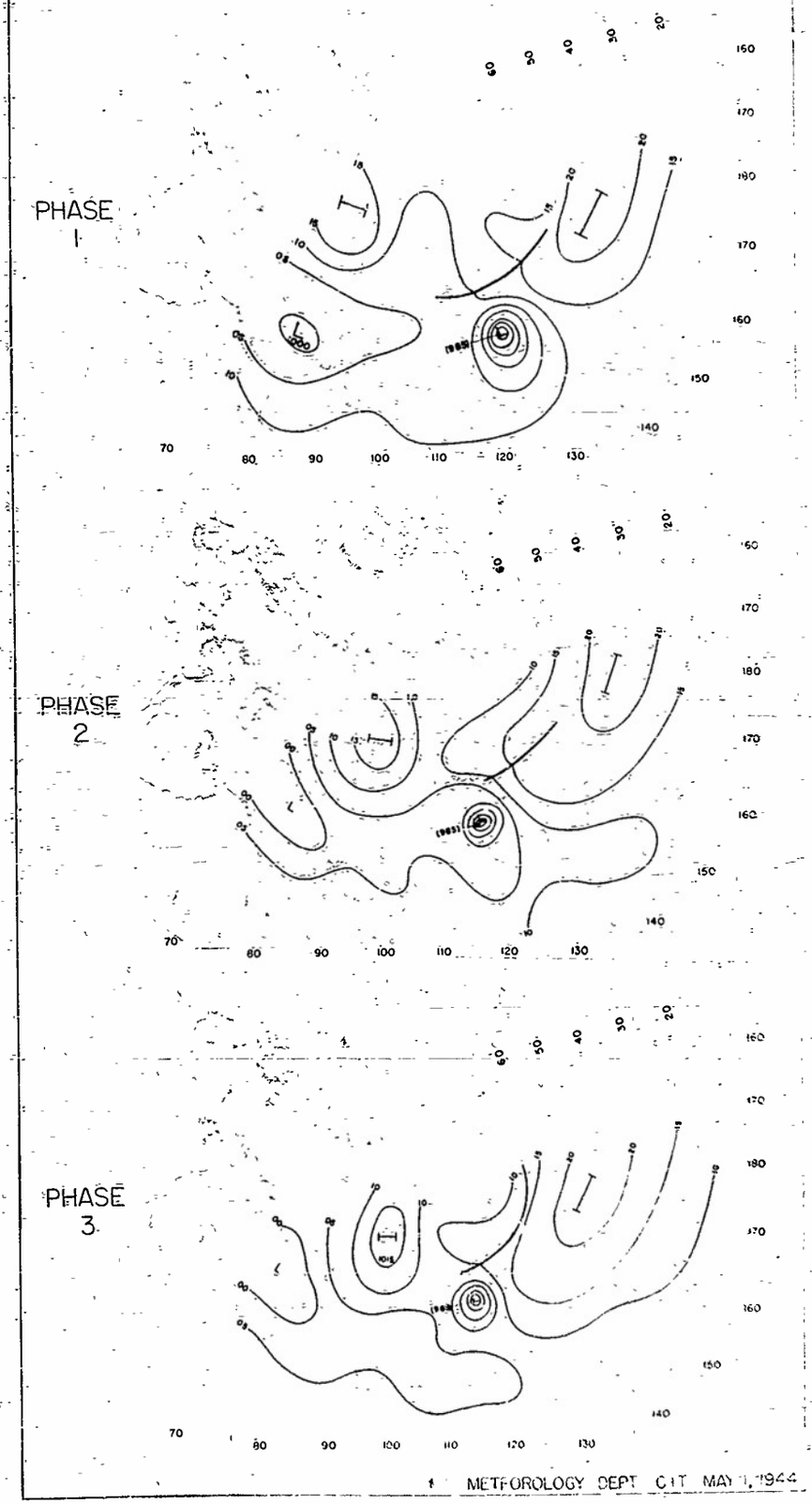
Examples: Summer - August 14, 15, 16, 1928

Fall - October 22, 23, 24, 1929

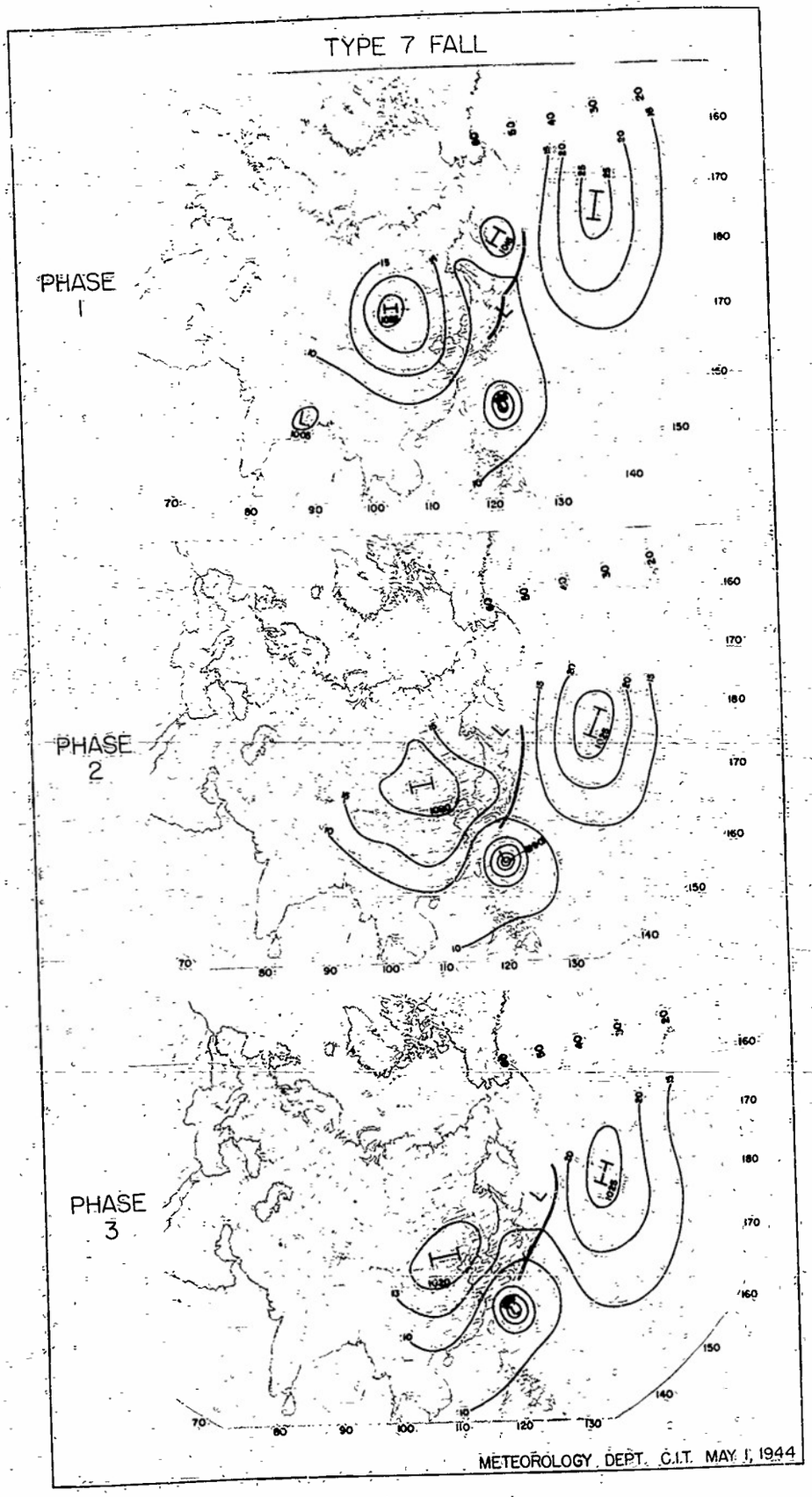
Type 7 can be best described as a typhoon type. On phase one a typhoon is located just to the northeast of the Philippines or a weak cyclone intensifies in this area. For three phases this typhoon remains in the area or moves very slowly north-northwest. A moderate Pacific HIGH occupies the western Pacific. A weak stationary frontal boundary lies through southern Japan. During this three-day period there is little if any eastward movement of any pressure systems.

This type is common in summer and fall seasons. In the majority of cases Type 7 is followed by Type 7a which sequence provides a synoptic continuity of six days.

TYPE 7 SUMMER



METEOROLOGY DEPT CIT MAY 1, 1944


TYPE 7 FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 7a.

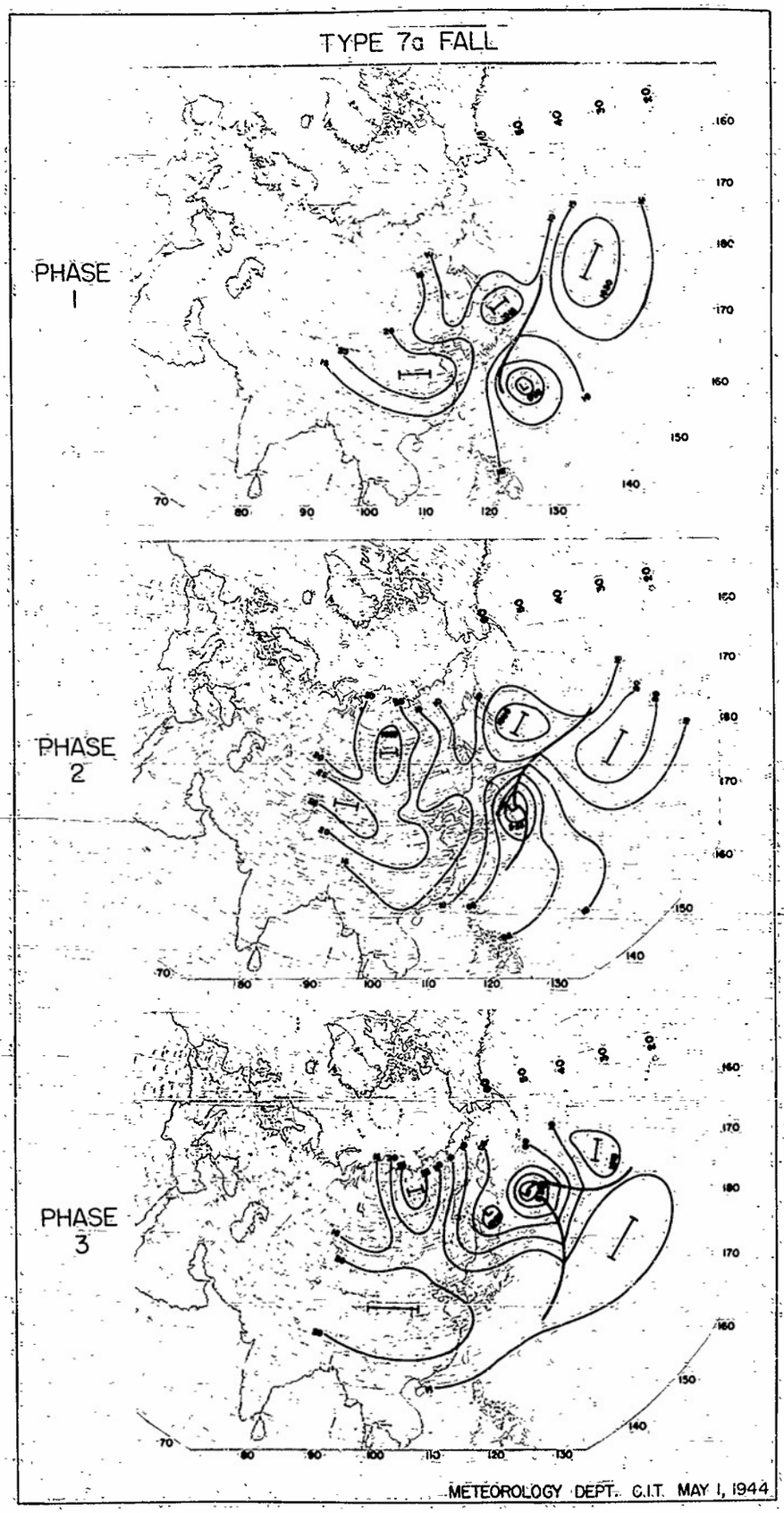
Examples: Summer - August 17, 18, 19, 1928

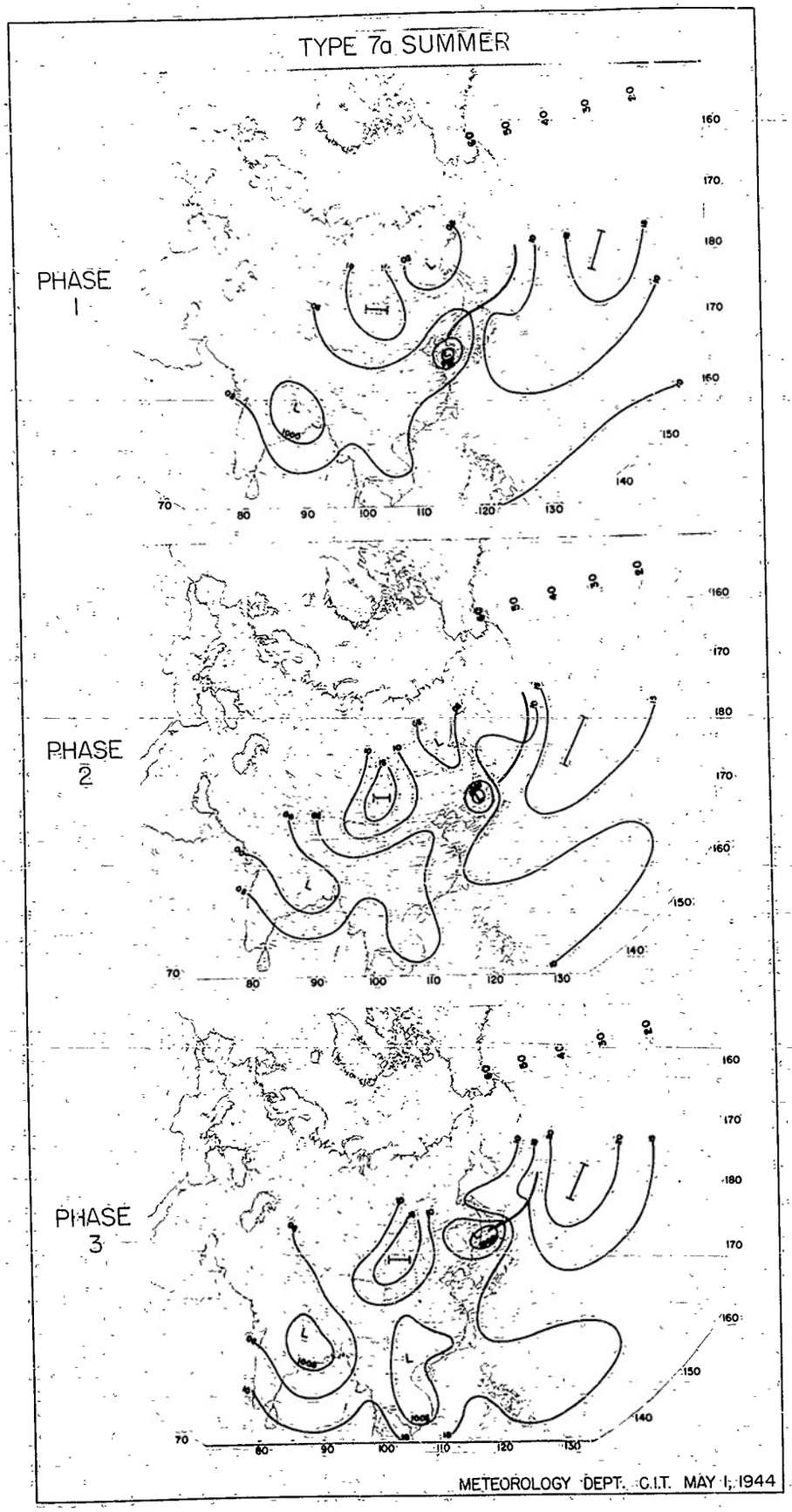
Fall - October 25, 26, 27, 1929

Type 7a is preceded by Type 7 in a high percentage of cases. In summer the typhoon from Type 7 moves north of 30°N. latitude between phase three of Type 7 and phase one of Type 7a. In fall Type 7a when preceded by Type 7 starts slightly further east and south than in summer. In the majority of cases in fall the typhoon on Type 7 does not necessarily pass 30°N. latitude until during phase one of Type 7a.

In the summer season through phase two and three the typhoon moves northward between the coast of Asia and Japan, being centered on phase three near Vladivostok. A moderate Polar Pacific HIGH occupies the western Pacific Ocean. The typical thermal LOW lies over India and southern China with a weak stationary wedge over central Siberia.

During the fall season the typhoon moves north of 30°N. latitude developing into an active cyclonic center by phase two. The movement in contrast to the summer season is along the east coast of Japan on phase two with a rapid northeastward movement by phase three. The western Pacific HIGH moves eastward after phase two. Moderate stationary high pressure persists over China and southern Siberia with a traveling wedge over central and northern Siberia.


TYPE 7a FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 7a SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

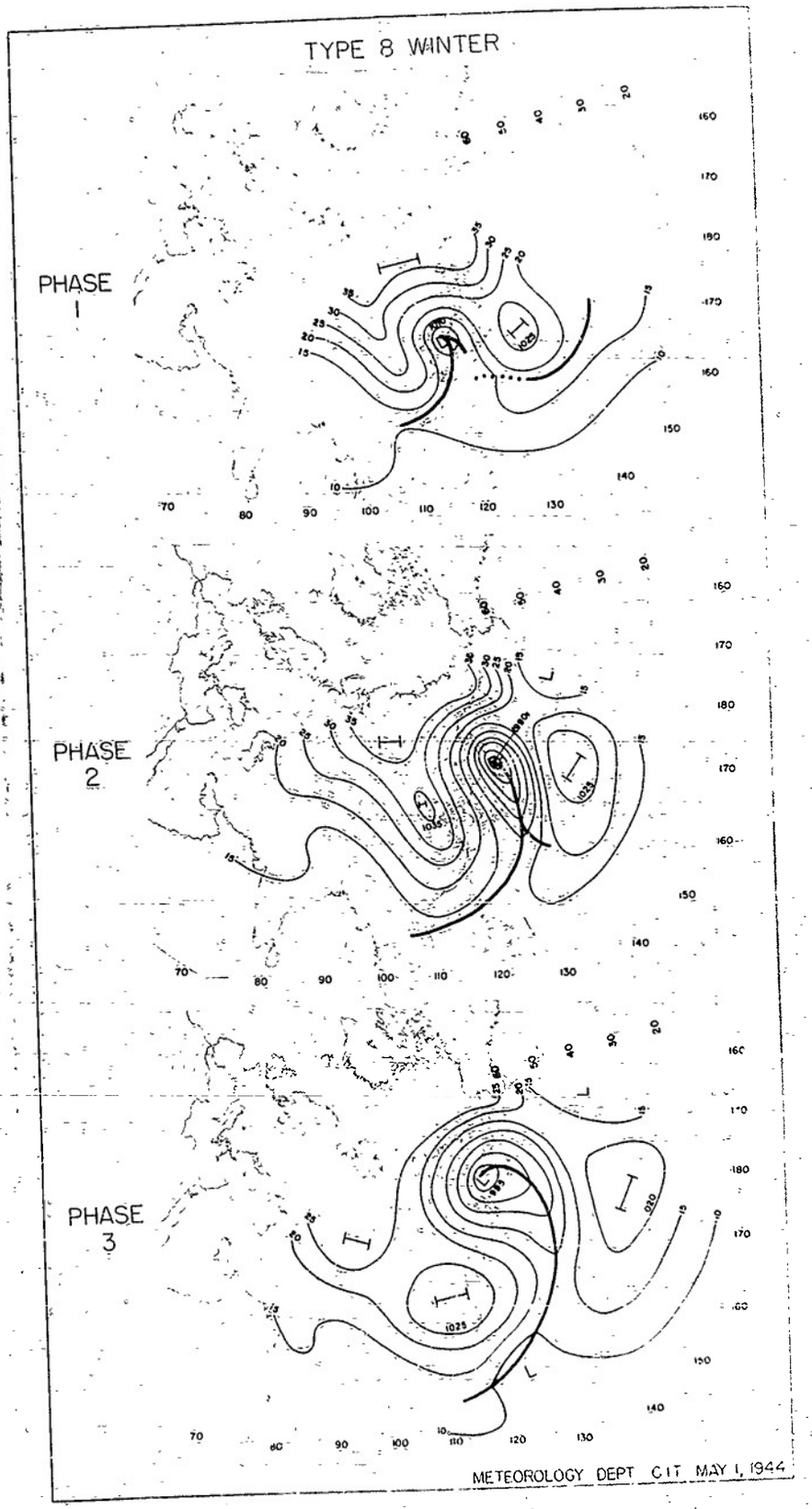
TYPE 8.

Examples: Spring - April 19, 20, 21, 22, 1927

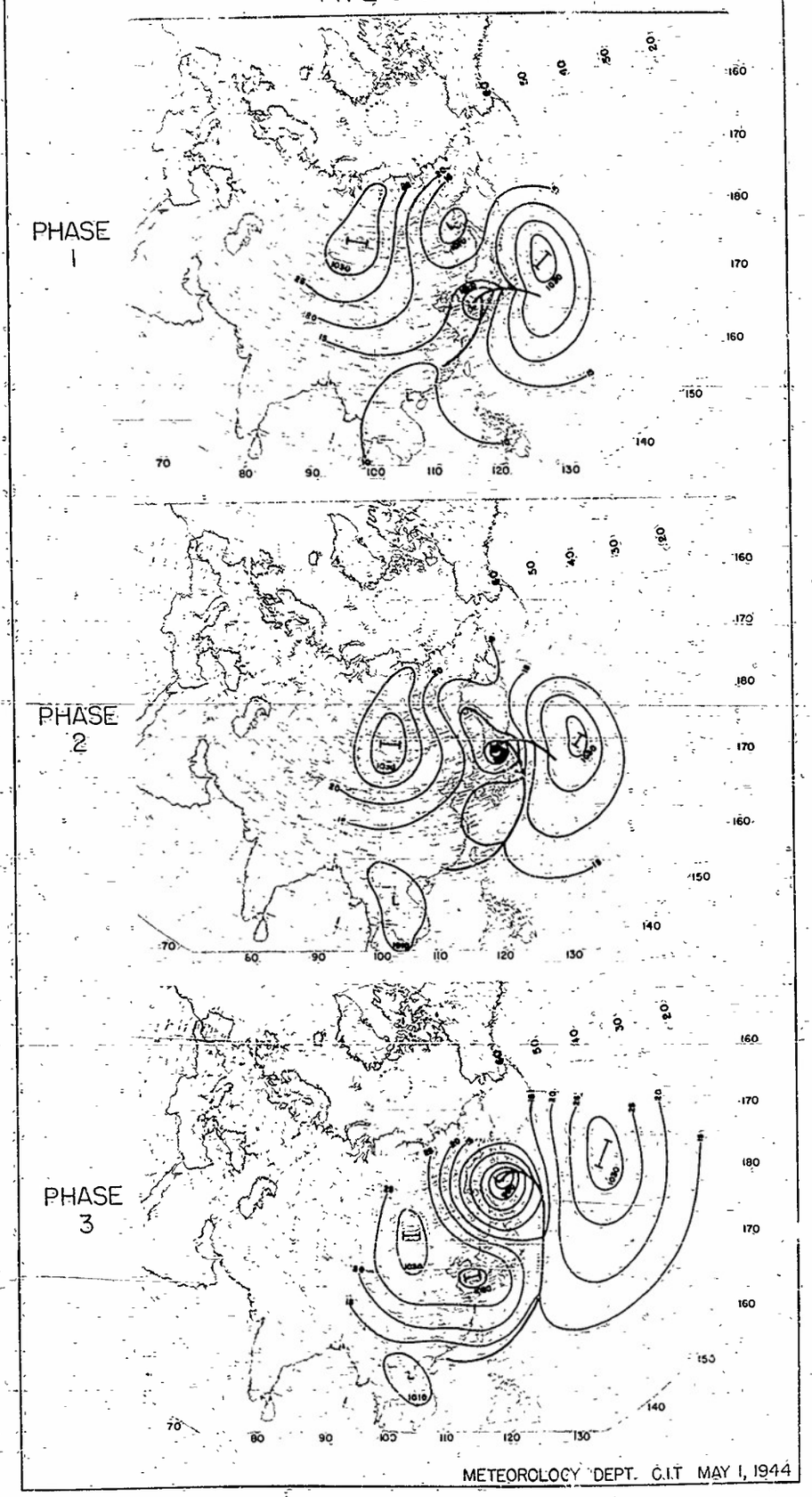
Spring - March 18, 19, 20, 21, 1929

On phase one a weak wave that has originated in Northern China has moved to a position normally near Korea or slightly west. Usually an intense Pacific HIGH is located around 38°N. latitude. This HIGH remains in this position for three phases causing the cyclone to move rapidly northeast to phase two position and then north-northeast to a position north of 60°N. latitude on phase three. In many cases, according to the analyses, the center fills after phase three position passing eastward aloft over North Alaska.

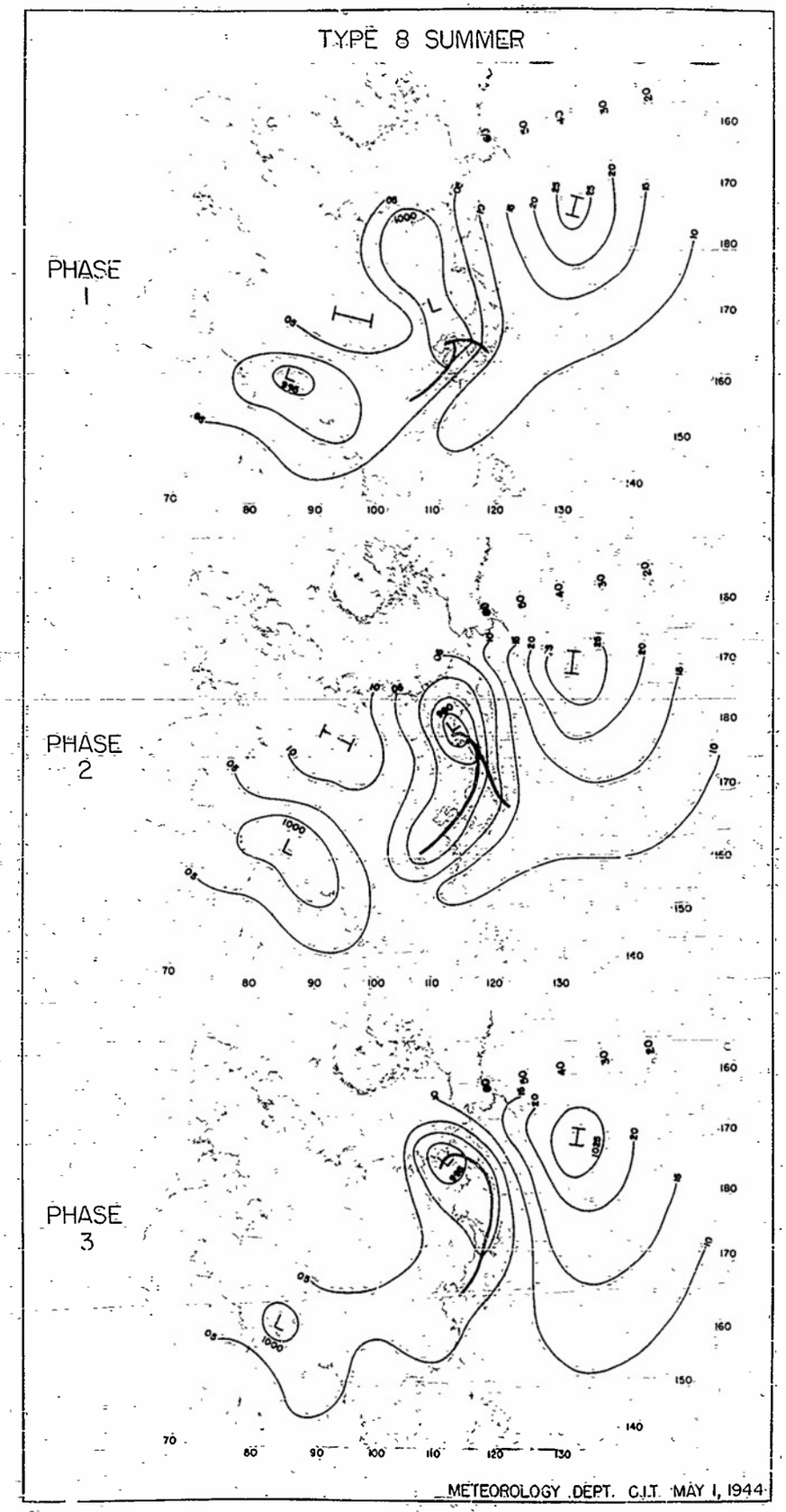
Type 8 occurs very seldom in winter and about evenly distributed during the other seasons.


TYPE 8 WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT C.I.T. MAY 1, 1944

TYPE 8 SPRING 1

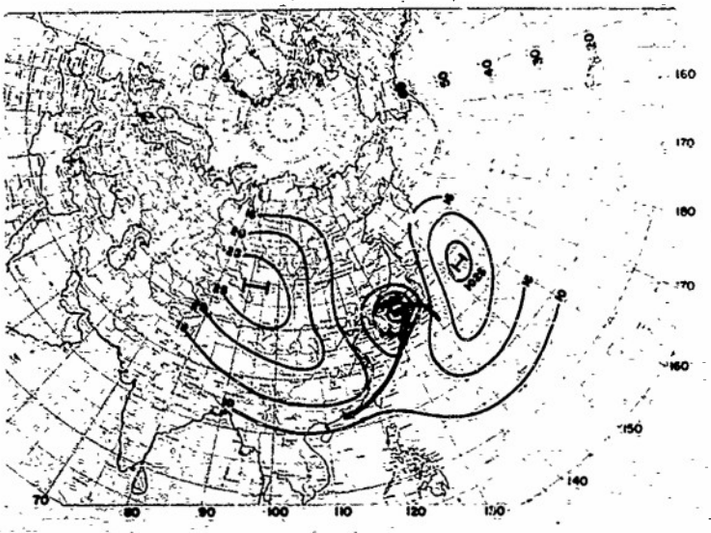


METEOROLOGY DEPT. C.I.T MAY 1, 1944

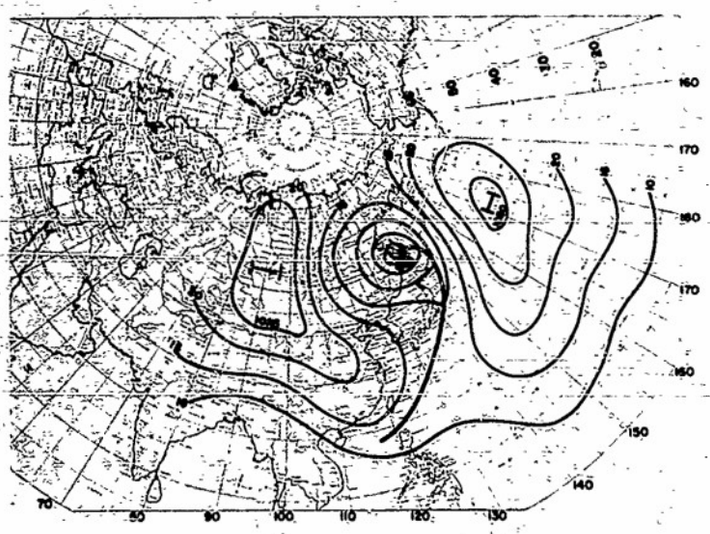

TYPE 8 SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 8 FALL

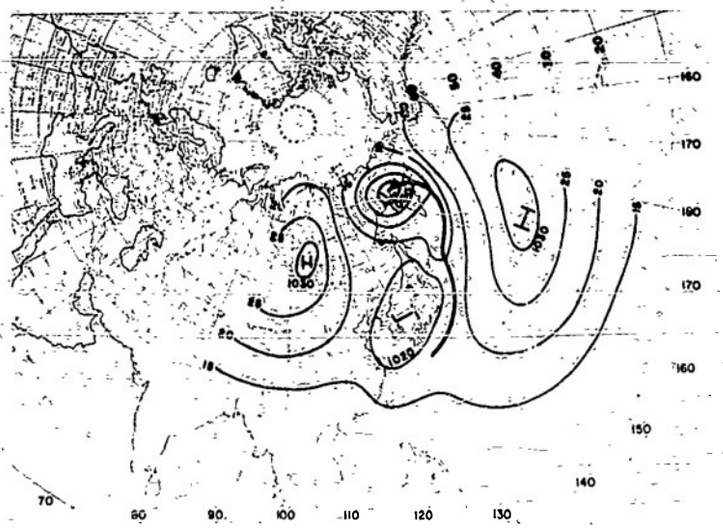
PHASE 1



PHASE 2



PHASE 3



METEOROLOGY DEPT. C.I.T. MAY 1, 1944

TYPE 9.

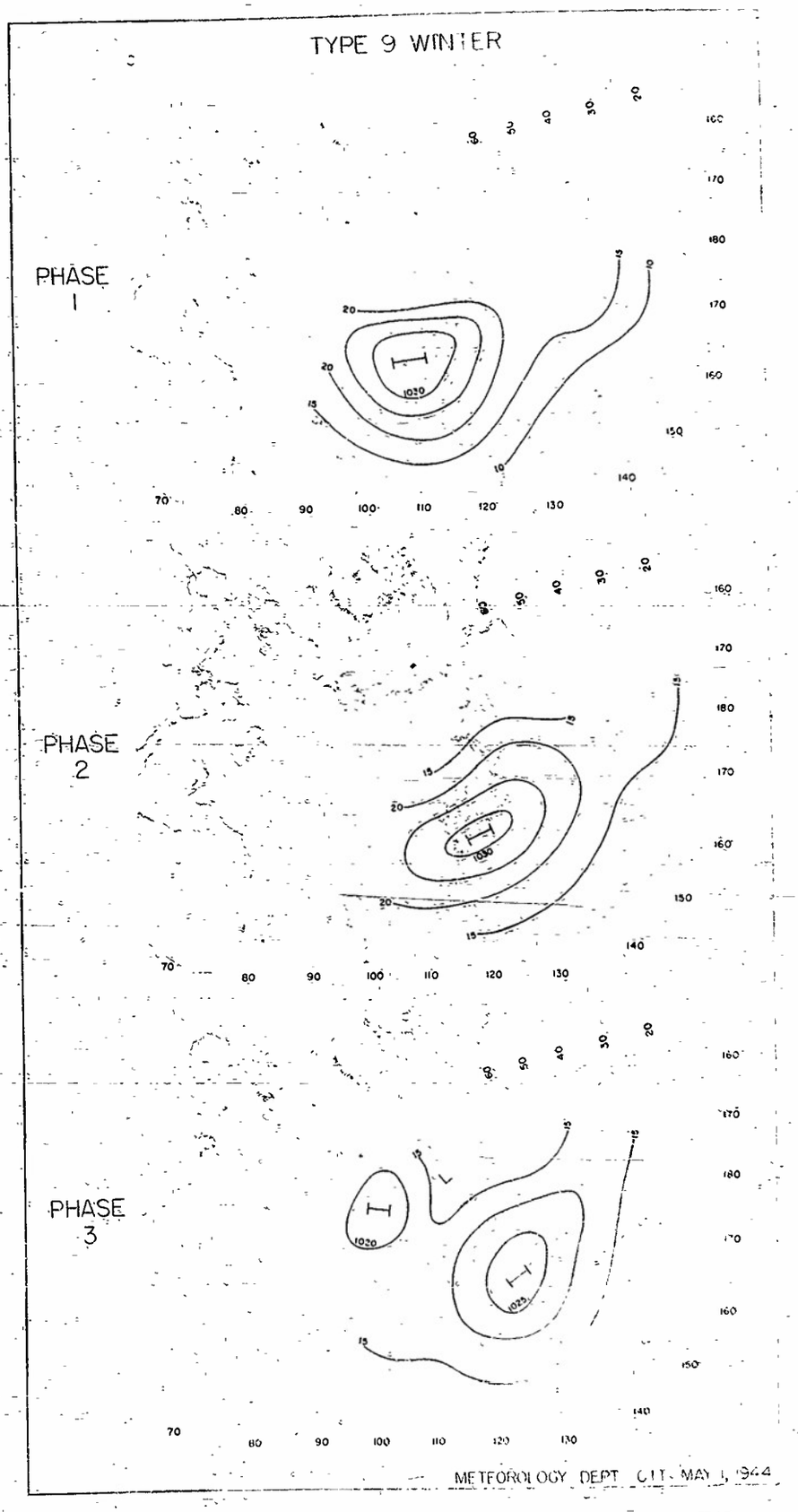
Examples: Spring - April 6, 7, 1934

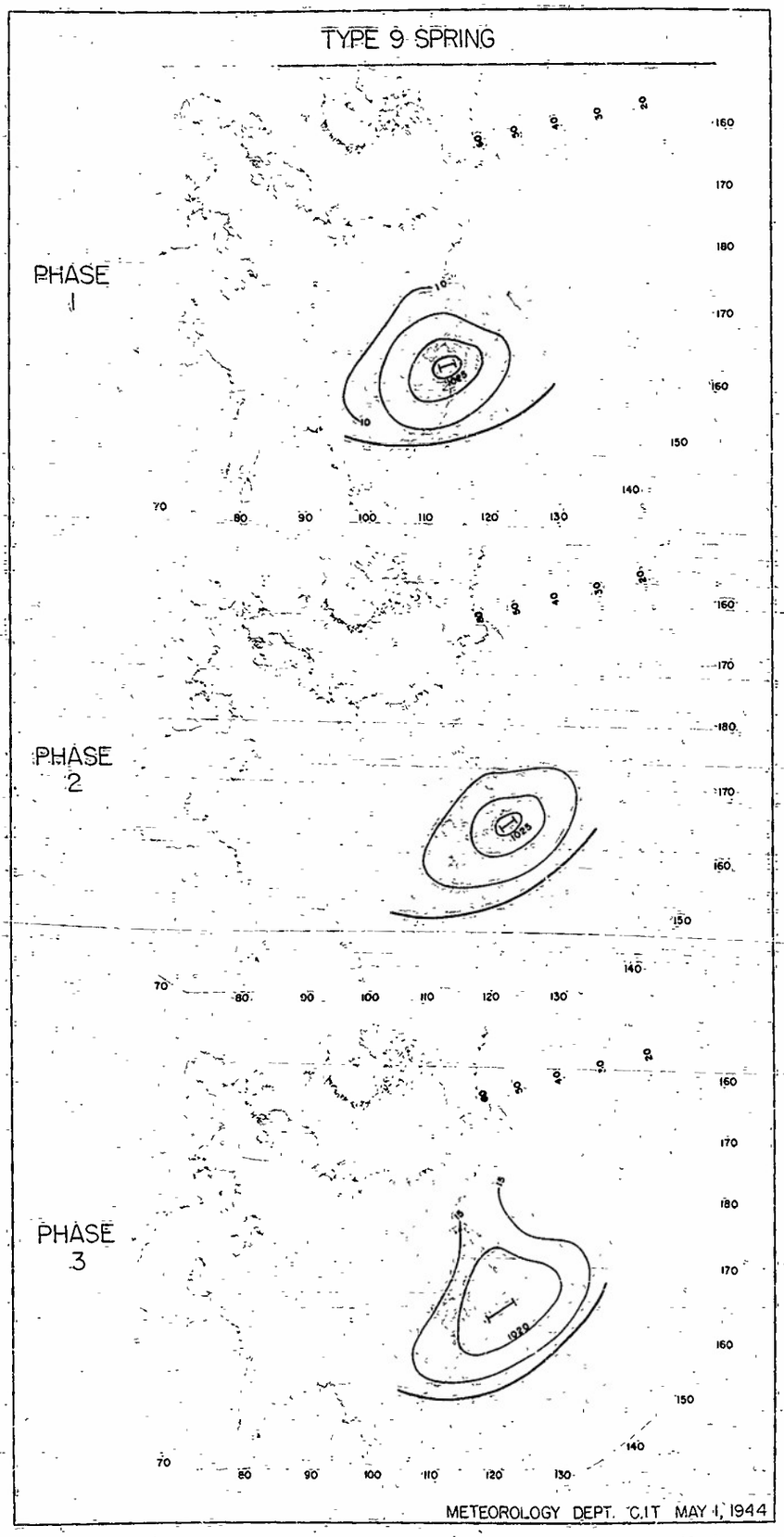
Spring - May 27, 28, 29, 1901

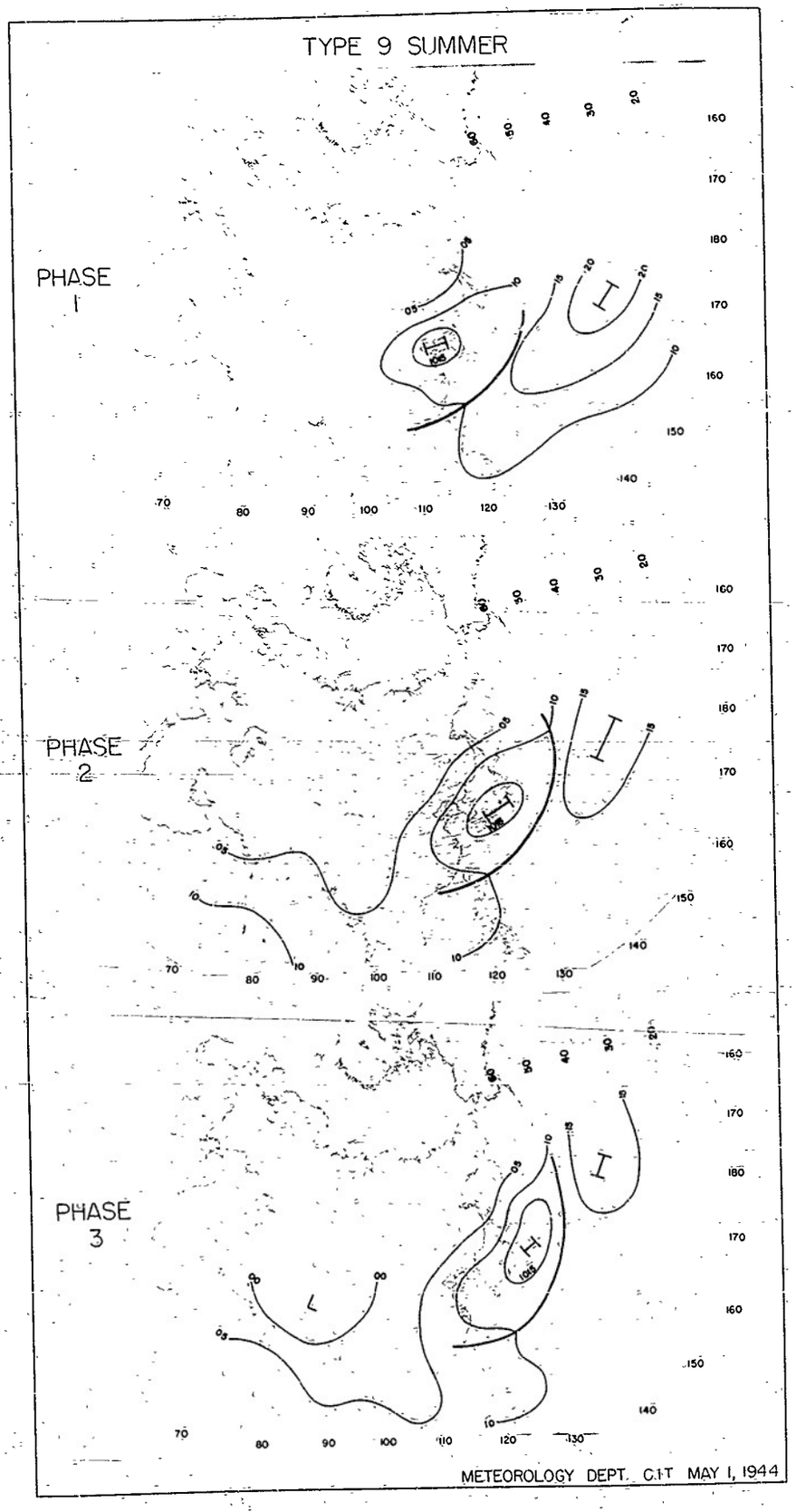
This type occurs at all seasons with very few cases in winter. It is more frequent in spring than in summer.

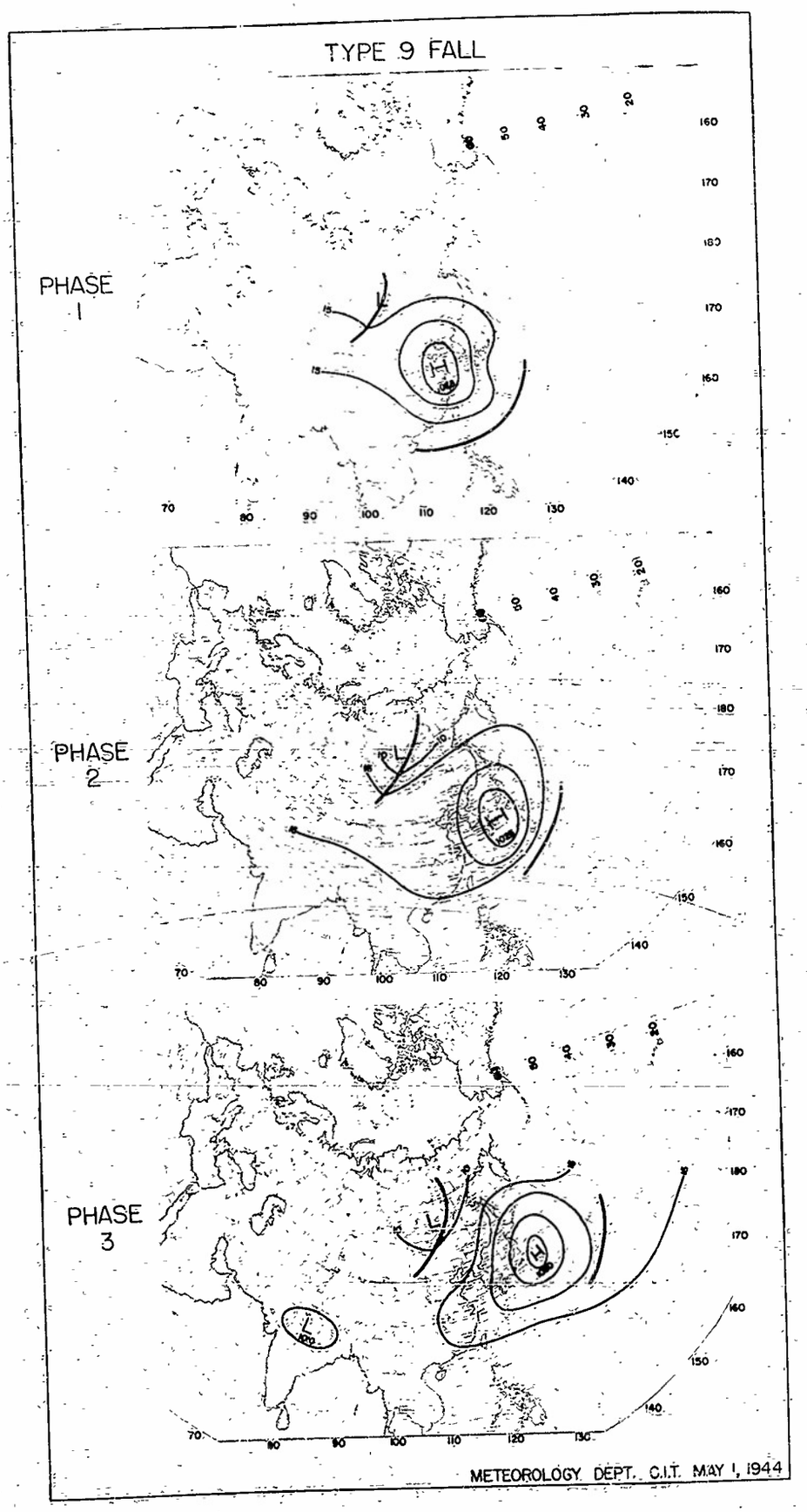
In spring a high pressure center of approximately 1020 to 1025 millibars moves eastward following a moderately intense LOW which has moved northeast on phase minus one. By phase one the HIGH is centered between 30 to 40°N. latitude generally to the west of Japan. By phase three the HIGH center is slightly to the east of Japan with a returning southerly flow in the Tokyo area.

A semi-stationary east-west frontal zone is prevalent on all three phases of this type, normally between 15 to 25°N. latitude. In summer the intensity of the high cell varies from 1010 to 1020 millibars, otherwise the synoptic pattern is much the same as spring for the three phases. In winter the general pattern for the three phases are very similar to spring. The intensity of the HIGH cell moving eastward out of Siberia varies from 1030 to 1035 millibars.


TYPE 9 WINTER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT C.I.T. MAY 1, 1944


TYPE 9 SPRING
PHASE 1
PHASE 2
PHASE 3
1045
1025
1020
10
160
170
180
150
140
70
80
90
100
110
120
130
METEOROLOGY DEPT. C.I.T. MAY 1, 1944


TYPE 9 SUMMER
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T MAY 1, 1944


TYPE 9 FALL
PHASE 1
PHASE 2
PHASE 3
METEOROLOGY DEPT. C.I.T. MAY 1, 1944

III. SYMBOLS AND MODIFICATIONS USED IN DEVELOPING CLASSIFICATION GRAPH FOR THE EAST ASIA-WEST PACIFIC SYNOPTIC REGION.

As an aid in selecting analogues, the Classification Graph presents a visual index of similar daily synoptic patterns with modifications for the period from January 1, 1899 through June 30, 1939. Ideal types are indicated by the following color blocks:

COLOR	TYPE
	1
	2
	23
	3
	4
	4a
	5
	6
	7
	7a
	8
	9

The types as indicated on the Classification Graph have not been identified as good, fair, or poor, since it was desired to indicate the modification for each synoptic weather map from the ideal so that analogue selection could be based on the differences present as well as on the regular weather patterns.

Modifications of ideal types are represented as follows:

SYMBOL	MODIFICATION
	TYPE 2 but entire pattern shifted north from the normal position.
	" " " " " " west " " " "
	" " " " " " south " " " "
	" " " " " " east " " " "
	" " " " " " south and east " " "
	" " " " " " north and east " " "
	" " " " " " north and west " " "
	" " " " " " west and south " " "
	TYPE 1 in the north and 23 in the south.
	" 5 " " " " 2 " " "
	" 5 " " " " 23 " " "
	" 5 " " " " 3 " " "
	" 5 " " " " 6 " " "
	" 5 " " " " 7 " " "
	" 5 " " " " 7a " " "
	Indicates TYPE 5 with TYPE 3 characteristics. Differs from the normal TYPE 5 in that the synoptic pattern is such that warm front activity is occurring in Japan causing a slight intensification of a normal TYPE 5 with anomalies somewhat like TYPE 3 but not to such a degree as to be classified TYPE 3 or TYPE "5 North" and TYPE "3 South." This method has been used to indicate a modification in the pure type as represented by the preliminary weather patterns included in this report.

SYMBOL	MODIFICATION
W	Winter Type } Fall and Spring not marked
S	Summer Type }
+	Major trough position ahead of normal phase position but not far enough to be identified as the next phase.
—	Major trough position behind normal phase position but not far enough to be identified as the previous phase.
H	Blocking HIGH with cold air generally flowing southward through the Bering Sea halting the eastward movement of major trough with the effective blocking action from 50°N. latitude northward.
M	Same as H except that the effective blocking action extends south to about 40°N. latitude.
L	Same as H and M with blocking action southward to about 30°N. latitude.
B	Used with Types 4 and 4a to indicate a persisting trough along the east coast of Siberia.
I	A phase mark indicating the beginning or/and end of a weather type.
T	Typhoon with two or more closed isobars. See Figure 13 for division and 13a for an example of a typhoon of two or more closed isobars between 130°E. longitude and 140°E. longitude on Classification Graph.

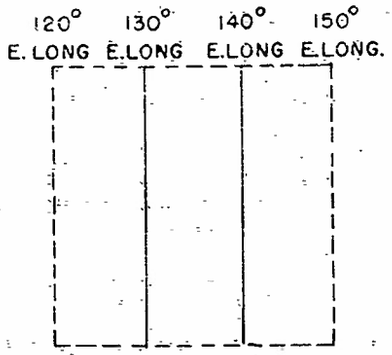


FIG. 13

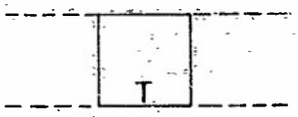


FIG. 13a

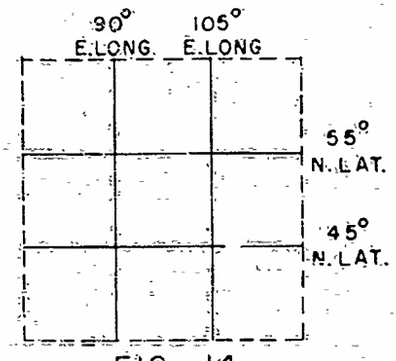


FIG. 14

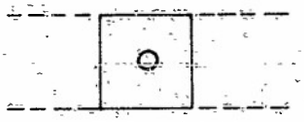


FIG. 14a

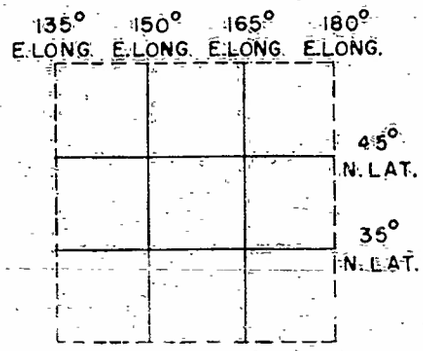


FIG. 15

FIG. 15a

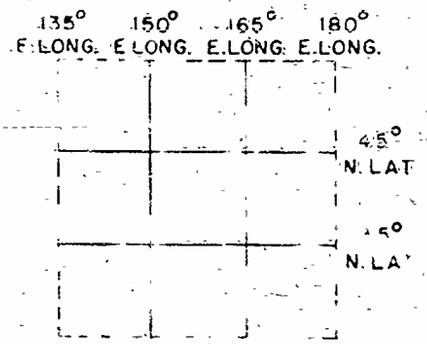


FIG. 16

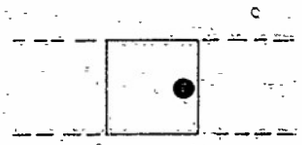


FIG. 16a

SYMBOL	MODIFICATION
○	Indicates relative position of Polar Siberian HIGH of 1055 millibars or greater. See Figure 14 for divisions and Figure 14a for an example of a Polar Siberian HIGH of 1055 millibars or greater located between 45 and 55°N. latitude, and between 90 and 105°E. longitude.
⊕	Indicates relative position of Polar Pacific HIGH of 1035 millibars or greater. See Figure 15 for divisions and Figure 15a for an example of a Polar Pacific HIGH of 1035 millibars or greater located north of 45°N. latitude and between 150 and 165°E. longitude.
●	Indicates relative position of Polar Pacific LOWS of 975 millibars or less. See Figure 16 for divisions and 16a for an example of a Polar Pacific LOW of 975 millibars or less located between 35 and 45°N. latitude and between 165 and 180°E. longitude.
Ⓣ	Indicates typhoon with pressure 975 millibars or less. See Figure 13 and 13a.

IV. EXPLANATION OF FOLLOWING CHARTS:

The chart on page 71 indicates the monthly frequency of each weather type for the forty (40) years 1899 to 1939. For example, the total number of cases of Type 2 for September is 32.

The chart on page 72 indicates the number of cases for the forty years that a particular weather type is followed by any other. For example, the number of cases of Type 3 following Type 23 for winter for the forty year period is 16.

Due to unidentified types, the total given in the last column of the Frequency Chart, page 71, does not agree with the total cases of each type as would be obtained by totaling the columns of the Transition Chart, page 72.

The table on page 73 indicates a few representative examples of the weather types. By use of the Classification Graph two representative examples of the weather types were selected for each season. If a blank space is indicated, that particular type did not occur during that season.

FREQUENCY CHART OF WEATHER TYPES
EAST ASIA–WEST PACIFIC SYNOPTIC REGION
OCCURRING 1899 – 1939

TYPE	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1	15	22	12	1	—	—	—	—	1	4	11	41	107
2	68	72	77	70	79	111	42	10	32	40	25	39	665
23	49	59	93	73	62	32	12	7	21	45	56	58	567
3	51	39	62	67	44	37	26	23	31	40	52	50	522
4	43	35	10	—	2	—	—	—	—	—	15	39	144
4a	62	47	20	2	1	—	—	—	—	—	11	30	173
5	67	54	77	98	107	67	97	122	101	137	133	95	1057
6	—	—	—	—	5	70	121	63	20	4	—	—	283
7	—	—	—	—	2	4	40	68	59	37	7	—	217
7a	—	—	—	—	2	5	26	66	59	43	5	—	206
8	1	2	9	13	6	8	10	4	8	10	5	1	77
9	14	16	15	23	9	10	2	4	11	27	24	16	171

METEOROLOGY DEPT. C.I.T. JUNE 1944

RESTRICTED

RESTRICTED

TRANSITION CHART OF WEATHER TYPES BY SEASONS

EAST ASIA-WEST PACIFIC SYNOPTIC REGION

OCCURRING 1899 – 1939

	1*	2	23	3	4	4a	5	6	7	7a	8	9
1	14 3 2	13 2 3	9 11 1	11 1 1	5 1	8 1	14 3 5					2 1 1
2	6 1 2	49 60 64 18	25 39 9 5	25 28 10 13	17 2	13 12 1	26 41 26 28	1 43 1	3 8	3 3	7 3 1	3 6 2 3
23	9 2 2	21 48 8 8	26 43 17 19	16 23 5 8	26 3 2	23 3 1	15 38 8 34	14 2	7	3	3 4	7 19 2 9
3	12 4 1	13 29 17 12	20 34 5 9	19 26 15 15	14 5 4	16 2 1	21 37 17 42	23 5	5 8	1 7	2 5	9 12 3 8
4	8 1 2	14 2 2	18 1 2	10 1 1	17 1	19 3 1	11 1 1			1		4
4a	12 1 1	22 9 2	16 6 3	14 1	11 1	37 4 3	10 1				6	6
5	13 5	19 38 23 24	28 53 7 55	26 41 27 39	10 8	13 1 4	80 70 130 112	3 50 5	40 42	1 10 19	1 6 5 5	10 7 3 26
6		32 6	2 10 1	20 5			46 4	96 1	26 4	7	7 1	
7	1	3	2	1 4	1		6 11	1	19	81 69		
7a		2 10	1 2 5	1 6 14		1	34 32	22 3	1 13 10	2	4	1 7
8		4 2	7 1 2	2 2 1	1		1 5 5 1	5	2 3	1 3	1 3	3 4
9		5 10 3 8	4 10 1 4	12 6 2 9		1	14 25 5 28	6 1	1 2	1 1	3	3 1

WINT	SPR
SUM	FALL

Winter - December, January, February
Spring - March, April, May
Summer - June, July, August
Fall - September, October, November

* Type heading columns follows Type heading rows.
Example: Number of cases Type 7a following Type 7 for fall is 69.

REPRESENTATIVE EXAMPLES OF WEATHER TYPES
EAST ASIA–WEST PACIFIC SYNOPTIC REGION
1899 – 1939

TYPE	WINTER	SPRING	SUMMER	FALL
1	Dec. 1, 1909			
	Dec. 22, 1924			
2	Feb. 4, 1927	May 12, 1913	June 19, 1909	Oct. 1, 1937
	March 2, 1910	June 13, 1899	June 28, 1922	Oct. 28, 1911
23	Dec. 12, 1909	March 14, 1920	July 1, 1932	Oct. 11, 1924
	Feb. 25, 1914	April 11, 1932	July 8, 1903	Oct. 21, 1903
3	Jan. 4, 1911	March 24, 1904	Aug. 4, 1919	Oct. 10, 1927
	Dec. 10, 1904	March 15, 1935	July 26, 1899	Nov. 5, 1904
4	Feb. 7, 1927			
	Jan. 18, 1899			
4a	Dec. 4, 1910			
	Dec. 22, 1933			
5	March 4, 1899	March 13, 1922	Aug. 30, 1900	Oct. 20, 1899
	Nov. 10, 1904	March 18, 1902	July 17, 1903	Oct. 15, 1916
6			July 9, 1901	Sept. 25, 1907
			June 22, 1906	Oct. 8, 1926
7			Aug. 23, 1908	Sept. 8, 1937
			Aug. 24, 1936	Oct. 11, 1910
7a			June 18, 1911	Sept. 11, 1937
			July 21, 1913	Oct. 23, 1906
8	Feb. 24, 1916	May 15, 1931	Aug. 8, 1936	Oct. 12, 1900
	March 18, 1935	April 20, 1936	June 16, 1927	Oct. 9, 1900
9	Dec. 9, 1932	May 27, 1901	July 25, 1917	Sept. 23, 1913
	March 27, 1914	April 14, 1900	Aug. 16, 1915	Oct. 15, 1900

V. STATUS OF RESEARCH TO DATE.

This concludes the development of a preliminary Classification Graph for the East Asia-West Pacific Synoptic Region for the forty (40) years 1899-1939. This is Report No. 5 and material included supersedes that of previous reports. The only major difference in material included in the five reports is additional information being submitted with each subsequent paper. A few minor mechanical mistakes have been corrected such as the labeling of an isobar, typographical errors, etc.

It was indicated in the earlier reports that further refinement of some of the types, and therefore in the Classification Graph, may be necessary after the preliminary investigation.

As work progresses on the Classification Graph for the East Pacific (180° to 135°W. Longitude), it is fairly certain that some modification of the Classification Graph will be necessary in order that a natural continuous weather sequence be indicated through the transition zones. Preparation of the East Pacific Classification Graph has been authorized by the Weather Division, Headquarters Army Air Forces, and is scheduled for the period from July 1 to December 31, 1944.

It would be greatly appreciated if written suggestions or criticisms would be submitted by meteorologists who have had experience in the East Asia-West Pacific area.

E R R A T A

Page 24 - Type 2 Spring - Phase 2

Center of wave to the east of Japan should be corrected to read 995 instead of 1000.