PROGRESS REPORT

3000 DYNAMIC METER IDEAL CHARTS CORRESPONDING TO THE IDEAL SURFACE TYPES FOR ZONES 3 AND 4

BY

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PURPOSE OF PROJECT

This project was initiated in order to determine the correlation between the 3000 dynamic meter charts and corresponding surface charts which were used in formulating the ideal surface types as described in Report No. 2 CITAAF Research Unit (Project #32) October 31, 1945 entitled: "Preparation of a Catalogue of Synoptic Weather Sequences for North America, January 1899 through June 1939."

The patterns established by this work provide an additional aid in identification of weather types as well as giving some indication of wind directions and velocities to be expected aloft with a given surface type. These patterns reduced to slides for projection on a screen can also be used as a visual aid in presenting the characteristics of the various ideal types and especially to illustrate the steering effect of the upper winds.

SOURCE OF MATERIAL

Our data was obtained from the "Daily Synoptic Series, Historical Weather Maps, Northern Hemisphere, 3000 Dynamic Meters" prepared under agreement of Joint Meteorological Committee (Army, Navy, Weather Bureau). Maps prior to January 1, 1935 represented 1200 GMT data while those after this date represented 0900 GMT data.

In the case of the 3000 Dynamic Meter Charts it was not possible to make use of data for as long a period as was used in the surface types due to the fact that the available charts covered only the years from 1932 through 1940. In this preliminary work only the charts for the months of December, January and February were used. This was due to the fact that, because of relatively sharp contrasts in adjacent air masses, winter patterns are more clearly discernable than those of other seasons. Thus, by first developing the ideal types aloft for the winter season a basis can be obtained for determining the isobaric configuration for the other seasons when these contrasts are not so distinct.

Although these analyses are the best available

for this problem, as in the case of classifying surface charts it was found that in many cases variations occurred due to differences in the analysis techniques of various analysts. Therefore, it was necessary to recheck and in numerous instances relocate positions of troughs.

METHOD OF APPROACH

The first step consisted of going through the Catalog of Synoptic Weather Sequences for North America and listing the frequencies of all types that occurred during the period for which 3000 dynamic meter charts were available. Below are the results of the above tabulation:

Type	Zone 3*	Zone 4*
40	22	10
41a	14	11
41b	26	28
42	21	22
43a	10	8
43b	24	21
43c	28	20
44	26	17
45a	4	2
45b	11	6
46	10	10
48	0	14
49	15	10
50a	15	7
50b	9	9
53	30	26
58	3	2

Our preliminary study was confined only to those types occurring most frequently and to those which it

* North America has been divided into 2 zones - Zone 3 covering from 135° to 90°W Long. and Zone 4 covering from 90° to 45°W Long.

was felt would show the most distinct characteristics namely: Types 41a, 41b, 44 and 53, and 42.

For each type in each zone a separate list was made showing the dates of occurrance of each phase. The corresponding upper level charts were then selected and grouped by type, zone and phase. After this, tracings were made showing the trough positions, the 690mb isobar and the 710mb isobar since these factors best represented the significant features of the charts. In general, four to six examples representing the same phase were traced on one sheet of paper. A different color was used in making the trace for each day in order to facilitate the identification of corresponding troughs, isobars and other features of the charts. Then a partial composite chart was made of these traces and, in a similar manner, the partial composite charts were combined to form the one composite chart of each phase of each type in each zone. A time consuming difficulty was encountered due to the fact that our material was on charts of two different scales. Since the majority was on the smaller chart, it was decided to reduce the partial composites obtained from the large scale charts to the smaller.

PRELIMINARY RESULTS

Enclosed with this report are the composite charts of the five types completed at this time, together with all the data for type 41b (to show the details of the methods used). In general, phases one and two of both zones indicated very definite patterns. When the type was continuous through zones 3 and 4, phase 3 of zone 3 also had a definite pattern showing reasonable continuity with the other phases. However, in phase 3 of zone 3 where the type does not maintain its characteristics in the next zone, troughs became scattered with the breaking down of the type. In zone 4 we found similar cases of definite patterns on phase 3 also some with less definite characteristics, obviously due to the same continuity or break-down of the type, though we had no data to check this.

The detailed analysis of Type 41b indicates the following features:

Zone 3 Phase 1

On this phase a very definite ridge appears over the basin area corresponding to the closed basin high of approximately 1035mb which is a feature of the

surface ideal type. East of this ridge is located a good trough left over from the previous type and it moves off the east coast in the following two phases.

The SW-NE orientation of the axis of the surface Pacific reference cell is reflected in a similarly oriented cell aloft. Just as the intensity of the surface cell decreases somewhat during the 3 phases, so also does that of the cell aloft.

Zone 3 Phase 2

Here the ridge over British Columbia is not quite as sharp as in the previous phase, due no doubt, to the surface front which has by this time moved in north of the surface high cell and is therefore located almost directly below this ridge.

Zone 3 Phase 3

The ridge of high pressure is again very sharp and appears thus in all cases. To the east of this, there is a good trough almost directly over the position of the regenerated surface front as shown by the ideal type. A slight retardation in the hitherto fairly rapid movement of the surface front is therefore indicated.

Zone 4 Phase 1

In this phase the relative positions of the surface and upper troughs have not changed appreciably thus indicating a continuation of the retardation process as noted in Zone 3 phase 3.

Zone 4 Phase 2

In phase 2 a secondary shallow trough appears well behind the polar outbreak at the surface. The ridge over British Columbia is still quite definite aloft and has been responsible for tapping the cold air of north-western Canada. The major trough aloft has now moved over to the Appalachians, a movement corresponding to that of the warm front at the surface.

Zone 4 Phase 3

In the west, the pattern aloft shows a slight flattening of the ridge with the major trough now located on the east coast of the United States.

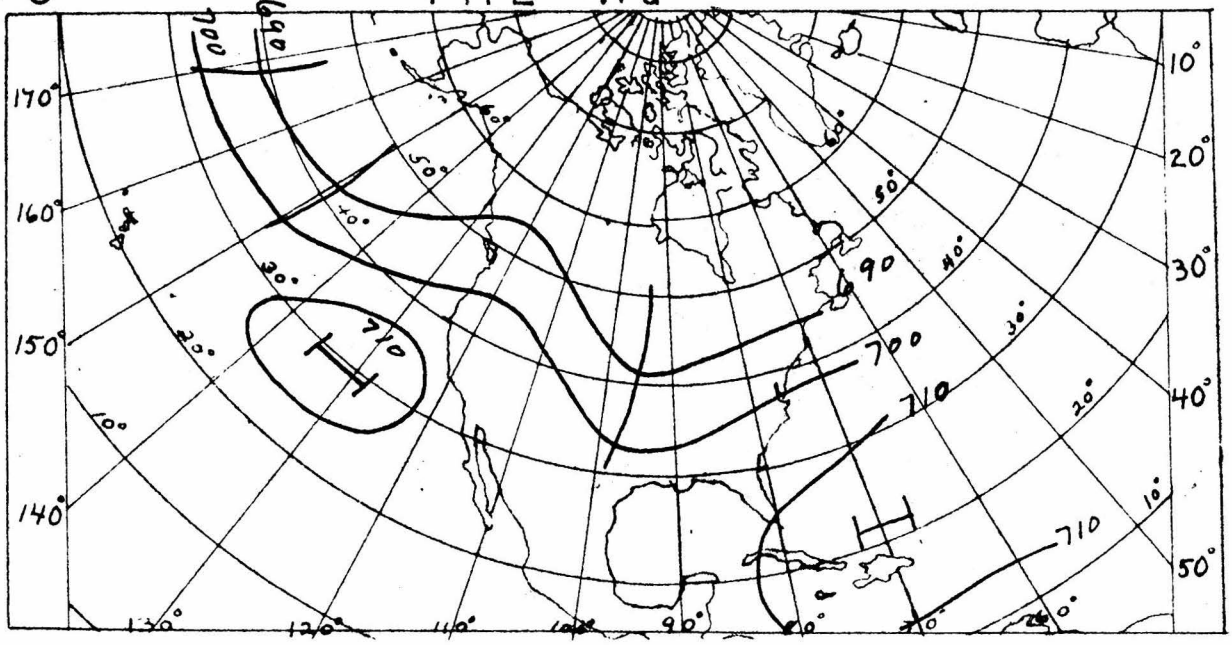
WORK YET TO BE ACCOMPLISHED

A study of types 43a,43b, 43c, 49 and 50a is yet to be made. The Composite charts of all the types have as yet to be compared with their corresponding surface types and studied for compatibility. The final form which perhaps will be most useful will show these composite upper level patterns superimposed on the corresponding surface chart.

ZONE 3

TYPE 41a

PHASE 1.



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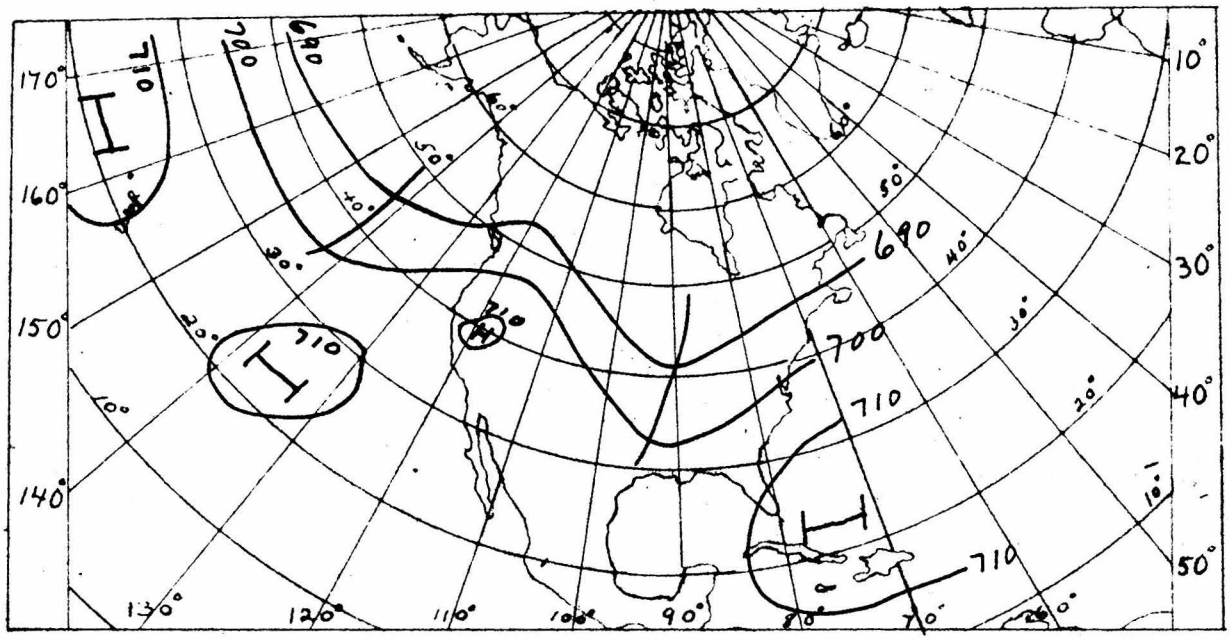

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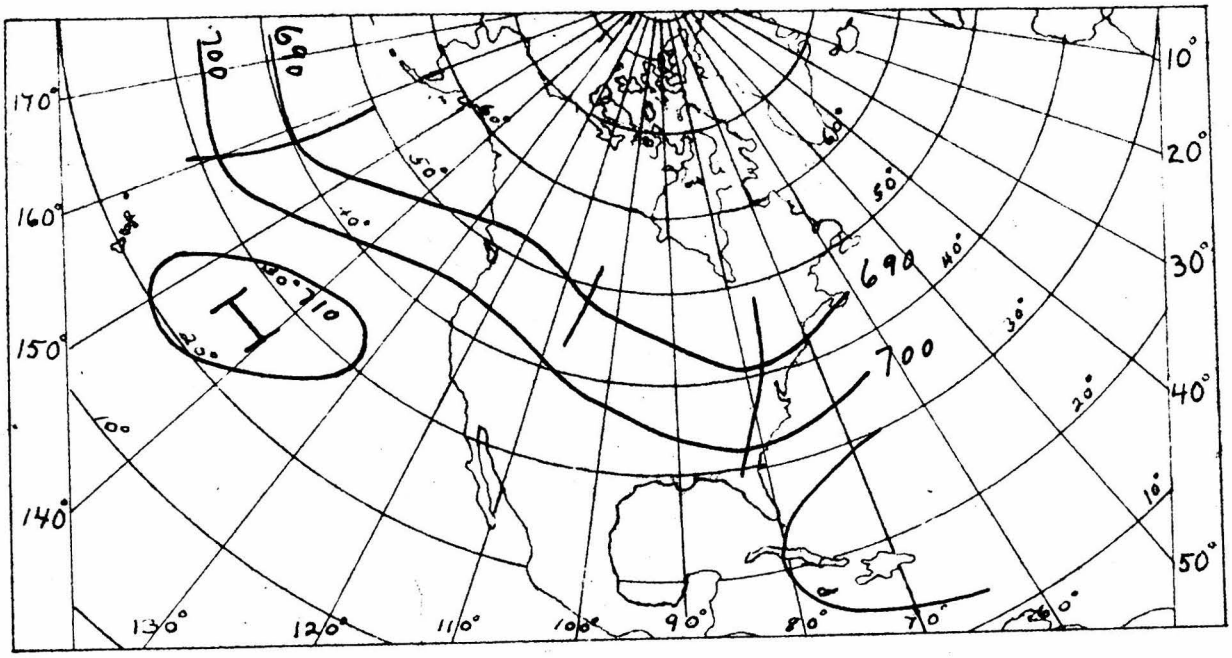

ZONE 4 TYPE 41a

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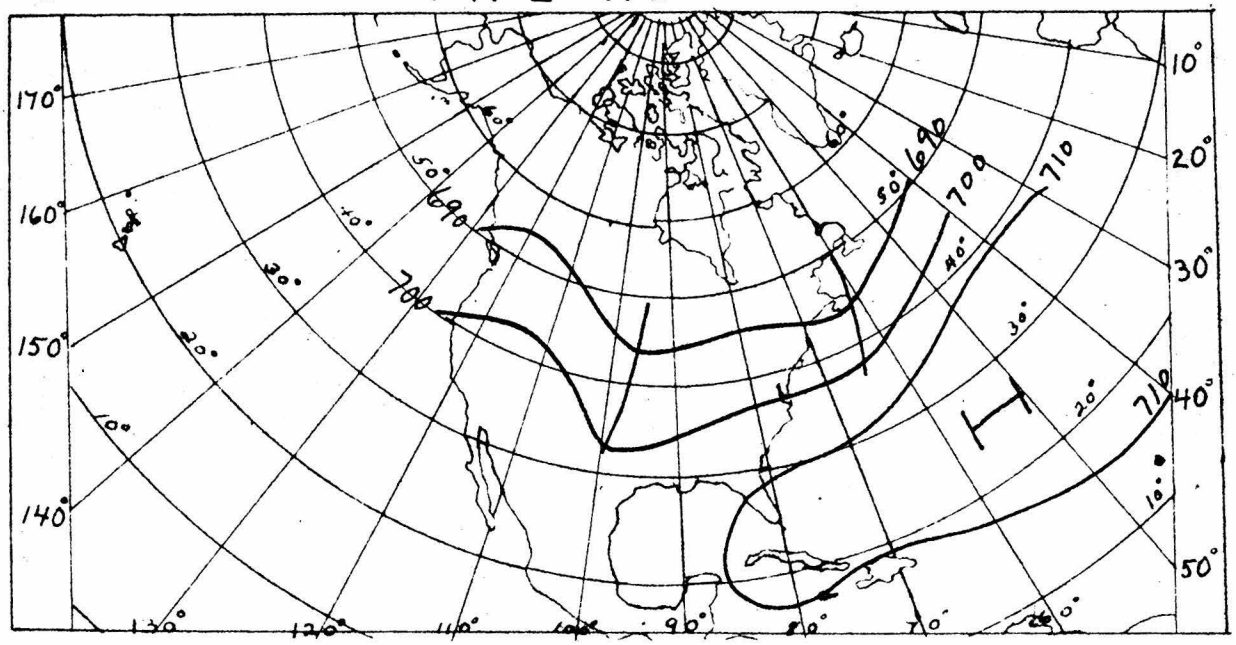

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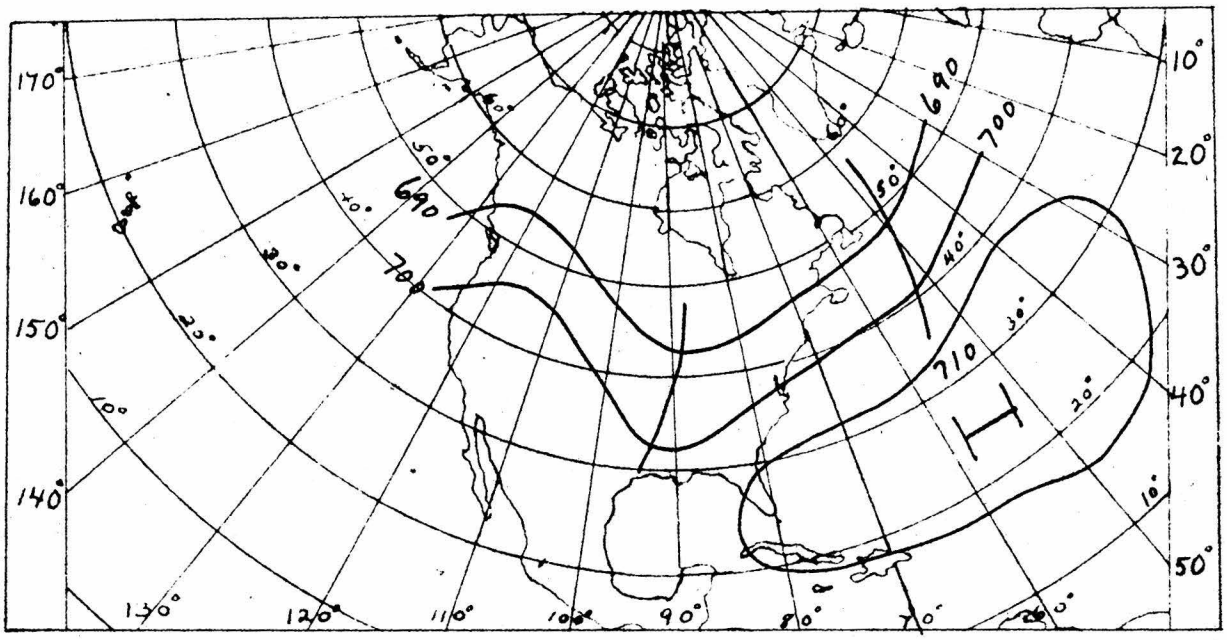

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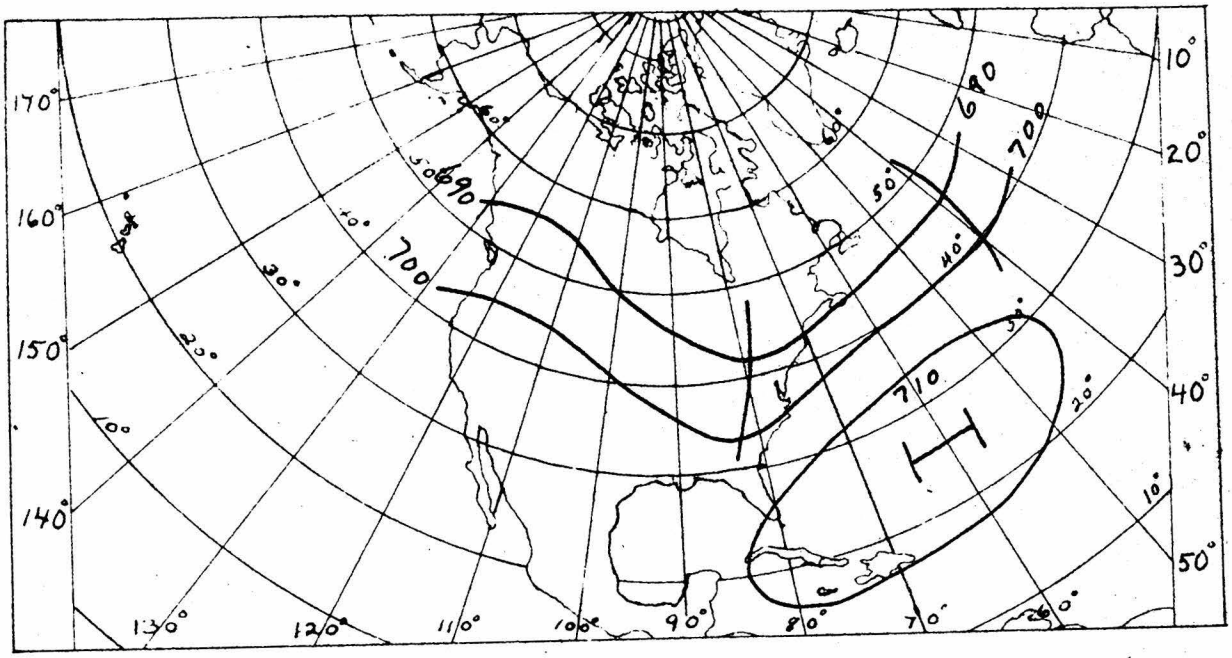

ZONE 3 TYPE 41b

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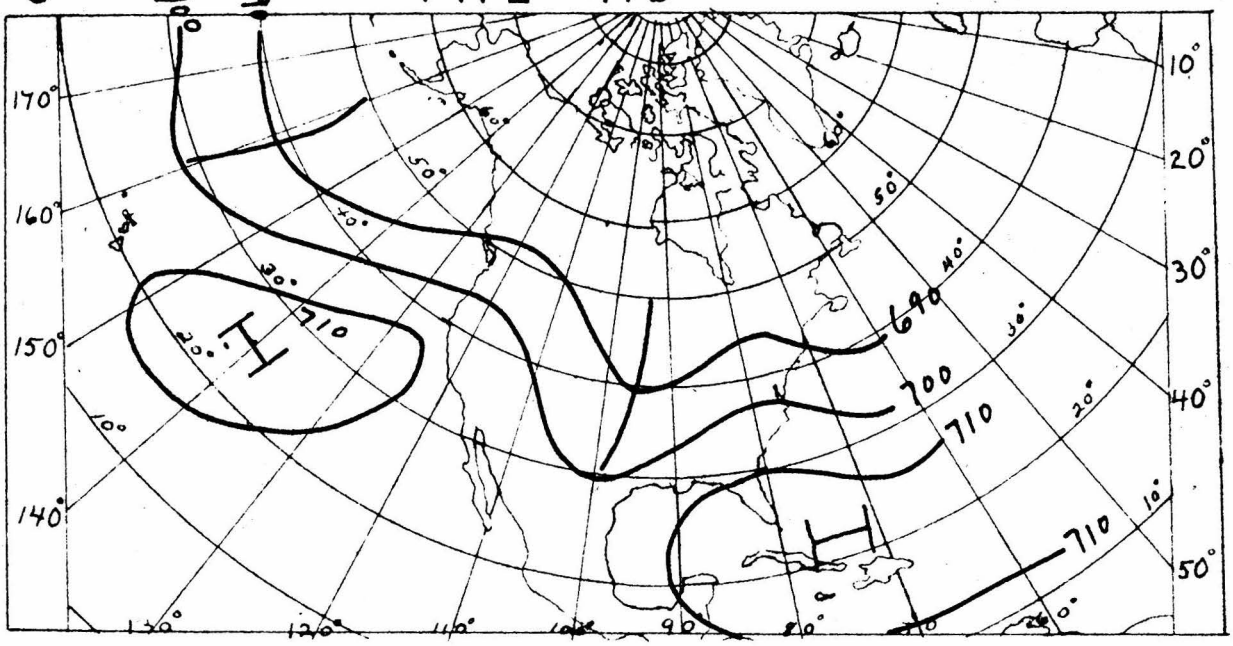

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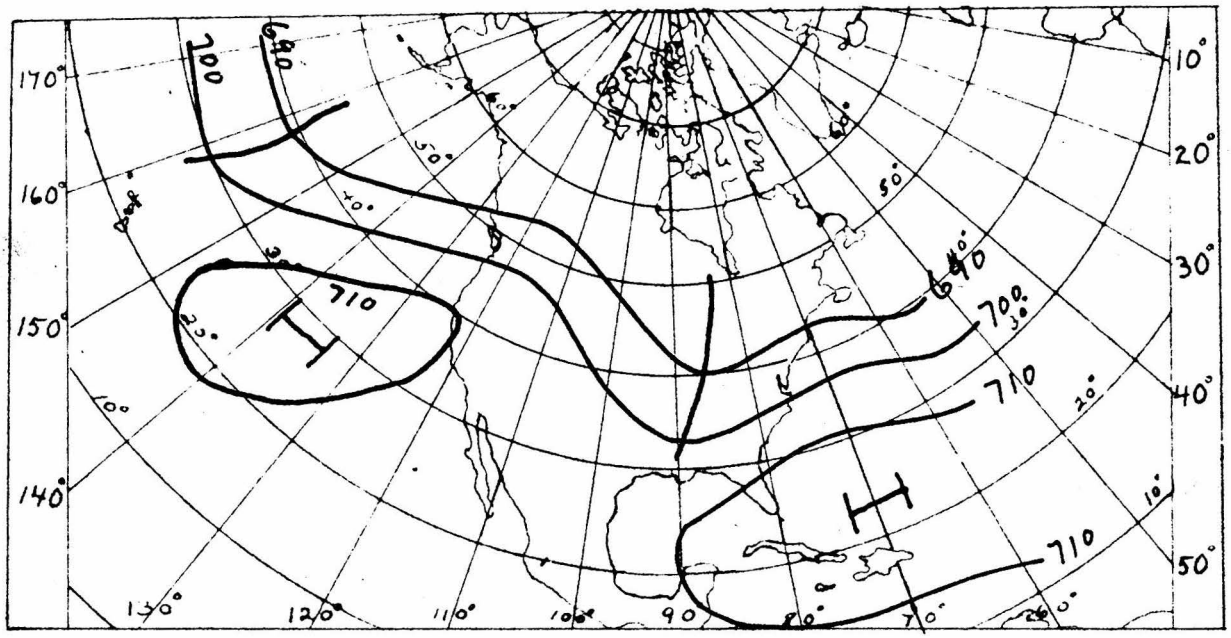

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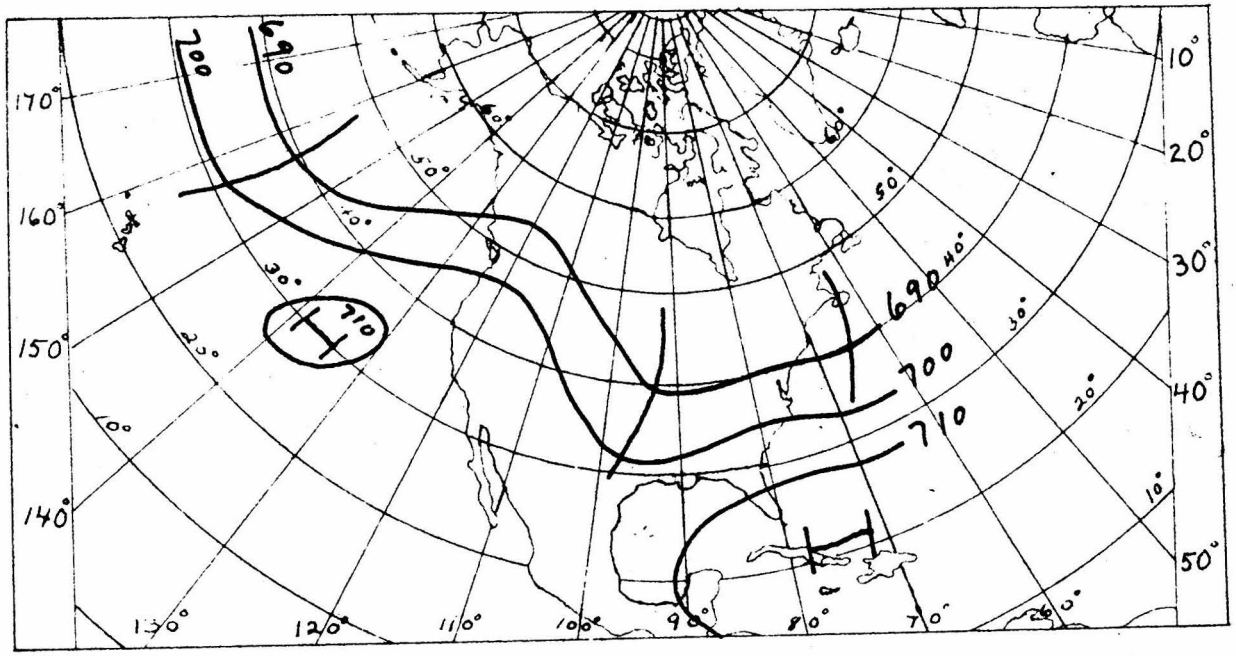

ZONE 4

TYPE 41b

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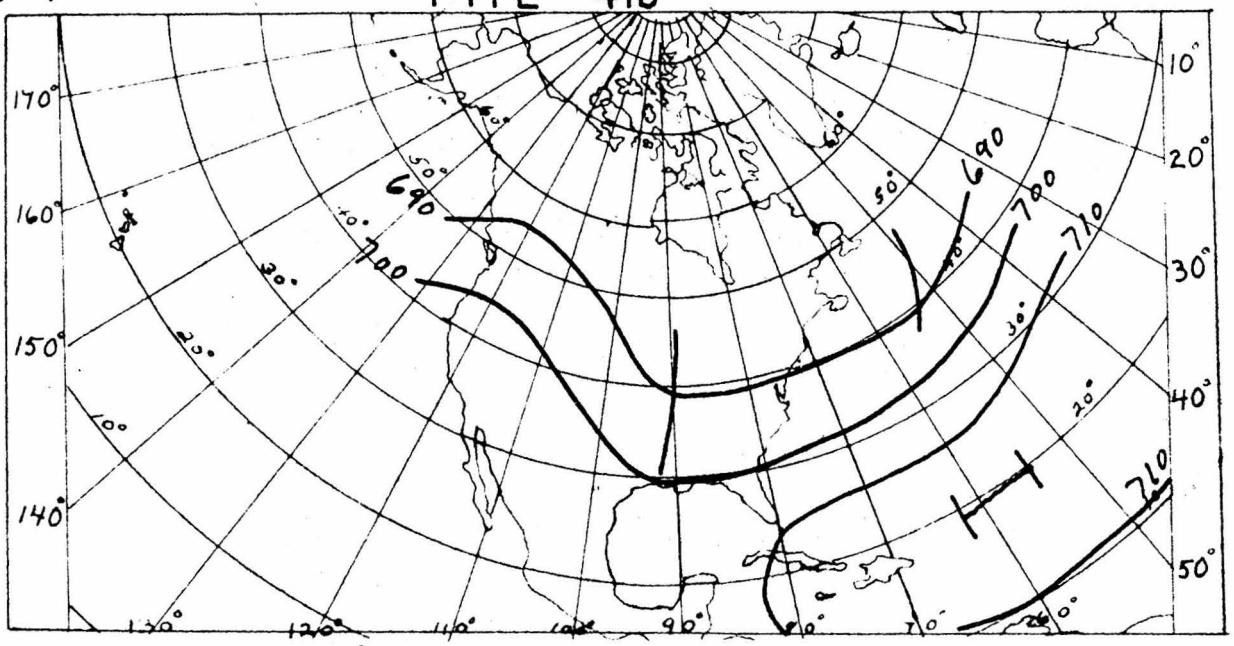

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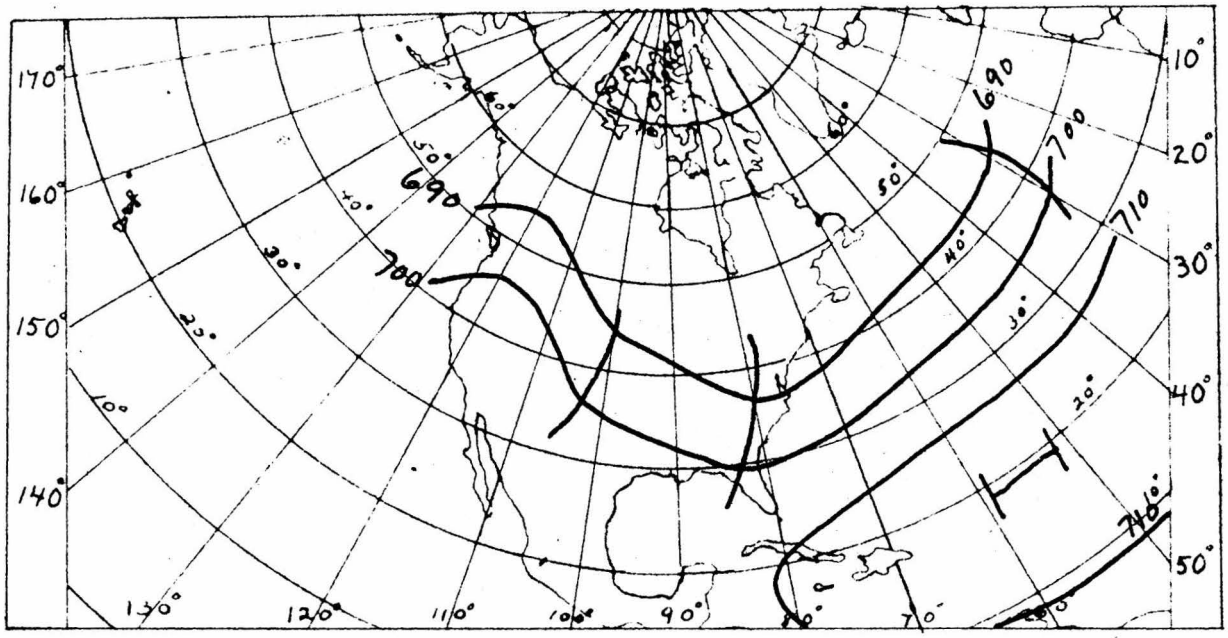

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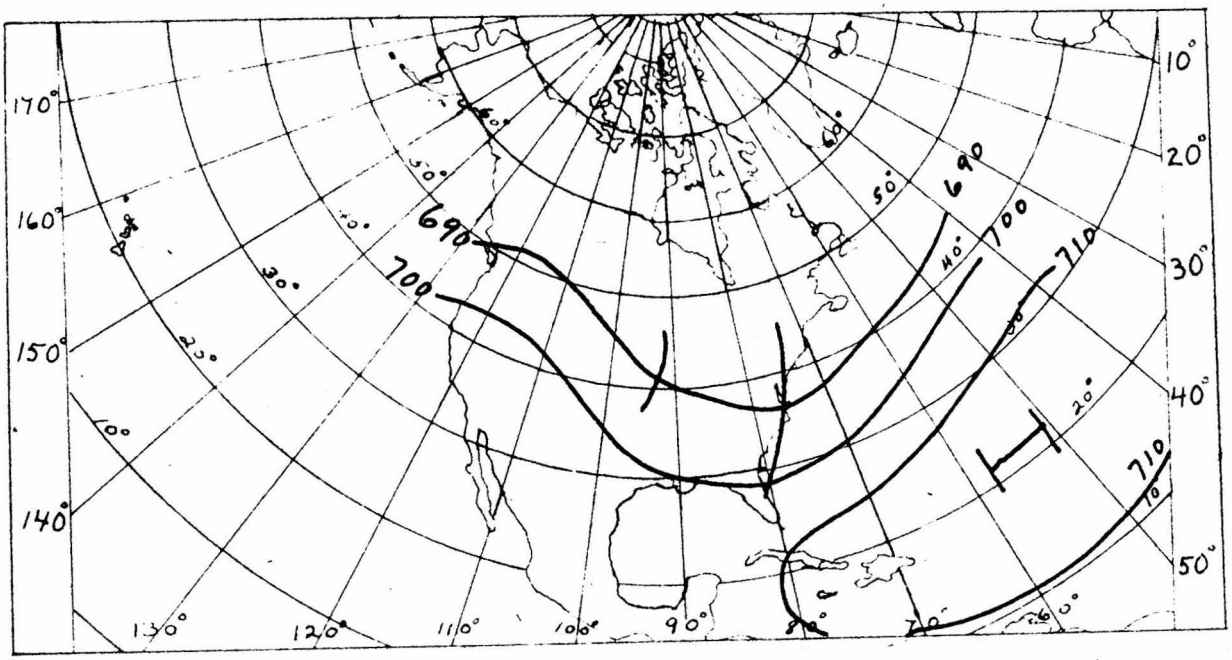

ZONE 3

TYPE 42 - ZONE 3

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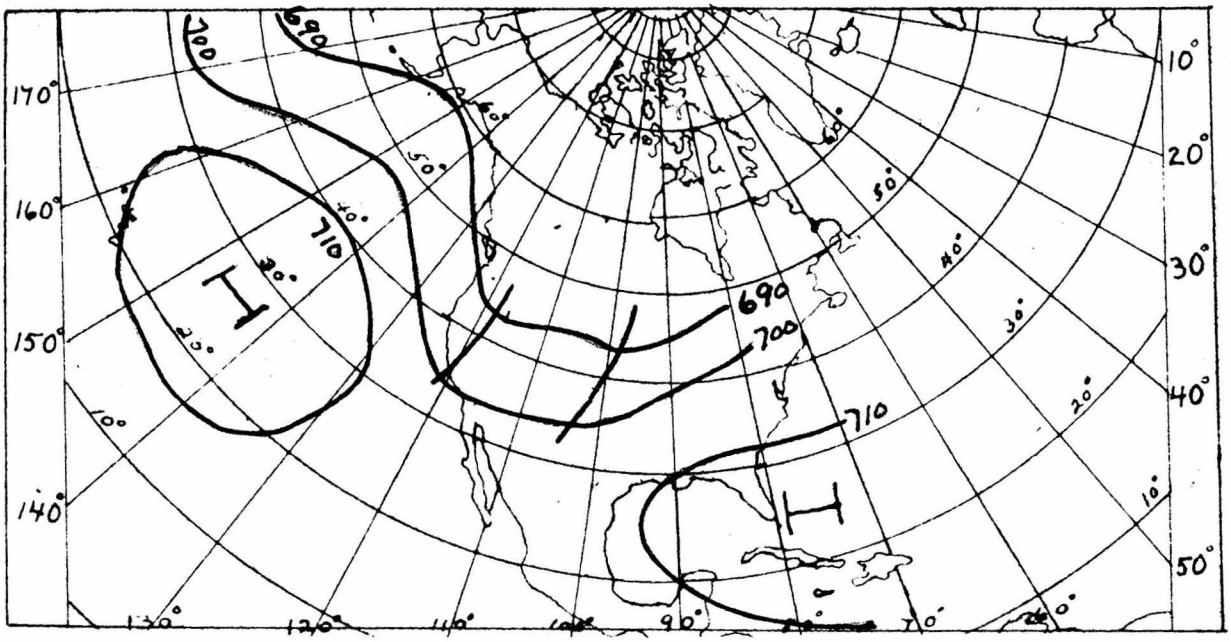

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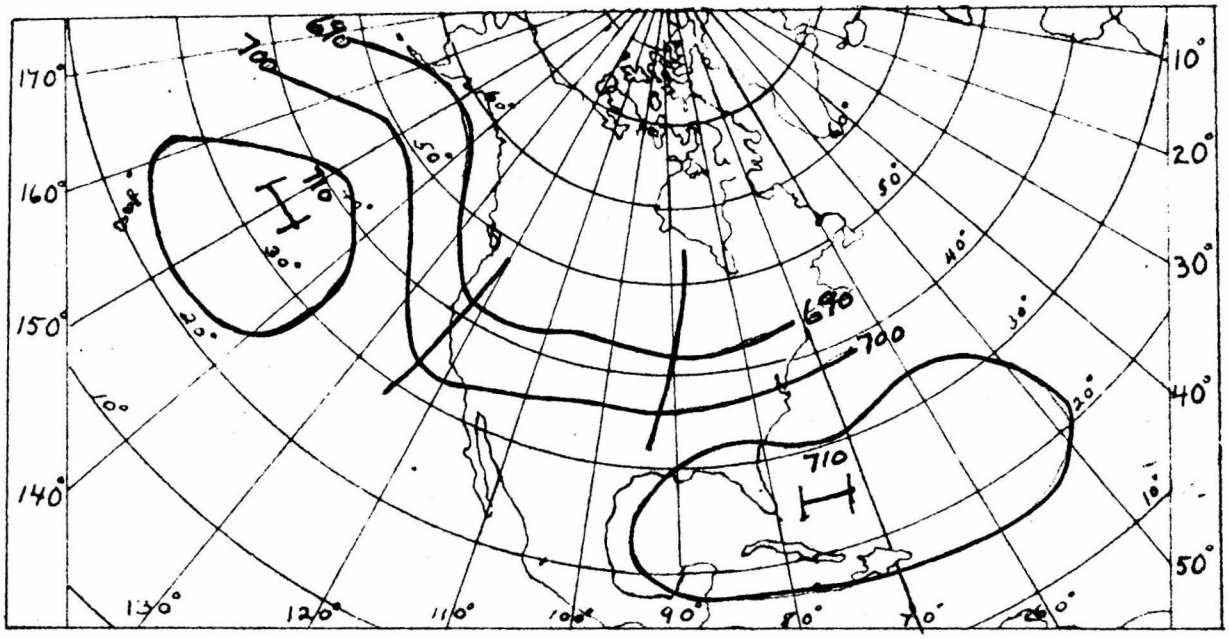

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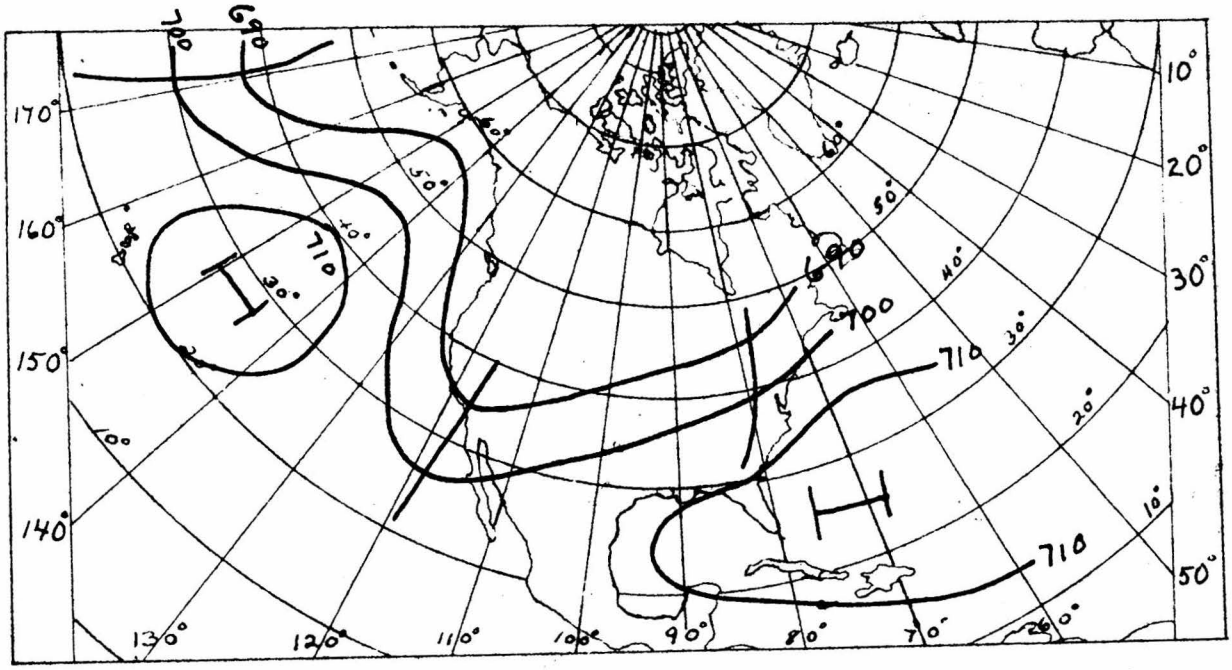

ZONE 4 TYPE 42

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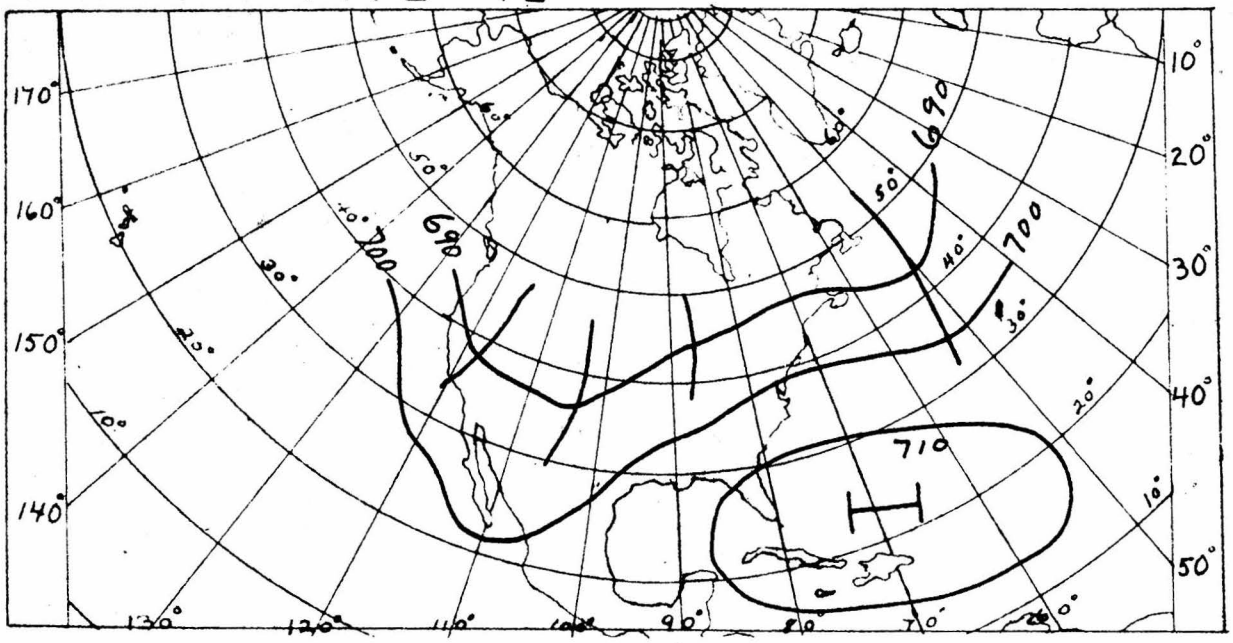

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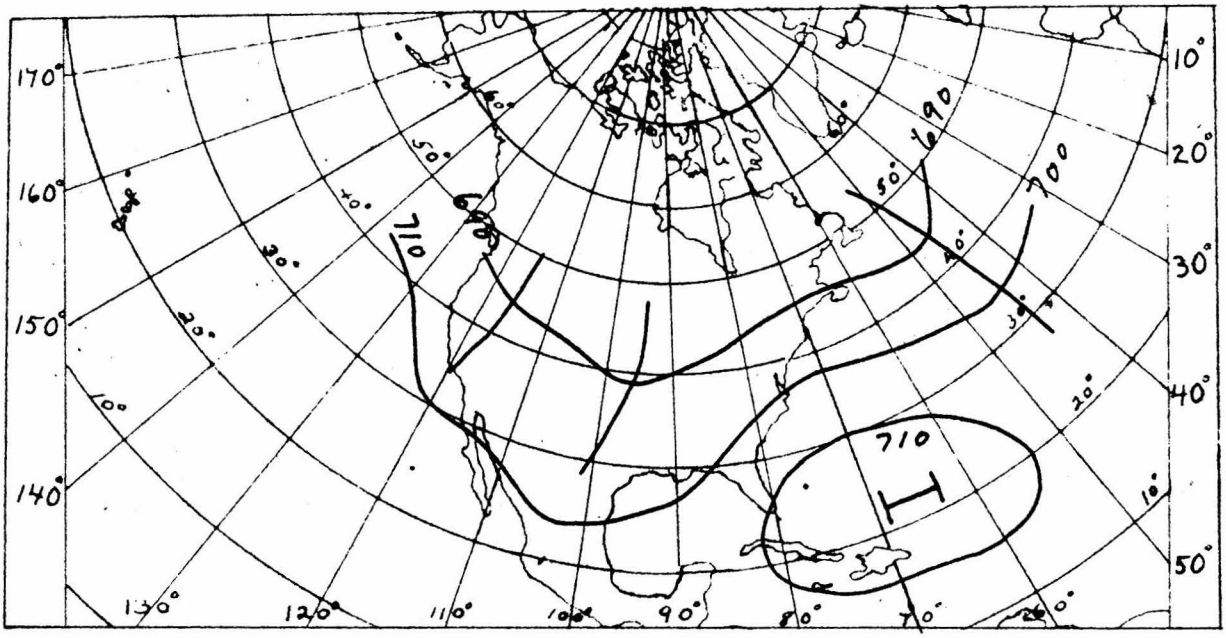

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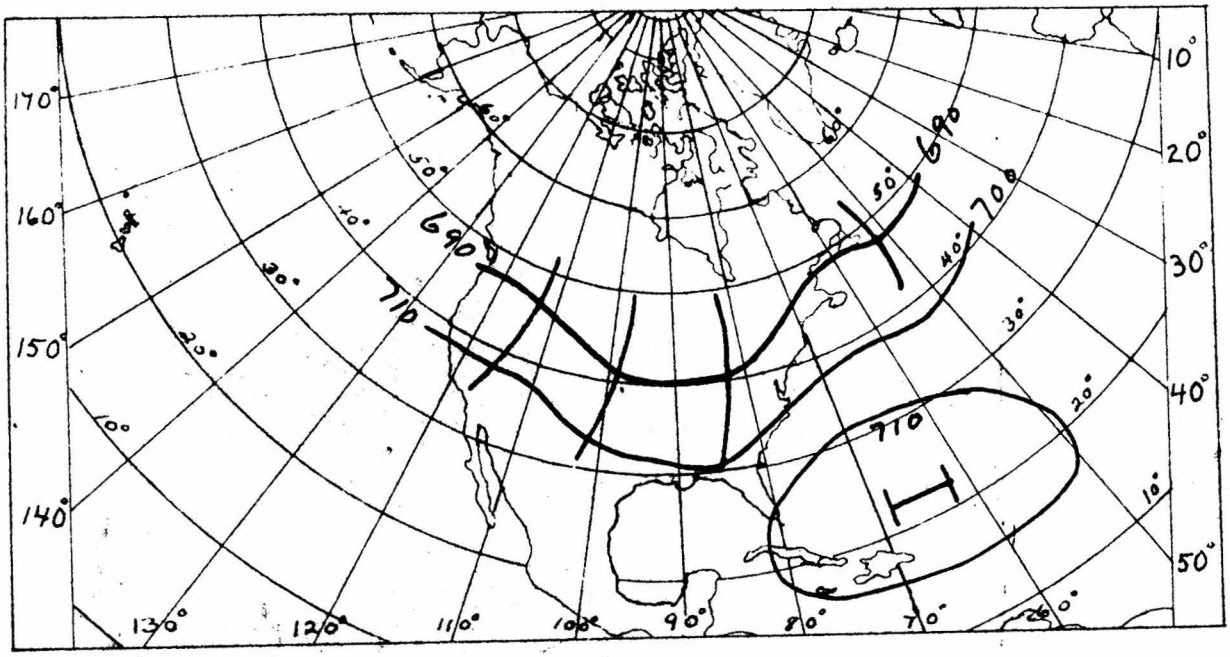

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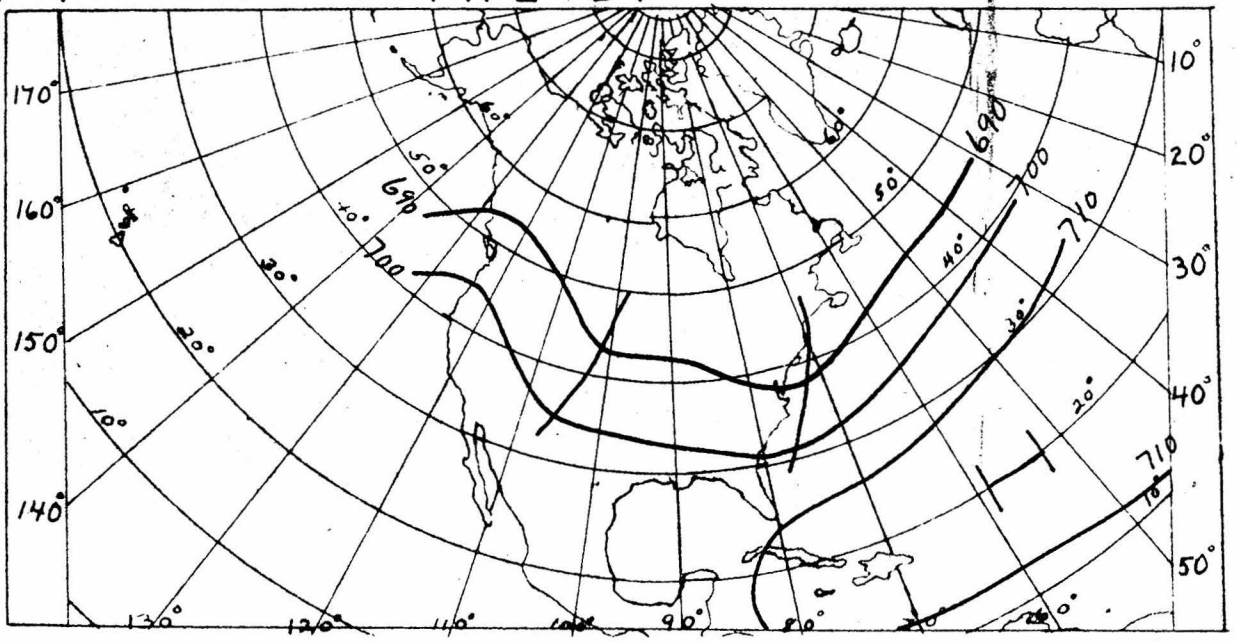

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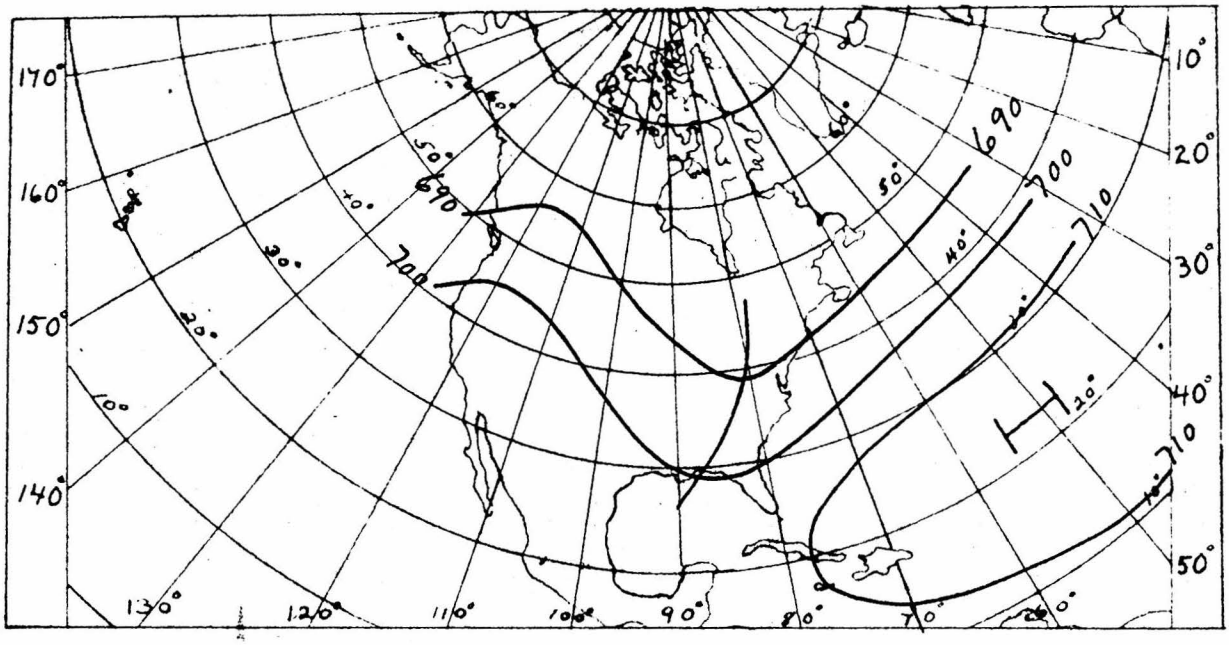

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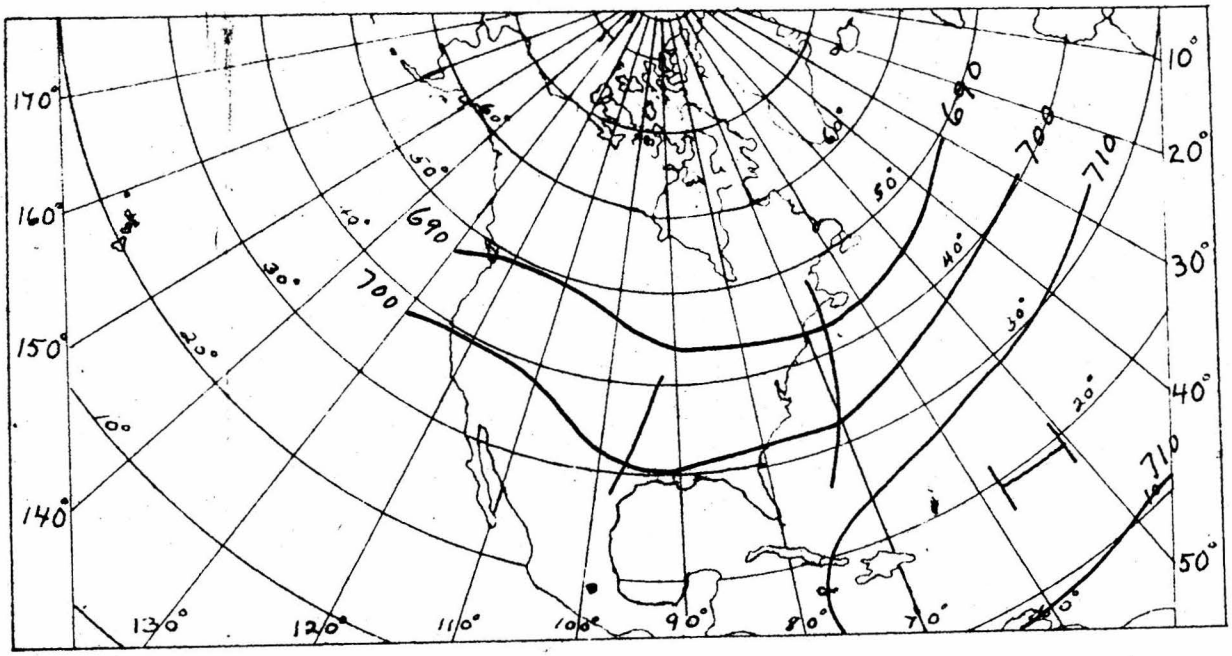

ZONE 3 TYPE 53

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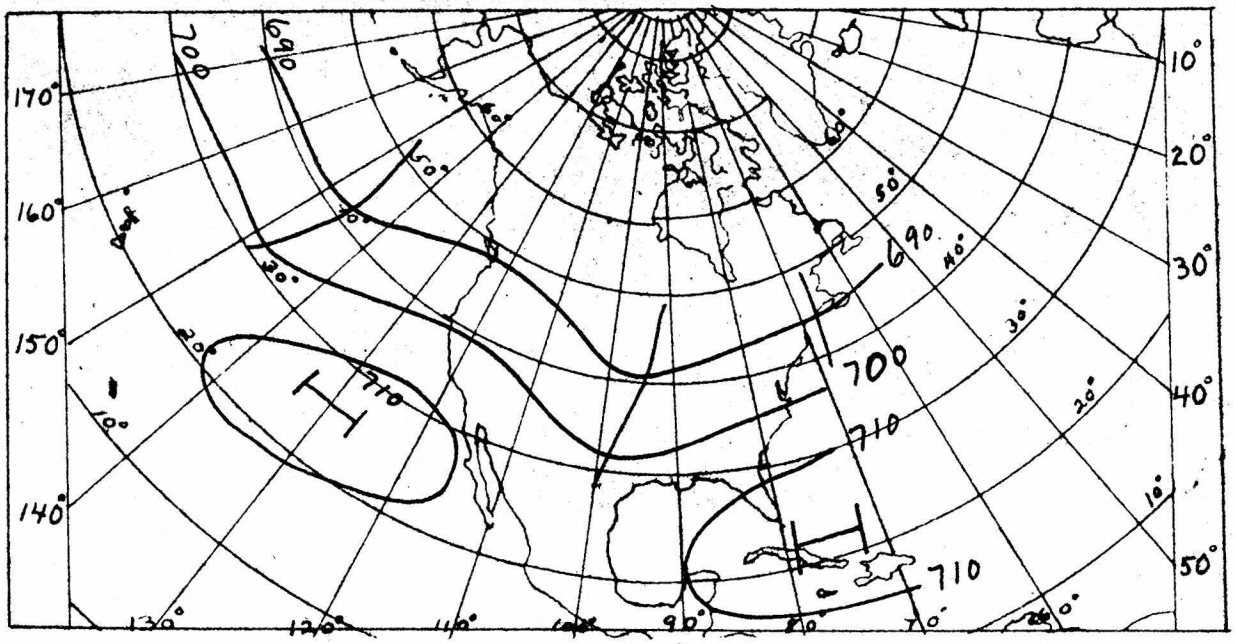

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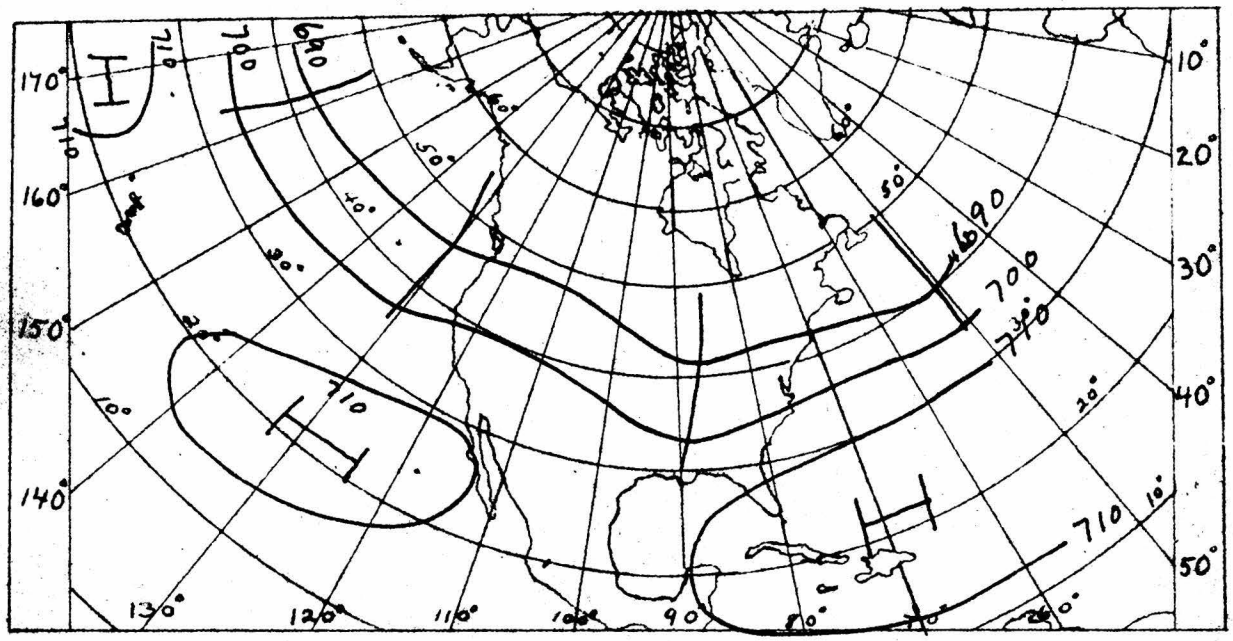

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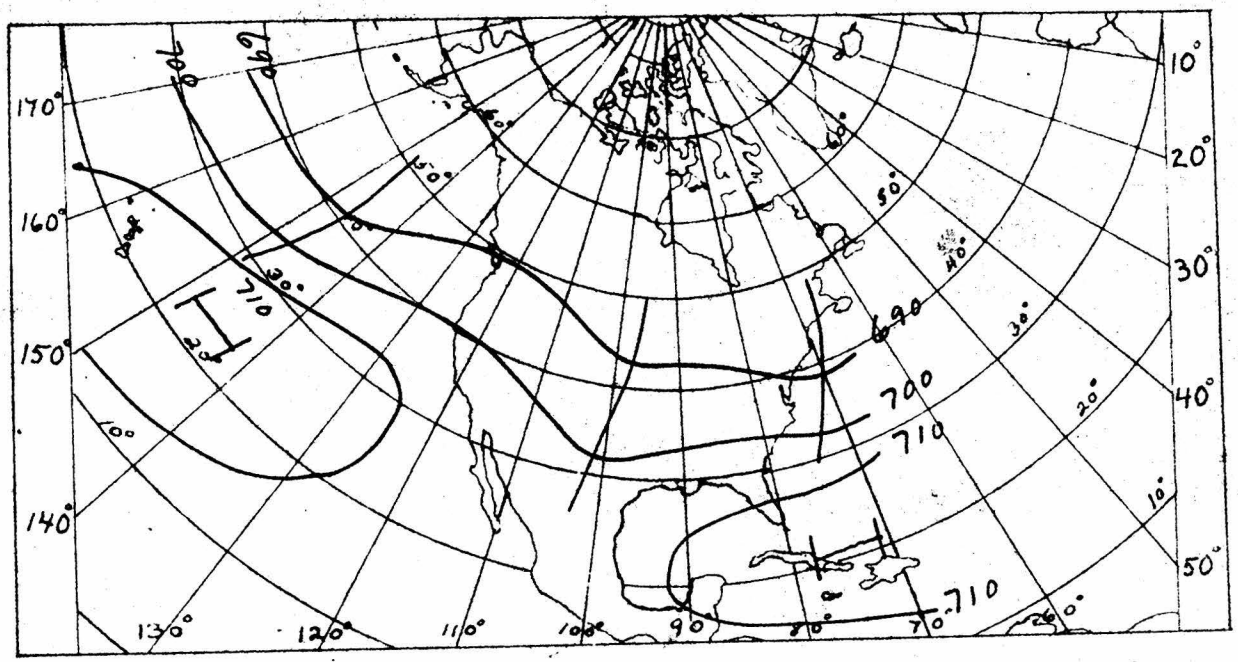

ZONE 4 TYPE 53

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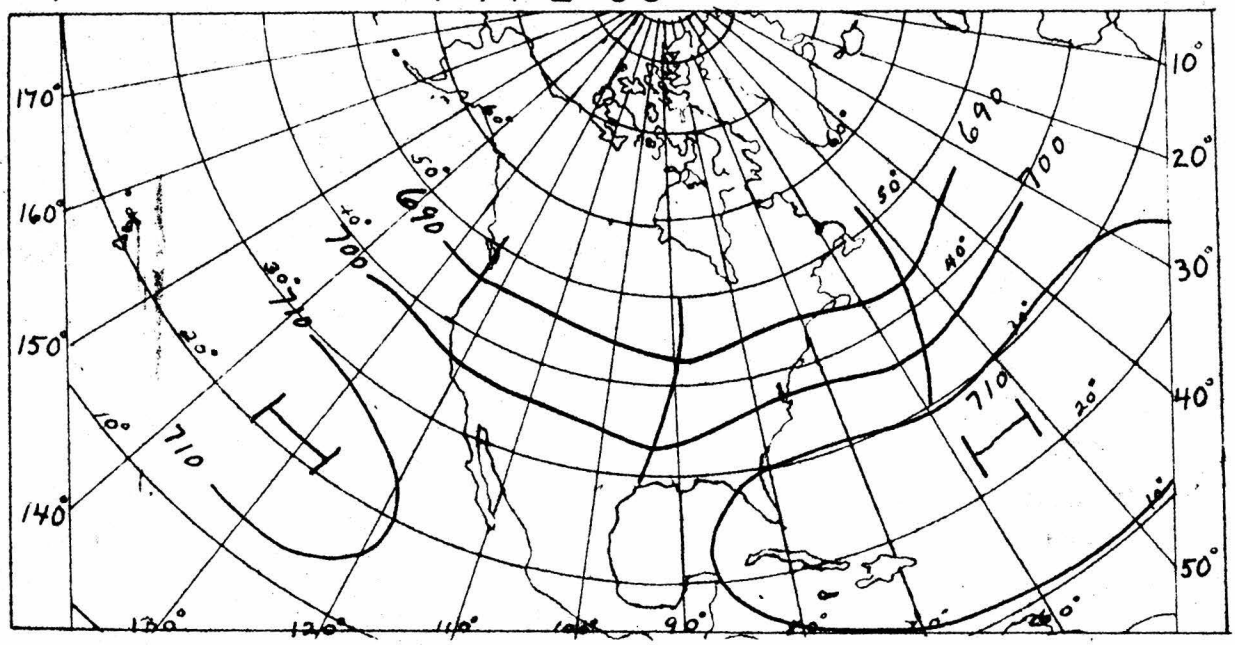

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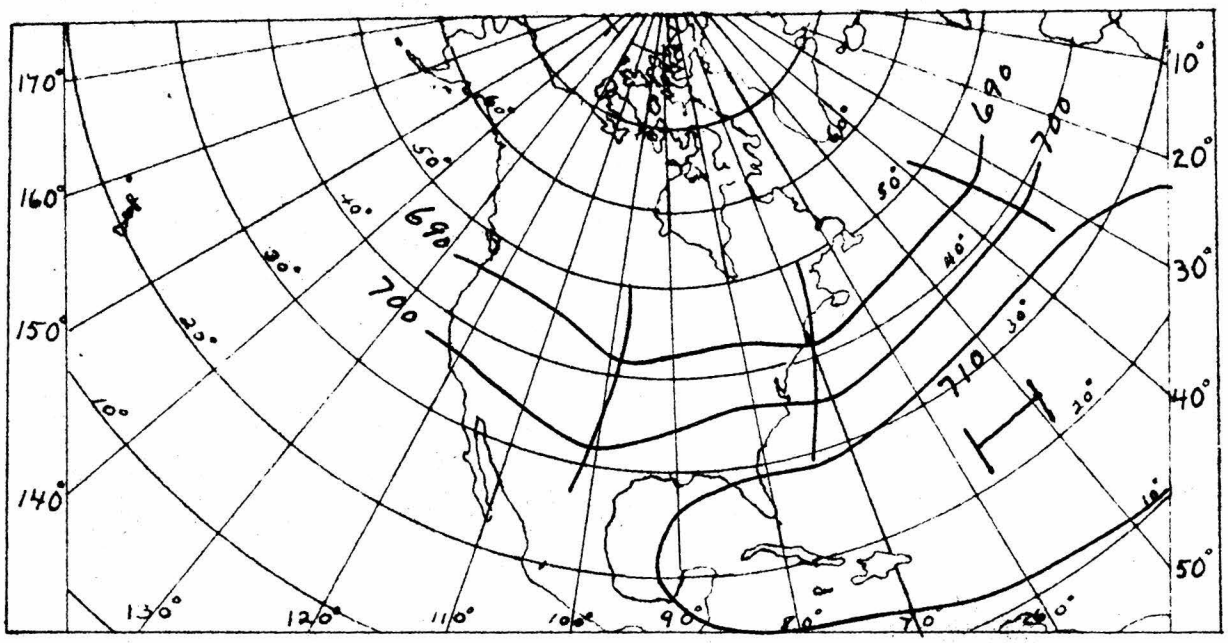

PHASE 3.