CHAPTER I

OPERATIONAL PROCEDURES

A. GENERAL

OPERATIONAL PROCEDURES TAKE TWO STEPS, THAT OF ANALYSIS AND FORECAST AIDS, IN THE PREPARATION SEQUENCE PRIOR TO ISSUING THE WARNING. WITHIN THE FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER (FWC/JTWC), THE BASIC ANALYSIS IS THE RESPONSIBILITY OF THE FLEET WEATHER CENTRAL (FWC). MICRO-ANALYSIS, FORECAST AID EVALUATION, AND THE WARNINGS AS DESCRIBED BELOW, ARE THE FUNCTIONS OF THE JOINT TYPHOON WARNING CENTER (JTWC).

B. ANALYSIS - FWC/JTWC:

1. TYPES OF CONTOUR AND/OR STREAMLINE CHARTS:

   A. SURFACE (FIG. 1)
   B. 700 MB
   C. 500 MB
   D. 300 MB
   E. 200 MB
   F. 100 MB

2. CROSS SECTIONS:

   A. CHECKERBOARD OR STIDD DIAGRAM (FIG. 2)
   B. TIME CROSS SECTIONS ANALYZED FOR θ_E (FIG. 3)
   C. SPACE CROSS SECTION (FIG. 4)

3. MICRO-ANALYSIS:

   A. SECTIONAL CHARTS, HOURLY AND 3 HOURLY, AS REQUIRED
   B. RECONNAISSANCE REPORTS (FIG. 5)

4. SPACE MEAN CHART AT 500 MB WITH THE M-1 AND M-2 FIELDS.

5. EASTERLY WAVE CONTINUITY GRAPH (FIG. 6)

C. FORECAST AIDS

THESE ARE LISTED IN ALPHABETICAL ORDER SO AS NOT TO (INFER THAT ANY OTHER ORDER WOULD) ESTABLISH A PRIORITY OF IMPORTANCE.

1. CLIMATOLOGY

ONCE A TROPICAL CYCLONE HAS BEEN DETECTED, THE FIRST STEP IN PREPARING TO ISSUE THE INITIAL WARNING IS TO LAY OUT A TRACK BASED ON CLIMATOLOGY. THIS TRACK IS LAID OUT ON THE TOP ACETATE OF THE WORK CHART DESCRIBED BELOW SO AS TO EXTEND IT 4 OR 5 DAYS AT THE SPEED INDICATED BY CLIMATOLOGY. NEXT, THE TRACK IS MODIFIED IN ACCORDANCE WITH THE EXISTING AND FORECAST UPPER AIR PATTERN, AFTER WHICH THE INITIAL WARNING IS PREPARED AND ISSUED. THE FORECAST TRACK

IS EXTENDED AND MODIFIED WITH TIME, AS RECONNAISSANCE FIXES ARE RECEIVED AND THE SYNOPTIC UPPER AIR PATTERN CHANGES.

THE FINEST COMPILATION OF TYPHOON CLIMATOLOGICAL DATA FOR THE PAST 78 YEARS IS CONTAINED IN THE PUBLICATION OF THE ROYAL OBSERVATORY HONG KONG, "TROPICAL CYCLONES IN THE WESTERN PACIFIC AND CHINA SEA AREA."

2. COMPUTER PRODUCTS

IN 1961, THE PROGNOSIS FUPA 53 AND 56, PRODUCTS OF JNWP, WERE USED EXTENSIVELY. LONG WAVE POSITIONS AND PROGNOSES (FIG. 7) WERE RECEIVED IN NOVEMBER 1961 FROM THE FLEET NUMERICAL WEATHER FACILITY, MONTEREY, CALIFORNIA (FNWF). ALSO, ZONAL INDEX COMPUTATIONS ARE EXPECTED FROM FNWF AND WILL BE EVALUATED DURING THE 1962 SEASON.

IT IS UNDERSTOOD THAT IN ADDITION TO JNWP, NOW NMC, THAT FNWF AND KUNIA AIR FORCE WEATHER CENTRAL WILL PROVIDE TYPHOON COMPUTER POSITION FORECASTS IN 1962. DURING 1961, THOUGH IRREGULARLY RECEIVED, JNWP POSITIONS WERE CONSIDERED FOR TRACK HEADING AND SPIRAL OF MOVEMENT BUT NOT THE COORDINATES FOR WARNINGS.

3. COORDINATION

COORDINATION WITH OTHER AGENCIES IS ROUTINE TO OBTAIN THEIR CONSIDERATIONS PRIOR TO ISSUANCE OF A WARNING. WHEN A CIRCULATION, FOR WHICH WARNINGS ARE BEING ISSUED, IS N OF APPROXIMATELY 20N, FUCHU AIR FORCE WEATHER CENTRAL TRANSMITS COORDINATION FORECASTS TWICE DAILY TO JTWC. COORDINATION WITH OTHER AIR FORCE AND NAVY ACTIVITIES IS ON AN "AS REQUIRED" BASIS DEPENDING UPON THE LOCATION OF A PARTICULAR TROPICAL CYCLONE.

4. STATISTICAL METHODS

SEE CHAPTER V FOR RESEARCH PAPERS ON THE MILLER-MOORE AND ARAKAWA EQUATIONS.

5. STEERING

SEE CHAPTER IV ON THE INDIVIDUAL TYPHOON WRITE-UPS.

THE SPACE MEAN CHART, AS DISCUSSED HEREIN, IS A BRIEF ON HOW IT IS USED AT FWC/JTWC. THE CHART IS CONSTRUCTED FROM THE 500 MB CHART AND HAS THE SINGLE SPACE MEAN, DOUBLE SPACE MEAN, AND DOUBLE SPACE MEAN PLUS THE M-2 FIELD THEREON. DURING THE TYPHOON SEASON THE CHART IS PRODUCED, AS NEEDED, EXCEPT THAT BETWEEN JULY AND NOVEMBER IT IS CONSTRUCTED TWICE DAILY. ONE GREAT ADVANTAGE OF THE CHART IS THAT IT MORE NEARLY PORTRAYS THAT PORTION OF THE ATMOSPHERE UNDER CONSIDERATION ON ONE CHART, THAN DOES ANY OTHER ANALYSIS OR SYSTEM OF PRESENTATION.

THE CHART IS USEFUL FOR STEERING S OF THE RIDGE LINE UNDER THE FOLLOWING CONDITIONS:

A. WHEN THE TYPHOON IS MOVING ALONG THE S PERIPHERY OF A LARGE QUASI-STATIONARY ANTICYCLONE, THE SINGLE SPACE MEAN MAY ACT AS A STEERING TOOL AS FAR AS 8 TO 10N TO THE RIDGE LINE. A TYPICAL EXAMPLE OF THIS SITUATION IS THE TRACK OF NANCY.

B. WHEN THE SYNOPTIC FEATURES ARE PERFORMING CONSISTENTLY, A PROGNOSTIC CHART CAN BE CONSTRUCTED FROM THE SINGLE SPACE MEAN TO BE USED AS A STEERING TOOL FROM 10N TO THE RIDGE LINE. SEVERAL TYPHOONS FULFILLED THIS CATEGORY.

C. THE SINGLE SPACE MEAN MAY BE USED WITH A LESSER DEGREE OF RELIABILITY FROM 15N TO THE RIDGE LINE AT ANY TIME EXCEPT WHEN THE CYCLONE IS UNDER OR NEAR AN INVERTED TROUGH AXIS. AT THIS TIME, THE CYCLONE USUALLY "DRIFTS," FREQUENTLY TO THE W, BUT THE CHART IS NOT RELIABLE AS A STEERING TOOL. THE CIRCULATION MAY ALSO "LOOP" UNDER THESE CONDITIONS. ANALYSIS IS SELDOM SUFFICIENTLY PRECISE TO INTERPRET THESE CIRCUMSTANCES. TILDA IS AN EXAMPLE OF THIS SITUATION, AND THE TYPHOON DRIFTED WESTWARD. LORNA LOOPED WHILE NEAR THE AXIS OF THE INVERTED TROUGH JUST E OF THE PHILIPPINES, 221200Z AUGUST.

THE SPACE MEAN CHART WILL AID IN FORECASTING THE POINT OF RECURVATURE BUT SHOULD BE USED WITH CAUTION FOR ON LARGE TYPHOONS THIS POINT MAY BE A DEGREE OR TWO N OF THAT INDICATED BY THE SPACE MEAN CHART.

AFTER RECURVING, THE CHART IS USED TO FORECAST THE MOVEMENT OF THE TYPHOON SOMEWHAT SIMILAR TO THAT OF FORECASTING THE MOVEMENT OF EXTRATROPICAL SYSTEMS.

IT IS EMPHASIZED THAT THE SPACE MEAN CHART IS ANOTHER TOOL, ONE OF MANY, AND CANNOT BE SUCCESSFULLY USED AS THE SOLE DEVICE FOR MAKING TYPHOON TRAJECTORY FORECASTS.

AN IMPORTANT DERIVATIVE OF THE SPACE MEAN CHART, THE LONG WAVE PATTERNS THAT ARE PRODUCED AND PROVIDED BY FNWF, MONTEREY, AIDS IN DETERMINING THE CONDITIONS OF THE MAJOR ATMOSPHERIC FEATURES IN THE NORTHERN HEMISPHERE AND IS A GUIDE TO THE CHANGES THAT MAY BE EXPECTED THROUGHOUT THE HEMISPHERE. THESE PATTERNS, WHEN USED WITH THE SPACE MEAN CHART THAT COVERS THE WESTERN NORTH PACIFIC, PROVIDE A SUBSTANTIAL BACKGROUND UPON WHICH TO BASE TYPHOON FORECASTS.

6. SURVEILANCE SYSTEMS

SEE CHAPTER II FOR EVALUATIONS OF AERIAL RECONNAISSANCE, LAND RADAR, AND SATILLITES.

7. Wachholz Graph

Refer to report of validity of this graphical correlation of measured and observed eye meteorological parameters to maximum surface wind in Chapter V.

8. Work Chart

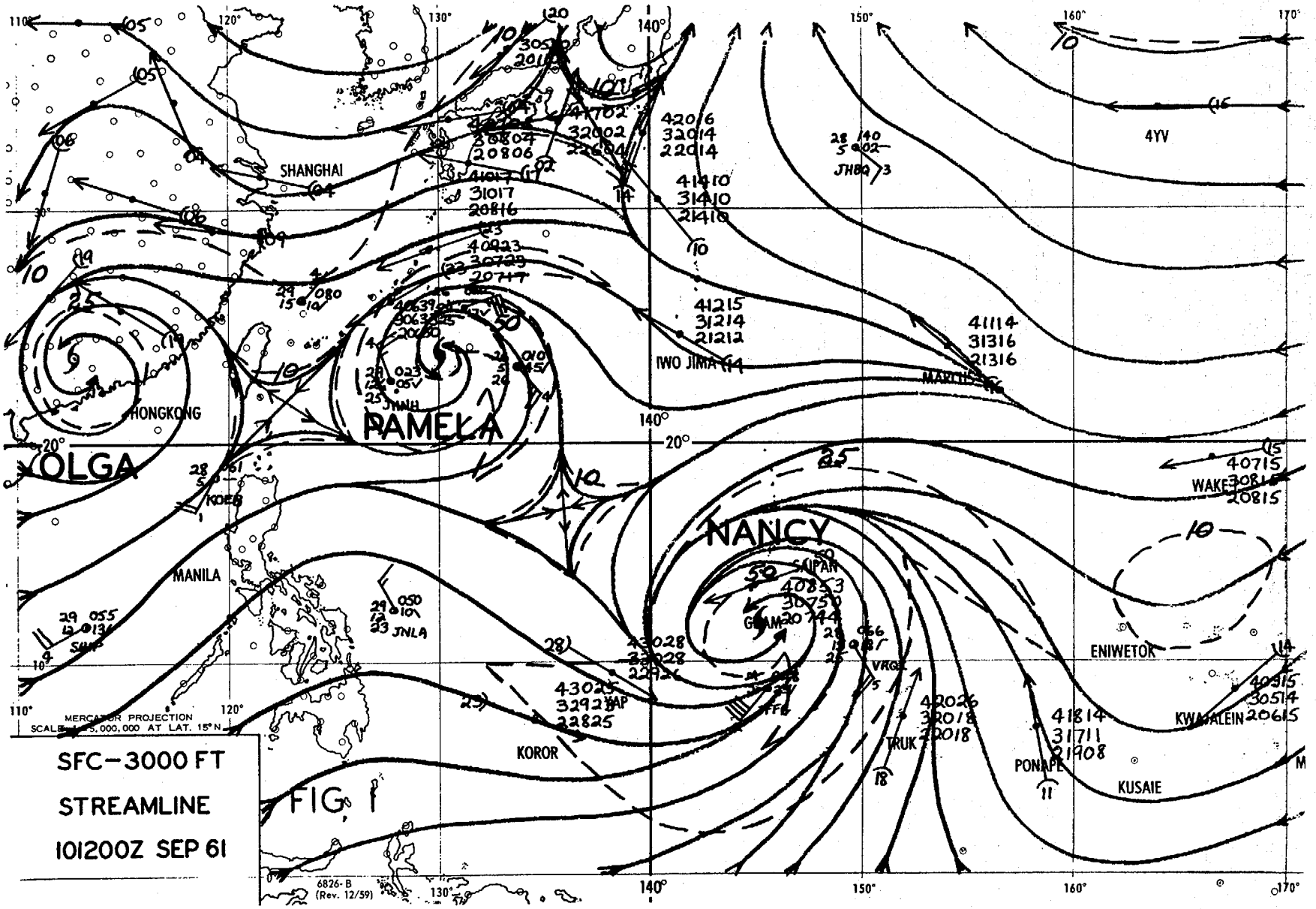
As an operational and recording tool in preparing tropical cyclone warnings, a basic chart from the Pacific Airways Plotting Chart series, plus 3 acetate overlays is used. All aircraft and radar fixes are plotted on the basic chart. Twenty-four hour forecast positions are plotted on the bottom overlay, warning positions are plotted on the second overlay, and the top overlay is utilized as a work sheet.

D. WARNINGS

Warnings are filed and transmitted every 6 hours at synoptic times of 0000Z, 0600Z, 1200Z, and 1800Z. In accordance with CINCPAC IMST 3140.1 C., the message contains the present position of the tropical cyclone being valid for the scheduled transmission time. Therefore, the "present position" of a tropical cyclone is actually a short range forecast position. This position may be based on a reconnaissance fix 30 minutes to perhaps 6 hours old, on surface observations as much as 6 hours old, etc., as confirmed in the warning. It is for this reason that the 0600Z warning, for example, may not agree with the position of the tropical cyclone as indicated by the 0600Z analysis. Amendments are issued when the difference is significant. The numbers of tropical warnings run consecutively when the cyclone is upgraded or downgraded. If warnings are discontinued and the circulation regenerates, the new series of warnings are numbered consecutively from the number of the last warning of the previous series. When necessary, amendments and corrections are issued, and these are numbered the same as the warning which they amend or correct.

The 1961 Verification Summary is contained in Chapter III.

All 24 and 48 hour forecasts, made when a tropical cyclone is of tropical storm or typhoon intensity, are verified against the best 1961 tracks at all latitudes through the last warning issued. In 1959 and 1960 verification was limited to being at or S of 35N.



SFC–3000 FT

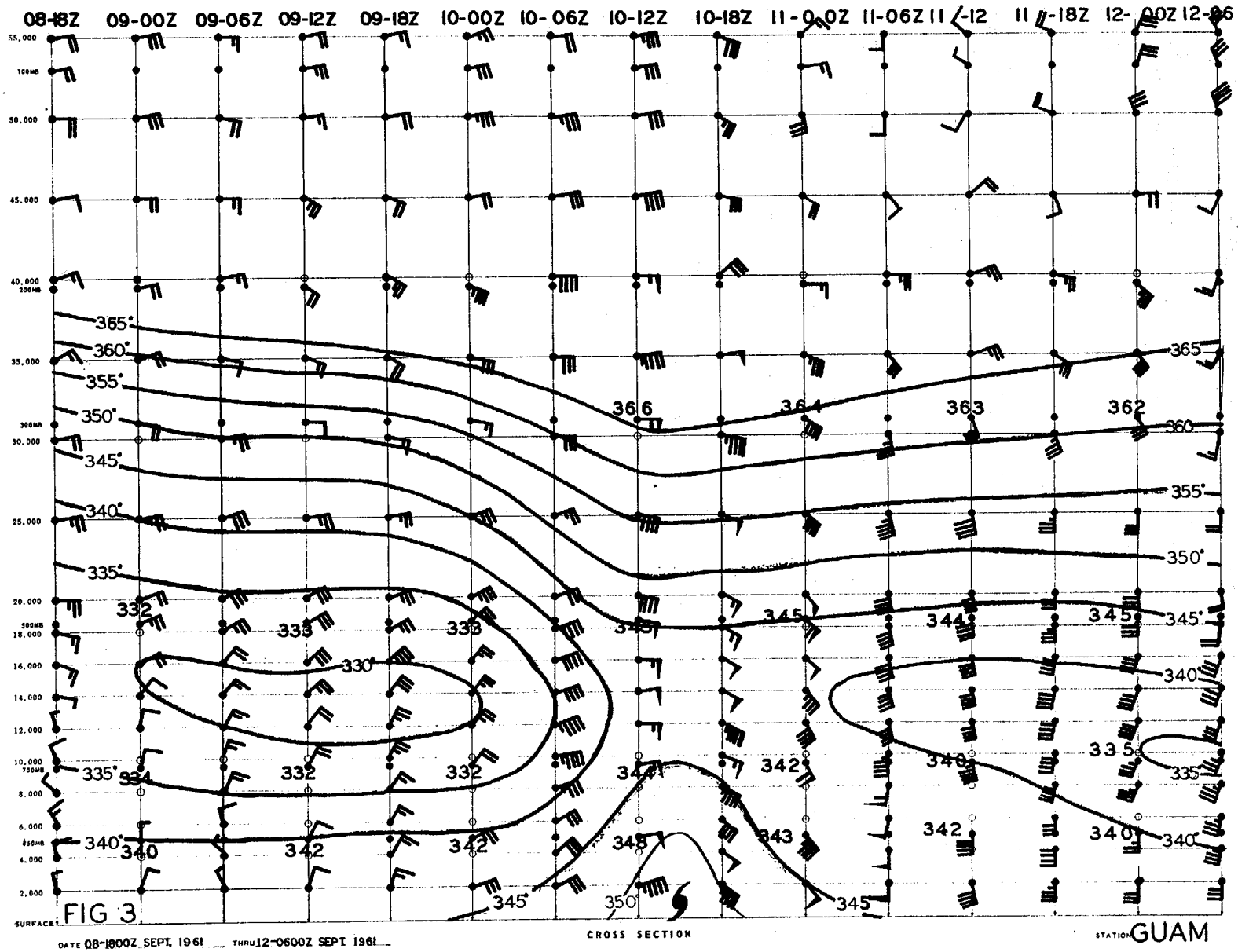
STREAMLINE

101200Z SEP 61

FIG. 1

FIG 2

MAR-FWC 3140-1 (REV. 9/59)


08-18Z
09-00Z
09-06Z
09-12Z
09-18Z
10-00Z
10-06Z
10-12Z
10-18Z
11-00Z
11-06Z
11-12
11-18Z
12-00Z
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10,000
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SURFACE
365°
360°
355°
350°
345°
340°
335°
366
364
363
362
365
360
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345
344
345
345°
340°
335
335
342
340
340
332
333
332
330°
335°
334
332
332
342
340
342
342
348
343
342
340
340
345
350
345
FIG 3
DATE 08-1800Z SEPT. 1961 THRU 12-0600Z SEPT 1961
CROSS SECTION
STATION GUAM

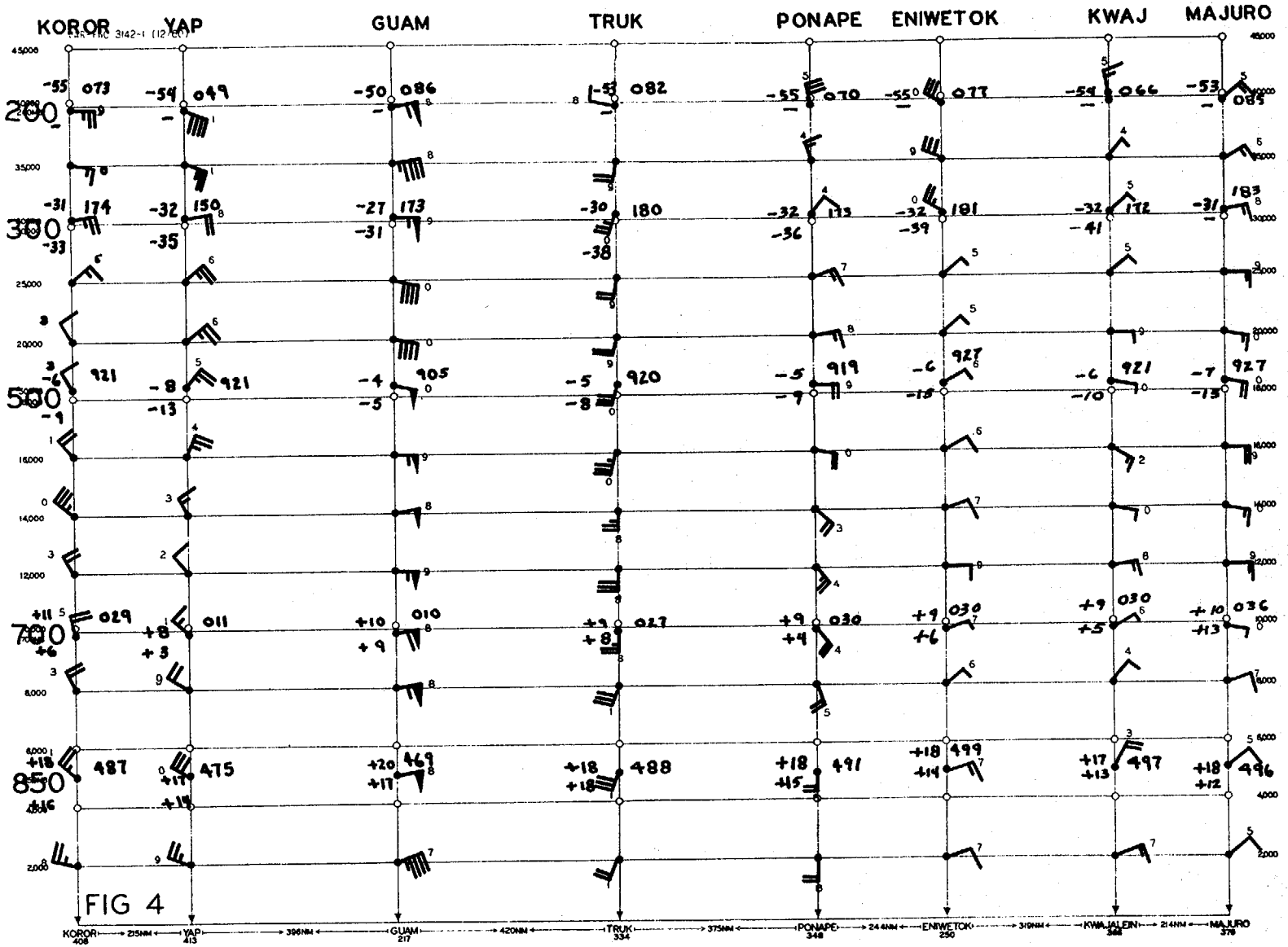

FIG 4

DTG: 10-1200 Z MO: SEPT YR: 1961

CROSS SECTION (KOROR-MAJURO)

SCALE: 1" = 110NM
FWC/JTWC DEC 1960

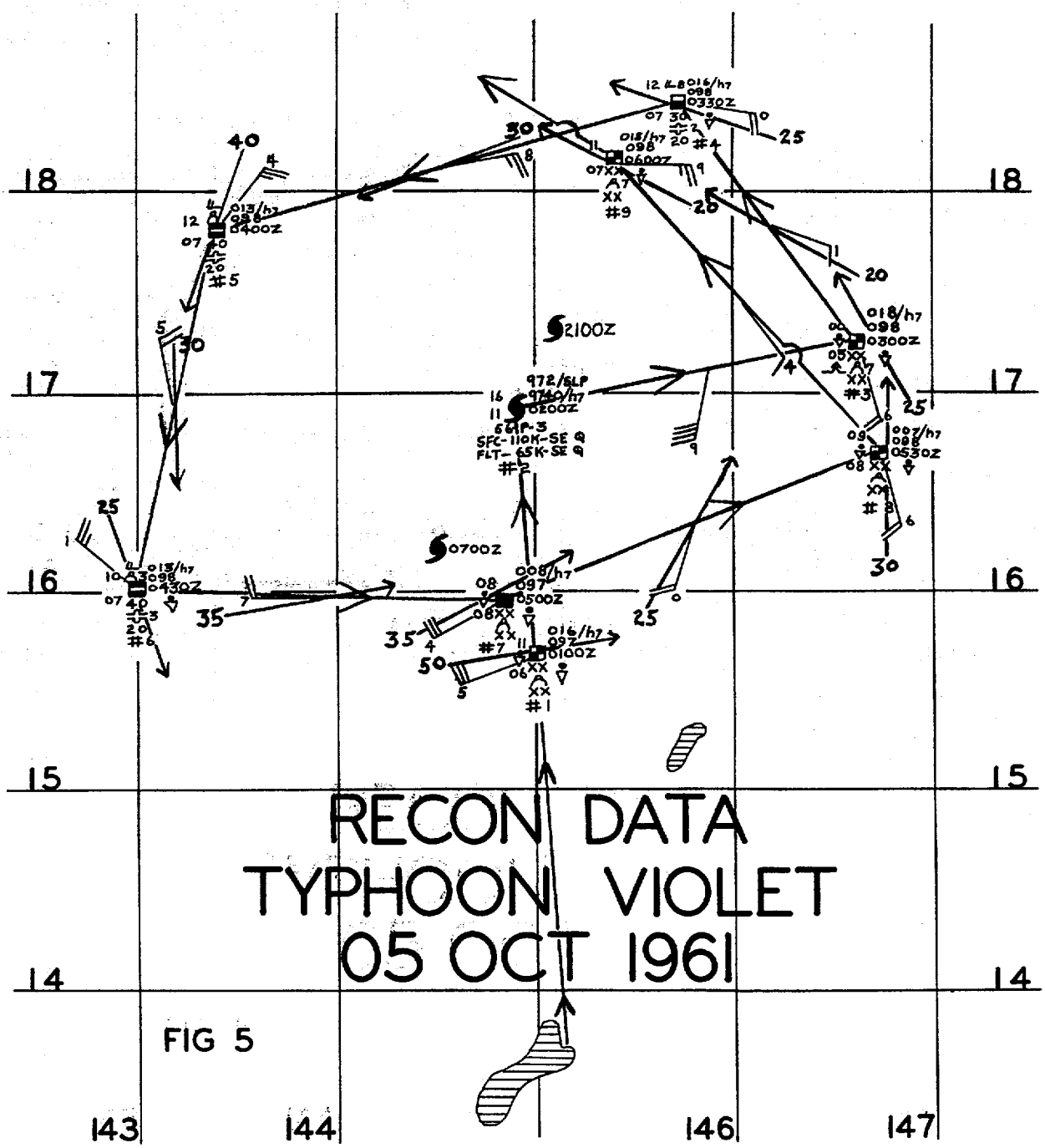
18
17
16
15
14
143
144
146
147
2100Z
0700Z
RECON DATA
TYPHOON VIOLET
05 OCT 1961

FIG 5

EASTERLY WAVE CONTINUITY GRAPH

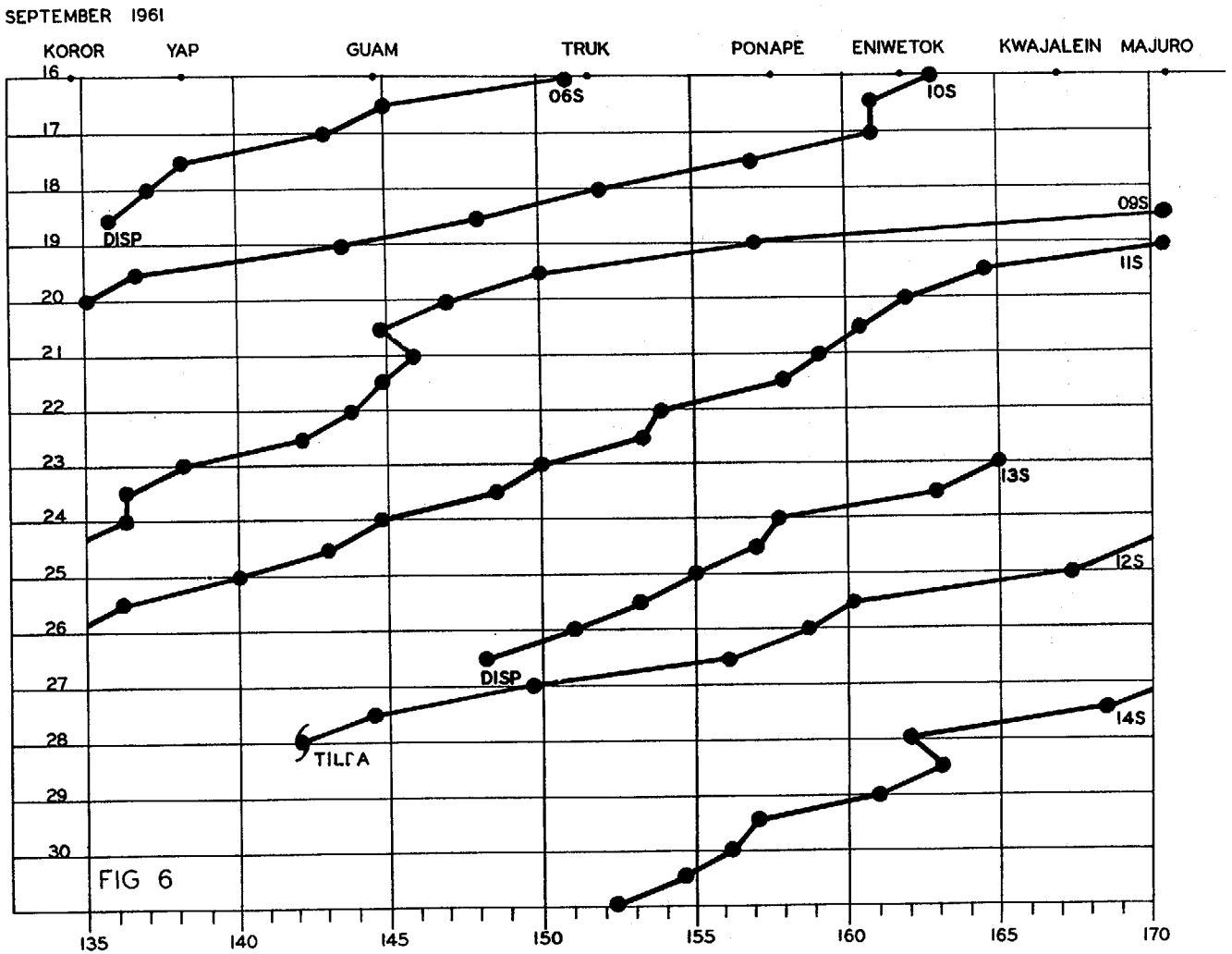

FIG 6

LONG WAVE ANALYSIS AND 48 HR. PROG

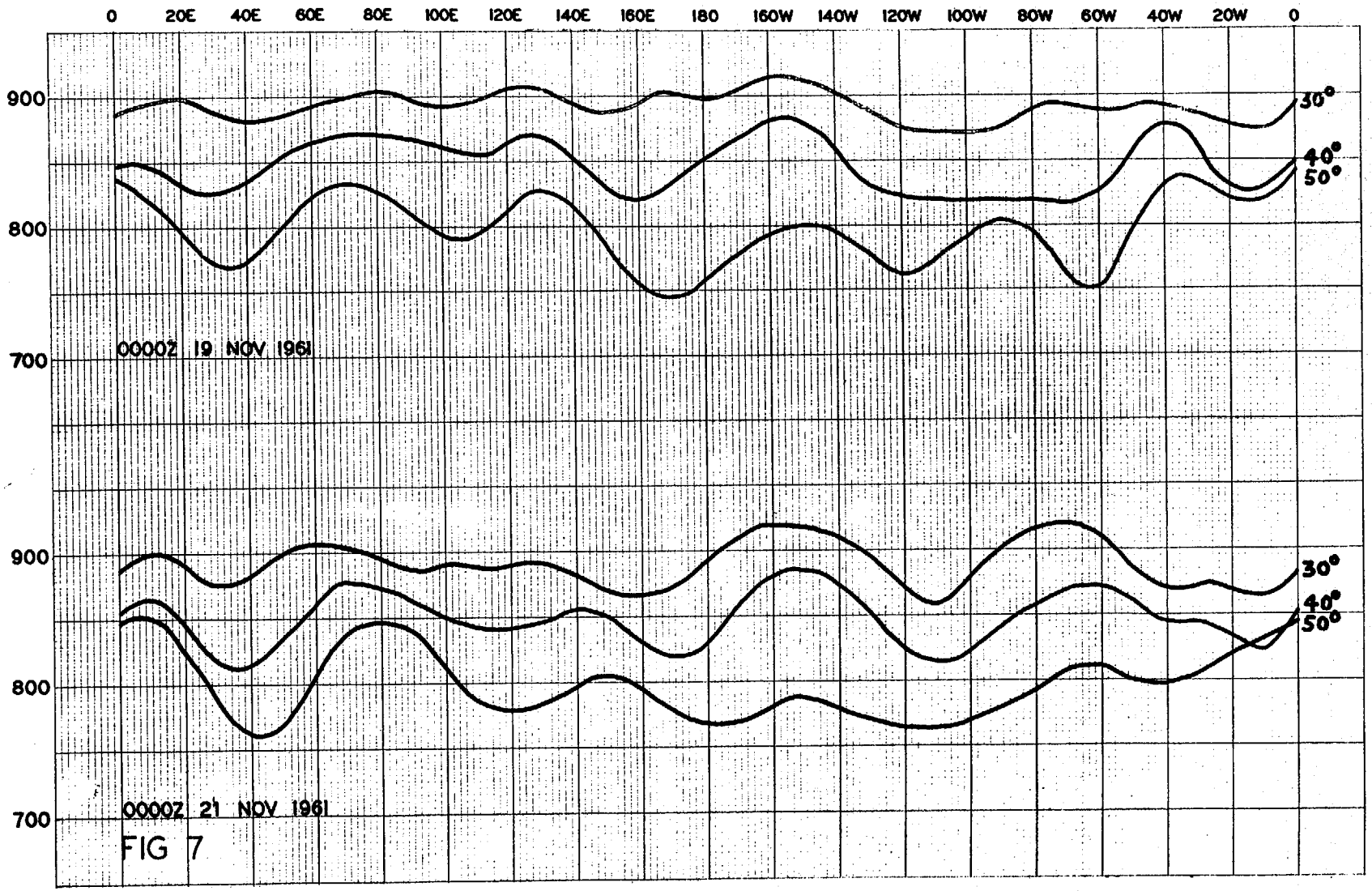

FIG 7