

UNCLASSIFIED

AD 274 033

*Reproduced
by the*

**ARMED SERVICES TECHNICAL INFORMATION AGENCY
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA**



UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

274033

AFCRL-42-242

CATALOGED BY ASTIA
AS AD NO.

UNIVERSITY OF WASHINGTON
DEPARTMENT OF
METEOROLOGY AND CLIMATOLOGY

Seattle, Washington

**Detailed Analyses of Selected Pacific Storms
Based on Continuous Radar Records and
Short-Interval Serial Ascents**

Vol I. Case of January 6-8, 1961

BY

RICHARD J. REED

DECEMBER 1961

Project No. 8641

Task 86414

Contract No. AF 19 (604)-5192

Technical Report No. 3



Prepared for
GEOPHYSICS RESEARCH DIRECTORATE
AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
BEDFORD, MASSACHUSETTS

UNIVERSITY OF WASHINGTON
DEPARTMENT OF
METEOROLOGY AND CLIMATOLOGY
Seattle, Washington

Detailed Analyses of Selected Pacific Storms
Based on Continuous Radar Records and
Short-Interval Serial Ascents

Vol I. Case of January 6-8, 1961

BY

RICHARD J. REED

DECEMBER 1961

Project No. 8641

Task 86414

Contract No. AF 19 (604) - 5192

Technical Report No. 3

Prepared for
GEOPHYSICS RESEARCH DIRECTORATE
AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
BEDFORD, MASSACHUSETTS

•

“Requests for additional copies by Agencies of the Department of Defense, their contractors, and other Government agencies should be directed to the:

ARMED SERVICES TECHNICAL INFORMATION AGENCY
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA

Department of Defense contractors must be established for ASTIA services or have their 'need-to-know' certified by the cognizant military agency of their project or contract.”

b. Unclassified reports shall also display the following additional information: “All other persons and organizations should apply to the:

U. S. DEPARTMENT OF COMMERCE
OFFICE OF TECHNICAL SERVICES
WASHINGTON 25, D. C.”

TABLE OF CONTENTS

I. General Information

List of Figures	iv
Introduction	1
Instruments	1
Topography	2
Data and Analyses	4
1. Synoptic Charts	4
2. Time Sections	4
3. Barograph Traces	4
4. Radar	4
5. Soundings	5
Acknowledgements	6

II. Case of January 6-8, 1961

Synoptic Description	7
Time Section	8
Appendix A	37
Appendix B	43
References	44

LIST OF FIGURES

1. Topographical map of western Washington	3
2. Surface and 500-mb charts for 1200 GCT January 6, 1961	10
3. 850-mb, 700-mb, 250-mb, and frontal contour charts for 1200 GCT January 6, 1961	11
4. Surface and 500-mb charts for 0000 GCT January 7, 1961	12
5. 850-mb, 700-mb, 250-mb, and frontal contour charts for 0000 GCT January 7, 1961	13
6. Surface and 500-mb charts for 1200 GCT January 7, 1961	14
7. 850-mb, 700-mb, 250-mb, and frontal contour charts for 1200 GCT January 7, 1961	15
8. Surface and 500-mb charts for 0000 GCT, January 8, 1961	16
9. 850-mb, 700-mb, 250-mb, and frontal contour charts for 0000 GCT January 8, 1961	17
10. Hourly sectional charts	18-20
11. Barograph, temperature, and 500-mb height-time records	21
12. Plotted soundings	22-27
13. Time section for Seattle, January 6-8, 1961	29
14. Radar echoes, January 6-8, 1961	31-36

I. GENERAL INFORMATION

INTRODUCTION

Preliminary study of Pacific storm systems by means of routine synoptic data and continuously recorded radar echoes [Kreitzberg (1961)] revealed a considerable diversity and fluctuation of echo types in relation to synoptic features and much complexity and deviation from ideal models in the storm structures. For the purpose of clarifying certain puzzling aspects of the wind and temperature (frontal) structures and of seeking an explanation for the seemingly erratic changes in echo character, a program of short-interval, serial ascents was inaugurated in January 1961. During the remainder of the winter and the ensuing spring five series of observations of one to three days duration were undertaken in which radiosondes were released as frequently as once an hour, while the radar echoes from an AN/APQ-39, 1.87 cm vertical-beam radar were being continuously recorded on film strip. The interpretation of the large quantity of data obtained during the special series will require considerable time. Meanwhile, it has seemed advisable to make available to interested parties the complete radar and synoptic records and preliminary analyses for each series. The present volume is one in a series of five which is being prepared to fulfil this objective.

INSTRUMENTS

The APQ-39 radar is housed in the Meteorology Building with the vertically-pointing antenna mounted directly overhead on the roof. The echo is observed visually on an A-scope and is photographed continuously on a second scope which presents an intensity modulated trace. During the first three series the scope

was photographed at a fixed gain setting. A sinusoidally varying gain which extended the dynamic range was in operation during the final two series.

Following the fourth series the sensitivity of the set was increased and even rather thin cirrus cloud was recorded on the film. Prior to this time, drizzle was the smallest hydrometer observed. Even after the improvement in sensitivity, rather dense-looking cumulus escaped detection.

The GMD-1 radiosonde was located during the first series at the edge of the University Golf Course on the lower campus. Unfortunately, interference by the University Hospital caused valuable records to be lost during this series, and before the second series was begun the radiosonde was moved to the roof of the hospital where no further difficulty was experienced.

TOPOGRAPHY

Major topographical features of the area surrounding the project site are depicted in Figure 1. The University is situated in an elongated north-south basin about a mile from the east shore of Puget Sound. To the west lie the Olympic Mountains with peaks rising to nearly 8,000 feet and beyond these the Pacific Ocean. To the southwest of the station a gap exists in the coastal mountains which provides a favored entry point of maritime air into the Seattle area. About twenty miles east of the station rises the Cascade Range, a higher and more continuous barrier.

Also shown in the figure are the locations of weather reporting stations. At the Seattle-Tacoma Airport temperature soundings are taken twice a day and rawins four times daily. Special pilot reports were provided by McChord Field in Tacoma and Paine Field in Everett.

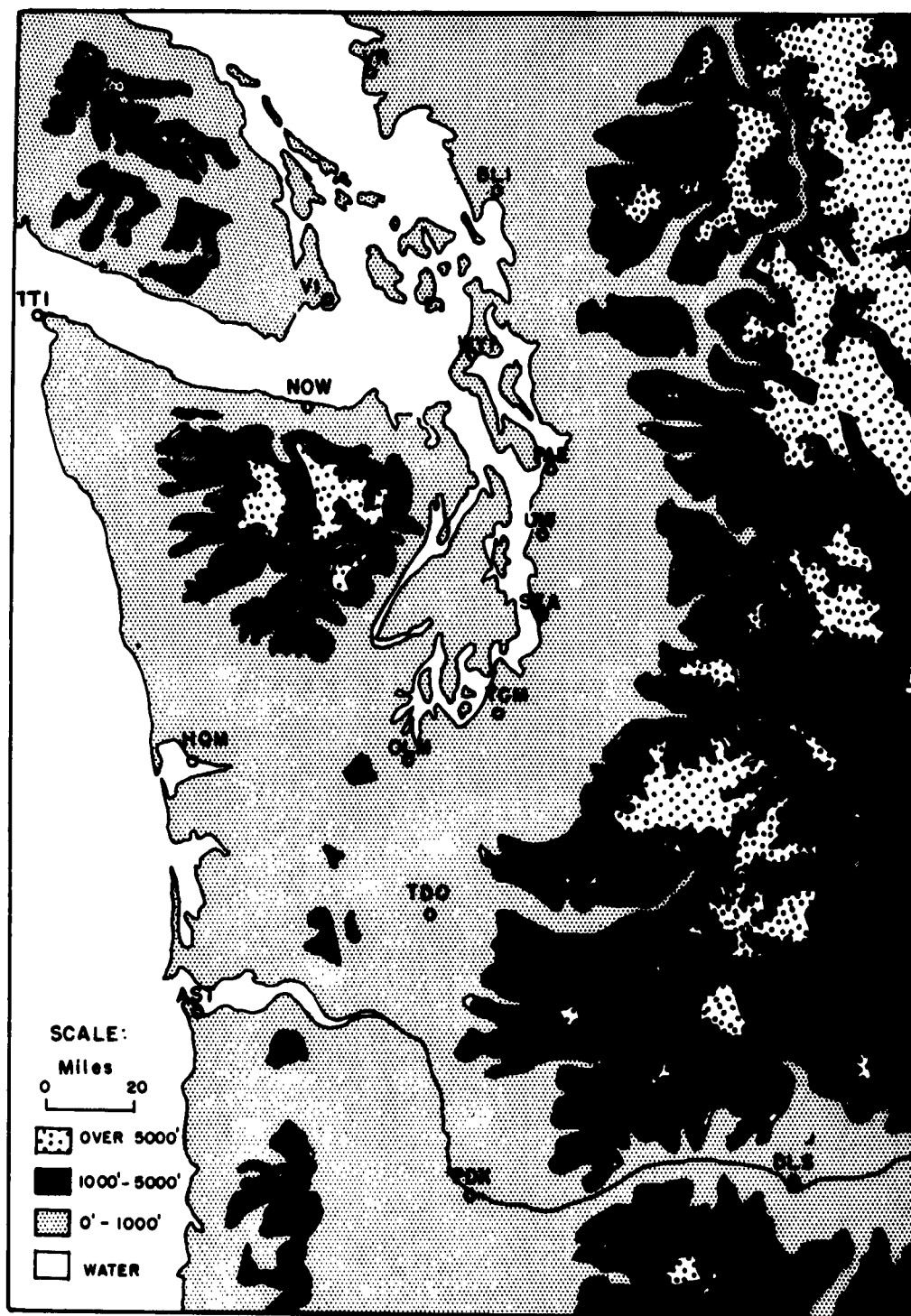


Fig. 1. Topographical map of western Washington with locations of selected stations.

DATA AND ANALYSES

1. Synoptic Charts.

These were prepared according to standard procedures at the following levels: Surface (both 6-hourly synoptics and hourly sectionals), 850 mb, 700 mb, 500 mb, 250 mb.

2. Time Sections.

The analyses are based on plotted temperatures, pressures, and winds. Only the winds are shown on the sections reproduced here since sounding data are provided separately. For soundings taken by the U.S. Weather Bureau, temperatures, dew points, and winds were plotted at coded points. For special soundings, temperatures were plotted at 4°C intervals and at significant points between. Dew points were plotted at significant points in the humidity trace and at points corresponding to the plotted temperatures. Winds were plotted for each minute up to the fourteenth minute (roughly 14,000 feet) and every second minute beyond. In computing the winds two-minute averages were used up to the fourteenth minute and four-minute averages beyond.

Cloud analyses are based on radiosonde traces, radar echoes, ground observations and pilot reports.

3. Barograph Traces.

Copies were made of the microbarograph trace located at the U.S. Weather Bureau office in downtown Seattle.

4. Radar.

The radar record for each series consists of 35 mm film exposed continuously at a rate of 10 in/hr. An angel, evidently caused by reflection of a side lobe from a church steeple, is present on all film near the 5,000-foot marker despite

efforts at shielding. Below the scope picture is a counter which gives the accumulated precipitation in hundredths of an inch, as measured by a tipping bucket gauge, and a clock from which the time can be read at approximately $2\frac{1}{2}$ -minute intervals.

5. Soundings

The data from soundings taken at the University of Washington were reduced in the following manner. Temperatures, relative humidities, elevation angles, and azimuth angles were read every half minute from the original records. The dew points, heights, and wind data were computed from these readings on the IBM 709 in the Research Computer Laboratory.

The soundings from SEA were reduced in a slightly different fashion. The 1-minute elevation and azimuth angles, as well as the pressure-time data, were obtained from WBAN-20; significant temperatures, relative humidities, and the corresponding pressures were obtained from the data blocks on WBAN-31A, B, and C. From this information the IBM 709 was used to obtain the information at 1-minute intervals listed in Appendix A.

The plotted soundings give (1) for U. W. soundings: every significant point plus every third half-minute point below 600 mb and every fourth above 600 mb (2) for SEA soundings: every significant point. Data for all the half-minute points for U. W. soundings and all minute points for SEA soundings are included in Appendix A.

ACKNOWLEDGEMENTS

We would like to thank the following persons for assisting in various phases of the program: Mr. Albert K. Showalter, Chief, Observations and Stations, U.S. Weather Bureau, for authorizing 6-hourly soundings at Seattle-Tacoma Airport on the special days and the observers for working up the extra soundings; Mr. Ralph W. Hester, Meteorologist-in-Charge, Boeing Field, Seattle, and his assistants, especially Mr. John Zimmerman for providing facsimile data; Major Buchanan, Paine Field, Everett, and Captain Roddee Lord, McChord Field, Tacoma, for forwarding pilot reports from these locations; Mr. Norman Thyer, University of Washington, for his assistance in the writing of a computer program for processing the sounding data; and Mrs. Nancy Levin, University of Washington, for providing an extra and much-needed hand during most of the ascents.

II. THE CASE OF 6-8 JANUARY 1961

SYNOPTIC DESCRIPTION

Although the intent was to study occluded type cyclones, the warm front in this case was so unusually sharp in the Pacific Northwest area that it was decided to proceed with ascents even though it appeared that Seattle would enter or nearly enter the warm sector.

At 1200Z on 6 January (Fig. 2.) the warm front extended from the Oregon Coast westward to an occluded front about 200 miles west of the picket ship S.P. The occluded low was located about 300 miles south of the weather ship 4YP, and the cold front extended from the peak of the warm sector southwest to a position slightly west of ship 4YN.

During the ensuing 36 hours (Figs. 4, 6, 8,) the low center moved slowly northeastward. Over water the warm front gradually advanced northward and weakened. Over land it remained nearly stationary in northern Oregon and likewise weakened. At first the cold front progressed slowly as a shallow wave developed on it. During the final 12 hours it accelerated and swept ashore bringing brief but pronounced pressure rises.

A closed cyclonic circulation lay above the surface occlusion at the 500-mb level (Figs. 2, 4, 6, 8). Anticyclogenesis occurred over the western states during the period. The warm front, which was located near the Canadian border at the beginning of the sequence, gradually dissipated as the ridge strengthened. The cold front as it came ashore was associated with a small, sharp upper-level trough which probably was present but unidentifiable over the ocean at the earlier hours.

Further information concerning the upper-level circulation, temperatures and fronts appears in Figures 3, 5, 7, and 9.

The sectional maps (Fig. 10) reveal the details of the cold or occluded front passage. At most stations a sudden barometric rise or pressure jump was observed at the time of passage, as in Figure 11. Not all stations, however, showed significant wind changes immediately. Eugene, Oregon, was one of the few stations that reported strong winds with the jump. Some property damage and the loss of one life were attributed to the sudden squall. Also shown in Figure 11 are temperature traces at surface, 850 mb, 700 mb, and 500 mb, and the height trace at 500 mb.

TIME SECTION

The serial ascents appear in Figure 12 and the time section analysis based on the ascents in Figure 13. The cloud analysis on the time section was derived from hourly ground observations, the radar echoes in Figure 14, the pilot reports listed in appendix B, and from the moisture distribution on the soundings. At times there were not sufficient data to locate the cloud boundaries accurately and at other times the data were conflicting. The tops of lower layers and bases and tops of upper layers must therefore be regarded as subject to considerable uncertainty.

According to the synoptic and radar time sections the sequence begins with a moderately well-defined warm frontal surface at 16,000 feet with a middle cloud deck inclined along it and with a cirrus overcast above. Echoes are observed from the middle deck. These are of the stable type and show generating cells near 20,000 feet and some stalactic formation at the echo base. The frontal zone contains a number of sublayers of particularly large temperature gradient.

At about 1800GCT breaks appear in the altostratus and the radar echoes become sporadic. However, as the storm approaches and the frontal surface continues to lower, the clouds thicken again and a deep precipitating layer is observed.

Rain commences at the ground when the middle cloud reaches 8,500 feet. Meanwhile, new cloud layers form at successively lower levels in the rain-moistened air.

A general lowering of both the lower and upper cloud layers seems to accompany the lowering of the front, suggesting an upglide motion in the warm air mass.

As the rain comes to an end, the echoes take on a more convective character, and isolated cells appear to bridge both layers. It is important to note that from the point of view of the air parcels what we refer to here as the ending of precipitation may actually be the beginning. If the air is gliding up along the frontal surface, as seems likely, the echoes at 0400GCT on 7 January are newly formed echoes, not decaying ones.

Following the cessation of the rain, the warm front does not come to the ground but flattens into an inversion surface which remains near 2000 feet. The predominant cloud during the interval between the flattening of the warm front and the arrival of the cold front is a broken-to-overcast cirrus.

Immediately preceding the arrival of the surface cold front (actually an occlusion in the shallow layer next to the surface) the clouds temporarily dissolve. From the 0000GCT sounding for the 8th it appears in fact that the front has already passed at intermediate levels, and that the dissolution is associated with subsidence in the cold air.

Shortly after the time of frontal passage at the surface a sharp-edged cloud mass drifted in at middle levels. An elevated echo of more or less stable type was noted on the radar, and some very light rain reached the ground briefly. Sporadic shower activity developed in the cold air and continued for the remainder of the period. The later echoes were more convective in appearance, and the bases and tops of the cells were located at lower elevation than in the cell immediately behind the front.

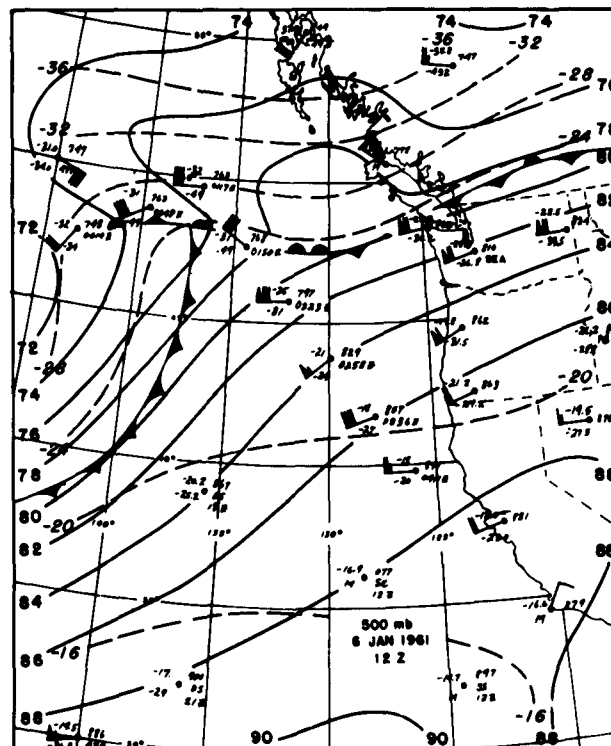
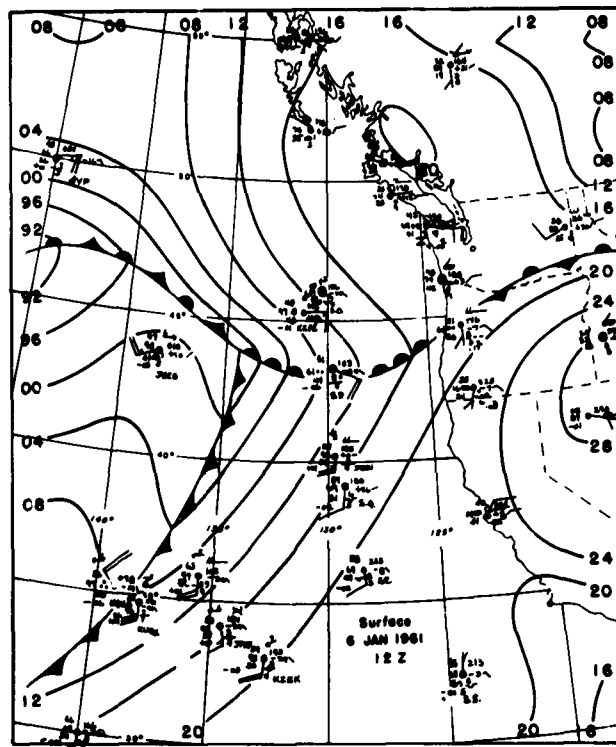


Fig. 2. Charts for 1200GCT January 6, 1961. Upper, surface; lower, 500 mb.

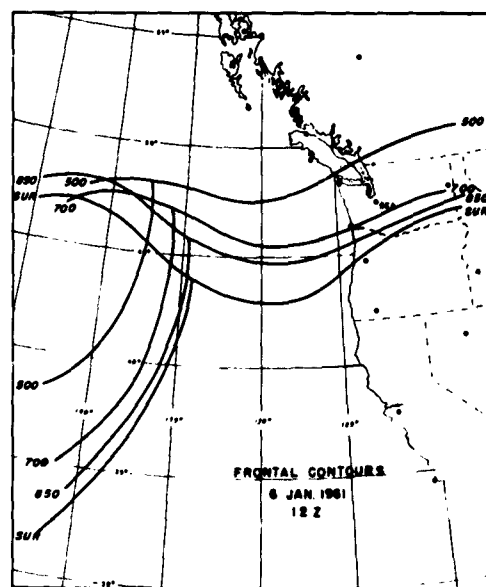
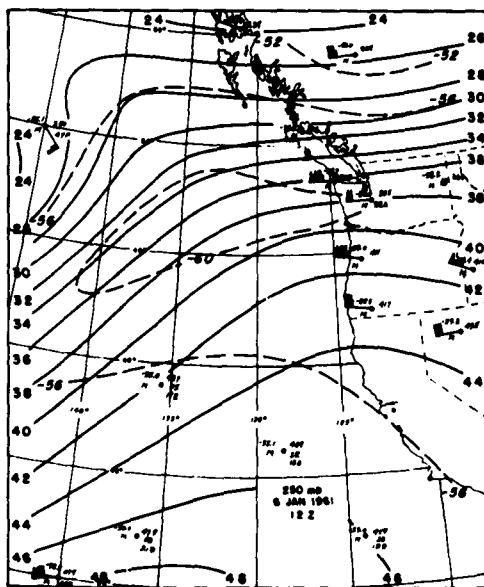
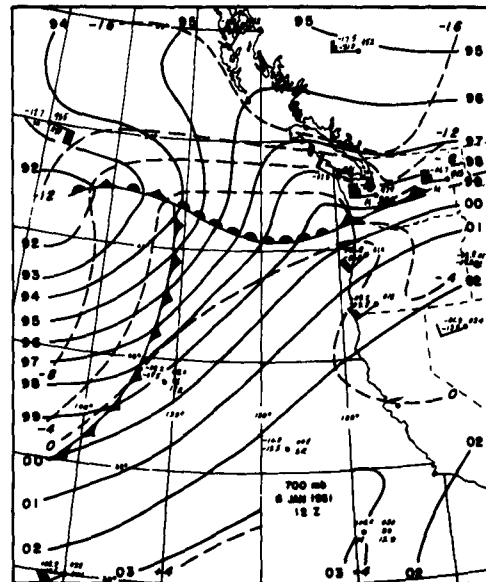
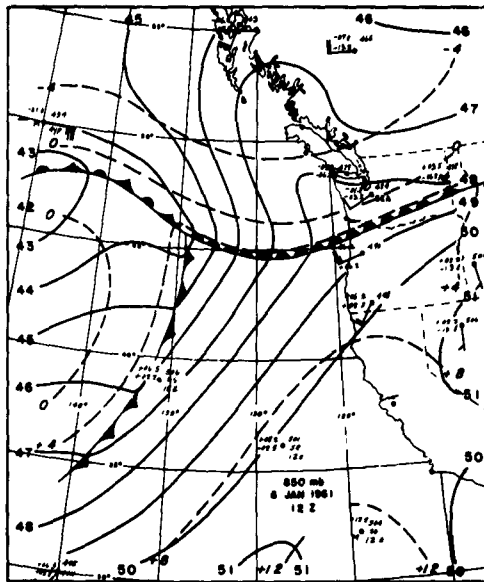


Fig. 3. Charts for 1200GCT January 6, 1961. Upper left, 850 mb; upper right, 700 mb; lower left, 250 mb; lower right, frontal contours.

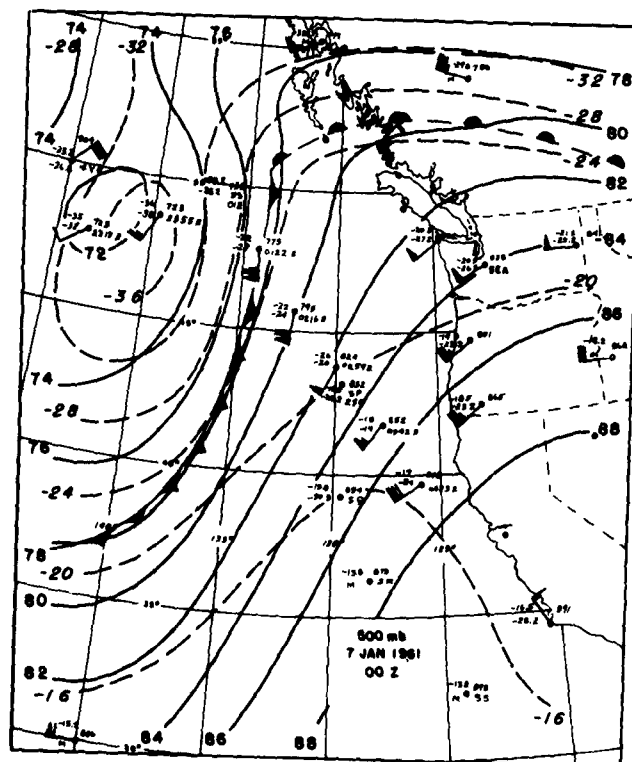
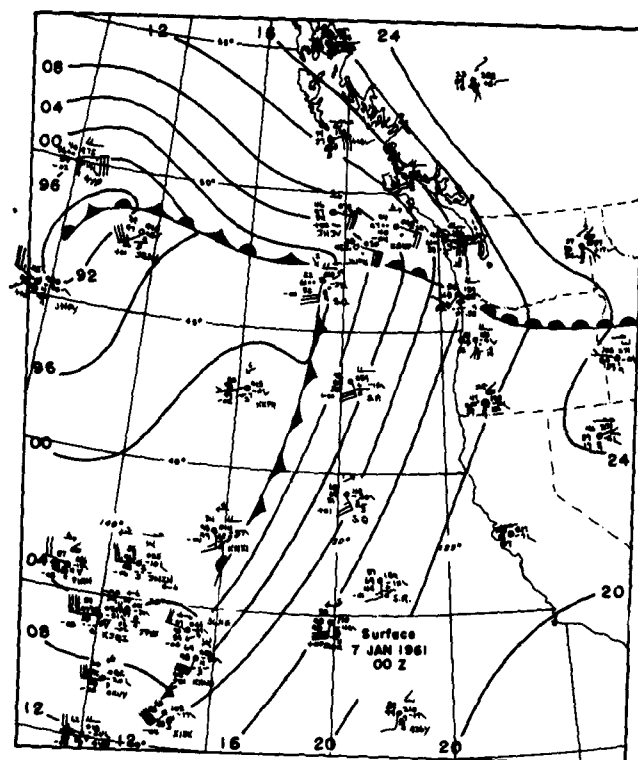


Fig. 4. Charts for 0000GCT January 7, 1961. Upper, surface; lower, 500 mb.

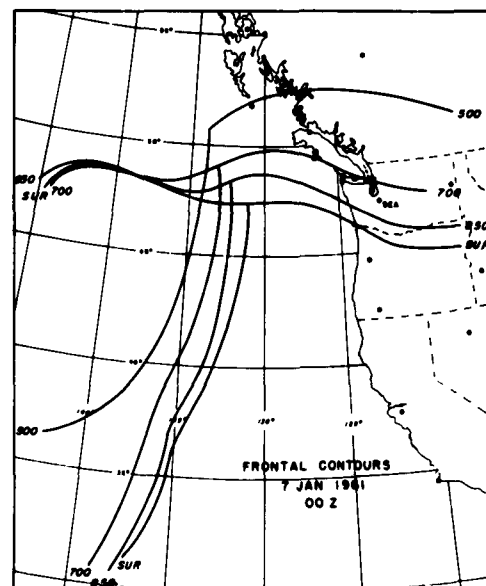
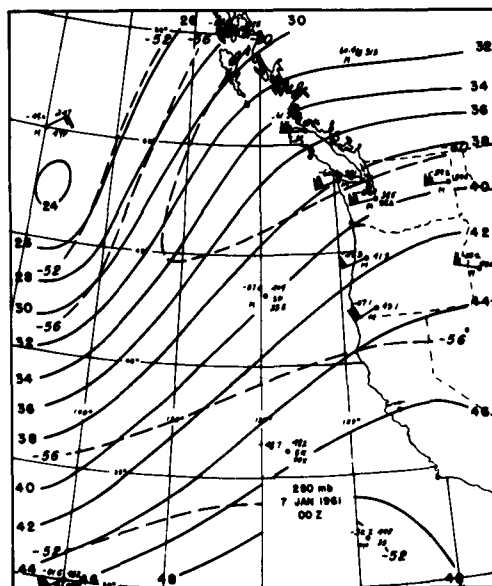
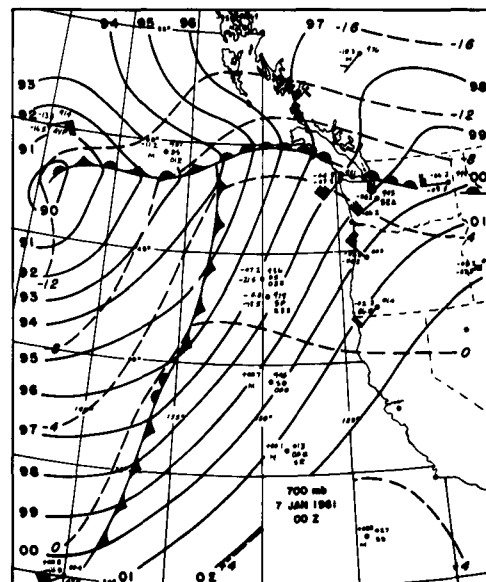
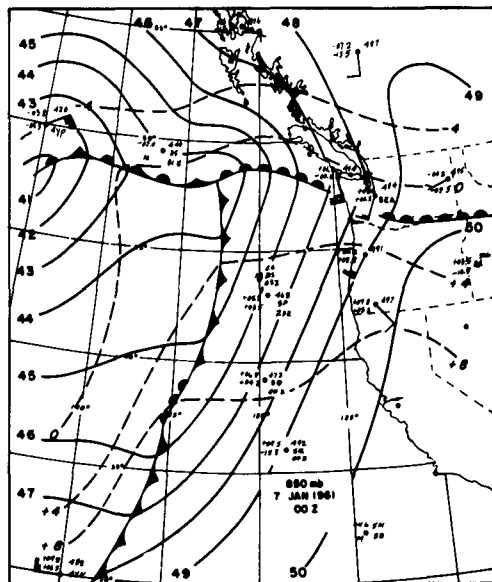


Fig. 5. Charts for 0000GCT January 7, 1961. Upper left, 850 mb; upper right, 700 mb; lower left, 250 mb; lower right, frontal contours.

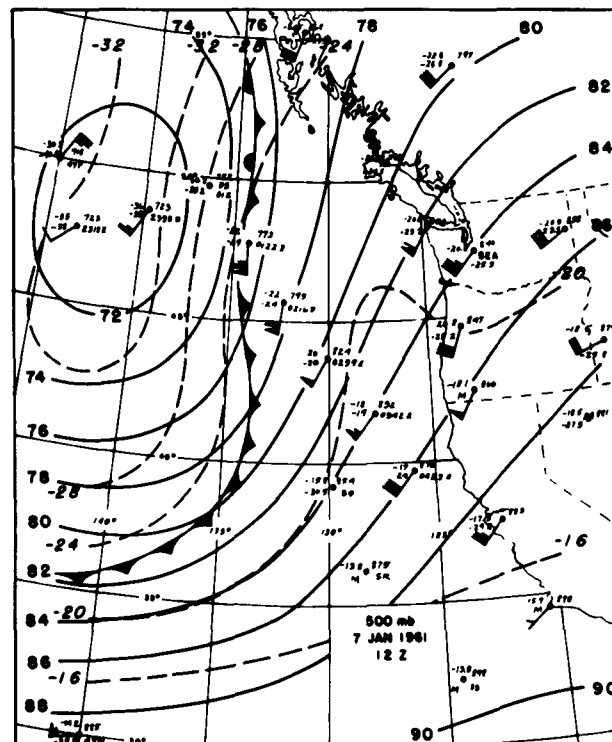
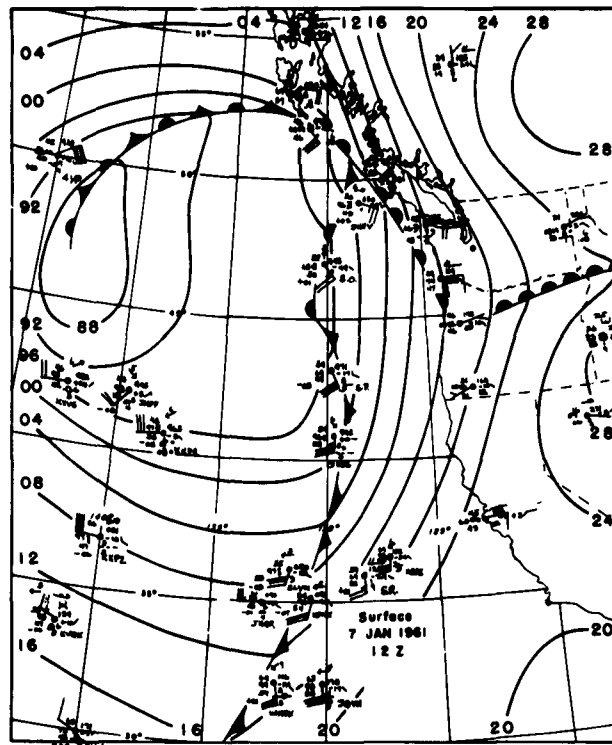


Fig. 6. Charts for 1200GCT January 7, 1961. Upper, surface; lower, 500 mb.

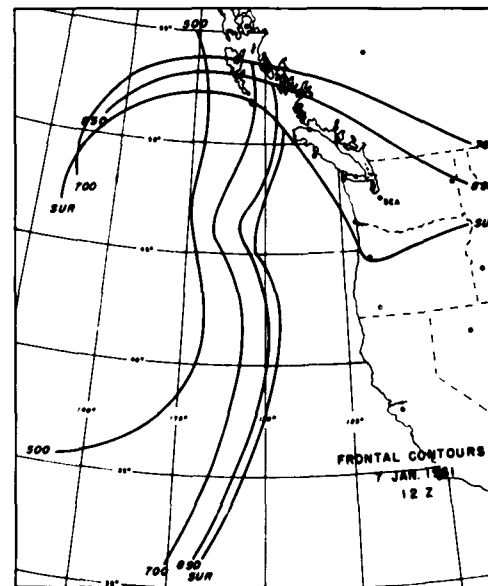
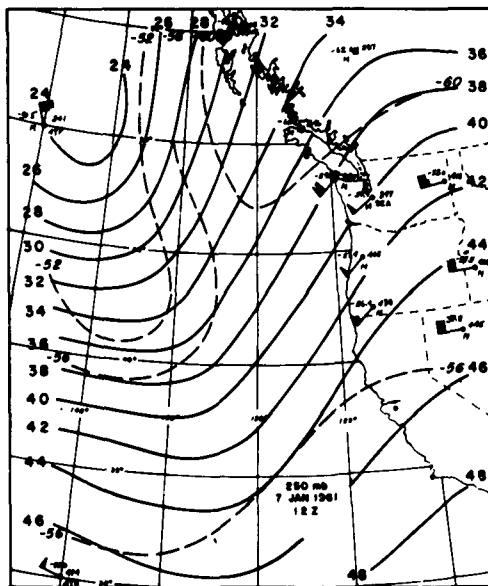
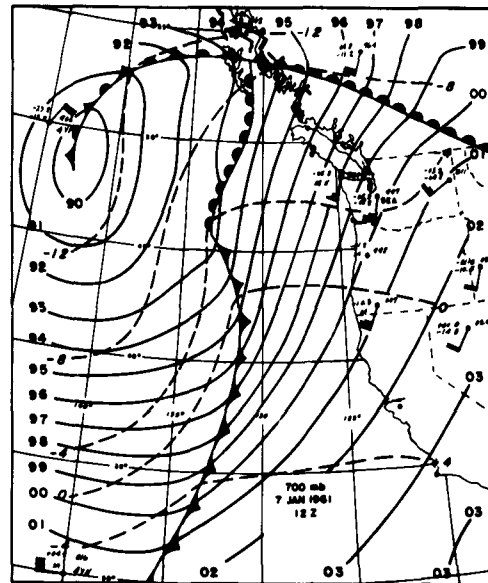
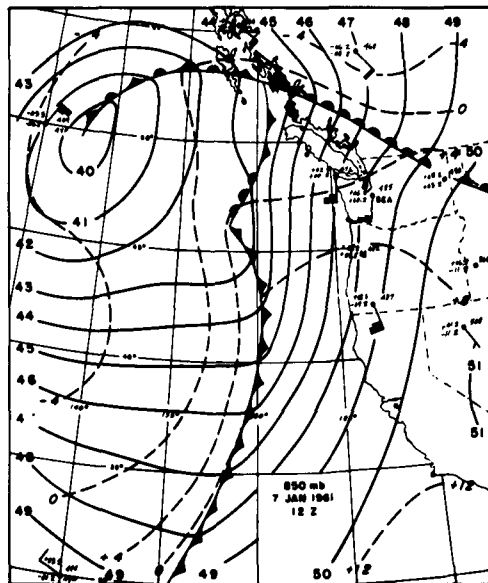


Fig. 7. Charts for 1200GCT January 7, 1961. Upper left, 850 mb; upper right, 700 mb; lower left, 250 mb; lower right, frontal contours.

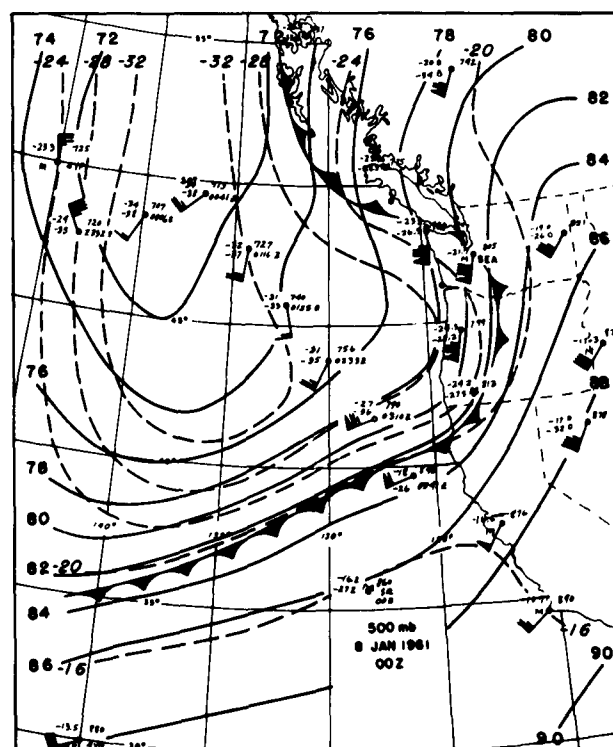
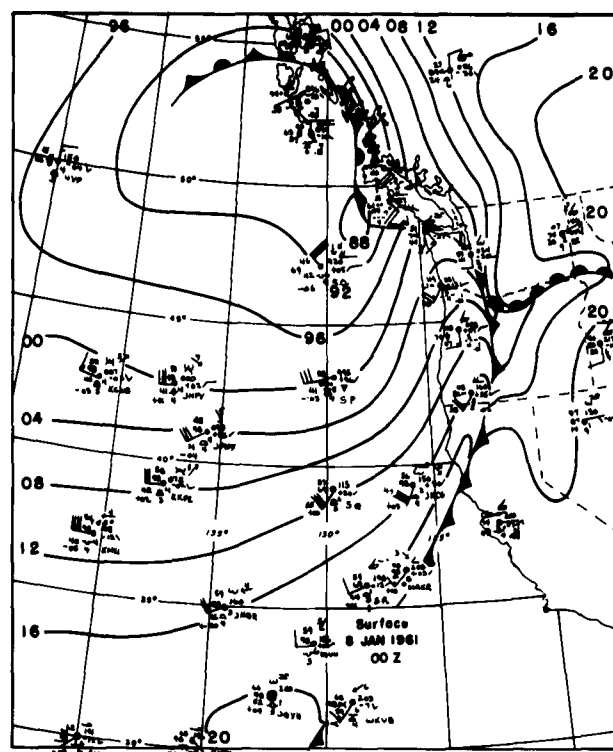


Fig. 8. Charts for 0000GCT January 8, 1961. Upper, surface; lower, 500 mb.

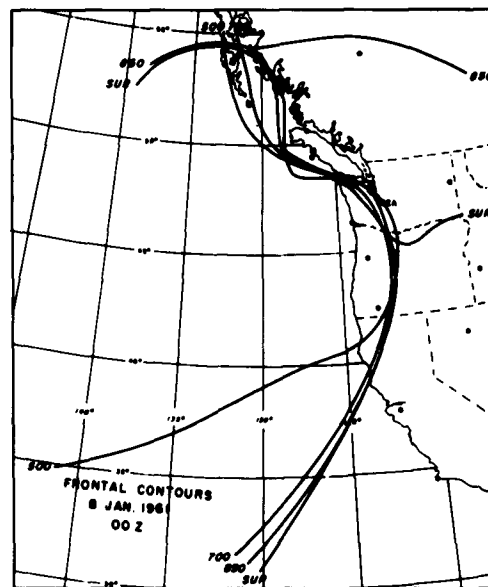
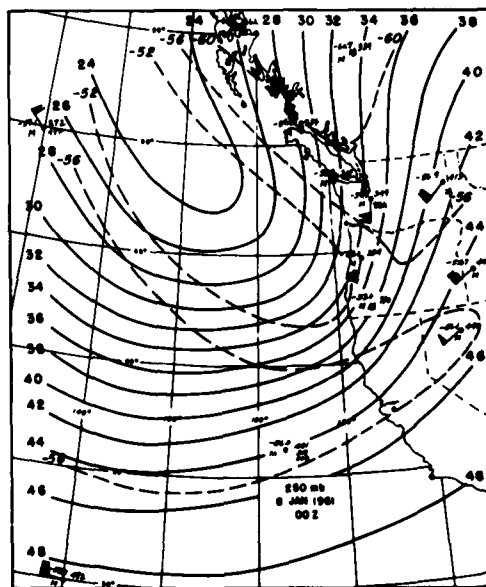
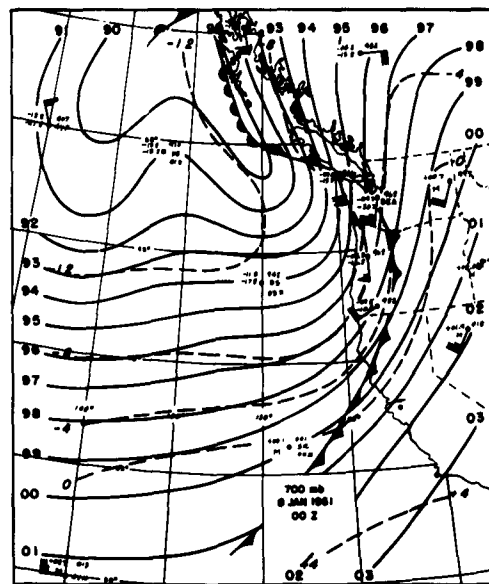
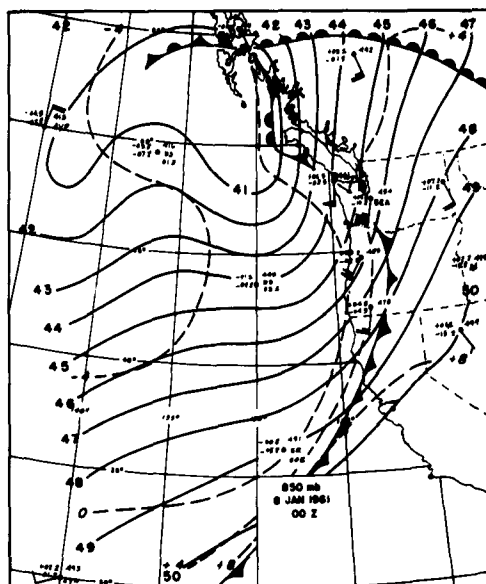


Fig. 9. Charts for 0000GCT January 8, 1961. Upper left, 850 mb; upper right, 700 mb; lower left, 250 mb; lower right, frontal contours.

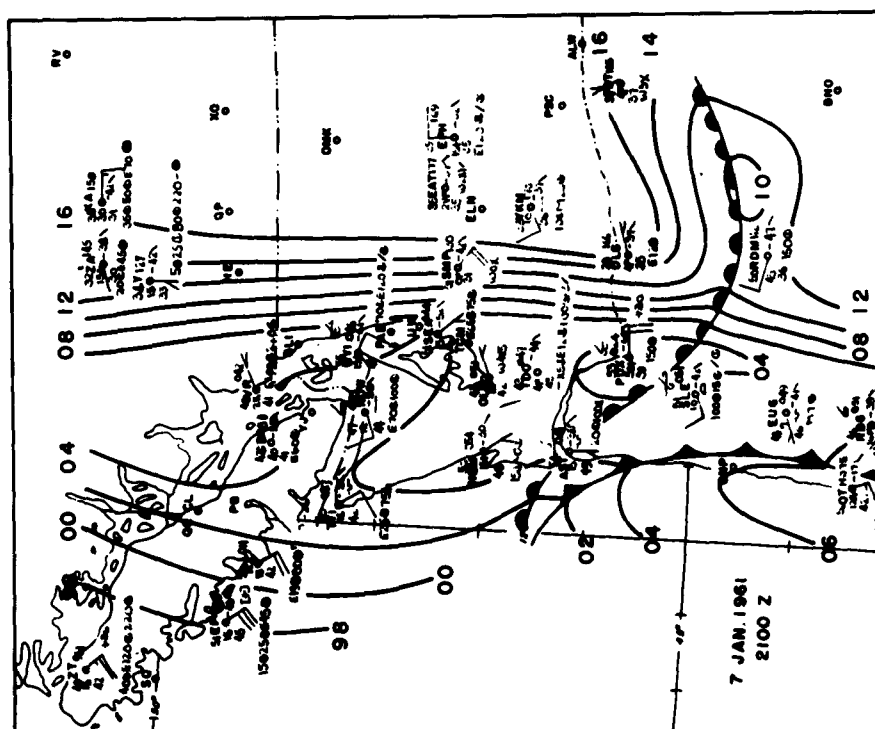
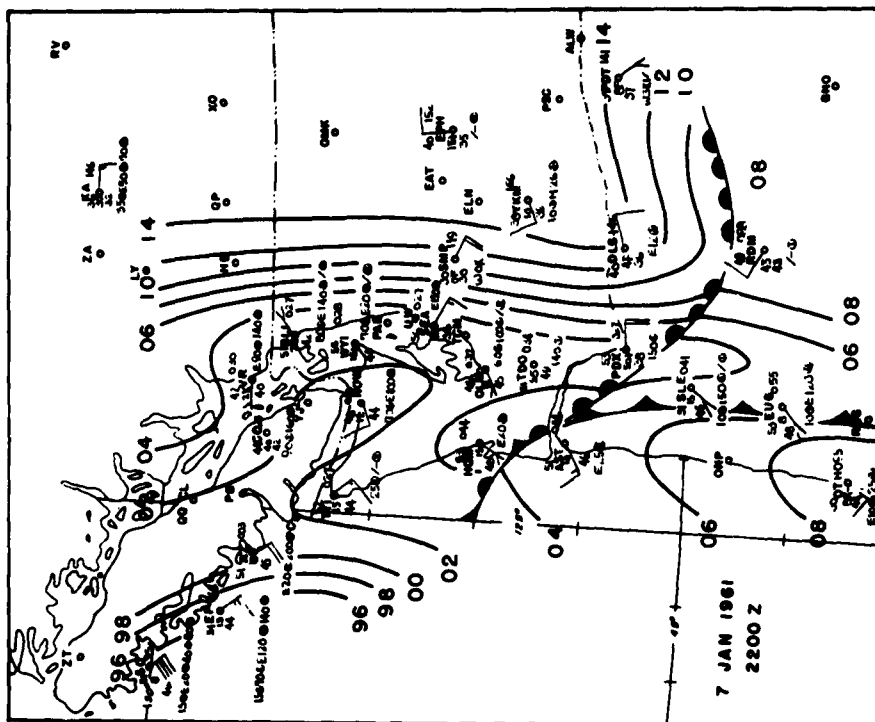


Fig. 10. Hourly sectional charts. (Part I)

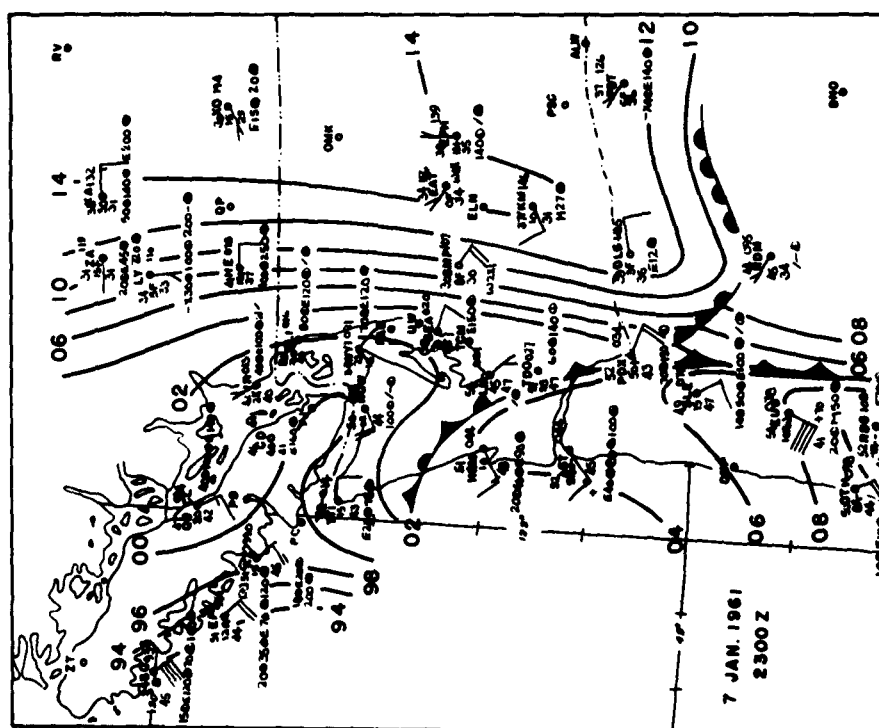
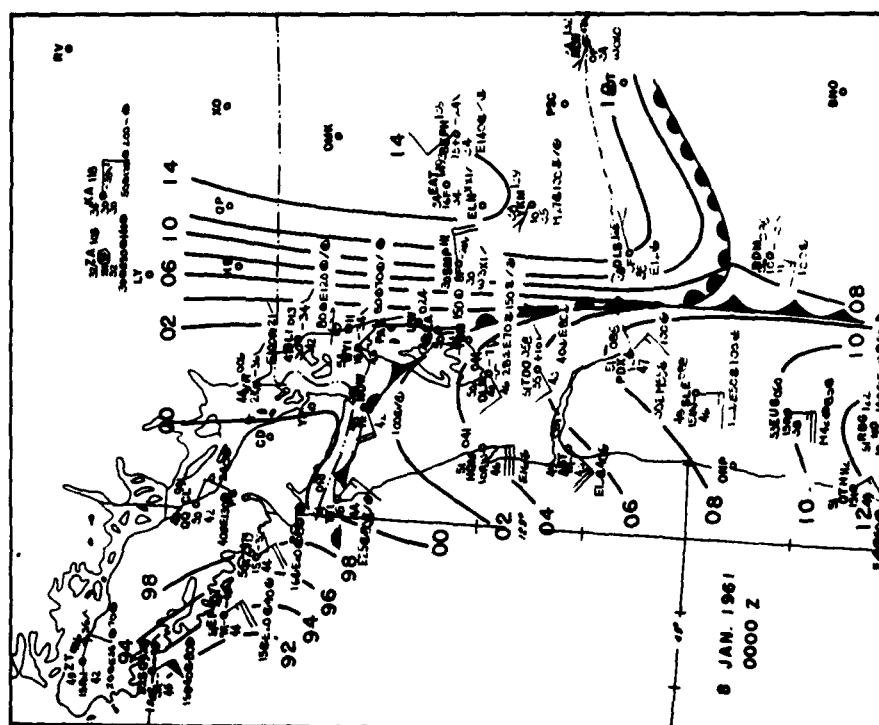


Fig. 10. (Part II)

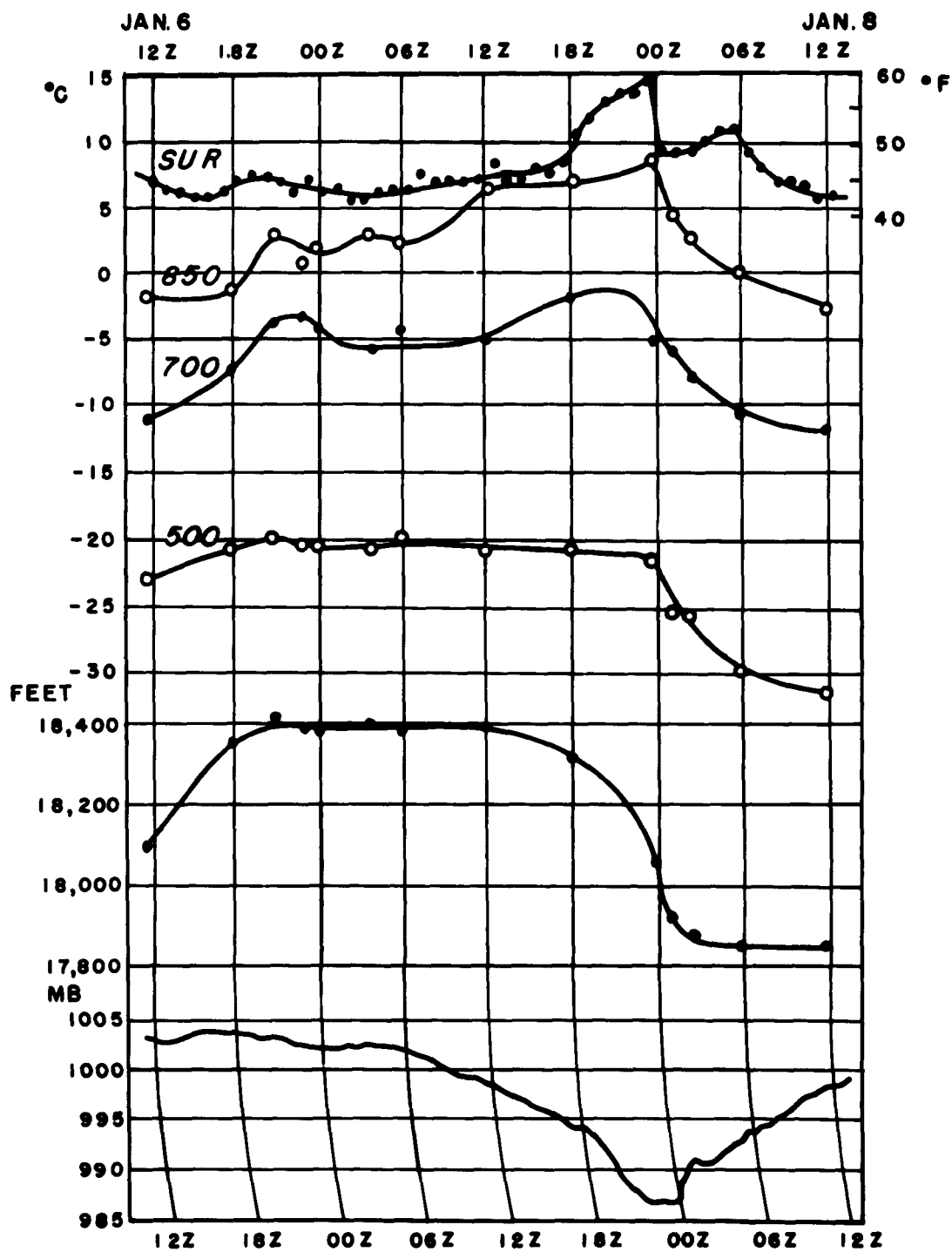


Fig. 11 Barograph trace for Seattle, and temperature traces at surface, 850 mb, 700 mb, and 500 mb, and height trace at 500 mb based on soundings released at Seattle-Tacoma Airport and the University of Washington.



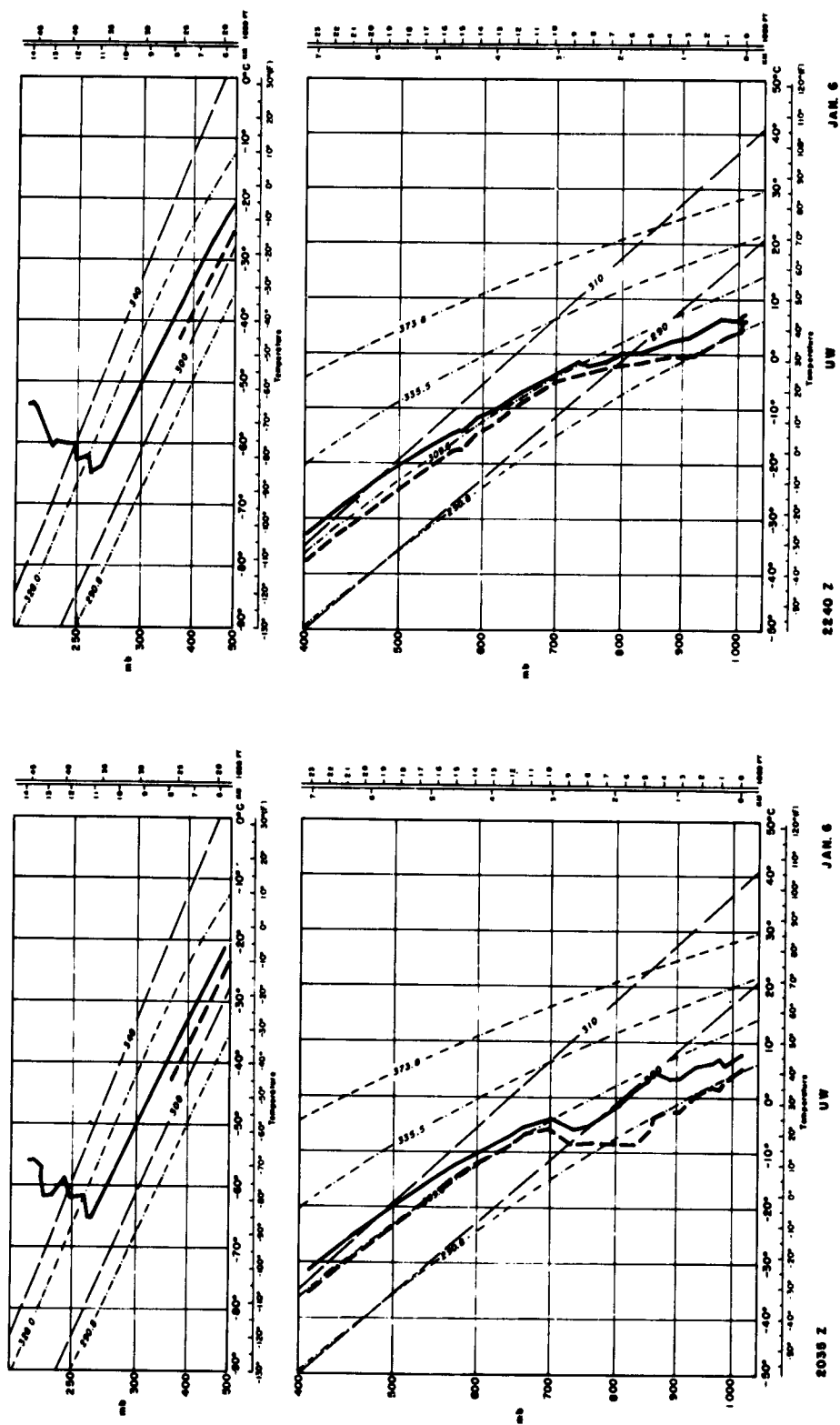


Fig. 12. (Part II)

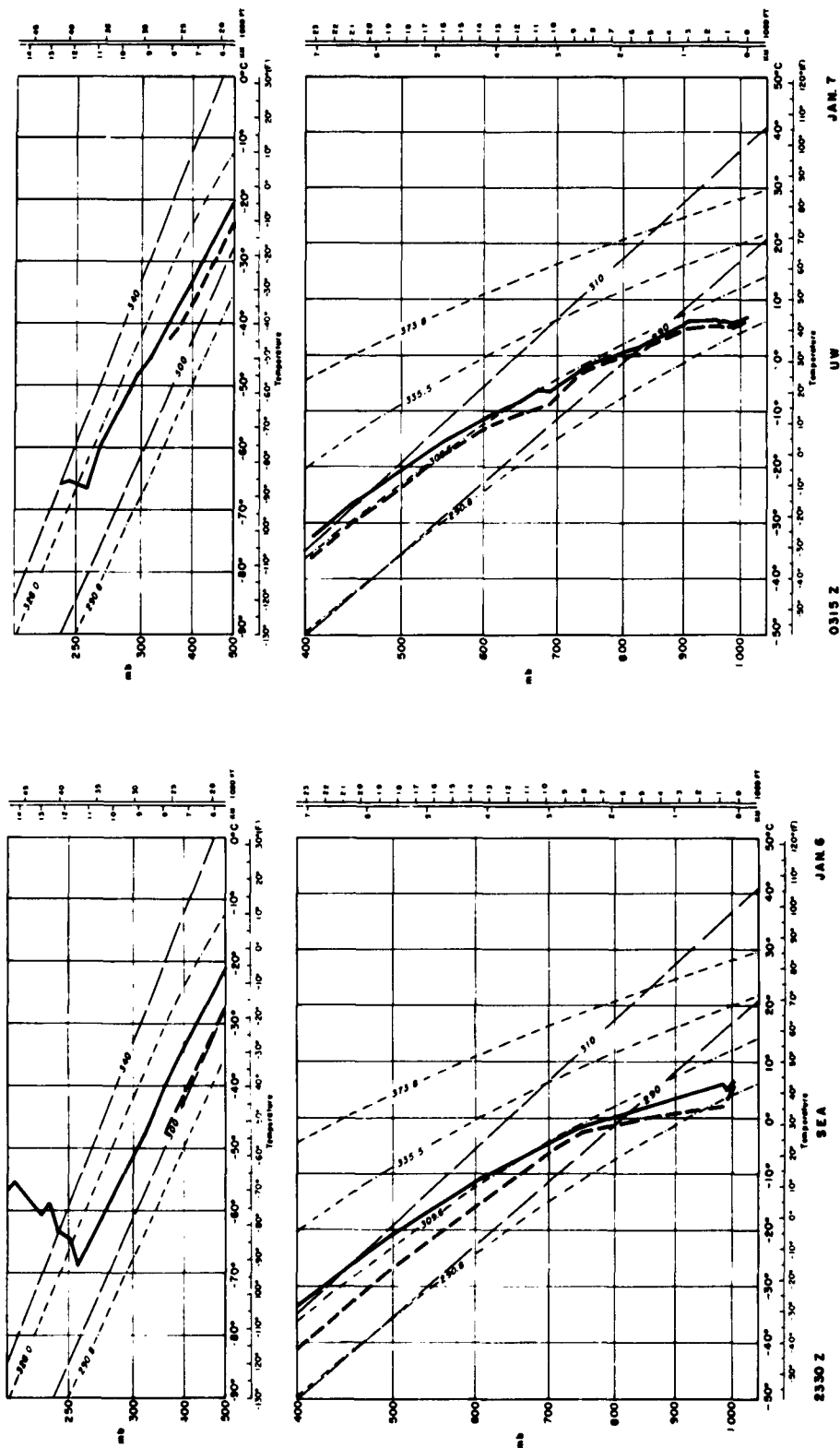


Fig. 12. (Part III)

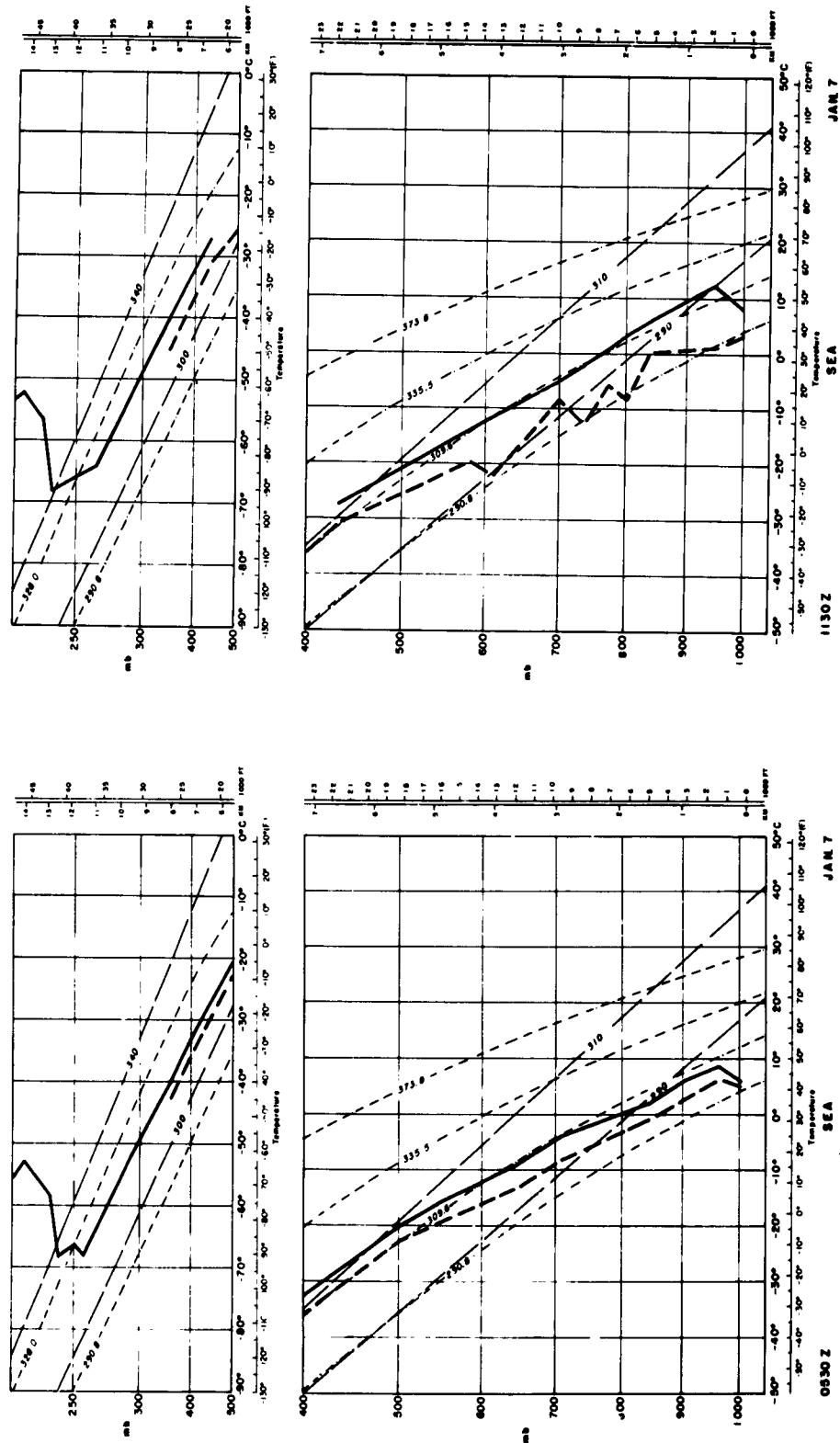


Fig. 12. (Part IV)

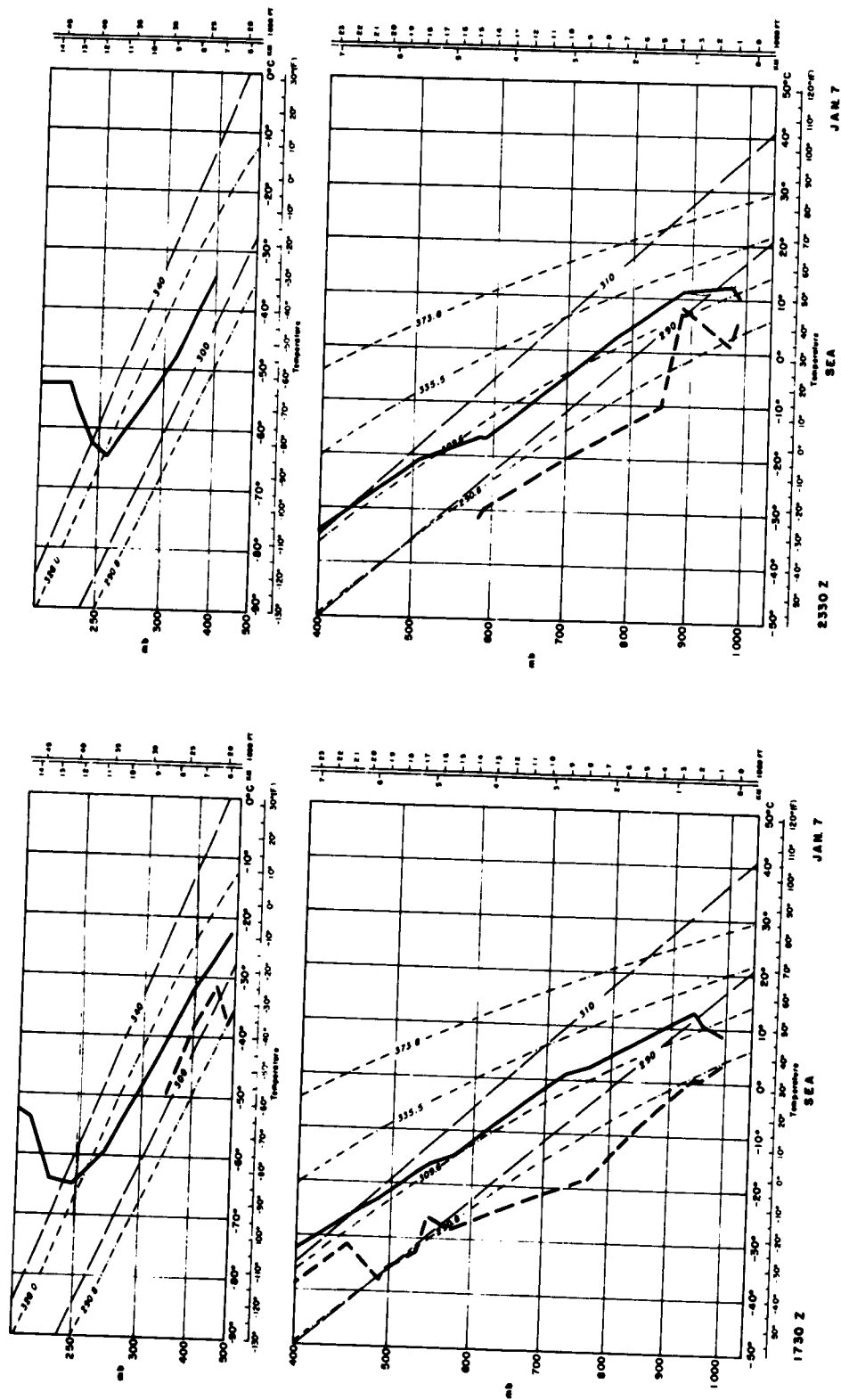


Fig. 12. (Part V)

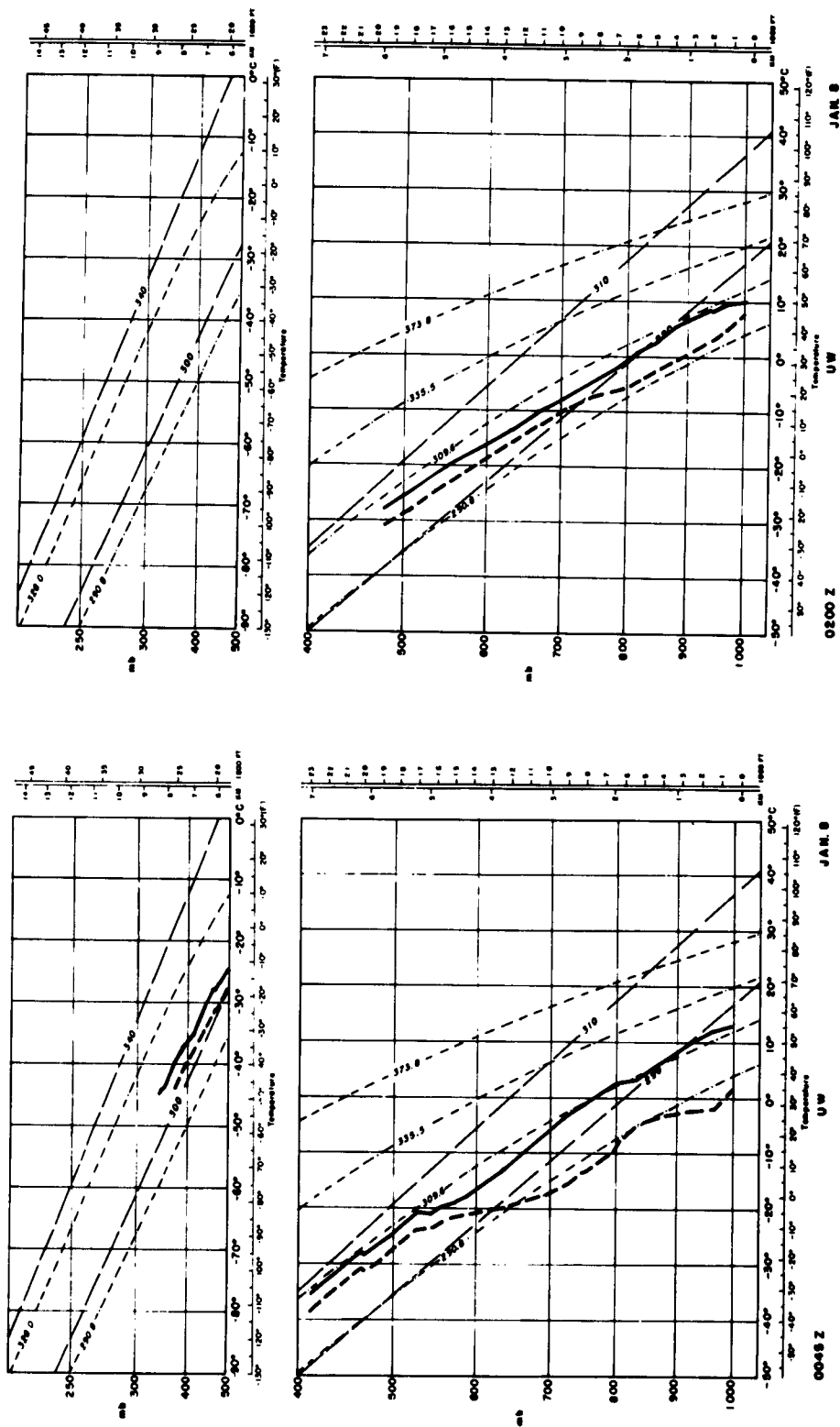


Fig. 12. (Part VI)

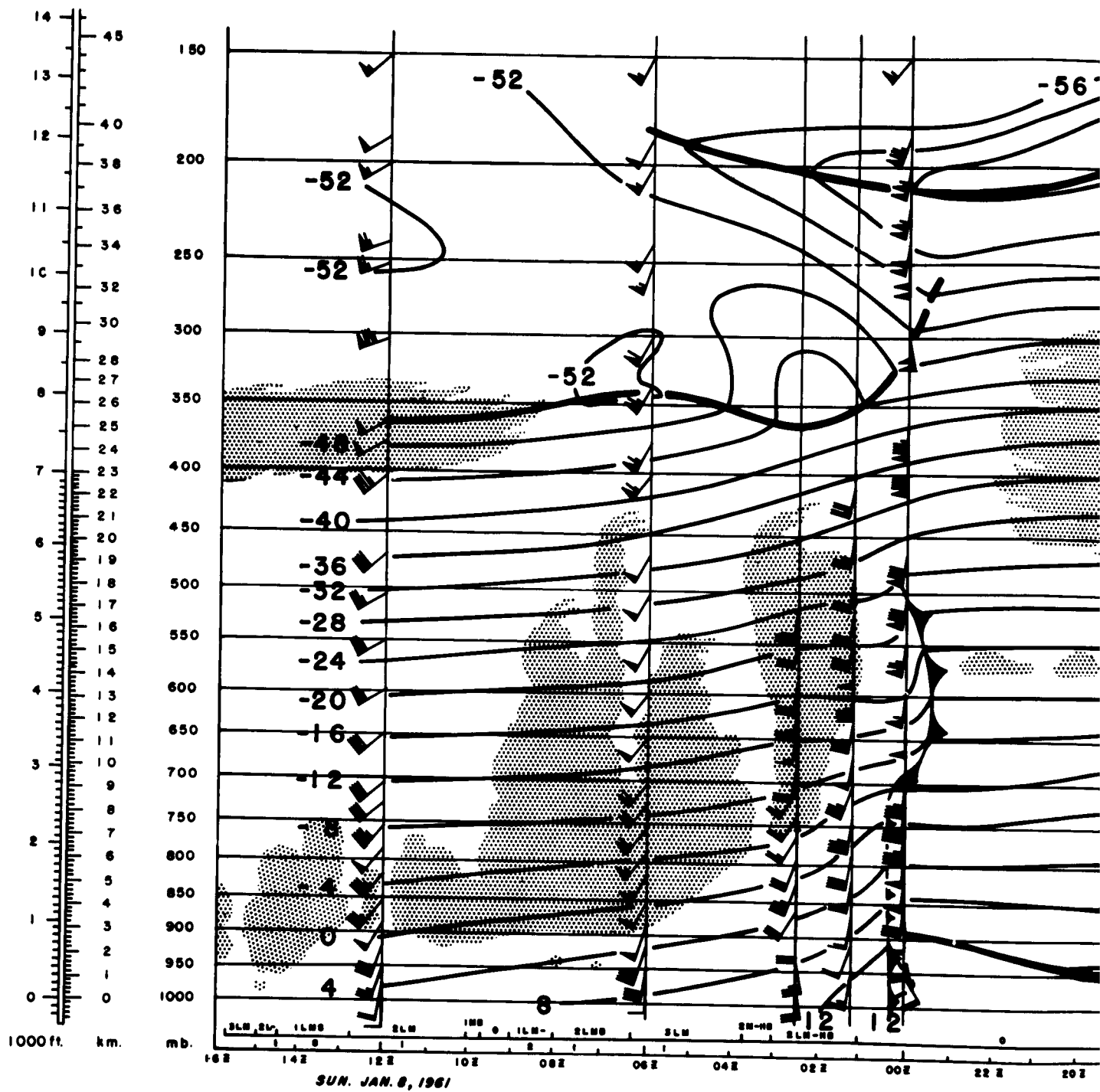
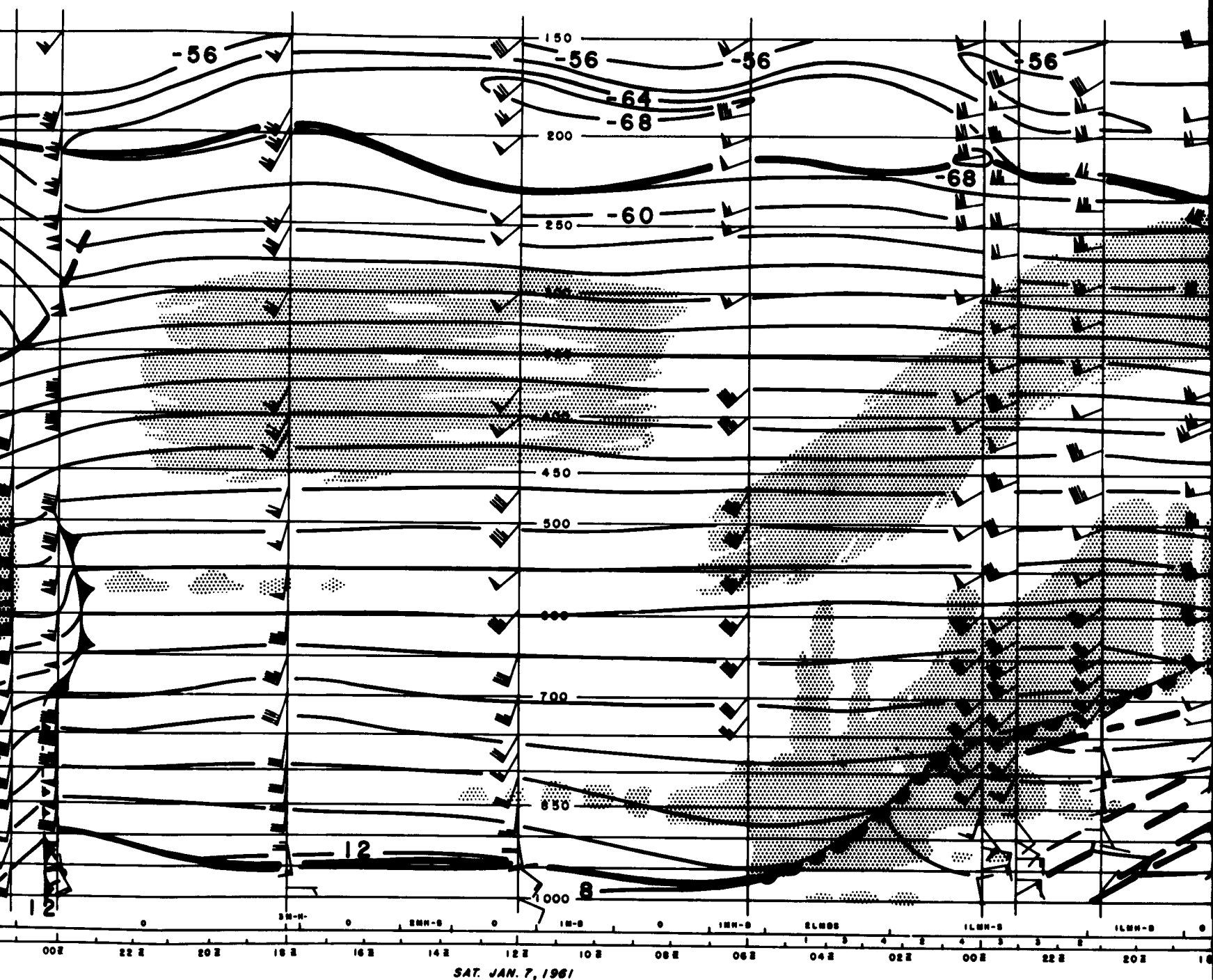


Fig. 13. Time section for Seattle, January 6-8, 1961. Winds denoted by usual convention hourly precipitation (in hundredths of an inch), and hourly surface observation



otted by usual convention. Heavy lines represent frontal, inversion, or tropopause discontinuities; thin lines, isotherms. Early surface observations are entered at bottom of section. Soundings are plotted at observation time (30 minutes a

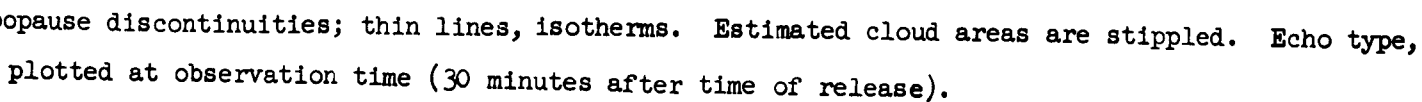




Fig. 14. Radar echoes January 6-8, 1961. Height scale to right in 1000's of feet, time scale below. (Part I)

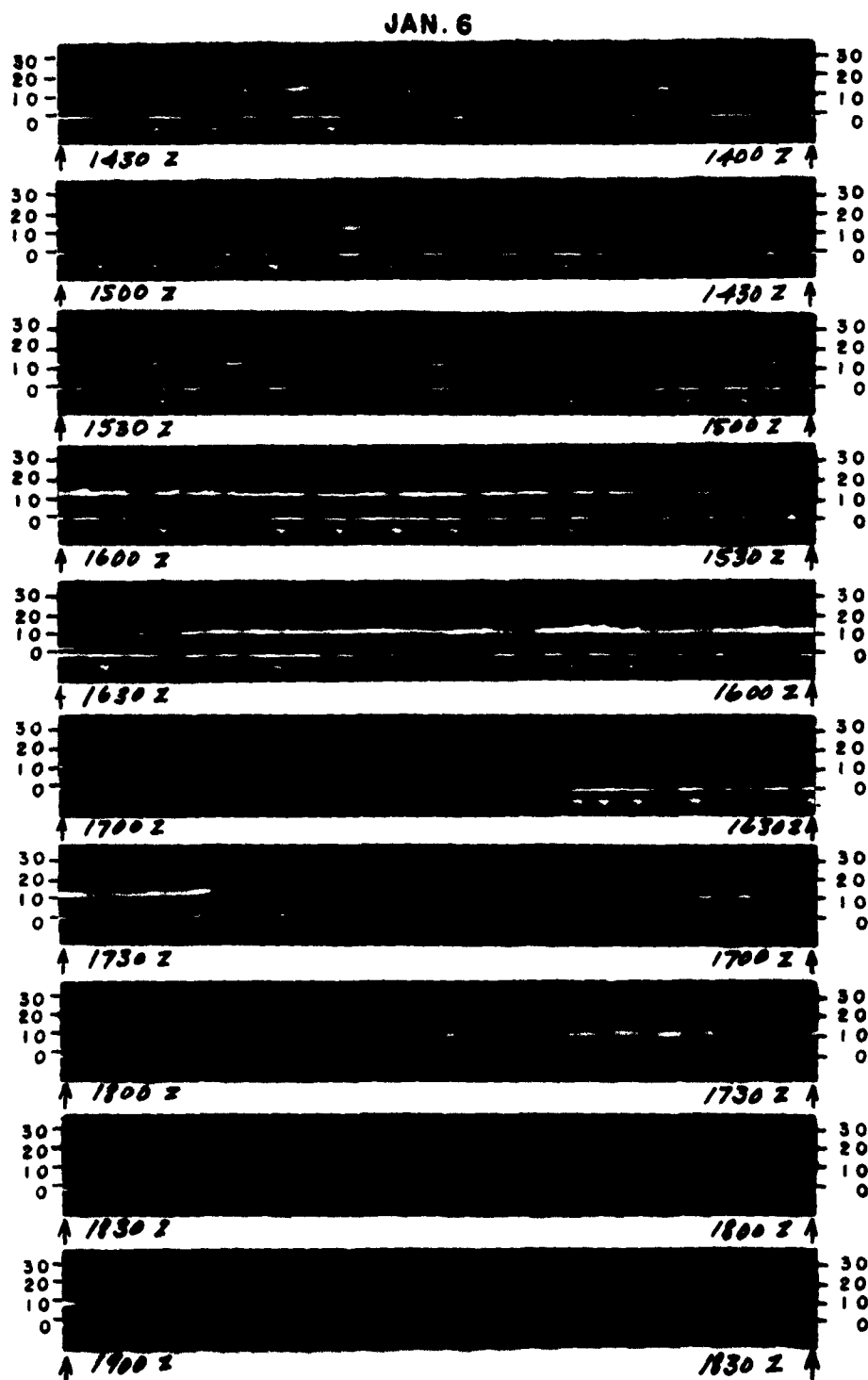


Fig. 14. (Part II)

JAN. 6



Fig. 14. (Part III)

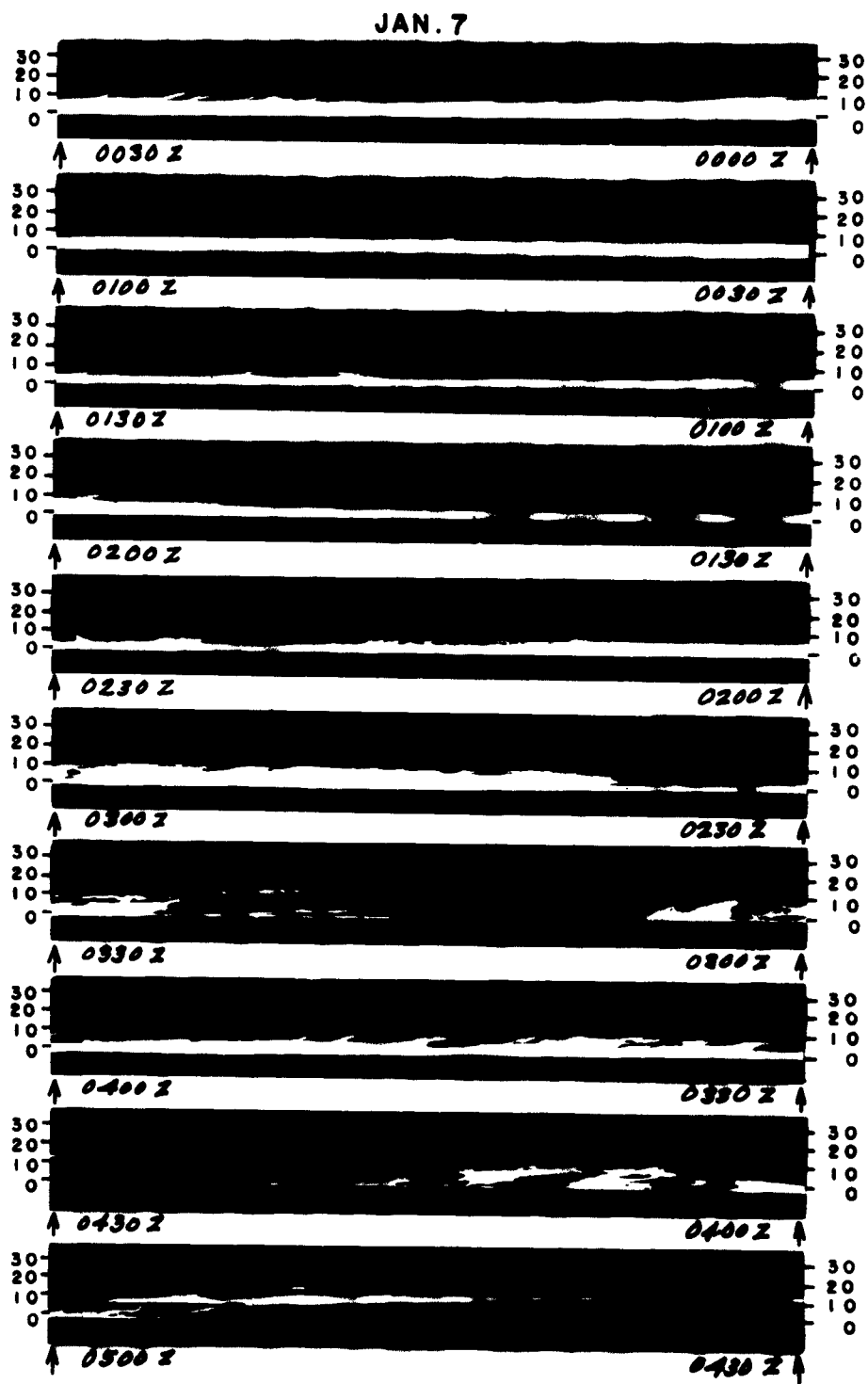
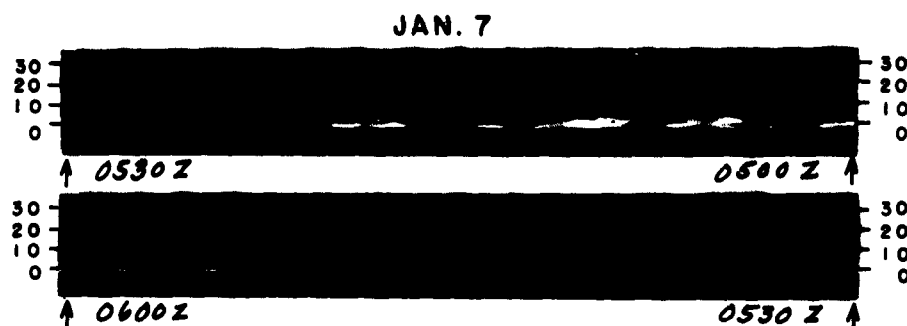


Fig. 14. (Part IV)



ONLY A FEW INTERMEDIATE ECHOES WERE DETECTED
BETWEEN 0600 Z JAN. 7 AND 0050 Z JAN. 8

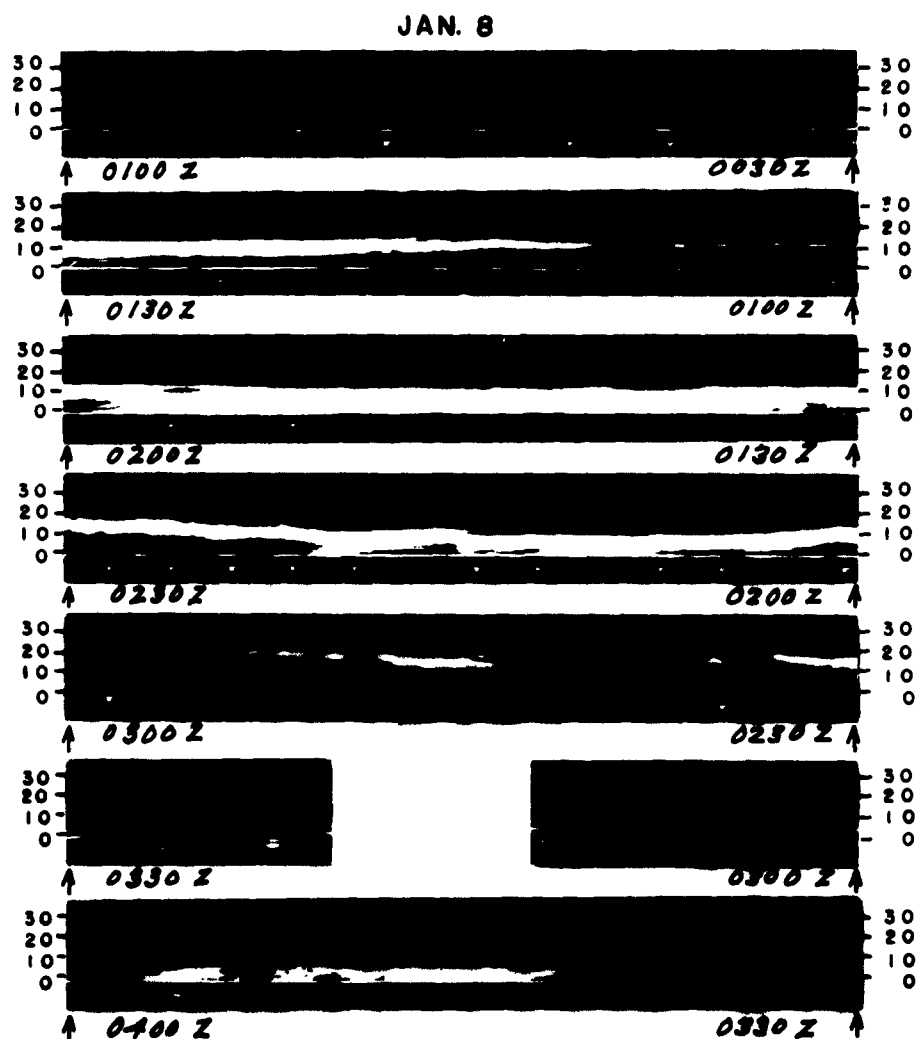


Fig. 14. (Part V)

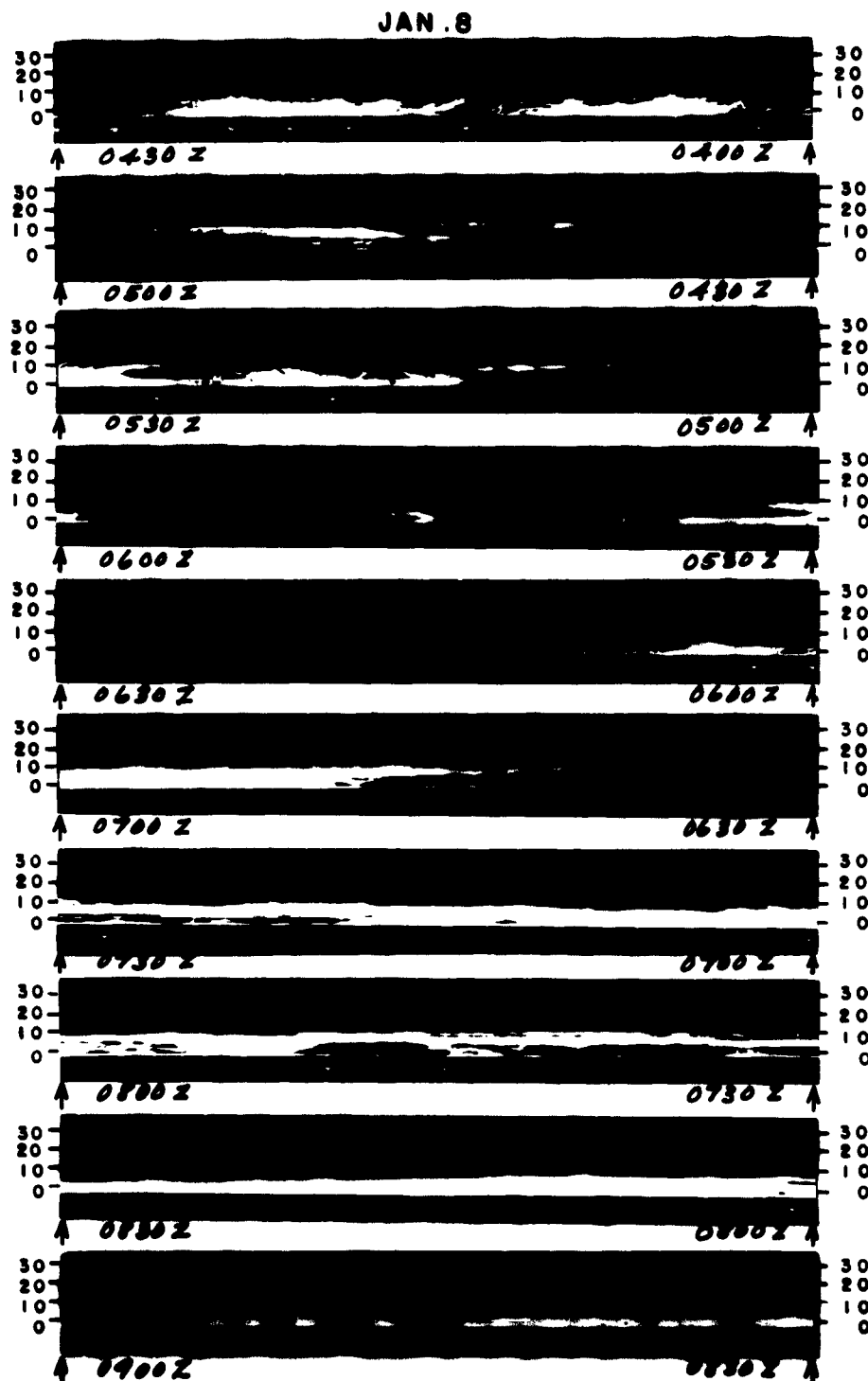


Fig. 14. (Part VI)

APPENDIX A

This section contains detailed sounding information as outlined in Section I-5. Notice that the sounding times in this section and in Figure 12 are the release times. Both the computer input and output data for these soundings are on punch cards which are available upon request.

The "1 MIN" winds for U.W. soundings give the mean rate of horizontal displacement of the balloon from 30 seconds before to 30 seconds after the indicated time of the wind. The SEA "2 MIN" wind is a similar mean over a two minute period. The "2 MIN RUN AV" winds were computed from the running mean formula

$$\vec{V}_2(M) = [\vec{V}_1(M-1) + 2 \vec{V}_1(M) + \vec{V}_1(M+1)] / 4$$

where $\vec{V}_2$ is the "2 MIN RUN AV" and the $\vec{V}_1$ is the "1 MIN" wind for U.W. data and the "2 MIN" wind for the SEA data. The indices refer to the level, for instance (M-1) is the level below level (M) - 30 seconds below for U.W. data and one minute below for SEA data. The "4 MIN RUN AV" wind was obtained in both cases from the "2 MIN RUN AV" data according to a similar relation,

$$\vec{V}_4(M) = [\vec{V}_2(M-2) + \vec{V}_2(M) + \vec{V}_2(M+2)] / 4$$

where $\vec{V}_4$ is the "4 MIN RUN AV."

SEA 6 JANUARY 1961 1130Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	1004	83	7.2	4.5	410	-0	-0	-0
1	985	83	6.2	3.7	899	195	13	-0
2	960	85	4.7	2.4	1610	229	10	-0
3	934	86	3.2	1.2	2323	236	10	-0
4	908	87	1.7	-0.1	3091	236	11	239
5	874	89	-0.4	-1.8	4078	234	10	233
6	842	91	-2.4	-3.6	5068	220	8	238
7	816	85	-4.7	-6.7	5883	228	7	248
8	792	75	-6.9	-10.6	6654	269	8	259
9	768	54	-8.6	-16.4	7426	274	15	265
10	744	32	-10.4	-24.5	8239	265	27	266
11	720	19	-10.7	-31.1	9066	265	37	266
12	696	17	-11.1	-32.7	9899	268	45	267
13	674	20	-12.2	-31.6	10713	266	50	264
14	653	23	-13.3	-30.8	11530	261	50	262
15	631	33	-13.5	-26.9	12359	259	46	260
16	609	41	-13.3	-25.9	13237	262	46	263
17	588	48	-17.5	-26.1	14118	267	48	263
18	567	58	-17.8	-24.0	15009	271	54	269
19	546	65	-18.7	-23.7	15912	266	60	262
20	526	66	-20.4	-25.0	16821	259	74	258
21	496	69	-23.0	-27.1	18237	254	92	254
22	467	71	-25.7	-29.4	19719	250	97	250
23	445	71	-28.4	-32.0	20851	247	83	248
24	439	71	-29.2	-32.9	21147	248	62	249
25	434	70	-30.1	-33.7	21443	253	70	254
26	422	70	-31.9	-35.6	22084	255	88	256
27	406	69	-34.4	-38.1	22956	260	91	260
28	391	67	-36.7	-40.5	23828	263	88	262
29	376	66	-38.7	-42.8	24697	261	99	262
30	362	62	-40.8	-45.4	25567	261	97	261
31	348	55	-43.0	-48.6	26455	261	90	261
32	334	47	-45.2	-52.0	27367	261	108	262
33	320	40	-47.5	-55.6	28282	264	103	264
34	306	32	-49.7	-59.5	29220	266	97	266
35	293	25	-52.0	-63.8	30164	268	98	267
36	279	17	-54.5	-69.1	31164	268	115	269
37	266	8	-57.0	-76.7	32223	270	136	271
38	253	0	-59.4	-96.1	33220	274	113	274
39	242	0	-61.5	-0	34121	281	77	280
40	231	0	-62.8	-0	35026	285	65	283
41	221	0	-62.6	-0	35978	283	74	282
42	211	0	-61.2	-0	36946	279	72	276
43	201	0	-60.7	-0	37898	263	70	265
44	192	0	-60.1	-0	38850	254	75	256
45	182	0	-59.6	-0	39872	253	71	254
46	172	0	-58.9	-0	41039	256	43	256
47	163	0	-58.3	-0	42184	259	44	259
48	155	0	-57.8	-0	43164	262	30	-0
49	147	0	-57.3	-0	44299	-0	-0	-0

SEA 6 JANUARY 1961 1730Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	1005	86	6.1	3.9	410	-0	-0	-0
1	973	76	6.1	2.2	1274	148	7	-0
2	942	75	4.6	0.8	2123	59	2	136
3	913	77	2.9	-0.6	2970	177	4	172
4	885	79	1.2	-2.0	3795	181	9	178
5	858	58	1.8	-5.8	4626	170	8	171
6	830	29	0.7	-16.2	5503	154	5	163
7	802	20	0.1	-21.7	6403	170	3	170
8	774	23	-1.0	-20.7	7333	194	3	193
9	745	31	-3.5	-18.8	8323	261	1	251
10	717	39	-6.0	-18.0	9306	269	6	253
11	692	60	-7.6	-14.1	10213	242	20	242
12	668	78	-8.4	-11.5	11126	238	36	241
13	644	85	-9.3	-11.2	12039	245	44	245
14	621	85	-10.8	-12.9	12956	249	44	249
15	599	84	-12.4	-14.5	13872	250	46	252
16	577	82	-14.0	-16.4	14785	256	49	256
17	557	77	-15.9	-19.0	15700	260	46	259
18	536	72	-17.8	-21.6	16621	261	43	262
19	516	67	-19.7	-24.3	17545	265	42	266
20	496	63	-21.7	-27.0	18514	271	46	269
21	475	63	-24.1	-29.3	19530	268	52	266
22	456	63	-26.5	-31.5	20526	260	57	260
23	438	63	-28.8	-33.6	21475	252	60	252
24	420	63	-31.1	-35.8	22427	247	64	248
25	403	63	-33.5	-38.1	23434	247	68	248
26	385	62	-36.1	-40.8	24443	250	69	250
27	369	60	-38.7	-43.6	25409	253	68	252
28	354	52	-41.3	-47.4	26371	253	64	254
29	339	39	-43.7	-52.4	27284	255	63	256
30	326	26	-46.0	-58.1	28164	259	67	259
31	313	13	-48.4	-66.2	29066	263	64	262
32	299	0	-50.9	-0	30045	264	74	265
33	285	0	-53.1	-0	31027	268	78	268
34	272	0	-55.2	-0	32002	272	70	271
35	260	0	-57.3	-0	32981	271	81	272
36	248	0	-59.5	-0	33969	276	82	276
37	236	0	-61.4	-0	34961	280	82	279
38	223	0	-62.1	-0	36128	280	78	279
39	209	0	-60.8	-0	37359	272	57	271
40	197	0	-60.8	-0	38595	254	31	260
41	185	0	-61.9	-0	39842	254	31	254
42	175	0	-62.5	-0	41040	253	48	252
43	165	0	-59.1	-0	42256	247	40	251
44	156	0	-58.6	-0	43595	254	38	254
45	147	0	-58.8	-0	44953	-0	-0	-0

UW 2035Z JANUARY 6, 1961

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	1 MIN DEG KNOT	2 MIN DEG KNOT RUN. AV	4 MIN DEG KNOT RUN. AV
0.	1018	82	7.9	5.0	35			
0.5	1000	80	6.5	3.3	322	1	1	1
1.0	983	78	5.8	1.8	684	47	42	42
1.5	963	72	5.2	0.5	1537	142	1	149
2.0	942	71	5.5	0.6	2130	185	2	179
2.5	923	67	4.9	-0.6	2676	184	1	176
3.0	908	65	3.5	-2.6	3172	71	0	96
3.5	888	67	3.6	-2.5	3797	76	2	92
4.0	868	58	3.6	-4.1	4313	127	3	146
4.5	853	52	3.0	-6.2	4777	188	6	182
5.0	834	50	1.5	-8.1	5374	187	10	184
5.5	819	54	0.2	-8.3	5883	176	10	177
6.0	806	59	-1.2	-8.4	6273	173	9	174
6.5	794	65	-2.0	-7.8	6683	176	9	173
7.0	782	70	-2.8	-7.0	7062	168	10	167
7.5	768	74	-4.1	-8.1	7531	162	15	163
8.0	756	77	-5.2	-8.6	7938	160	16	159
8.5	745	79	-5.7	-8.8	8316	151	14	162
9.0	732	82	-5.9	-8.5	8769	153	15	168
9.5	720	84	-3.2	-5.5	9186	214	26	213
10.0	709	87	-3.3	-5.2	9595	224	32	222
10.5	698	88	-3.8	-5.5	10002	223	31	223
11.0	687	88	-4.2	-5.9	10414	223	39	224
11.5	678	89	-5.1	-6.6	10755	224	31	226
12.0	666	89	-5.4	-6.9	11216	227	35	228
12.5	656	89	-6.3	-7.8	11605	233	37	232
13.0	644	88	-6.7	-8.4	11999	236	38	232
13.5	636	88	-7.8	-9.4	12399	235	32	234
14.0	628	87	-8.5	-10.3	12803	230	33	230
14.5	618	87	-9.0	-10.8	13213	228	37	231
15.0	608	87	-9.8	-11.6	13670	232	39	231
15.5	597	86	-10.5	-12.4	14077	233	43	233
16.0	587	85	-11.3	-13.3	14434	233	46	234
16.5	576	84	-11.8	-14.0	14910	232	46	233
17.0	565	83	-13.0	-15.3	15394	229	45	233
17.5	554	80	-14.2	-16.9	15795	233	47	238
18.0	544	80	-15.0	-17.7	16246	238	49	236
18.5	536	79	-15.7	-18.5	16704	241	47	241
19.0	528	78	-17.0	-19.9	17217	243	33	243
19.5	513	77	-18.6	-21.3	17785	246	53	245
20.0	503	75	-19.5	-22.6	18367	245	51	246
20.5	493	73	-20.6	-24.2	18755	247	53	248
21.0	484	72	-21.4	-25.2	19202	254	48	251
21.5	474	70	-22.5	-26.5	19605	255	47	253
22.0	464	68	-23.4	-27.4	20012	253	46	254
22.5	459	70	-24.7	-28.7	20477	255	45	255
23.0	450	69	-25.8	-29.9	20949	254	46	255
23.5	439	68	-27.2	-31.4	21536	254	45	253
24.0	428	68	-28.5	-32.6	22080	251	43	251
24.5	419	67	-29.5	-34.1	22633	258	44	251
25.0	410	67	-31.3	-35.5	23139	249	52	250
25.5	399	67	-33.2	-37.3	23769	254	50	253
26.0	391	66	-34.6	-38.8	24235	254	51	252
26.5	381	66	-36.0	-40.2	24827	253	54	253
27.0	372	68	-37.4	-41.6	25370	253	54	253
27.5	364	68	-38.8	-43.0	25861	252	55	252
28.0	355	68	-40.3	-44.3	26423	253	59	252
28.5	346	68	-41.8	-45.6	26996	250	65	251
29.0	338	68	-43.3	-46.9	27541	251	56	250
29.5	330	68	-44.9	-48.2	28041	251	56	250
30.0	322	68	-46.6	-49.5	28578	252	58	251
30.5	313	68	-48.2	-50.8	29193	250	65	250
31.0	305	68	-49.7	-52.1	29775	248	67	251
31.5	297	67	-51.0	-53.4	30330	250	65	250
32.0	290	67	-52.7	-54.7	30828	253	62	254
32.5	283	67	-53.6	-56.0	31344	256	68	257
33.0	275	67	-55.0	-57.3	31847	259	70	260
33.5	268	67	-56.3	-58.6	32355	266	65	263
34.0	262	66	-58.4	-59.4	32854	273	73	263
34.5	256	66	-59.3	-61.1	33511	262	75	263
35.0	248	66	-61.1	-62.9	34081	262	81	263
35.5	243	65	-63.5	-64.3	34631	262	81	263
36.0	238	65	-63.5	-64.3	34615	265	60	264
36.5	233	64	-64.0	-64.0	35343	265	80	267
37.0	228	64	-65.1	-65.1	35777	271	84	272
37.5	218	64	-67.7	-67.7	36131	281	81	278
38.0	216	64	-68.1	-68.1	36777	282	99	284
38.5	214	64	-61.4	-61.4	37055	285	61	284
39.0	208	64	-61.7	-61.7	37633	273	64	274
39.5	204	64	-61.7	-61.7	38027	266	62	266
40.0	199	64	-60.0	-60.0	38599	259	62	263
40.5	196	64	-60.5	-60.5	38842	257	72	264
41.0	191	64	-58.8	-58.8	39373	260	93	260
41.5	187	64	-59.8	-59.8	39808	262	84	261
42.0	182	64	-59.2	-59.2	40241	262	83	263
42.5	178	64	-61.3	-61.3	40818	259	53	258
43.0	174	64	-61.6	-61.6	41280	251	43	253
43.5	171	64	-61.4	-61.4	41634	245	30	246
44.0	168	64	-59.0	-59.0	41998	241	28	242
44.5	164	64	-57.1	-57.1	42468	246	38	246
45.0	161	64	-57.1	-57.1	42876	246	37	246
45.5	158	64	-57.0	-57.0	43266	241	54	251
46.0	154	64	-56.2	-56.2	43650	260	43	258
46.5	152	64	-56.0	-56.0	44073	262	44	
47.0	149	64	-56.0	-56.0	44499			

UW 2240Z JANUARY 6, 1961

TIME MIN	PRES MB	RH %	TEMP °C	OP °C	HEIGHT FT MSL	1 MIN DEG KNOT	2 MIN DEG KNOT RUN. AV.	4 MIN DEG KNOT RUN. AV.
0.0	1017	92	7.6	6.4	38	27	6	
0.5	1009	87	6.8	6.2	27	6		
1.0	993	82	6.0	5.1	692		60	8
1.5	977	77	5.7	2.9	1129	80	13	78
2.0	960	74	5.8	1.5	1602	87	15	85
2.5	945	74	4.8	0.2	2024	86	15	86
3.0	928	76	3.9	-0.2	2367	88	14	87
3.5	912	78	3.1	-0.4	2973	97	12	98
4.0	896	80	2.7	-0.4	3444	116	11	115
4.5	881	82	2.4	-0.4	3892	132	11	132
5.0	865	84	2.4	-0.4	4378	144	12	147
5.5	850	86	0.7	-1.4	4841	166	13	166
6.0	835	88	0.4	-1.4	5310	182	17	184
6.5	818	89	0.3	-1.3	5852	199	21	199
7.0	803	90	0.1	-1.3	6399	210	25	212
7.5	790	91	-0.8	-2.1	6768	211	29	212
8.0	774	92	-1.4	-2.5	7305	214	31	215
8.5	758	91	-1.7	-3.0	7851	221	33	220
9.0	745	90	-2.0	-3.4	8303	225	37	225
9.5	729	90	-2.1	-3.5	8870	230	40	230
10.0	715	90	-2.4	-3.8	9376	234	42	233
10.5	699	89	-3.5	-5.1	9965	234	44	234
11.0	685	88	-4.8	-6.5	10489	236	47	236
11.5	670	87	-5.7	-7.8	11061	238	48	238
12.0	655	86	-6.8	-8.8	11642	239	47	239
12.5	642	85	-7.7	-9.8	12156	240	45	240
13.0	629	83	-8.7	-11.1	12677	240	46	240
13.5	615	82	-10.0	-12.5	13249	240	50	240
14.0	599	79	-10.9	-13.5	13915	240	50	240
14.5	586	78	-12.7	-15.8	14467	244	48	244
15.0	573	76	-13.8	-17.2	15028	245	50	246
15.5	560	75	-14.8	-17.7	15603	249	47	248
16.0	549	72	-15.3	-19.3	16093	249	46	248
16.5	536	72	-16.6	-20.5	16686	248	43	248
17.0	525	72	-17.8	-21.7	17196	249	42	249
17.5	514	72	-18.9	-22.7	17715	249	43	248
18.0	501	69	-20.2	-24.5	18340	247	40	248
18.5	490	68	-21.4	-25.8	18878	246	38	247
19.0	479	67	-22.7	-27.2	19427	246	43	247
19.5	467	66	-24.2	-28.6	20036	248	45	247
20.0	458	65	-25.4	-30.0	20500	247	50	248
20.5	446	65	-26.5	-31.2	21131	248	50	249
21.0	438	65	-27.8	-32.4	21559	253	43	252
21.5	430	65	-28.9	-33.5	21993	253	48	252
22.0	421	64	-30.0	-35.1	22488	251	54	251
22.5	412	63	-31.7	-36.5	22991	251	50	250
23.0	403	63	-32.7	-37.5	23503	249	50	249
23.5	395	62	-34.2	-39.1	23965	247	51	248
24.0	387	62	-35.5	-40.3	24433	250	45	249
24.5	379	64	-36.8	-41.5	24909	251	43	250
25.0	372	60	-37.7	-42.1	25332	249	50	249
25.5	364	60	-38.9	-43.9	25823	248	49	248
26.0	355		-40.3		26385	249	46	249
26.5	348		-41.7		26929	249	48	249
27.0	341		-43.1		27480	247	55	247
27.5	333		-44.2		27803	247	55	247
28.0	325		-45.5		28337	247	55	248
28.5	318		-47.0		28812	250	53	251
29.0	311		-48.1		29294	255	48	254
29.5	303		-49.7		29854	257	53	257
30.0	295		-50.7		30429	259	55	257
30.5	289		-51.9		30867	258	55	258
31.0	283		-53.6		31311	256	62	257
31.5	275		-55.3		31914	257	55	257
32.0	268		-56.4		32453	258	53	258
32.5	263		-57.6		32944	258	63	257
33.0	257		-58.8		33320	256	63	257
33.5	251		-59.8		33806	259	63	259
34.0	244		-60.8		34218	242	75	261
34.5	240		-61.9		34720	260	72	261
35.0	235		-63.2		35146	261	64	263
35.5	228		-64.3		35755	269	74	268
36.0	223		-64.7		36199	270	84	269
36.5	217		-63.3		36747	268	96	269
37.0	211		-62.1		37314	271	61	269
37.5	206		-62.2		37801	265	32	264
38.0	200		-62.4		38400	252	39	255
38.5	196		-60.8		38910	254	39	256
39.0	193		-59.7		39126	261	51	260
39.5	188		-59.5		39644	261	66	261
40.0	183		-57.8		40220	260	65	260
40.5	179		-56.7		40476	257	50	258
41.0	175		-59.7		41141	255	43	254
41.5	171		-60.8		41614	247	38	249
42.0	167		-59.8		42098	245	39	246
42.5	163		-58.7		42597	248	53	248
43.0	160		-57.5		42981	245	64	246
43.5	157		-55.7		43374	248	61	249
44.0	154		-54.4		43779	254	61	252
44.5	151		-53.6		44193	251	48	251
45.0	148		-53.6		44613	247	42	247
45.5	145				45049			

SEA 6 JANUARY 1961 2330Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT RUN. AV.	2 MIN DEG KNOT RUN. AV.	4 MIN DEG KNOT RUN. AV.
0	1003	93	6.7	5.6	410	-0	-0	-0
1	978	78	6.0	2.4	1083	125	10	-0
2	947	80	5.1	1.9	1947	100	12	108
3	917	81	4.2	1.3	2814	110	12	114
4	888	83	3.3	0.8	3666	142	10	148
5	860	85	2.4	0.2	4523	187	16	188
6	833	87	1.5	-0.4	5369	207	26	208
7	806	88	0.7	-1.0	6210	221	32	221
8	781	90	-0.2	-1.5	7055	232	36	229
9	756	92	-1.0	-2.1	7901	232	38	229
10	732	90	-2.2	-3.6	8751	230	39	230
11	708	86	-3.8	-5.7	9618	229	40	229
12	684	82	-5.3	-7.8	10498	228	39	229
13	661	78	-6.9	-10.0	11381	228	37	228
14	638	74	-8.5	-12.2	12279	229	40	229
15	616	70	-10.0	-14.5	13180	232	44	232
16	594	67	-11.9	-16.7	14115	236	47	236
17	571	65	-13.8	-19.0	15066	239	48	238
18	551	63	-15.7	-21.2	15983	238	51	239
19	532	61	-17.4	-23.2	16847	239	51	239
20	513	59	-19.2	-25.2	17713	242	49	241
21	494	57	-21.2	-27.6	18668	242	52	242
22	474	55	-23.7	-30.2	19635	242	52	242
23	455	53	-26.1	-32.9	20591	242	47	241
24	438	51	-28.5	-35.5	21541	240	48	240
25	420	50	-30.9	-38.1	22482	240	49	240
26	404	48	-33.1	-40.6	23384	241	46	242
27	389	46	-35.4	-43.0	24287	247	42	245
28	373	45	-37.8	-45.6	25202	245	47	245
29	358	42	-40.2	-48.4	26121	243	49	244
30	344	27	-42.7	-51.6	27039	246	47	246
31	330	13	-45.2	-54.7	27955	249	49	249
32	316	0	-47.6	-57.8	28871	250	51	251
33	303	0	-50.0	-60.9	29785	252	54	252
34	290	0	-52.4	-64.0	30701	255	53	254
35	278	0	-54.7	-67.1	31575	255	55	254
36	267	0	-56.9	-70.2	32432	253	63	253
37	256	0	-59.1	-73.3	33305	252	67	253
38	245	0	-61.4	-76.4	34241	254	70	255
39	234	0	-63.7	-79.5	35178	261	68	260
40	222	0	-66.2	-82.6	36196	263	76	263
41	211	0	-68.7	-85.7	37224	265	71	264
42	201	0	-71.2	-88.8	38165	263	50	260
43	192	0	-73.6	-91.9	39103	251	68	254
44	183	0	-76.1	-95.0	40072	253	76	254
45	174	0	-78.5	-98.1	41095	260	46	256
46	165	0	-80.9	-101.2	42136	250	32	251
47	158	0	-83.3	-104.3	43048	241	41	244
48	151	0	-85.7	-107.4	43940	246	43	-0
49	145	0	-88.1	-110.5	44848	-0	-0	-0

UW 0315Z JANUARY 7, 1961

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL
0.5	1016	97	7.0	6.6	35
0.5	9.6	95	6.1	5.5	595
1.0	976	93	6.2	5.2	1141
1.5	956	92	6.8	5.6	1700
2.0	940	92	6.3	5.1	2155
2.5	918	93	6.2	5.2	2793
3.0	900	94	5.6	4.7	3326
3.5	881	95	4.8	4.1	3899
4.0	864	95	3.9	3.2	4420
4.5	846	95	3.0	2.3	4982
5.0	829	95	1.8	1.1	5521
5.5	813	95	1.1	0.4	6037
6.0	788	96	0.3	-0.3	6661
6.5	775	97	-0.3	-0.7	7299
7.0	754	97	-1.4	-1.8	8020
7.5	739	96	-2.2	-2.8	8545
8.0	723	93	-3.7	-4.7	9115
8.5	707	88	-5.0	-6.7	9694
9.0	699	85	-6.3	-8.7	10358
9.5	679	78	-6.0	-9.2	10734
10.0	664	83	-6.9	-9.3	11308
10.5	648	85	-8.2	-10.3	11931
11.0	634	87	-8.7	-10.5	12488
11.5	620	88	-9.5	-11.1	13055
12.0	608	88	-10.7	-12.3	13550
12.5	592	88	-11.7	-13.3	14222
13.0	578	87	-12.5	-14.2	14884
13.5	565	85	-13.9	-15.9	15593
14.0	551	83	-15.3	-17.5	16017
14.5	537	82	-16.8	-19.2	16653
15.0	522	78	-18.2	-21.2	17350
15.5	510	77	-19.1	-22.7	17918
16.0	498	76	-20.8	-24.0	18497
16.5	486	74	-22.2	-25.6	19087
17.0	472	73	-23.6	-27.1	19791
17.5	460	72	-25.0	-28.6	20407
18.0	447	72	-26.7	-30.3	21089
18.5	435	71	-28.3	-32.0	21731
19.0	423	70	-29.9	-33.7	22387
19.5	415	70	-31.2	-34.9	22833
20.0	408	69	-32.3	-36.1	23227
20.5	400	69	-32.9	-36.7	23685
21.0	391	69	-34.7	-38.5	24209
21.5	382	68	-35.7	-39.6	24742
22.0	374	69	-37.0	-40.7	25223
22.5	366	70	-38.3	-41.8	25713
23.0	358	70	-39.2	-42.7	26211
23.5	352		-40.3		26590
24.0	345		-41.3		27038
24.5	337		-42.7		27559
25.0	330		-43.6		28023
25.5	324		-44.4		28427
26.0	317		-45.2		28907
26.5	312		-46.0		29254
27.0	305		-46.8		29749
27.5	301		-47.6		30035
28.0	295		-48.1		30471
28.5	290		-49.2		30840
29.0	285		-50.2		31214
29.5	279		-51.2		31668
30.0	273		-52.3		32131
30.5	264		-54.1		32840
31.0	254		-56.2		33649
31.5	245		-57.9		34398
32.0	236		-59.7		35169
32.5	228		-61.7		35873
33.0	221		-64.0		36503
33.5	216		-65.4		36961
34.0	212		-66.3		37334
34.5	207		-66.7		37808
35.0	202		-65.9		38294
35.5	198		-65.4		38692
36.0	193		-65.3		39203
36.5	188		-65.4		39727
37.0	184		-65.6		40156
37.5	180		-65.9		40594

SEA 7 JANUARY 1961 0530Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	1003	93	6.1	5.1	410			
1	961	85	8.7	6.3	1563			
2	920	90	6.9	5.4	2733			
3	881	88	4.6	2.8	3909			
4	842	81	2.0	-0.8	5088			
5	806	79	0.5	-2.7	6273			
6	770	76	-1.1	-4.7	7467			
7	735	74	-2.6	-6.6	8670			
8	702	72	-4.3	-8.6	9871	220	37	
9	670	72	-6.9	-11.1	11072	220	40	220 39
10	639	73	-9.4	-13.3	12267	221	40	220 41
11	609	77	-11.4	-14.6	13465	217	42	217 41
12	579	81	-13.5	-16.1	14772	214	42	214 42
13	548	84	-15.6	-17.6	16098	213	40	213 41
14	519	83	-18.2	-20.4	17453	211	40	211 40
15	491	81	-20.9	-23.3	18791	209	40	210 40
16	465	79	-24.1	-26.7	20132	212	38	214 39
17	438	76	-27.5	-30.4	21559	223	41	223 40
18	411	74	-30.9	-34.1	23018	231	46	230 45
19	385	73	-34.8	-37.8	24506	235	48	235 48
20	361	75	-38.9	-41.6	25982	237	51	237 51
21	340	58	-42.4	-47.4	27362	237	55	236 54
22	320	38	-45.5	-54.2	28648	235	56	236 56
23	301	17	-48.9	-64.4	30013	236	59	237 59
24	282	0	-52.3	-74.4	31378	240	55	241 54
25	266	0	-55.6	-84.4	32651	248	49	245 52
26	250	0	-59.0	-94.4	33927	245	55	243 52
27	234	0	-62.4	-104.4	35206	239	53	238 53
28	219	0	-66.1	-114.4	36595	242	52	244 53
29	204	0	-69.6	-124.4	38012	256	59	252 55
30	190	0	-73.2	-134.4	39400	254	52	252 55
31	177	0	-76.9	-144.4	40748	243	56	243 55
32	166	0	-80.5	-154.4	42104	235	58	236 58
33	156	0	-84.1	-164.4	43427	233	59	233 59
34	146	0	-87.7	-174.4	44745	-0	-0	-0 -0

SEA 7 JANUARY 1961 1130Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	1000	71	8.3	3.3	410	-0	-0	-0 -0
1	973	57	10.5	2.4	1133	133	29	-0 -0
2	947	46	12.5	0.8	1878	132	12	138 16
3	922	51	11.0	0.9	2629	167	11	162 13
4	896	56	9.4	0.9	3413	176	19	178 18
5	869	61	7.8	0.6	4220	186	24	187 21
6	844	66	6.3	0.3	5029	195	26	194 25
7	819	53	4.7	-4.2	5830	201	29	199 28
8	795	46	3.0	-7.8	6626	205	32	204 31
9	771	59	0.8	-6.5	7423	205	32	204 32
10	748	50	-1.3	-10.6	8221	202	32	202 32
11	725	56	-3.1	-10.8	9020	199	32	199 33
12	703	74	-4.7	-8.6	9820	194	35	195 35
13	681	70	-6.2	-10.7	10640	195	38	196 37
14	659	61	-7.7	-13.9	11478	202	39	202 38
15	638	52	-9.2	-17.3	12319	211	39	210 39
16	618	44	-10.6	-20.9	13140	215	40	216 41
17	598	49	-12.2	-21.0	13947	222	43	222 43
18	579	60	-14.0	-20.2	14757	228	48	227 47
19	559	61	-15.7	-21.5	15632	228	49	227 50
20	538	63	-17.5	-22.9	16552	226	54	226 53
21	518	65	-19.3	-24.3	17476	225	53	224 51
22	501	66	-20.9	-25.6	18300	221	43	221 45
23	484	68	-22.5	-26.8	19128	217	40	219 41
24	468	69	-24.1	-28.1	19956	220	43	220 42
25	452	71	-25.7	-29.4	20777	223	44	222 44
26	437	72	-27.3	-30.7	21602	224	45	224 45
27	421	70	-29.3	-32.9	22430	225	46	225 47
28	407	68	-31.4	-35.4	23270	225	52	224 51
29	392	65	-33.5	-37.8	24111	222	55	222 54
30	377	62	-35.7	-40.4	24978	220	53	220 53
31	363	59	-37.9	-43.0	25884	218	53	219 53
32	348	56	-40.2	-45.7	26792	220	53	220 54
33	333	50	-42.8	-49.2	27777	223	56	223 53
34	318	44	-45.4	-52.9	28782	226	52	225 52
35	304	37	-48.1	-56.8	29796	226	49	226 50
36	290	31	-50.8	-60.8	30815	224	51	225 51
37	276	24	-53.5	-65.2	31859	223	51	224 51
38	262	18	-56.4	-70.3	32940	224	53	225 52
39	249	11	-59.2	-76.3	34013	227	54	226 52
40	236	5	-61.9	-84.8	35064	226	55	227 52
41	224	0	-64.3	-90.0	36118	227	48	228 52
42	212	0	-65.1	-90.0	37183	232	47	231 49
43	201	0	-65.9	-90.0	38247	232	54	232 55
44	191	0	-66.7	-90.0	39272	230	66	229 65
45	181	0	-67.5	-90.0	40308	226	76	227 70
46	172	0	-68.3	-90.0	41392	228	65	229 63
47	162	0	-69.1	-90.0	42512	239	47	234 50
48	155	0	-69.6	-90.0	43406	233	40	230 40
49	148	0	-70.2	-90.0	44406	-0	-0	-0 -0

SEA 7 JANUARY 1961 1730Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	995	68	8.9	3.2	410	-0	-0	-0
1	965	53	10.2	1.0	1242	133	26	-0
2	935	42	12.6	-0.6	2086	135	17	142
3	905	38	10.9	-3.5	2998	169	19	167
4	874	34	9.1	-6.6	3927	185	25	183
5	846	30	7.5	-9.7	4810	190	28	188
6	820	27	5.9	-12.8	5648	186	28	187
7	795	23	4.3	-16.0	6488	185	30	189
8	770	20	2.7	-19.6	7346	197	34	196
9	745	16	1.7	-23.4	8209	202	38	200
10	720	15	0.1	-25.4	9128	200	41	200
11	693	19	-2.3	-24.2	10126	200	45	200
12	666	23	-4.8	-24.0	11130	199	46	198
13	640	25	-7.4	-25.2	12150	195	47	195
14	615	27	-10.0	-26.5	13169	191	47	192
15	591	28	-12.6	-28.0	14169	191	48	191
16	568	33	-14.7	-28.1	15171	191	52	191
17	547	41	-15.9	-26.4	16089	192	52	193
18	527	25	-17.9	-34.2	17000	195	51	194
19	508	25	-20.2	-35.9	17922	195	51	195
20	488	25	-22.4	-37.7	18855	197	51	197
21	470	42	-24.3	-33.8	19786	200	57	200
22	452	58	-26.1	-31.9	20702	201	60	201
23	435	57	-28.0	-34.0	21622	203	60	203
24	418	55	-30.0	-36.2	22528	204	60	204
25	402	54	-31.9	-38.3	23433	203	56	203
26	387	49	-34.2	-41.2	24331	202	56	202
27	372	45	-36.4	-44.3	25207	201	53	201
28	358	40	-38.6	-47.5	26085	199	56	201
29	345	35	-40.7	-50.7	26952	203	55	203
30	332	30	-42.8	-53.9	27818	206	53	204
31	318	25	-45.0	-57.4	28723	202	58	203
32	304	20	-47.4	-61.6	29719	204	61	204
33	290	15	-49.8	-66.3	30711	207	61	206
34	278	10	-52.0	-71.5	31641	207	63	207
35	266	5	-54.2	-78.9	32572	208	69	208
36	253	0	-56.6	-80	33571	207	67	207
37	241	0	-59.2	-80	34588	207	68	208
38	228	0	-60.7	-80	35748	208	70	208
39	214	0	-62.4	-80	37011	210	70	211
40	202	0	-63.9	-80	38187	213	68	211
41	191	0	-64.5	-80	39352	209	62	209
42	179	0	-64.2	-80	40569	205	59	209
43	169	0	-63.8	-80	41814	217	64	215
44	160	0	-60.7	-80	42912	220	67	216
45	151	0	-57.2	-80	44024	205	52	-0
46	143	0	-53.7	-80	45179	-0	-0	-0

SEA 7 JANUARY 1961 2330Z

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	2 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	988	71	10.6	5.5	410	-0	-0	-0
1	957	43	12.1	-0.7	1266	153	24	-0
2	927	35	11.8	-3.8	2132	161	20	164
3	894	27	11.5	-8.2	3137	176	33	176
4	860	25	9.5	-10.9	4181	182	44	183
5	828	25	7.1	-12.8	5206	189	49	188
6	798	25	4.6	-14.7	6223	192	48	191
7	769	26	2.3	-16.5	7195	192	44	190
8	742	26	-0.3	-18.4	8136	190	41	190
9	716	27	-2.9	-20.3	9081	188	42	188
10	690	28	-5.6	-22.2	10033	185	45	185
11	664	28	-8.2	-24.1	10986	183	47	184
12	642	29	-10.6	-25.7	11874	185	48	185
13	619	30	-13.0	-27.8	12764	187	50	187
14	596	30	-15.7	-29.8	13732	189	55	189
15	571	24	-16.9	-33.7	14758	191	67	191
16	549	22	-18.2	-35.9	15736	190	85	190
17	529	20	-19.5	-38.1	16666	188	89	189
18	508	18	-20.8	-40.4	17619	188	84	188
19	487	18	-23.2	-42.1	18645	187	89	187
20	466	19	-25.7	-43.9	19673	185	90	185
21	447	19	-28.1	-45.6	20699	182	85	182
22	427	20	-30.6	-47.4	21726	180	87	180
23	407	20	-33.3	-49.4	22884	178	89	178
24	387	17	-36.4	-53.5	24035	176	81	176
25	369	13	-39.3	-58.8	25095	176	83	176
26	352	8	-42.2	-65.2	26158	177	104	177
27	335	4	-45.1	-74.3	27230	177	103	176
28	319	0	-48.0	-80	28302	174	80	175
29	304	0	-50.3	-80	29352	175	101	174
30	289	0	-52.5	-80	30412	174	114	174
31	274	0	-54.9	-80	31529	175	88	177
32	260	0	-56.9	-80	32621	184	96	183
33	248	0	-58.6	-80	33595	188	94	186
34	236	0	-60.4	-80	34574	186	79	187
35	224	0	-62.3	-80	35645	187	98	188
36	213	0	-64.2	-80	36723	189	126	189
37	203	0	-63.5	-80	37650	189	120	190
38	194	0	-62.5	-80	38574	191	137	193
39	183	0	-53.0	-80	39791	204	86	203
40	170	0	-52.7	-80	41328	235	43	218
41	162	0	-52.5	-80	42370	213	48	220
42	155	0	-52.6	-80	43295	218	19	-0
43	148	0	-52.6	-80	44231	-0	-0	-0

UN 00452 JANUARY 8, 1961

TIME MIN	PRES MB	RH %	TEMP °C	DP °C	HEIGHT FT MSL	1 MIN DEG KNOT	2 MIN DEG KNOT RUN AV	4 MIN DEG KNOT RUN AV
0	998	47	13.4	1.8	110	193	22	188
1	978	39	12.8	-1.4	1439	183	23	193
2	958	38	12.5	-2.0	2080	195	22	193
3	939	43	10.6	-4.0	2734	201	20	198
4	907	46	9.0	-6.9	3307	195	16	196
5	888	49	7.5	-9.9	3902	192	16	193
6	867	52	6.0	-12.8	4510	192	18	190
7	846	54	4.6	-15.7	5116	187	26	187
8	827	55	3.3	-18.6	5747	184	37	185
9	806	46	3.1	-21.5	6341	188	42	185
10	786	39	1.9	-24.4	6925	194	47	194
11	767	38	0.5	-27.3	7513	188	44	188
12	745	41	-1.4	-30.2	8104	193	46	193
13	727	40	-3.0	-33.1	8614	196	49	195
14	708	40	-4.8	-36.0	9130	195	45	195
15	691	44	-6.8	-38.9	9655	197	46	197
16	672	48	-8.8	-41.8	10186	193	54	193
17	654	52	-10.7	-44.7	10724	191	48	190
18	638	58	-12.7	-47.6	11267	187	47	187
19	619	57	-14.5	-50.5	11813	182	45	182
20	605	72	-16.5	-53.4	12362	177	46	179
21	588	77	-18.6	-56.3	12912	180	46	180
22	573	80	-20.7	-59.2	13465	181	51	182
23	557	81	-22.8	-62.1	14021	186	50	185
24	543	80	-24.9	-65.0	14579	187	41	184
25	529	78	-27.0	-67.9	15139	189	40	191
26	517	78	-29.1	-70.8	15705	195	40	192
27	504	78	-31.2	-73.7	16277	190	38	191
28	491	75	-33.3	-76.6	16851	188	31	188
29	481	75	-35.4	-79.5	17427	185	26	186
30	471	74	-37.5	-82.4	18004	186	28	186
31	462	73	-39.6	-85.3	18582	187	26	186
32	452	73	-41.7	-88.2	19161	187	31	187
33	443	72	-43.8	-91.1	19741	187	41	187
34	427	72	-45.9	-94.0	20322	189	42	189
35	413	72	-48.0	-96.9	20904	190	37	190
36	402	70	-50.1	-99.8	21487	191	36	191
37	388	69	-52.2	-102.7	22071	189	45	189
38	376	69	-54.3	-105.6	22656	186	46	185
39	364	69	-56.4	-108.5	23241	176	37	175
40	353	69	-58.5	-111.4	23826	165	46	164
41	345	69	-60.6	-114.3	24411	149	40	149
42	340	69	-62.7	-117.2	25000	149	40	149

UN 02002 JANUARY 8, 1961

TIME	PRES	RH	TEMP	DP	HEIGHT	1 MIN	2 MIN	4 MIN
MIN	MB	%	°C	°C	FT MSL	DEG KNOT	DEG KNOT	DEG KNOT
						RUN	AV.	RUN. AV.
0.	1003	86	10.1	7.9	50			
0.5	987	78	10.0	6.3	489	170	18	168
1.0	968	73	9.3	4.6	1019	166	31	169
1.5	948	70	8.5	3.0	1587	169	38	169
2.0	930	67	7.9	2.0	2107	172	37	172
2.5	914	66	7.3	1.2	2577	177	35	177
3.0	895	65	6.3	0.1	3143	183	30	183
3.5	878	66	5.2	-0.8	3653	194	23	194
4.0	860	67	3.8	-1.9	4213	209	25	209
4.5	844	67	2.7	-2.7	4713	207	42	204
5.0	825	69	1.3	-3.8	5316	196	50	199
5.5	811	72	-0.1	-4.9	5767	197	36	197
6.0	792	75	-1.8	-6.0	6388	199	26	200
6.5	778	78	-3.1	-7.3	6953	205	24	205
7.0	763	82	-3.9	-8.5	7358	213	25	209
7.5	750	83	-4.8	-9.3	7803	206	23	209
8.0	737	85	-5.9	-10.4	8254	210	24	212
8.5	722	85	-6.7	-11.8	8782	219	26	216
9.0	708	85	-7.6	-13.5	9288	225	22	220
9.5	696	85	-8.6	-14.9	9790	230	20	228
10.0	684	85	-9.7	-16.8	10162	191	33	191
10.5	667	84	-10.5	-17.3	10799	175	20	182
11.0	656	84	-11.6	-18.8	11218	177	11	178
11.5	643	83	-12.4	-19.7	11721	183	19	183
12.0	631	83	-13.1	-20.7	12131	177	27	186
12.5	622	82	-13.8	-21.6	12551	187	27	187
13.0	611	82	-14.9	-17.3	12995	187	30	187
13.5	598	81	-16.2	-18.7	13528	187	30	187
14.0	588	80	-17.0	-19.6	13944	186	28	187
14.5	577	79	-18.2	-21.0	14408	186	31	187
15.0	565	78	-19.4	-22.4	14919	187	37	186
15.5	550	77	-20.2	-23.2	15579	187	38	186
16.0	538	77	-21.4	-24.4	16115	185	33	186
16.5	528	77	-22.8	-25.7	16587	185	36	185
17.0	514	76	-24.1	-27.2	17213	185	38	185
17.5	504	75	-25.4	-28.4	17813	183	37	184
18.0	490	75	-26.5	-29.6	18352	183	37	
18.5	477	75	-27.7	-30.8	18988			

APPENDIX B

This section contains the list of pilot reports used in the analysis of the time section.

JANUARY 6, 1961

0540Z 5 W SEA 30 CAVU N and W
 1540Z TOPS PAE 50 /⊕ ABV
 1730Z OVR PAE 100 ⊕ LYRD 310
 1730Z S TCM MDT RIME AND CIR ICG AT 110
 1740Z TCM S BND TOPS 170-200 BLD UP TO W
 1745Z OVR TCM 80 ⊕ SCTD BLO 0°C
 1825Z LGT RIME 80-100 20W TCM
 1825Z 20W TCM LGT RIME LGT-MDT TURBC 80-100
 1840Z EPH-ELN-SEA 140 MDT RIME ICG TMP-4
 1940Z 10 S TCM 50⊕130 THN CI ABV
 2010Z 70 S BF1⊕TOPS 35M
 2025Z OVR TCM⊕340
 2100Z CI TOP 320 AT 350 TMP -51 WIND 235 AT 68
 2130Z OUR PAE 36 ⊕
 2130Z TCM 8⊕ V⊕10 40⊕165 R+ 8⊕V⊕10 40⊕R+
 2200Z TCM 4⊕18 50⊕290
 2330Z OVR TCM 10 ⊕ 30 100⊕240
 2345Z 30 S TCM TPS 300

JANUARY 7, 1961

0020Z NO CLDS INDICATED WIND AT 280 250 AT 82
 0131Z E TCM T OVC 266
 0240Z VCY TCM BETWEEN LYRS AT 70
 0345Z T OVC 230 VCY TCM
 1815Z OUR TCM ⊕ 320 TOP OF FOG 450 FEET
 2105Z OUR PAE 200 ⊕ 300

JANUARY 8, 1961

1520Z 10 W TCM TPS 50-70
 1650Z ⊕80 OVR TCM
 1749Z C/O PAE ⊕ 45-55 MDT TURBC ON C/O
 2245Z OUR TCM 35⊕150 190 220/⊕ABV