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ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-51B) LAUNCH

By G. L. Jasper, D. L. Johnson, C. K. Hill, and G. W. Batts
Systems Dynamics Laboratory

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*Computer Sciences Corporation, Huntsville, Alabama

16. ABSTRACT

This report presents a summary of selected atmospheric conditions observed near Space Shuttle STS-51B launch time on April 29, 1985, at Kennedy Space Center Florida. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of pre-launch Jimsphere measured vertical wind profiles is given in this report. The final atmospheric tape, which consists of wind and thermodynamic parameters versus altitude, for STS-51B vehicle ascent has been constructed. The STS-51B ascent atmospheric data tape has been constructed by Marshall Space Flight Center's Atmospheric Sciences Division to provide an internally consistent data set for use in post flight performance assessments.

This is the last regular formal report of Space Shuttle launched from Kennedy Space Center, Florida. The Atmospheric Effects Branch will maintain atmospheric environment data files for reference on future missions through the first few Vandenberg Air Force Base (VAFB) launches.

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ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-51B) LAUNCH

I. INTRODUCTION

This report presents an evaluation of the atmospheric environmental data taken during the launch of the Space Shuttle/STS-51B vehicle. This Space Shuttle vehicle was launched from Pad 39A at Kennedy Space Center (KSC), Florida, on a bearing of 38 deg east of north at 1602 UT (1202 EDT) on April 29, 1985.

This report presents a summary of the atmospheric environment at launch time (L+0) of the STS-51B, together with the sequence of prelaunch Jimsphere measured winds aloft profiles from L-22 hr through liftoff. The general atmospheric situation for the launch and flight area is described, and surface and upper level wind/thermodynamic observations near launch time are given. Since the ship Redstone was unavailable for STS-51B duty, the SRB descent/impact atmospheric data were not taken. However, one can use the STS-51B ascent data for SRB studies, as the best substitute.

Previous MSFC-related launch vehicle atmospheric environmental conditions have been published as Appendix A of individual MSFC Saturn Flight Evaluation Working Group reports [1]. Office memorandums have been issued for previous flights giving launch pad wind information. A report has also been published [2] which summarizes most launch atmospheric conditions observed for the past 155 MSFC/ABMA-related vehicle launches through SA-208 (Skylab 4). Reports summarizing ASTP, STS-1 through STS-51D launch conditions are presented in References 3 through 19, respectively. Table 1 gives the atmospheric L+0 launch conditions for all Space Shuttle missions.

II. SOURCES OF DATA

Atmospheric observational data used in this report were taken from synoptic maps made by the National Weather Service, plus all available surface observations and measurements from around the launch area. Upper air observations were taken from balloon-released instruments sent aloft from Cape Canaveral Air Force Station (CCAFS). High-altitude winds and thermodynamic data were measured by the Super-Loki rocketsondes launched from the CCAFS. Table 2 presents a listing of systems used to obtain the upper level wind profiles used in compiling the final ascent atmospheric data tape. Data cutoff altitudes are also given in Table 2.

III. GENERAL SYNOPTIC SITUATION AT LAUNCH TIME

A massive area of high pressure, centered over Michigan, was building over the eastern half of the United States during the launch of STS-51B. A weak frontal system stretched eastward from a low over northeastern New Mexico extending into the Atlantic Ocean, just east of Georgia. Surface winds were moderate and northerly. Figure 1 shows the surface weather map approximately 4 hr before launch of STS-51B.

The wind flow aloft was ruled by northwesterly winds over the KSC Florida area. Figure 2 depicts the winds aloft condition approximately 4 hr prior to launch. Clouds were scattered over the KSC launch area around launch of STS-51B. Total sky cover at liftoff was five-tenths. Figure 3 exhibits the GOES-6 visible picture taken at 1600 UT (2 min before liftoff). Figure 4 presents an up-close visible picture of the Florida peninsula as recorded by GOES-6, taken also at 1600 UT.

IV. SURFACE OBSERVATIONS AT LAUNCH TIME

Surface observations at launch time for selected KSC locations are given in Table 3. Included are pad 39A, shuttle runway, and CCAFS balloon release station observations. Neither precipitation nor lightning was observed at launch time.

Table 4 presents Pad 39A wind data along with other standard hourly atmospheric measurements and sky observations for the 6-hr period prior to launch of STS-51B. Values for wind speed and direction are given for the 84 m (275 ft) FSS reference level and 18 m (60 ft) pad light pole level.

V. UPPER AIR MEASUREMENTS DURING LAUNCH

The FPS-16 Jimsphere (1617 UT), MSS Rawinsonde (1628 UT), Super-Loki Rocketsonde (1730 UT), and Super-Loki Robin (1700 UT) systems were used to measure the upper level wind and thermodynamic parameters for STS-51B launch. At altitudes above the rocket-measured data, the Global Reference Atmosphere (GRA) [20] parameters for April KSC conditions were used. A tabulation of the STS-51B final atmospheric data for ascent is presented in Table 5 which lists the wind and thermodynamic parameters versus altitude. A brief summary of parameters is given in the following paragraphs.

A. Wind Speed

At launch time, wind speeds were 11.5 ft/sec (6.8 kn) at 60 ft and increased to a maximum of 68 ft/sec (40 kn) flowing from 297 deg. This maximum occurred at an altitude of 40,700 ft (12,405 m). The winds decreased above this level as shown in Figure 5. The overall maximum measured speed was 189 ft/sec (112 kn) at 257,000 ft (78,334 m) altitude.

B. Wind Direction

At launch time, the 60-ft wind direction was from the north (005 deg) and shifted to a northwesterly component by 5,000 ft (1524 m). Winds kept this northwesterly flow until the 51,400 ft (15,667 m) altitude level where they returned to a northerly flow. The winds displayed an oscillatory pattern above the previously mentioned level throughout 209,000 ft (63,703 m). Above this level to 301,000 ft (91,745 m) winds favored an easterly component and above this altitude the winds displayed a westerly component.

C. Prelaunch/Launch Wind Profiles

Prelaunch/launch wind profiles presented in Figures 6 through 9 were measured by the Jimsphere FPS-16 system for the launch at 1602 UT, April 29, 1985. Data are shown for four measurement periods beginning at L-13 hr and extending through L+0.

The wind speed and direction profiles for the 13 hr period prior to and including L+0 are shown in Figures 6 and 7. The in-plane (head-tail wind) and out-of-plane (left-right crosswind) profiles are given on Figures 8 and 9. The wind speeds and associated component values did not differ significantly from the April means. No exceedances in the simulated, ascent loads were calculated throughout the entire countdown period. The prelaunch atmospheric conditions are discussed in more detail in Section III.

D. Thermodynamic Data

The thermodynamic data taken at STS-51B launch time, consisting of atmospheric temperature, dew-point temperature, pressure, and density have been compiled as the STS-51B ascent atmospheric data and are presented in Table 5. The vertical structure of temperature (T) and dew-point temperature (T_d) for the STS-51B ascent are shown graphically versus altitude in Figure 10.

The atmospheric thermodynamic parameters of temperature, pressure, and density, measured during STS-51B launch below 116,000 ft were all within 4 percent of their respective PRA-63 [21] annual values. All these parameters stayed within 13 percent of their respective PRA-63 values, at all levels of measurement.

E. SRB Upper Air and Surface Measurements

As has been mentioned in the introduction, since there was no ship available, an SRB descent atmospheric data tape has not been constructed. The tabular values for the ascent atmospheric tape as presented in Table 5 should be used for SRB descent/impact studies since it is the closest measured data source.

TABLE 1. SELECTED ATMOSPHERIC OBSERVATIONS FOR THE FLIGHTS OF THE SPACE SHUTTLE VEHICLES

Vehicle Data				Surface Observations					Inflight Conditions Max. Wind Below 60,000 ft			Count Down and Launch Comments of Meteorological Significance
				Thermodynamic[a]			Wind[b]					
Seq. No.	Vehicle No.	Launch Date	Time (EST) Nearest Minute	Press.[c] N/cm^2	Temp. (°C)	Rel. Hum. (%)	Speed (ft/sec)	Dir. (deg)	Alt. (ft)	Speed (ft/sec)	Dir. (deg)	
1	STS-1 Columbia	4/12/81	0700	10.234[d]	21	82	11.8 15.2	125 120	44,300	98	250	
2	STS-2 Columbia	11/12/81	1010	10.166	23	61	27.0 27.0	345 355	36,300	158	286	
3	STS-3 Columbia	3/22/82	1100	10.160	24	71	7.0[e] 8.0[e]	50[e] 145[e]	45,000	119	250	Wind directional change observed at Pad just prior to L+0. Onset of sea breeze.
4	STS-4 Columbia	6/27/82	1100[f]	10.200	29	70	5.8[g] 4.9[g]	133[g] 141[g]	47,900	37	329	
5	STS-5 Columbia	11/11/82	0719	10.227	22	68	22.0 35.0	90 90	40,600	146	336	
6	STS-6 Challenger	4 4/83	1330	10.183	23	55	12.7 16.4	63 55	46,100	155	277	
7	STS-7 Challenger	6/18/83	0733[f]	10.146	25	80	5.9[e] 10.3[e]	10[e] 350[e]	45,900	76	278	
8	STS-8 Challenger	8/30/83	0232[f]	10.111	24	97	8.8 14.0	269 268	45,100	30	349	17 min countdown delay due to adverse weather conditions.
9	STS-9 (SL-1) Columbia	11/28/83	1100	10.153	24	83	19.1 32.0	183 190	47,100	117	252	
10	STS-11 (41-B) Challenger	2/3/84	0800	10.173	17	75	0.0 NA	0 NA	38,200	143	288	
11	STS-13 (41-C) Challenger	4/6/84	0858	10.149	16	56	21.5 18.6	320 275	37,700	176	289	
12	STS-41D Discovery	8/30/84	0842[f]	10.172	26	81	3.0 3.6	106 39	40,300	44	270	
13	STS-41G Challenger	10/5/84	0703[f]	10.210	23	60	16.5 14.8	73 58	40,600	78	303	
14	STS-51A Discovery	11/8/84	0715	10.227	20	59	23.0 31.1	24 10	33,100	131	272	1 day delay due to excessive wind loads, calculated at high altitudes.

a. Pad 39A thermodynamic measurements taken at approximately 1.2 m (4 ft) above natural grade at camera site No. 3.
b. 1 min average prior to L+0 of 60 ft PLP (listed first) and 275 ft FSS winds measured above natural grade.
c. Pressure measurement applicable to 21 ft above MSL unless otherwise indicated.
d. Pressure measurement applicable to 14 ft above MSL.
e. 10 sec average prior to L+0.
f. Eastern Daylight Time.
g. 30 sec average prior to L+0.
h. All vehicles launched from LC39A

TABLE 1. (Concluded)

Vehicle Data[h]				Surface Observations					Inflight Conditions Max. Wind Below 60,000 ft			
				Thermodynamic[a]			Wind[b]					
Seq. No.	Vehicle No.	Launch Date	Time (EST) Nearest Minute	Press.[c] N/cm^2	Temp. (°C)	Rel. Hum. (%)	Speed (ft/sec)	Dir. (deg)	Alt. (ft)	Speed (ft/sec)	Dir. (deg)	Count Down and Launch Comments of Meteorological Significance
15	STS-51C Discovery	1/24/85	1450	10.173	18	46	17.1 15.5	228 253	42,900	199	265	1 day delay due to extreme cold surface temperatures.
16	STS-51D Discovery	4/12/85	1359	10.257	21	55	19.9 22.3	82 82	42,600	134	265	55-min delay due to a ship in the SRB impact area, and concerns over potential weather related impacts (cloud cover).
17	STS-51B Challenger	4/29/85	1202[f]	10.128	27	65	11.5 18.4	005 337	32,900 40,700	68 68	320 297	

TABLE 2. SYSTEMS USED TO MEASURE UPPER AIR WIND DATA FOR STS-51B ASCENT

Type of Data	Date: April 29, 1985		Portion of Data Used			
	Release Time		Start		End	
	Time (UT) (hr/min)	Time After L+0 (min)	Altitude m (ft)	Time After L+0 (min)	Altitude m (ft)	Time After L+0 (min)
FPS-16 Jimsphere	16:17	15	6 (21)	15	18,288 (60,000)	75
MSS Rawinsonde	16:28	26	18,593 (61,000)	87	29,870 (98,000)	124
Super-Loki Rocketsonde (Datasonde)	17:30	88	58,826 (193,000)	88	30,175 (99,000)	107
Super-Loki Rocketsonde (Robin)	17:00	58	83,515 (274,000)	58	59,131 (194,000)	59

TABLE 3. SURFACE OBSERVATIONS AT STS-51B LAUNCH TIME

Location[a]	Time After L+0 (min)	Pressure (MSL) N/cm^2 (psia)	Temperature °K (°F)	Dew Point °K (°F)	Relative Humidity (%)	Visibility km (miles)	Sky Cover			Wind	
							Cloud** Amount	Cloud Type	Height of Base Meters (ft)	Speed ft/sec (kt)	Direction (deg)
NASA Space Shuttle Runway X68[e] Winds Measured at 10.4 m (34 ft)	1	10.135 (14.699)	302.2 (84.2)	294.3 (70.0)	63	11 (7)	2 4	Cumulus Cirro-stratus	610 (2,000) 7,620 (25,000)	13.5 (8.0)	360
CCAFS XMR[c] Surface Measurements	1	10.132 (14.695)	301.9 (83.8)	292 6 (67.0)	58	11 (7)	4 10	Cumulus Cirro-stratus	549 (1,800) 7,620 (25,000)	21.9 (13.0)	360
Pad 39A[d] Lightpole NW 18.3 m (60.0 ft)	0	10.128* (14.689)*	300.5 (81.3)	293.2 (68.0)	65	-	-	-	-	11.5[b] (6.8)	005[b]
Pad 39A FSS (Top NW) 83.8 m (275 ft)	0	-	-	-	-	-	-	-		18.4[b] (10.9)	337[b]

*Pad 39A Camera Site 3 barometric pressure instrument appeared to be reading too low. Therefore, the KSC Shuttle runway station pressure value interpolated to 10.128 N/cm^2 at 21 ft above MSL was used as the L+0 pad atmospheric pressure measurement.

**5/10 total sky cover reported at X68 and 10/10 at XMR.

a. Altitudes of measurements are above natural grade, except where noted.

b. Approximately 1 min average prior to L+0.

c. Balloon release site.

d. Pad 39A thermodynamic measurements are taken at camera site No. 3, approximately 6.4 m (21 ft) above MSL.

e. Official STS-51B sky observational site.

TABLE 4. STS-51B PRE-LAUNCH THROUGH LAUNCH KSC PAD 39A ATMOSPHERIC MEASUREMENTS[a]

Hourly Atmospheric Measurements								Sky Condition[b]			
29 April 1985 Time UT	Temp. (°F)	Dew Point (°F)	RH (%)	275' Level (NW)		60' Level (NW)		Clouds	Total Sky Cover	Vis. (mi)	Other Remarks
				WS Kt	WD°	WS Kt	WD°				
1000	71	68	90	13	258	11	291	Scattered at 1200 and 3000 ft and overcast at 25,000 f	10/10	7	
1100	71	68	91	14	246	9	272	Scattered at 25,000 ft	5/10	5	Vision obstructed by fog.
1200	72	69	91	11	257	8	295	Clear skys	0/10	5	Vision obstructed by fog and haze
1300	75	70	85	14	265	12	294	Scattered at 1200 ft	2/10	6	Vision obstructed by haze
1400	78	71	79	12	272	12	304	Scattered at 1200 ft and thin scattered at 29,000 ft	2/10	7	
1500	81	69	68	10	305	10	329	Scattered at 1500, 14,000 and 29,000 ft	3/10	7	
1600	81	68	65	7	307	8	359	Scattered at 2000 and thin scattered at 25,000 ft	5/10	7	
L+0[c] 1602	81	68	65	11	337	7	005	Scattered at 2000 and thin scattered at 25,000 ft	5/10	7	Towering Cumulus SW

a. Hourly pad observations (obtained via MSFC/HOSC) averaged over 2 min, centered on the hour.

b. Sky observations taken at the Shuttle runway site X68.

c. L+0 PAD Wind and thermodynamic parameters obtained from HOSC data bank. NW Anemometers used at 60 and 275 ft levels for L+0 wind conditions (approximately 1 min average prior to L+0). Pad 39A L+0 atmospheric pressure, at 21 ft (MSL), was 10.128 N/cm^2. Sea level pressure was 10.135 N/cm^2.

TABLE 5. STS-51B ASCENT ATMOSPHERIC DATA TAPE

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
000021	013	355	27.4	.1013+04	.1164+04	20.1
000100	013	358	27.0	.1010+04	.1162+04	19.7
000200	015	346	26.5	.1006+04	.1160+04	19.2
000300	017	340	25.9	.1003+04	.1159+04	18.6
000400	014	353	25.4	.9994+03	.1157+04	18.1
000500	015	354	24.9	.9959+03	.1155+04	17.6
000600	015	355	24.4	.9925+03	.1153+04	17.1
000700	016	355	23.9	.9890+03	.1152+04	16.6
000800	016	356	23.3	.9855+03	.1150+04	16.0
000900	016	356	22.8	.9821+03	.1148+04	15.5
001000	017	357	22.3	.9787+03	.1146+04	15.0
001100	017	357	22.0	.9753+03	.1143+04	15.1
001200	017	358	21.7	.9718+03	.1141+04	15.3
001300	018	358	21.4	.9685+03	.1138+04	15.4
001400	018	359	21.1	.9651+03	.1135+04	15.6
001500	018	359	20.8	.9617+03	.1132+04	15.7
001600	019	360	20.4	.9584+03	.1129+04	15.8
001700	019	000	20.1	.9550+03	.1126+04	16.0
001800	020	001	19.8	.9517+03	.1123+04	16.1
001900	020	001	19.5	.9484+03	.1121+04	16.3
002000	019	353	19.2	.9450+03	.1118+04	16.4
002100	021	358	19.0	.9417+03	.1115+04	16.2
002200	020	003	18.8	.9384+03	.1111+04	16.0
002300	019	357	18.7	.9351+03	.1108+04	15.8
002400	019	355	18.5	.9318+03	.1105+04	15.6
002500	019	003	18.3	.9285+03	.1102+04	15.4
002600	016	007	18.1	.9252+03	.1099+04	15.2
002700	016	357	17.9	.9219+03	.1096+04	15.0
002800	017	349	17.8	.9187+03	.1092+04	14.8
002900	019	357	17.6	.9154+03	.1089+04	14.6
003000	018	001	17.4	.9122+03	.1086+04	14.4
003100	016	356	17.2	.9089+03	.1083+04	14.3
003200	015	342	17.0	.9057+03	.1080+04	14.2
003300	016	343	16.8	.9025+03	.1077+04	14.2
003400	019	346	16.6	.8993+03	.1074+04	14.1
003500	020	357	16.4	.8961+03	.1071+04	14.0
003600	019	357	16.1	.8929+03	.1068+04	13.9
003700	018	354	15.9	.8897+03	.1065+04	13.8
003800	021	355	15.7	.8865+03	.1062+04	13.8
003900	019	003	15.5	.8834+03	.1059+04	13.7
004000	018	353	15.3	.8802+03	.1056+04	13.6
004100	018	346	15.1	.8771+03	.1053+04	13.5
004200	019	356	14.9	.8739+03	.1050+04	13.3
004300	015	003	14.6	.8708+03	.1047+04	13.2
004400	013	352	14.4	.8677+03	.1044+04	13.1
004500	014	350	14.2	.8646+03	.1041+04	13.0
004600	016	351	14.0	.8615+03	.1038+04	12.8
004700	015	003	13.8	.8584+03	.1036+04	12.7
004800	013	340	13.5	.8553+03	.1033+04	12.6
004900	019	336	13.3	.8522+03	.1030+04	12.4

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
005000	021	332	13.1	.8492+03	.1027+04	12.3
005100	020	331	12.9	.8461+03	.1024+04	12.0
005200	019	324	12.7	.8431+03	.1021+04	11.7
005300	022	322	12.6	.8400+03	.1018+04	11.3
005400	024	329	12.4	.8370+03	.1015+04	11.0
005500	026	332	12.2	.8340+03	.1012+04	10.7
005600	025	325	12.0	.8310+03	.1009+04	10.4
005700	025	317	11.8	.8280+03	.1006+04	10.1
005800	029	316	11.7	.8250+03	.1003+04	9.7
005900	031	320	11.5	.8220+03	.1001+04	9.4
006000	029	324	11.3	.8190+03	.9977+03	9.1
006100	027	324	11.1	.8160+03	.9949+03	8.9
006200	026	317	10.9	.8131+03	.9921+03	8.8
006300	029	310	10.6	.8101+03	.9893+03	8.6
006400	033	312	10.4	.8072+03	.9865+03	8.4
006500	032	316	10.2	.8042+03	.9837+03	8.3
006600	031	316	10.0	.8013+03	.9809+03	8.1
006700	031	312	9.8	.7984+03	.9781+03	7.9
006800	032	308	9.5	.7955+03	.9754+03	7.7
006900	035	308	9.3	.7926+03	.9726+03	7.6
007000	035	309	9.1	.7897+03	.9699+03	7.4
007100	035	311	8.9	.7868+03	.9670+03	7.2
007200	032	310	8.7	.7839+03	.9642+03	7.1
007300	033	307	8.5	.7810+03	.9614+03	6.9
007400	036	304	8.3	.7782+03	.9586+03	6.8
007500	038	306	8.1	.7753+03	.9558+03	6.6
007600	038	310	7.9	.7725+03	.9530+03	6.4
007700	037	312	7.7	.7696+03	.9502+03	6.3
007800	037	312	7.5	.7668+03	.9474+03	6.1
007900	037	307	7.3	.7640+03	.9446+03	6.0
008000	042	307	7.1	.7612+03	.9419+03	5.8
008100	044	304	7.0	.7584+03	.9388+03	5.3
008200	043	305	7.0	.7556+03	.9356+03	4.7
008300	040	304	6.9	.7528+03	.9325+03	4.2
008400	041	301	6.9	.7500+03	.9294+03	3.7
008500	043	299	6.8	.7473+03	.9263+03	3.2
008600	044	300	6.7	.7445+03	.9232+03	2.6
008700	044	304	6.7	.7418+03	.9201+03	2.1
008800	040	301	6.6	.7390+03	.9170+03	1.6
008900	038	299	6.6	.7363+03	.9139+03	1.0
009000	040	297	6.5	.7336+03	.9109+03	.5
009100	041	301	6.4	.7309+03	.9079+03	-.3
009200	038	304	6.4	.7282+03	.9049+03	-1.2
009300	035	308	6.3	.7255+03	.9019+03	-2.0
009400	034	306	6.2	.7228+03	.8990+03	-2.9
009500	036	308	6.2	.7201+03	.8960+03	-3.7
009600	037	313	6.1	.7175+03	.8930+03	-4.5
009700	036	317	6.0	.7148+03	.8901+03	-5.4
009800	036	315	5.9	.7122+03	.8871+03	-6.2
009900	038	311	5.9	.7095+03	.8842+03	-7.1

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
010000	041	316	5.8	.7069+03	.8812+03	-7.9
010100	038	322	5.7	.7043+03	.8782+03	-8.7
010200	036	315	5.7	.7017+03	.8752+03	-9.5
010300	038	313	5.6	.6991+03	.8723+03	-10.3
010400	035	316	5.6	.6965+03	.8693+03	-11.1
010500	032	323	5.5	.6939+03	.8663+03	-11.9
010600	031	318	5.4	.6913+03	.8634+03	-12.7
010700	034	320	5.4	.6887+03	.8604+03	-13.5
010800	033	326	5.3	.6862+03	.8575+03	-14.3
010900	031	325	5.3	.6836+03	.8545+03	-15.1
011000	032	320	5.2	.6811+03	.8516+03	-15.9
011100	034	325	5.0	.6785+03	.8491+03	-16.0
011200	031	330	4.8	.6760+03	.8466+03	-16.1
011300	029	329	4.5	.6735+03	.8441+03	-16.3
011400	031	323	4.3	.6710+03	.8416+03	-16.4
011500	033	326	4.1	.6685+03	.8391+03	-16.5
011600	032	330	3.9	.6660+03	.8367+03	-16.6
011700	031	325	3.7	.6635+03	.8342+03	-16.7
011800	033	322	3.4	.6610+03	.8318+03	-16.9
011900	035	325	3.2	.6585+03	.8293+03	-17.0
012000	034	331	3.0	.6561+03	.8269+03	-17.1
012100	033	329	2.8	.6536+03	.8245+03	-17.1
012200	035	327	2.5	.6511+03	.8222+03	-17.1
012300	038	330	2.3	.6487+03	.8198+03	-17.0
012400	036	331	2.0	.6463+03	.8175+03	-17.0
012500	038	327	1.8	.6438+03	.8151+03	-17.0
012600	040	326	1.5	.6414+03	.8128+03	-17.0
012700	040	332	1.3	.6390+03	.8104+03	-17.0
012800	037	334	1.0	.6366+03	.8081+03	-16.9
012900	037	329	.8	.6342+03	.8058+03	-16.9
013000	038	329	.5	.6318+03	.8035+03	-16.9
013100	038	334	.3	.6294+03	.8011+03	-16.6
013200	035	337	.0	.6270+03	.7987+03	-16.4
013300	034	335	-.2	.6246+03	.7963+03	-16.1
013400	036	331	-.4	.6223+03	.7940+03	-15.8
013500	037	334	-.6	.6199+03	.7916+03	-15.5
013600	039	336	-.9	.6175+03	.7892+03	-15.3
013700	036	335	-1.1	.6152+03	.7869+03	-15.0
013800	037	330	-1.3	.6129+03	.7845+03	-14.7
013900	039	327	-1.6	.6105+03	.7822+03	-14.5
014000	039	330	-1.8	.6082+03	.7798+03	-14.2
014100	037	328	-2.0	.6059+03	.7775+03	-14.2
014200	039	320	-2.3	.6036+03	.7753+03	-14.2
014300	038	324	-2.5	.6013+03	.7730+03	-14.3
014400	038	326	-2.8	.5989+03	.7707+03	-14.3
014500	038	320	-3.0	.5967+03	.7684+03	-14.3
014600	038	322	-3.2	.5944+03	.7662+03	-14.3
014700	035	326	-3.5	.5921+03	.7639+03	-14.3
014800	033	323	-3.7	.5898+03	.7617+03	-14.4
014900	036	321	-4.0	.5876+03	.7594+03	-14.4

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (KT)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
015000	035	326	-4.2	.5853+03	.7572+03	-14.9
015100	033	331	-4.4	.5831+03	.7548+03	-14.6
015200	032	329	-4.6	.5808+03	.7524+03	-14.7
015300	031	323	-4.8	.5786+03	.7501+03	-14.9
015400	032	323	-5.0	.5763+03	.7477+03	-15.0
015500	034	329	-5.1	.5741+03	.7453+03	-15.2
015600	033	337	-5.3	.5719+03	.7430+03	-15.4
015700	030	334	-5.5	.5697+03	.7407+03	-15.5
015800	031	330	-5.7	.5675+03	.7383+03	-15.7
015900	033	327	-5.9	.5653+03	.7360+03	-15.8
016000	037	331	-6.1	.5631+03	.7337+03	-16.0
016100	038	335	-6.3	.5609+03	.7315+03	-16.2
016200	037	334	-6.6	.5587+03	.7294+03	-16.4
016300	037	323	-6.8	.5566+03	.7272+03	-16.7
016400	042	321	-7.1	.5544+03	.7250+03	-16.9
016500	040	322	-7.3	.5522+03	.7229+03	-17.1
016600	040	322	-7.5	.5501+03	.7207+03	-17.3
016700	043	320	-7.8	.5480+03	.7186+03	-17.5
016800	045	324	-8.0	.5458+03	.7164+03	-17.8
016900	044	324	-8.3	.5437+03	.7143+03	-18.0
017000	043	319	-8.5	.5416+03	.7122+03	-18.2
017100	045	319	-8.6	.5395+03	.7097+03	-18.4
017200	048	323	-8.7	.5374+03	.7072+03	-18.7
017300	047	324	-8.8	.5353+03	.7047+03	-18.9
017400	049	321	-8.9	.5332+03	.7022+03	-19.1
017500	050	321	-9.0	.5311+03	.6997+03	-19.3
017600	046	321	-9.1	.5290+03	.6973+03	-19.6
017700	045	316	-9.2	.5269+03	.6948+03	-19.8
017800	045	310	-9.3	.5249+03	.6924+03	-20.0
017900	042	310	-9.4	.5228+03	.6899+03	-20.3
018000	043	304	-9.5	.5207+03	.6875+03	-20.5
018100	042	300	-9.6	.5187+03	.6851+03	-20.6
018200	039	306	-9.8	.5167+03	.6828+03	-20.7
018300	037	309	-9.9	.5146+03	.6804+03	-20.9
018400	040	308	-10.0	.5126+03	.6781+03	-21.0
018500	040	311	-10.1	.5106+03	.6758+03	-21.1
018600	035	312	-10.3	.5086+03	.6734+03	-21.2
018700	038	309	-10.4	.5066+03	.6711+03	-21.3
018800	040	315	-10.5	.5046+03	.6688+03	-21.5
018900	038	316	-10.7	.5026+03	.6665+03	-21.6
019000	039	313	-10.8	.5006+03	.6642+03	-21.7
019100	041	312	-11.0	.4986+03	.6621+03	-22.0
019200	041	314	-11.2	.4967+03	.6601+03	-22.3
019300	039	311	-11.4	.4947+03	.6580+03	-22.7
019400	042	309	-11.6	.4928+03	.6559+03	-23.0
019500	042	309	-11.8	.4908+03	.6539+03	-23.3
019600	039	307	-12.1	.4889+03	.6518+03	-23.6
019700	041	300	-12.3	.4869+03	.6498+03	-23.9
019800	041	303	-12.5	.4850+03	.6477+03	-24.3
019900	038	301	-12.7	.4831+03	.6457+03	-24.6

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
020000	038	297	-12.9	.4812+03	.6437+03	-24.9
020100	039	303	-13.1	.4792+03	.6417+03	-25.0
020200	036	307	-13.3	.4773+03	.6396+03	-25.0
020300	037	303	-13.6	.4754+03	.6376+03	-25.1
020400	037	304	-13.8	.4735+03	.6356+03	-25.1
020500	035	302	-14.0	.4716+03	.6336+03	-25.2
020600	036	298	-14.2	.4698+03	.6316+03	-25.3
020700	035	302	-14.4	.4679+03	.6296+03	-25.3
020800	035	302	-14.7	.4660+03	.6277+03	-25.4
020900	038	301	-14.9	.4642+03	.6257+03	-25.4
021000	035	306	-15.1	.4623+03	.6237+03	-25.5
021100	036	302	-15.4	.4604+03	.6218+03	-25.5
021200	038	307	-15.6	.4586+03	.6199+03	-25.5
021300	036	312	-15.9	.4567+03	.6181+03	-25.5
021400	036	309	-16.1	.4549+03	.6162+03	-25.5
021500	039	313	-16.4	.4531+03	.6143+03	-25.5
021600	037	315	-16.7	.4512+03	.6125+03	-25.5
021700	040	311	-16.9	.4494+03	.6106+03	-25.5
021800	039	316	-17.2	.4476+03	.6088+03	-25.5
021900	039	313	-17.4	.4458+03	.6070+03	-25.5
022000	040	308	-17.7	.4440+03	.6051+03	-25.5
022100	037	308	-17.9	.4422+03	.6032+03	-25.2
022200	042	306	-18.2	.4404+03	.6013+03	-24.8
022300	043	306	-18.4	.4386+03	.5994+03	-24.5
022400	046	302	-18.7	.4368+03	.5975+03	-24.1
022500	046	303	-18.9	.4351+03	.5956+03	-23.8
022600	047	301	-19.1	.4333+03	.5938+03	-23.4
022700	048	302	-19.4	.4315+03	.5919+03	-23.1
022800	046	300	-19.6	.4298+03	.5900+03	-22.7
022900	050	299	-19.9	.4280+03	.5882+03	-22.4
023000	048	299	-20.1	.4263+03	.5863+03	-22.0
023100	049	297	-20.3	.4245+03	.5845+03	-23.2
023200	052	296	-20.6	.4228+03	.5828+03	-24.5
023300	053	295	-20.8	.4211+03	.5810+03	-25.7
023400	054	295	-21.1	.4193+03	.5792+03	-26.9
023500	057	295	-21.3	.4176+03	.5774+03	-28.1
023600	055	296	-21.6	.4159+03	.5757+03	-29.4
023700	058	294	-21.8	.4142+03	.5739+03	-30.6
023800	057	294	-22.1	.4125+03	.5722+03	-31.8
023900	059	291	-22.3	.4108+03	.5704+03	-33.1
024000	059	293	-22.6	.4091+03	.5686+03	-34.3
024100	058	291	-22.9	.4074+03	.5669+03	-34.2
024200	061	290	-23.1	.4057+03	.5651+03	-34.2
024300	062	293	-23.4	.4040+03	.5634+03	-34.1
024400	061	289	-23.7	.4023+03	.5617+03	-34.0
024500	064	288	-23.9	.4007+03	.5599+03	-33.9
024600	063	290	-24.2	.3990+03	.5582+03	-33.9
024700	062	287	-24.5	.3974+03	.5565+03	-33.8
024800	064	287	-24.8	.3957+03	.5548+03	-33.7
024900	062	289	-25.0	.3941+03	.5531+03	-33.7

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
025000	062	287	-26.3	.3928+03	.5518+03	-33.6
025100	062	288	-25.5	.3908+03	.5495+03	-34.0
025200	061	289	-25.7	.3891+03	.5476+03	-34.3
025300	061	289	-25.8	.3875+03	.5457+03	-34.7
025400	059	288	-26.0	.3859+03	.5438+03	-35.1
025500	058	291	-26.2	.3843+03	.5419+03	-35.4
025600	058	291	-26.4	.3827+03	.5401+03	-35.8
025700	053	287	-26.6	.3811+03	.5382+03	-36.2
025800	051	288	-26.7	.3795+03	.5363+03	-36.6
025900	049	288	-26.9	.3779+03	.5345+03	-36.9
026000	051	285	-27.1	.3763+03	.5327+03	-37.3
026100	052	285	-27.3	.3747+03	.5309+03	-37.2
026200	050	289	-27.5	.3731+03	.5291+03	-37.1
026300	050	288	-27.8	.3716+03	.5273+03	-37.0
026400	052	286	-28.0	.3700+03	.5256+03	-36.9
026500	053	288	-28.2	.3684+03	.5238+03	-36.8
026600	049	287	-28.4	.3669+03	.5221+03	-36.7
026700	048	285	-28.6	.3653+03	.5203+03	-36.6
026800	047	283	-28.9	.3638+03	.5186+03	-36.5
026900	046	289	-29.1	.3622+03	.5169+03	-36.4
027000	045	293	-29.3	.3607+03	.5152+03	-36.3
027100	042	291	-29.4	.3592+03	.5132+03	-37.4
027200	045	290	-29.5	.3577+03	.5113+03	-38.5
027300	044	295	-29.6	.3561+03	.5094+03	-39.6
027400	041	299	-29.7	.3546+03	.5074+03	-40.7
027500	040	298	-29.8	.3531+03	.5055+03	-41.8
027600	043	296	-30.0	.3516+03	.5036+03	-42.9
027700	044	300	-30.1	.3501+03	.5017+03	-44.0
027800	040	304	-30.2	.3486+03	.4998+03	-45.1
027900	044	296	-30.3	.3471+03	.4979+03	-46.2
028000	046	297	-30.4	.3457+03	.4960+03	-47.3
028100	045	301	-30.6	.3442+03	.4943+03	-47.3
028200	048	297	-30.8	.3427+03	.4926+03	-47.3
028300	050	301	-31.0	.3413+03	.4908+03	-47.2
028400	047	309	-31.2	.3398+03	.4891+03	-47.2
028500	048	303	-31.3	.3383+03	.4874+03	-47.2
028600	048	305	-31.5	.3369+03	.4857+03	-47.2
028700	048	307	-31.7	.3355+03	.4840+03	-47.2
028800	047	305	-31.9	.3340+03	.4823+03	-47.1
028900	049	304	-32.1	.3326+03	.4806+03	-47.1
029000	050	306	-32.3	.3312+03	.4790+03	-47.1
029100	048	312	-32.6	.3297+03	.4774+03	-47.2
029200	047	313	-32.8	.3283+03	.4759+03	-47.2
029300	049	313	-33.1	.3269+03	.4743+03	-47.3
029400	046	317	-33.3	.3255+03	.4728+03	-47.4
029500	046	313	-33.6	.3241+03	.4713+03	-47.4
029600	046	314	-33.9	.3227+03	.4697+03	-47.5
029700	045	316	-34.1	.3213+03	.4682+03	-47.6
029800	046	311	-34.4	.3199+03	.4667+03	-47.7
029900	045	317	-34.6	.3185+03	.4652+03	-47.7

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
030000	044	314	-34.9	.3171+03	.4637+03	-47.8
030100	046	310	-35.2	.3158+03	.4622+03	-47.9
030200	045	312	-35.5	.3144+03	.4608+03	-48.1
030300	044	311	-35.8	.3130+03	.4593+03	-48.2
030400	046	311	-36.1	.3116+03	.4579+03	-48.4
030500	044	315	-36.3	.3103+03	.4564+03	-48.5
030600	045	309	-36.6	.3089+03	.4550+03	-48.7
030700	045	310	-36.9	.3076+03	.4536+03	-48.8
030800	043	309	-37.2	.3062+03	.4521+03	-49.0
030900	043	307	-37.5	.3049+03	.4507+03	-49.1
031000	046	307	-37.8	.3036+03	.4493+03	-49.3
031100	044	306	-38.1	.3022+03	.4478+03	-49.4
031200	045	306	-38.3	.3009+03	.4463+03	-49.6
031300	046	307	-38.6	.2996+03	.4449+03	-49.7
031400	047	306	-38.8	.2982+03	.4434+03	-49.8
031500	046	304	-39.1	.2969+03	.4419+03	-49.9
031600	048	310	-39.4	.2956+03	.4405+03	-50.1
031700	047	308	-39.6	.2943+03	.4390+03	-50.2
031800	050	310	-39.9	.2930+03	.4375+03	-50.3
031900	049	314	-40.1	.2917+03	.4361+03	-50.5
032000	050	312	-40.4	.2904+03	.4347+03	-50.6
032100	054	316	-40.6	.2891+03	.4331+03	-50.8
032200	055	317	-40.8	.2878+03	.4316+03	-50.9
032300	058	316	-41.1	.2866+03	.4301+03	-51.1
032400	061	321	-41.3	.2853+03	.4286+03	-51.3
032500	062	318	-41.5	.2840+03	.4271+03	-51.4
032600	063	320	-41.7	.2827+03	.4256+03	-51.6
032700	067	321	-41.9	.2815+03	.4241+03	-51.8
032800	065	322	-42.2	.2802+03	.4226+03	-52.0
032900	068	320	-42.4	.2790+03	.4211+03	-52.1
033000	065	318	-42.6	.2777+03	.4196+03	-52.3
033100	065	319	-42.9	.2765+03	.4182+03	-52.5
033200	063	319	-43.1	.2752+03	.4168+03	-52.6
033300	062	316	-43.4	.2740+03	.4154+03	-52.8
033400	062	319	-43.6	.2727+03	.4140+03	-53.0
033500	060	319	-43.9	.2715+03	.4126+03	-53.1
033600	061	316	-44.2	.2703+03	.4112+03	-53.3
033700	060	317	-44.4	.2691+03	.4098+03	-53.5
033800	060	318	-44.7	.2679+03	.4084+03	-53.7
033900	060	314	-44.9	.2667+03	.4070+03	-53.8
034000	059	315	-45.2	.2655+03	.4057+03	-54.0
034100	059	313	-45.5	.2642+03	.4043+03	-54.1
034200	059	311	-45.8	.2630+03	.4030+03	-54.2
034300	059	312	-46.0	.2618+03	.4016+03	-54.3
034400	059	309	-46.3	.2606+03	.4003+03	-54.4
034500	060	310	-46.6	.2595+03	.3989+03	-54.5
034600	060	309	-46.9	.2583+03	.3976+03	-54.7
034700	058	310	-47.2	.2571+03	.3963+03	-54.8
034800	060	308	-47.4	.2559+03	.3950+03	-54.9
034900	058	307	-47.7	.2548+03	.3937+03	-55.0

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
035000	058	307	-48.0	.2536+03	.3924+03	-55.1
035100	058	309	-48.3	.2524+03	.3910+03	-55.3
035200	059	307	-48.5	.2513+03	.3896+03	-55.5
035300	058	309	-48.8	.2501+03	.3882+03	-55.7
035400	059	309	-49.0	.2489+03	.3869+03	-55.9
035500	060	307	-49.3	.2478+03	.3855+03	-56.0
035600	058	311	-49.5	.2467+03	.3842+03	-56.2
035700	060	309	-49.8	.2455+03	.3828+03	-56.4
035800	057	311	-50.0	.2444+03	.3815+03	-56.6
035900	059	309	-50.3	.2433+03	.3802+03	-56.8
036000	059	311	-50.5	.2421+03	.3788+03	-57.0
036100	058	311	-50.8	.2410+03	.3775+03	-57.2
036200	060	308	-51.0	.2399+03	.3762+03	-57.4
036300	060	312	-51.3	.2388+03	.3748+03	-57.6
036400	060	311	-51.5	.2376+03	.3735+03	-57.8
036500	061	309	-51.8	.2365+03	.3722+03	-58.0
036600	061	311	-52.0	.2354+03	.3709+03	-58.3
036700	062	312	-52.3	.2343+03	.3695+03	-58.5
036800	062	312	-52.5	.2332+03	.3682+03	-58.7
036900	065	312	-52.8	.2322+03	.3669+03	-58.9
037000	063	314	-53.0	.2311+03	.3656+03	-59.1
037100	066	311	-53.2	.2300+03	.3643+03	-59.3
037200	065	314	-53.5	.2289+03	.3630+03	-59.5
037300	065	312	-53.7	.2278+03	.3617+03	-59.8
037400	064	316	-54.0	.2267+03	.3604+03	-60.0
037500	063	315	-54.2	.2257+03	.3590+03	-60.2
037600	066	315	-54.4	.2246+03	.3577+03	-60.4
037700	062	313	-54.7	.2235+03	.3564+03	-60.6
037800	065	313	-54.9	.2225+03	.3552+03	-60.9
037900	063	314	-55.2	.2214+03	.3539+03	-61.1
038000	063	311	-55.4	.2204+03	.3526+03	-61.3
038100	064	315	-55.6	.2193+03	.3513+03	-61.5
038200	062	314	-55.8	.2183+03	.3499+03	-61.7
038300	066	312	-56.1	.2173+03	.3486+03	-61.9
038400	064	311	-56.3	.2162+03	.3473+03	-62.1
038500	064	314	-56.5	.2152+03	.3460+03	-62.3
038600	061	312	-56.7	.2142+03	.3447+03	-62.5
038700	063	312	-56.9	.2131+03	.3434+03	-62.7
038800	060	314	-57.2	.2121+03	.3421+03	-62.9
038900	060	314	-57.4	.2111+03	.3409+03	-63.1
039000	058	315	-57.6	.2101+03	.3396+03	-63.3
039100	057	308	-57.8	.2091+03	.3383+03	-9999.
039200	056	311	-58.0	.2081+03	.3370+03	-9999.
039300	055	309	-58.3	.2071+03	.3357+03	-9999.
039400	057	307	-58.5	.2061+03	.3345+03	-9999.
039500	055	304	-58.7	.2051+03	.3332+03	-9999.
039600	055	302	-58.9	.2041+03	.3319+03	-9999.
039700	056	299	-59.1	.2031+03	.3307+03	-9999.
039800	056	297	-59.4	.2022+03	.3294+03	-9999.
039900	058	296	-59.6	.2012+03	.3282+03	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
040000	062	292	-59.8	.2002+03	.3269+03	-9999.
040100	059	297	-60.0	.1992+03	.3257+03	-9999.
040200	062	294	-60.3	.1983+03	.3245+03	-9999.
040300	062	296	-60.5	.1973+03	.3233+03	-9999.
040400	065	294	-60.8	.1963+03	.3221+03	-9999.
040500	066	295	-61.0	.1954+03	.3208+03	-9999.
040600	066	296	-61.2	.1944+03	.3196+03	-9999.
040700	068	297	-61.5	.1935+03	.3185+03	-9999.
040800	066	296	-61.7	.1926+03	.3173+03	-9999.
040900	064	292	-62.0	.1916+03	.3161+03	-9999.
041000	060	298	-62.2	.1907+03	.3149+03	-9999.
041100	062	292	-62.3	.1897+03	.3135+03	-9999.
041200	061	290	-62.5	.1888+03	.3122+03	-9999.
041300	058	294	-62.6	.1879+03	.3109+03	-9999.
041400	057	291	-62.7	.1870+03	.3095+03	-9999.
041500	057	292	-62.8	.1860+03	.3082+03	-9999.
041600	057	292	-63.0	.1851+03	.3069+03	-9999.
041700	058	295	-63.1	.1842+03	.3056+03	-9999.
041800	058	294	-63.2	.1833+03	.3042+03	-9999.
041900	058	294	-63.4	.1824+03	.3029+03	-9999.
042000	056	299	-63.5	.1815+03	.3016+03	-9999.
042100	062	295	-63.2	.1806+03	.2997+03	-9999.
042200	059	300	-62.8	.1798+03	.2978+03	-9999.
042300	054	314	-62.5	.1789+03	.2958+03	-9999.
042400	055	323	-62.2	.1780+03	.2939+03	-9999.
042500	050	327	-61.9	.1771+03	.2920+03	-9999.
042600	051	327	-61.5	.1763+03	.2902+03	-9999.
042700	049	327	-61.2	.1754+03	.2883+03	-9999.
042800	045	331	-60.9	.1746+03	.2864+03	-9999.
042900	046	326	-60.5	.1737+03	.2846+03	-9999.
043000	046	332	-60.2	.1728+03	.2828+03	-9999.
043100	045	336	-60.4	.1720+03	.2816+03	-9999.
043200	045	336	-60.6	.1712+03	.2805+03	-9999.
043300	045	335	-60.7	.1703+03	.2794+03	-9999.
043400	044	336	-60.9	.1695+03	.2782+03	-9999.
043500	044	330	-61.1	.1687+03	.2771+03	-9999.
043600	041	329	-61.3	.1679+03	.2760+03	-9999.
043700	039	324	-61.5	.1670+03	.2749+03	-9999.
043800	040	317	-61.6	.1662+03	.2738+03	-9999.
043900	038	324	-61.8	.1654+03	.2727+03	-9999.
044000	035	319	-62.0	.1646+03	.2716+03	-9999.
044100	035	319	-62.0	.1638+03	.2703+03	-9999.
044200	029	336	-62.0	.1630+03	.2690+03	-9999.
044300	026	324	-62.0	.1622+03	.2677+03	-9999.
044400	023	325	-62.0	.1614+03	.2664+03	-9999.
044500	021	322	-62.0	.1606+03	.2651+03	-9999.
044600	022	313	-62.1	.1598+03	.2638+03	-9999.
044700	024	306	-62.1	.1591+03	.2625+03	-9999.
044800	025	304	-62.1	.1583+03	.2612+03	-9999.
044900	025	296	-62.1	.1575+03	.2600+03	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
045000	027	295	-62.1	.1567+03	.2587+03	-9999.
045100	030	292	-62.1	.1560+03	.2574+03	-9999.
045200	033	294	-62.0	.1552+03	.2561+03	-9999.
045300	038	288	-62.0	.1545+03	.2548+03	-9999.
045400	041	291	-61.9	.1537+03	.2535+03	-9999.
045500	042	289	-61.9	.1529+03	.2522+03	-9999.
045600	041	293	-61.9	.1522+03	.2509+03	-9999.
045700	046	297	-61.8	.1515+03	.2497+03	-9999.
045800	051	300	-61.8	.1507+03	.2484+03	-9999.
045900	051	306	-61.7	.1500+03	.2471+03	-9999.
046000	053	306	-61.7	.1492+03	.2459+03	-9999.
046100	059	309	-61.7	.1485+03	.2447+03	-9999.
046200	059	316	-61.7	.1478+03	.2435+03	-9999.
046300	049	308	-61.8	.1471+03	.2424+03	-9999.
046400	049	316	-61.8	.1464+03	.2412+03	-9999.
046500	050	296	-61.8	.1456+03	.2401+03	-9999.
046600	049	296	-61.8	.1449+03	.2389+03	-9999.
046700	051	292	-61.8	.1442+03	.2378+03	-9999.
046800	051	291	-61.9	.1435+03	.2366+03	-9999.
046900	051	293	-61.9	.1428+03	.2355+03	-9999.
047000	049	296	-61.9	.1421+03	.2344+03	-9999.
047100	044	303	-62.0	.1414+03	.2333+03	-9999.
047200	042	303	-62.1	.1407+03	.2323+03	-9999.
047300	043	307	-62.2	.1400+03	.2312+03	-9999.
047400	043	315	-62.3	.1394+03	.2302+03	-9999.
047500	044	309	-62.3	.1387+03	.2292+03	-9999.
047600	043	317	-62.4	.1380+03	.2281+03	-9999.
047700	044	314	-62.5	.1373+03	.2271+03	-9999.
047800	044	312	-62.6	.1366+03	.2261+03	-9999.
047900	045	310	-62.7	.1360+03	.2251+03	-9999.
048000	046	312	-62.8	.1353+03	.2241+03	-9999.
048100	049	308	-62.9	.1346+03	.2231+03	-9999.
048200	052	307	-63.0	.1340+03	.2221+03	-9999.
048300	048	307	-63.1	.1333+03	.2211+03	-9999.
048400	051	308	-63.2	.1327+03	.2201+03	-9999.
048500	053	306	-63.3	.1320+03	.2192+03	-9999.
048600	055	307	-63.4	.1314+03	.2182+03	-9999.
048700	059	309	-63.5	.1307+03	.2172+03	-9999.
048800	064	310	-63.6	.1301+03	.2163+03	-9999.
048900	065	308	-63.7	.1294+03	.2153+03	-9999.
049000	067	307	-63.8	.1288+03	.2143+03	-9999.
049100	065	309	-63.9	.1282+03	.2133+03	-9999.
049200	062	313	-63.9	.1275+03	.2124+03	-9999.
049300	061	311	-64.0	.1269+03	.2114+03	-9999.
049400	060	315	-64.0	.1263+03	.2104+03	-9999.
049500	059	313	-64.1	.1257+03	.2094+03	-9999.
049600	058	317	-64.2	.1250+03	.2084+03	-9999.
049700	058	320	-64.2	.1244+03	.2075+03	-9999.
049800	056	317	-64.3	.1238+03	.2065+03	-9999.
049900	060	321	-64.3	.1232+03	.2055+03	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
050000	061	324	-64.4	.1226+03	.2046+03	-9999.
050100	062	323	-64.5	.1220+03	.2036+03	-9999.
050200	064	327	-64.5	.1214+03	.2027+03	-9999.
050300	062	326	-64.6	.1208+03	.2018+03	-9999.
050400	062	330	-64.7	.1202+03	.2008+03	-9999.
050500	063	332	-64.7	.1196+03	.1999+03	-9999.
050600	062	338	-64.8	.1190+03	.1990+03	-9999.
050700	061	335	-64.9	.1184+03	.1981+03	-9999.
050800	062	337	-65.0	.1178+03	.1971+03	-9999.
050900	063	338	-65.0	.1172+03	.1962+03	-9999.
051000	062	340	-65.1	.1166+03	.1953+03	-9999.
051100	064	343	-65.2	.1161+03	.1945+03	-9999.
051200	063	346	-65.4	.1155+03	.1936+03	-9999.
051300	065	348	-65.5	.1149+03	.1928+03	-9999.
051400	066	350	-65.6	.1143+03	.1919+03	-9999.
051500	063	350	-65.7	.1138+03	.1911+03	-9999.
051600	064	349	-65.9	.1132+03	.1903+03	-9999.
051700	063	352	-66.0	.1127+03	.1895+03	-9999.
051800	059	352	-66.1	.1121+03	.1886+03	-9999.
051900	059	352	-66.3	.1115+03	.1878+03	-9999.
052000	059	350	-66.4	.1110+03	.1870+03	-9999.
052100	059	348	-66.6	.1104+03	.1862+03	-9999.
052200	057	348	-66.8	.1099+03	.1855+03	-9999.
052300	055	351	-67.0	.1093+03	.1847+03	-9999.
052400	051	349	-67.2	.1088+03	.1840+03	-9999.
052500	050	349	-67.4	.1082+03	.1832+03	-9999.
052600	049	350	-67.6	.1077+03	.1825+03	-9999.
052700	048	346	-67.8	.1071+03	.1818+03	-9999.
052800	049	349	-68.0	.1066+03	.1810+03	-9999.
052900	047	351	-68.2	.1061+03	.1803+03	-9999.
053000	048	351	-68.4	.1055+03	.1796+03	-9999.
053100	047	349	-68.6	.1050+03	.1789+03	-9999.
053200	045	349	-68.8	.1045+03	.1781+03	-9999.
053300	047	350	-69.1	.1039+03	.1774+03	-9999.
053400	049	353	-69.3	.1034+03	.1767+03	-9999.
053500	046	352	-69.5	.1029+03	.1760+03	-9999.
053600	045	354	-69.7	.1024+03	.1753+03	-9999.
053700	044	352	-69.9	.1019+03	.1746+03	-9999.
053800	043	351	-70.2	.1013+03	.1739+03	-9999.
053900	042	348	-70.4	.1008+03	.1732+03	-9999.
054000	042	351	-70.6	.1003+03	.1725+03	-9999.
054100	041	345	-70.6	.9981+02	.1717+03	-9999.
054200	044	348	-70.7	.9930+02	.1709+03	-9999.
054300	044	347	-70.7	.9879+02	.1700+03	-9999.
054400	045	345	-70.8	.9829+02	.1692+03	-9999.
054500	047	347	-70.8	.9779+02	.1684+03	-9999.
054600	045	353	-70.8	.9729+02	.1675+03	-9999.
054700	045	351	-70.9	.9679+02	.1667+03	-9999.
054800	046	353	-70.9	.9630+02	.1659+03	-9999.
054900	047	351	-71.0	.9581+02	.1651+03	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
055000	048	349	-71.0	.9532+02	.1643+03	-9999.
055100	048	350	-70.9	.9484+02	.1633+03	-9999.
055200	046	350	-70.8	.9435+02	.1624+03	-9999.
055300	049	350	-70.7	.9387+02	.1615+03	-9999.
055400	050	348	-70.6	.9339+02	.1606+03	-9999.
055500	052	348	-70.4	.9292+02	.1597+03	-9999.
055600	053	351	-70.3	.9245+02	.1588+03	-9999.
055700	053	000	-70.2	.9198+02	.1579+03	-9999.
055800	051	006	-70.1	.9151+02	.1570+03	-9999.
055900	048	005	-70.0	.9104+02	.1561+03	-9999.
056000	048	006	-69.9	.9058+02	.1553+03	-9999.
056100	045	004	-70.0	.9012+02	.1545+03	-9999.
056200	043	004	-70.0	.8966+02	.1538+03	-9999.
056300	038	357	-70.1	.8921+02	.1531+03	-9999.
056400	040	359	-70.2	.8875+02	.1523+03	-9999.
056500	038	354	-70.2	.8830+02	.1516+03	-9999.
056600	038	351	-70.3	.8785+02	.1509+03	-9999.
056700	040	353	-70.4	.8741+02	.1502+03	-9999.
056800	039	351	-70.5	.8696+02	.1495+03	-9999.
056900	039	351	-70.5	.8652+02	.1488+03	-9999.
057000	039	352	-70.6	.8608+02	.1480+03	-9999.
057100	038	354	-70.7	.8564+02	.1473+03	-9999.
057200	039	355	-70.7	.8520+02	.1466+03	-9999.
057300	042	357	-70.8	.8477+02	.1459+03	-9999.
057400	044	356	-70.8	.8434+02	.1452+03	-9999.
057500	044	357	-70.9	.8391+02	.1445+03	-9999.
057600	047	358	-71.0	.8348+02	.1438+03	-9999.
057700	049	001	-71.0	.8305+02	.1431+03	-9999.
057800	048	002	-71.1	.8263+02	.1425+03	-9999.
057900	047	004	-71.1	.8221+02	.1418+03	-9999.
058000	045	004	-71.2	.8179+02	.1411+03	-9999.
058100	043	005	-71.2	.8137+02	.1404+03	-9999.
058200	040	003	-71.3	.8096+02	.1397+03	-9999.
058300	039	006	-71.3	.8054+02	.1390+03	-9999.
058400	040	004	-71.3	.8013+02	.1383+03	-9999.
058500	042	001	-71.3	.7972+02	.1376+03	-9999.
058600	042	002	-71.3	.7932+02	.1369+03	-9999.
058700	046	006	-71.4	.7891	.1362+03	-9999.
058800	045	006	-71.4	.7851	.1356+03	-9999.
058900	044	004	-71.5	.7811	.1349+03	-9999.
059000	044	007	-71.5	.7771	.1343+03	-9999.
059100	045	007	-71.6	.7731+02	.1336+03	-9999.
059200	046	009	-71.8	.7691+02	.1330+03	-9999.
059300	043	009	-71.9	.7652+02	.1324+03	-9999.
059400	040	011	-72.0	.7613+02	.1319+03	-9999.
059500	038	014	-72.1	.7573+02	.1313+03	-9999.
059600	038	017	-72.3	.7535+02	.1307+03	-9999.
059700	036	021	-72.4	.7496+02	.1301+03	-9999.
059800	034	022	-72.5	.7457+02	.1295+03	-9999.
059900	032	023	-72.7	.7419+02	.1289+03	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
060000	033	028	-72.8	.7381+02	.1283+03	-9999.
061000	035	033	-74.1	.7009+02	.1227+03	-9999.
062000	035	039	-73.9	.6655+02	.1164+03	-9999.
063000	034	046	-71.8	.6320+02	.1093+03	-9999.
064000	033	055	-70.9	.6005+02	.1039+03	-9999.
065000	033	060	-70.3	.5707+02	.9801+02	-9999.
066000	030	063	-69.7	.5429+02	.9288+02	-9999.
067000	026	068	-68.4	.5157+02	.8774+02	-9999.
068000	021	076	-65.2	.4904+02	.8215+02	-9999.
069000	018	079	-65.5	.4667+02	.7830+02	-9999.
070000	01.	078	-63.5	.4442+02	.7381+02	-9999.
071000	016	082	-61.3	.4229+02	.6954+02	-9999.
072000	017	087	-60.2	.4029+02	.6591+02	-9999.
073000	019	096	-59.3	.3839+02	.6254+02	-9999.
074000	021	105	-58.1	.3658+02	.5926+02	-9999.
075000	021	115	-56.5	.3487+02	.5607+02	-9999.
076000	017	124	-56.8	.3325+02	.5354+02	-9999.
077000	011	127	-57.0	.3170+02	.5109+02	-9999.
078000	005	101	-57.0	.3022+02	.4871+02	-9999.
079000	007	036	-57.4	.2881+02	.4652+02	-9999.
080000	013	039	-56.8	.2747+02	.4423+02	-9999.
081000	016	050	-55.9	.2620+02	.4201+02	-9999.
082000	019	062	-54.8	.2499+02	.3987+02	-9999.
083000	020	078	-53.0	.2384+02	.3772+02	-9999.
084000	020	094	-49.9	.2275+02	.3550+02	-9999.
085000	019	102	-48.2	.2173+02	.3365+02	-9999.
086000	015	108	-47.3	.2076+02	.3202+02	-9999.
087000	009	119	-47.3	.1983+02	.3059+02	-9999.
088000	005	124	-47.0	.1895+02	.2919+02	-9999.
089000	002	177	-46.7	.1811+02	.2786+02	-9999.
090000	004	248	-46.6	.1730+02	.2660+02	-9999.
091000	005	290	-47.5	.1653+02	.2552+02	-9999.
092000	006	319	-48.0	.1580+02	.2443+02	-9999.
093000	008	352	-48.1	.1509+02	.2336+02	-9999.
094000	008	020	-47.5	.1441+02	.2225+02	-9999.
095000	008	041	-47.0	.1377+02	.2121+02	-9999.
096000	006	065	-46.5	.1316+02	.2023+02	-9999.
097000	004	114	-44.5	.1258+02	.1917+02	-9999.
098000	006	179	-42.5	.1199+02	.1811+02	-9999.
099000	010	196	-41.8	.1143+02	.1721+02	-9999.
100000	013	207	-41.1	.1090+02	.1636+02	-9999.
101000	016	209	-40.2	.1043+02	.1560+02	-9999.
102000	018	209	-39.4	.9980+01	.1487+02	-9999.
103000	018	207	-38.6	.9550+01	.1419+02	-9999.
104000	020	203	-38.1	.9141+01	.1355+02	-9999.
105000	020	198	-37.6	.8750+01	.1294+02	-9999.
106000	021	195	-37.9	.8375+01	.1240+02	-9999.
107000	021	193	-38.0	.8017+01	.1188+02	-9999.
108000	023	193	-37.9	.7674+01	.1137+02	-9999.
109000	023	195	-37.5	.7346+01	.1086+02	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
110000	023	201	-16.3	.7034+01	.1035+02	-9999.
111000	023	208	-35.3	.6735+01	.9866+01	-9999.
112000	025	218	-34.6	.6451+01	.9521+01	-9999.
113000	027	227	-33.9	.6179+01	.8998+01	-9999.
114000	032	238	-33.4	.5919+01	.8601+01	-9999.
115000	037	238	-32.2	.5671+01	.8200+01	-9999.
116000	042	241	-30.1	.5435+01	.7790+01	-9999.
117000	042	247	-27.5	.5211+01	.7391+01	-9999.
118000	038	252	-25.7	.4999+01	.7037+01	-9999.
119000	035	251	-24.3	.4796+01	.6713+01	-9999.
120000	030	250	-23.5	.4602+01	.6422+01	-9999.
121000	027	248	-23.3	.4417+01	.6159+01	-9999.
122000	023	246	-23.6	.4239+01	.5918+01	-9999.
123000	023	245	-23.3	.4068+01	.5673+01	-9999.
124000	027	248	-21.9	.3905+01	.5414+01	-9999.
125000	028	254	-19.8	.3749+01	.5156+01	-9999.
126000	028	263	-17.4	.3601+01	.4904+01	-9999.
127000	030	275	-15.5	.3460+01	.4677+01	-9999.
128000	030	286	-14.8	.3325+01	.4483+01	-9999.
129000	030	296	-15.0	.3195+01	.4311+01	-9999.
130000	028	298	-16.1	.3070+01	.4161+01	-9999.
131000	025	298	-17.1	.2950+01	.4011+01	-9999.
132000	020	291	-17.4	.2834+01	.3860+01	-9999.
133000	016	279	-17.5	.2722+01	.3710+01	-9999.
134000	013	258	-17.5	.2615+01	.3564+01	-9999.
135000	013	226	-17.5	.2512+01	.3424+01	-9999.
136000	018	206	-17.5	.2414+01	.3289+01	-9999.
137000	021	201	-17.2	.2319+01	.3157+01	-9999.
138000	023	196	-16.8	.2228+01	.3028+01	-9999.
139000	025	193	-16.0	.2141+01	.2900+01	-9999.
140000	027	190	-15.4	.2057+01	.2780+01	-9999.
141000	030	187	-14.9	.1977+01	.2667+01	-9999.
142000	032	186	-14.4	.1900+01	.2558+01	-9999.
143000	033	185	-14.0	.1826+01	.2455+01	-9999.
144000	033	186	-13.4	.1756+01	.2355+01	-9999.
145000	035	188	-12.4	.1688+01	.2254+01	-9999.
146000	030	196	-10.3	.1623+01	.2150+01	-9999.
147000	018	193	-9.6	.1561+01	.2063+01	-9999.
148000	011	167	-9.3	.1501+01	.1983+01	-9999.
149000	016	167	-8.2	.1444+01	.1899+01	-9999.
150000	006	185	-6.8	.1390+01	.1817+01	-9999.
151000	005	029	-5.2	.1338+01	.1739+01	-9999.
152000	015	072	-3.9	.1287+01	.1666+01	-9999.
153000	020	092	-2.5	.1240+01	.1595+01	-9999.
154000	027	106	-1.0	.1194+01	.1528+01	-9999.
155000	025	109	.2	.1150+01	.1465+01	-9999.
156000	027	122	.4	.1107+01	.1410+01	-9999.
157000	028	138	-.5	.1067+01	.1363+01	-9999.
158000	020	134	-1.6	.1027+01	.1318+01	-9999.
159000	020	086	-2.6	.9892+00	.1274+01	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
160000	028	061	-3.6	.9524+00	.1231+01	-9999.
161000	028	053	-4.7	.9169+00	.1190+01	-9999.
162000	025	045	-5.6	.8825+00	.1149+01	-9999.
163000	023	044	-6.5	.8494+00	.1110+01	-9999.
164000	028	064	-7.4	.8173+00	.1072+01	-9999.
165000	045	089	-8.5	.7864+00	.1035+01	-9999.
166000	069	105	-9.4	.7565+00	.9990+00	-9999.
167000	084	116	-10.0	.7277+00	.9635+00	-9999.
168000	086	126	-10.4	.7000+00	.9280+00	-9999.
169000	076	138	-10.5	.6733+00	.8930+00	-9999.
170000	060	154	-10.7	.6475+00	.8596+00	-9999.
171000	047	176	-10.9	.6228+00	.8274+00	-9999.
172000	040	197	-11.1	.5990+00	.7963+00	-9999.
173000	035	201	-11.2	.5760+00	.7661+00	-9999.
174000	033	186	-11.4	.5540+00	.7374+00	-9999.
175000	038	164	-11.6	.5328+00	.7098+00	-9999.
176000	052	156	-11.8	.5123+00	.6829+00	-9999.
177000	065	156	-12.0	.4927+00	.6572+00	-9999.
178000	076	161	-12.2	.4738+00	.6324+00	-9999.
179000	081	170	-12.7	.4556+00	.6094+00	-9999.
180000	081	178	-13.9	.4380+00	.5887+00	-9999.
181000	076	183	-15.6	.4210+00	.5694+00	-9999.
182000	069	185	-17.2	.4046+00	.5506+00	-9999.
183000	067	183	-18.5	.3888+00	.5319+00	-9999.
184000	070	177	-19.5	.3734+00	.5128+00	-9999.
185000	077	170	-20.1	.3587+00	.4938+00	-9999.
186000	082	166	-20.6	.3445+00	.4753+00	-9999.
187000	079	166	-21.4	.3308+00	.4578+00	-9999.
188000	069	166	-22.4	.3177+00	.4413+00	-9999.
189000	054	162	-23.3	.3050+00	.4253+00	-9999.
190000	038	149	-24.3	.2927+00	.4097+00	-9999.
191000	028	124	-25.4	.2809+00	.3950+00	-9999.
192000	032	092	-26.3	.2719+00	.3837+00	-9999.
193000	040	075	-27.2	.2633+00	.3729+00	-9999.
194000	040	067	-27.6	.2549+00	.3616+00	-9999.
195000	042	069	-28.0	.2468+00	.3507+00	-9999.
196000	043	071	-28.4	.2389+00	.3400+00	-9999.
197000	047	072	-28.8	.2303+00	.3283+00	-9999.
198000	048	068	-29.2	.2216+00	.3165+00	-9999.
199000	050	060	-29.6	.2125+00	.3040+00	-9999.
200000	052	048	-30.0	.2035+00	.2916+00	-9999.
201000	059	039	-30.4	.1950+00	.2798+00	-9999.
202000	065	036	-30.8	.1868+00	.2685+00	-9999.
203000	074	035	-31.2	.1791+00	.2578+00	-9999.
204000	082	037	-31.2	.1717+00	.2472+00	-9999.
205000	091	042	-32.2	.1646+00	.2380+00	-9999.
206000	099	048	-36.0	.1578+00	.2318+00	-9999.
207000	106	056	-39.0	.1511+00	.2248+00	-9999.
208000	111	063	-40.2	.1446+00	.2162+00	-9999.
209000	118	071	-40.7	.1384+00	.2074+00	-9999.

TABLE 5. (Continued)

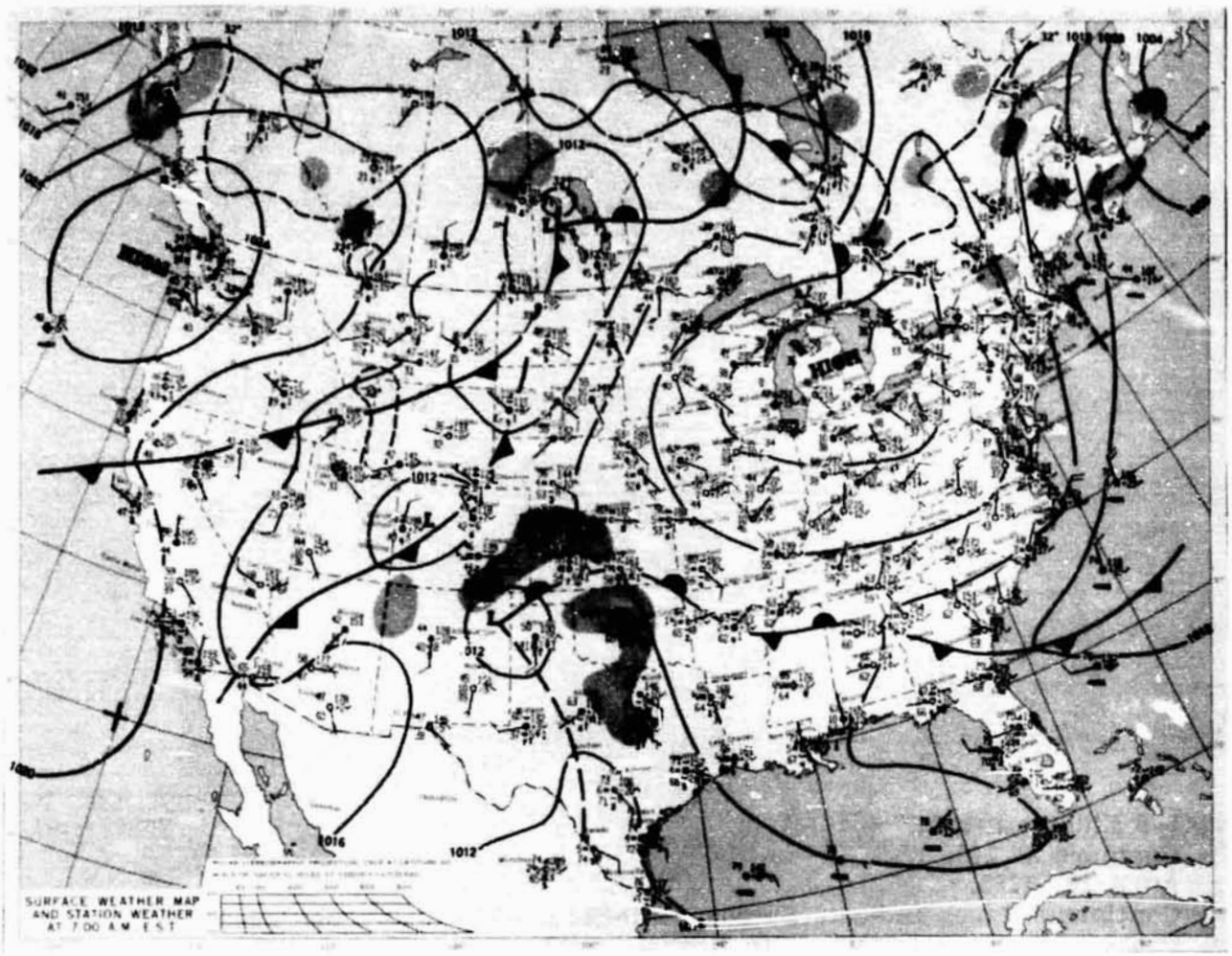
ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
210000	124	079	-43.2	.1325+00	.2007+00	-9999.
211000	131	086	-43.2	.1267+00	.1919+00	-9999.
212000	136	092	-41.2	.1213+00	.1821+00	-9999.
213000	140	098	-40.2	.1161+00	.1736+00	-9999.
214000	140	103	-40.3	.1111+00	.1662+00	-9999.
215000	138	108	-41.2	.1063+00	.1596+00	-9999.
216000	135	113	-41.2	.1018+00	.1529+00	-9999.
217000	130	118	-40.8	.9740-01	.1460+00	-9999.
218000	123	123	-39.2	.9320-01	.1388+00	-9999.
219000	114	128	-39.9	.8930-01	.1334+00	-9999.
220000	104	133	-41.6	.8550-01	.1286+00	-9999.
221000	092	138	-44.8	.8180-01	.1248+00	-9999.
222000	081	142	-48.1	.7820-01	.1211+00	-9999.
223000	069	147	-51.8	.7470-01	.1176+00	-9999.
224000	057	152	-54.9	.7140-01	.1140+00	-9999.
225000	045	156	-58.0	.6810-01	.1102+00	-9999.
226000	035	158	-59.2	.6490-01	.1056+00	-9999.
227000	023	154	-60.1	.6180-01	.1011+00	-9999.
228000	013	132	-61.6	.5890-01	.9700-01	-9999.
229000	011	077	-64.1	.5600-01	.9334-01	-9999.
230000	018	045	-65.7	.5340-01	.8966-01	-9999.
231000	030	037	-67.2	.5090-01	.8608-01	-9999.
232000	040	035	-68.2	.4850-01	.8242-01	-9999.
233000	050	036	-69.2	.4610-01	.7872-01	-9999.
234000	059	038	-69.8	.4390-01	.7520-01	-9999.
235000	069	041	-71.2	.4170-01	.7192-01	-9999.
236000	077	045	-71.8	.3970-01	.6869-01	-9999.
237000	086	048	-73.3	.3770-01	.6573-01	-9999.
238000	096	050	-74.9	.3580-01	.6290-01	-9999.
239000	104	052	-76.4	.3400-01	.6020-01	-9999.
240000	111	055	-77.2	.3230-01	.5741-01	-9999.
241000	119	057	-78.2	.3070-01	.5485-01	-9999.
242000	126	058	-77.3	.2910-01	.5177-01	-9999.
243000	135	060	-78.5	.2770-01	.4957-01	-9999.
244000	141	062	-79.2	.2630-01	.4723-01	-9999.
245000	150	065	-79.2	.2490-01	.4471-01	-9999.
246000	155	066	-79.2	.2370-01	.4256-01	-9999.
247000	160	068	-80.2	.2240-01	.4043-01	-9999.
248000	165	069	-81.1	.2130-01	.3864-01	-9999.
249000	170	071	-81.2	.2020-01	.3665-01	-9999.
250000	173	072	-82.2	.1920-01	.3502-01	-9999.
251000	179	073	-82.7	.1820-01	.3329-01	-9999.
252000	182	074	-84.2	.1720-01	.3171-01	-9999.
253000	184	075	-85.7	.1630-01	.3030-01	-9999.
254000	187	075	-87.3	.1550-01	.2905-01	-9999.
255000	187	075	-88.2	.1460-01	.2749-01	-9999.
256000	189	075	-89.2	.1390-01	.2632-01	-9999.
257000	189	075	-90.2	.1310-01	.2494-01	-9999.
258000	187	075	-90.3	.1240-01	.2363-01	-9999.
259000	187	075	-91.9	.1180-01	.2268-01	-9999.

TABLE 5. (Continued)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
260000	184	074	-92.4	.1110-01	.2139-01	-9999.
261000	182	074	-93.9	.1050-01	.2041-01	-9999.
262000	179	074	-94.4	.9900-02	.1930-01	-9999.
263000	175	074	-95.2	.9400-02	.1840-01	-9999.
264000	172	073	-95.2	.8900-02	.1742-01	-9999.
265000	167	072	-95.2	.8400-02	.1644-01	-9999.
266000	162	072	-94.8	.7900-02	.1543-01	-9999.
267000	155	071	-94.2	.7500-02	.1460-01	-9999.
268000	148	070	-93.7	.7100-02	.1378-01	-9999.
269000	140	069	-93.2	.6700-02	.1297-01	-9999.
270000	131	068	-92.2	.6300-02	.1213-01	-9999.
271000	123	066	-91.2	.6000-02	.1148-01	-9999.
272000	113	065	-90.6	.5700-02	.1088-01	-9999.
273000	103	063	-90.1	.5300-02	.1009-01	-9999.
274000	091	060	-89.2	.5100-02	.9656-02	-9999.
275000	086	060	-88.5	.4923-02	.9320-02	-9999.
276000	082	061	-87.9	.4752-02	.8996-02	-9999.
277000	077	062	-87.2	.4586-02	.8684-02	-9999.
278000	073	063	-86.6	.4427-02	.8382-02	-9999.
279000	068	064	-86.0	.4273-02	.8090-02	-9999.
280000	064	065	-85.3	.4125-02	.7809-02	-9999.
281000	059	066	-84.7	.3981-02	.7538-02	-9999.
282000	055	068	-84.1	.3843-02	.7276-02	-9999.
283000	051	070	-83.4	.3709-02	.7023-02	-9999.
284000	046	072	-82.8	.3580-02	.6779-02	-9999.
285000	042	075	-82.2	.3456-02	.6543-02	-9999.
286000	038	078	-81.5	.3336-02	.6316-02	-9999.
287000	034	082	-80.9	.3220-02	.6096-02	-9999.
288000	030	087	-80.3	.3108-02	.5884-02	-9999.
289000	027	093	-79.6	.3000-02	.5680-02	-9999.
292000	029	07[illegible]	-80.8	.2570-02	.4640-02	-9999.
295000	031	066	-81.9	.2200-02	.4000-02	-9999.
298000	024	063	-82.9	.1830-02	.3330-02	-9999.
301000	013	052	-83.[illegible]	.1550-02	.2830-02	-9999.
304000	006	331	-83.7	.1310-02	.2400-02	-9999.
307000	023	279	-84.1	.1110-02	.2030-02	-9999.
310000	049	271	-84.5	.9440-03	.1720-02	-9999.
313000	069	269	-84.2	.8020-03	.1460-02	-9999.
316000	070	269	-83.1	.6810-03	.1230-02	-9999.
319000	068	269	-82.0	.5790-03	.1030-02	-9999.
322000	064	269	-80.9	.4920-03	.8700-03	-9999.
325000	056	268	-79.8	.4180-03	.7320-03	-9999.
328000	042	267	-78.7	.3550-03	.6160-03	-9999.
331000	046	267	-75.2	.3040-03	.5170-03	-9999.
334000	051	267	-71.7	.2600-03	.4330-03	-9999.
337000	056	266	-68.2	.2220-03	.3640-03	-9999.
340000	061	265	-64.6	.1900-03	.3050-03	-9999.
343000	066	263	-61.1	.1630-03	.2560-03	-9999.
346000	070	265	-56.4	.1410-03	.2160-03	-9999.
349000	072	264	-50.4	.1230-03	.1840-03	-9999.

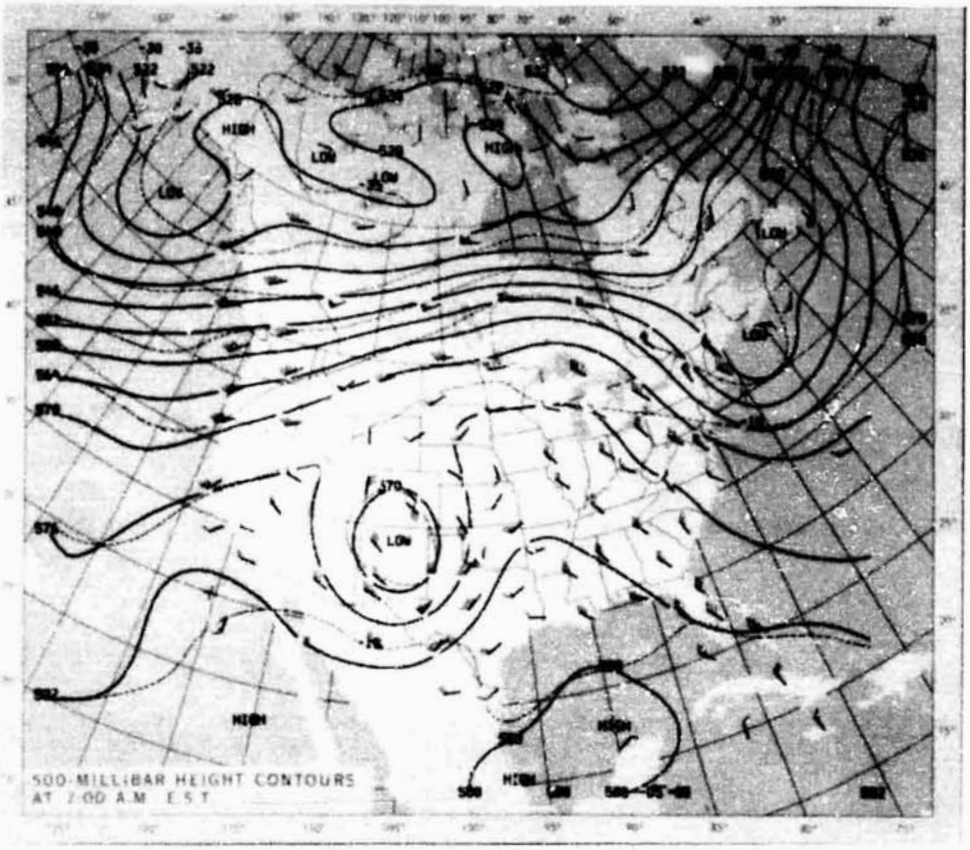
TABLE 5. (Concluded)

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
352000	073	262	-44.4	.1080-03	.1580-03	-9999.
355000	072	259	-38.5	.9450-04	.1330-03	-9999.
358000	066	255	-32.5	.8260-04	.1130-03	-9999.
361000	059	258	-26.5	.7220-04	.9590-04	-9999.
364000	060	254	-20.6	.6490-04	.8320-04	-9999.
367000	061	250	-10.6	.5830-04	.7220-04	-9999.
370000	061	243	-2.7	.5220-04	.6270-04	-9999.
373000	060	235	5.2	.4680-04	.5440-04	-9999.
376000	060	224	13.1	.4190-04	.4720-04	-9999.
379000	045	234	21.7	.3790-04	.4120-04	-9999.
382000	047	231	31.0	.3450-04	.3630-04	-9999.
385000	048	227	40.5	.3150-04	.3210-04	-9999.
388000	050	224	50.3	.2890-04	.2850-04	-9999.
391000	052	220	60.3	.2660-04	.2530-04	-9999.
394000	055	217	70.6	.2450-04	.2260-04	-9999.
397000	058	214	80.9	.2270-04	.2020-04	-9999.
400000	061	211	91.5	.2100-04	.1810-04	-9999.



Surface Synoptic Map at 1200 UT April 29, 1985 — Isobaric, Frontal, and Precipitation Patterns are Shown in Standard Symbolic Form.

Figure 1. Surface synoptic chart 4 hr 2 min prior to launch of STS-51B.



500 Millibar Height
Contours at 1200 UT
April 29, 1985.
Continuous Lines Indicate Height Contours in Feet Above Sea Level.
Dashed Lines are Isotherms In Degrees Centigrade. Arrows Show
Wind Direction and Speed at the 500 MB Level.

Figure 2. 500 mb map 4 hr 2 min prior to launch of STS-51B.

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Figure 3. GOES-6 visible imagery of cloud cover 2 min before launch of STS-51B (1600 UT, April 29, 1985). 500-mb contours and wind barbs are included for 1200 UT.

Figure 4. Enlarged view of GOES-6 visible imagery of cloud cover taken 2 min before launch of STS-51B (1600 UT, April 29, 1985). Surface temperatures and wind barbs for 1600 UT are also included).

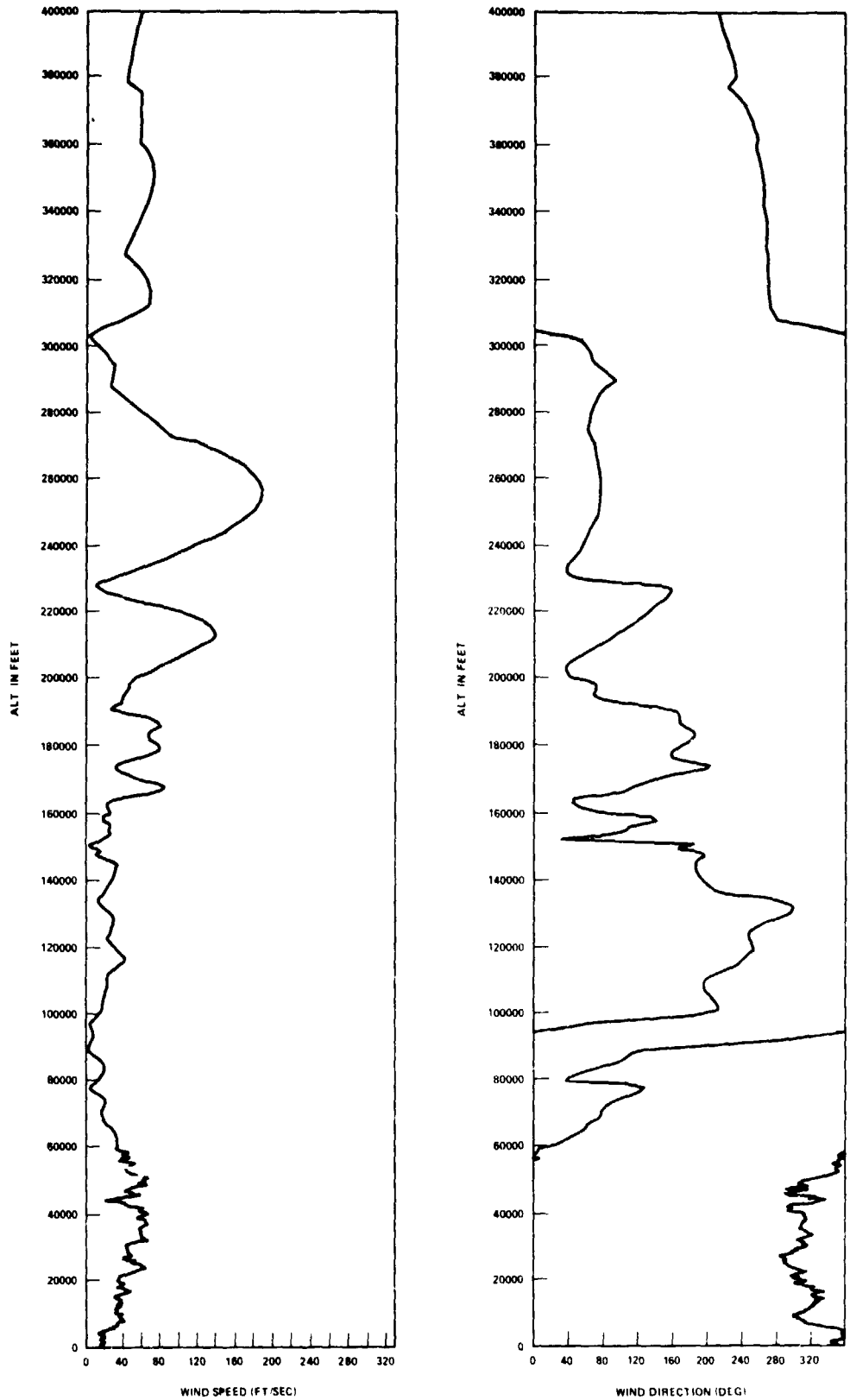

Figure 5. Scalar wind speed and direction at launch time of STS-51B.

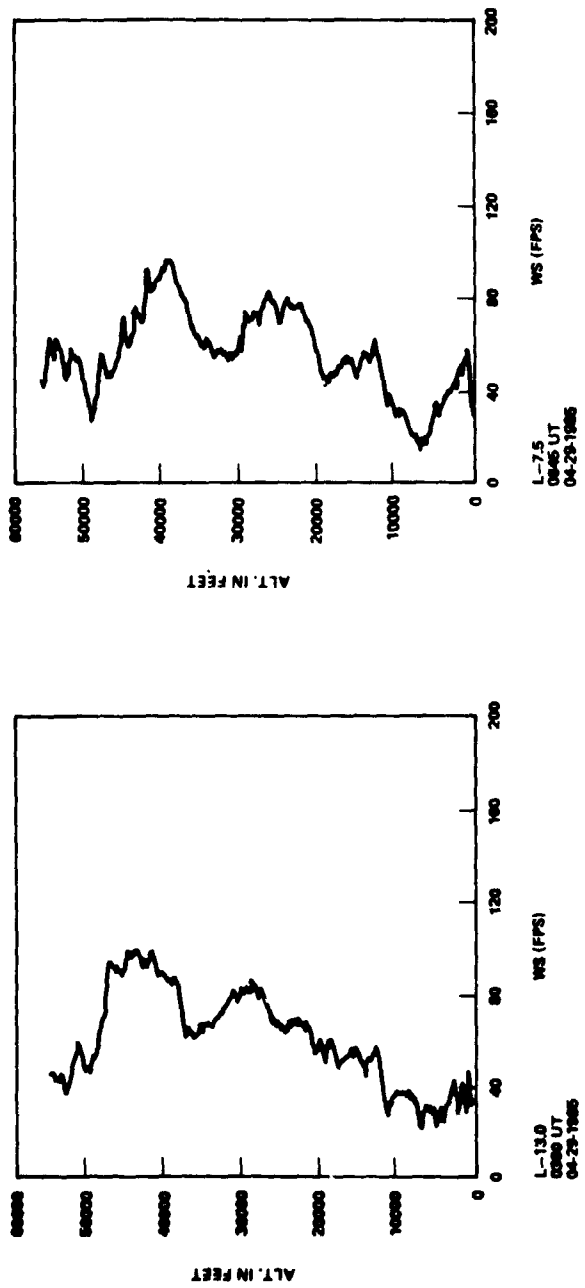

Figure 6. STS-51B prelaunch/launch Jimsphere-measured wind speeds (FPS).

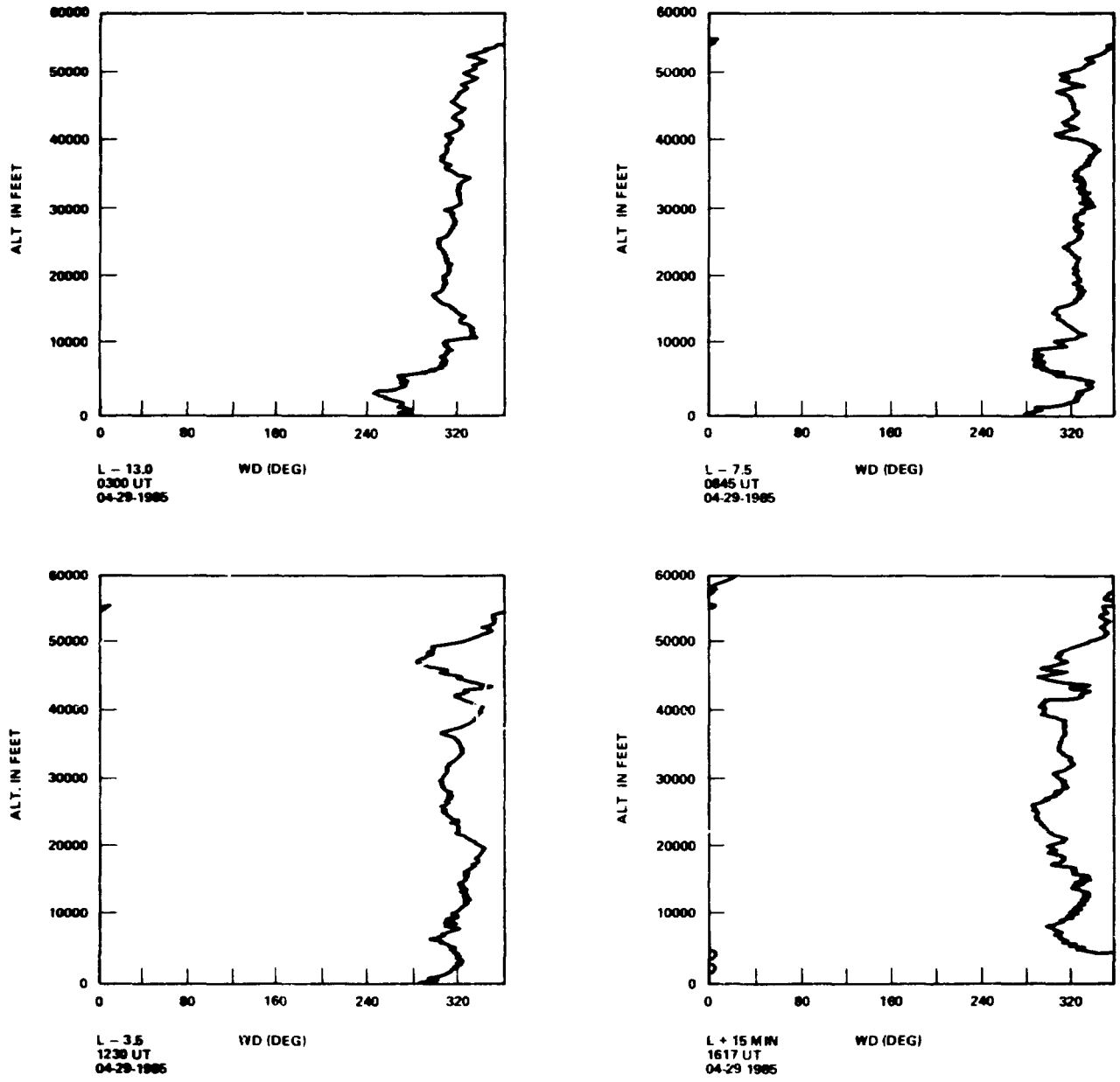

Figure 7. STS-51B prelaunch/launch Jimsphere-measured wind directions (degrees).

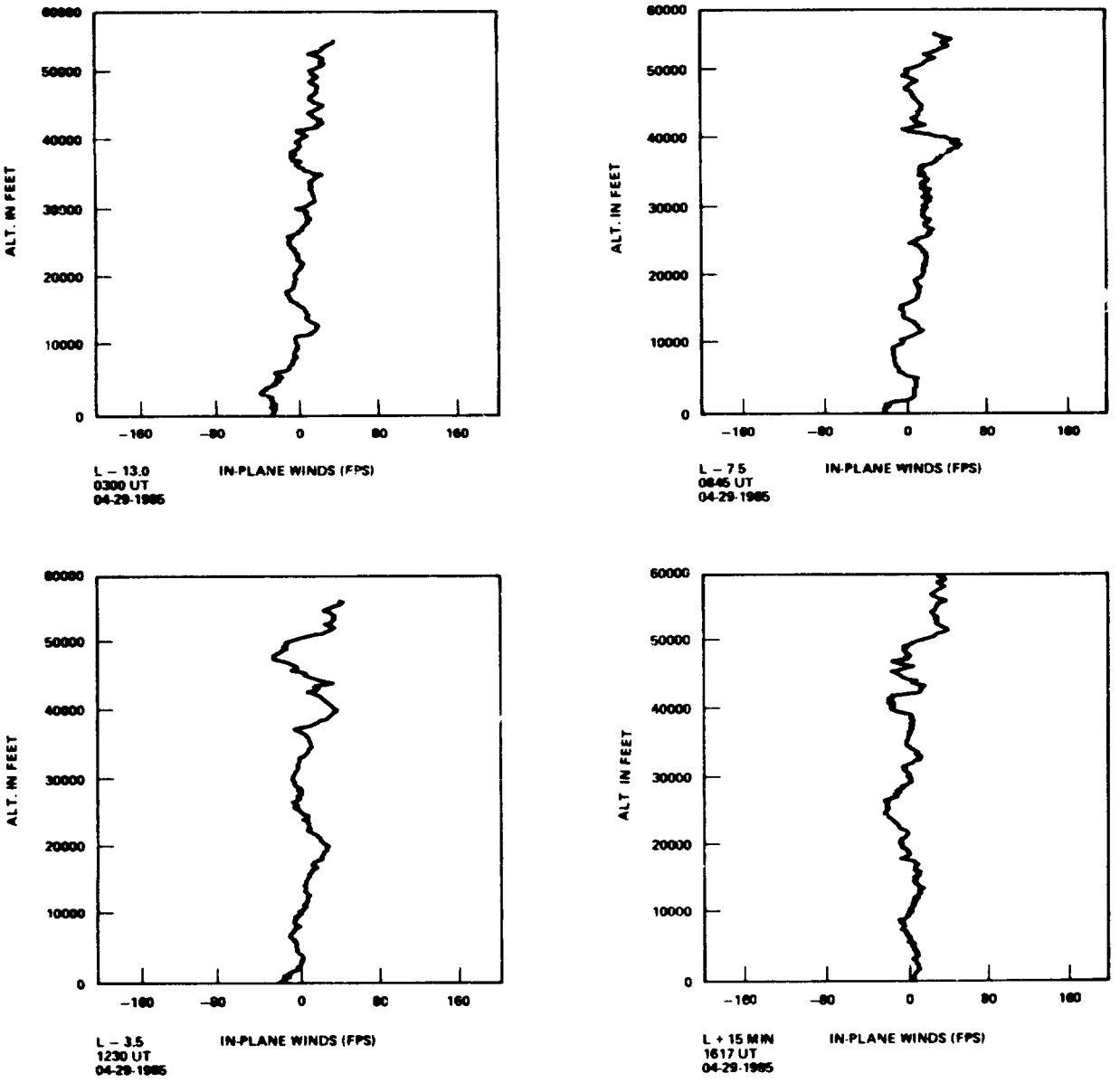

Figure 8. STS-51B prelaunch/launch Jimsphere-measured in-plane component winds (FPS). Flight azimuth = 38 degrees.

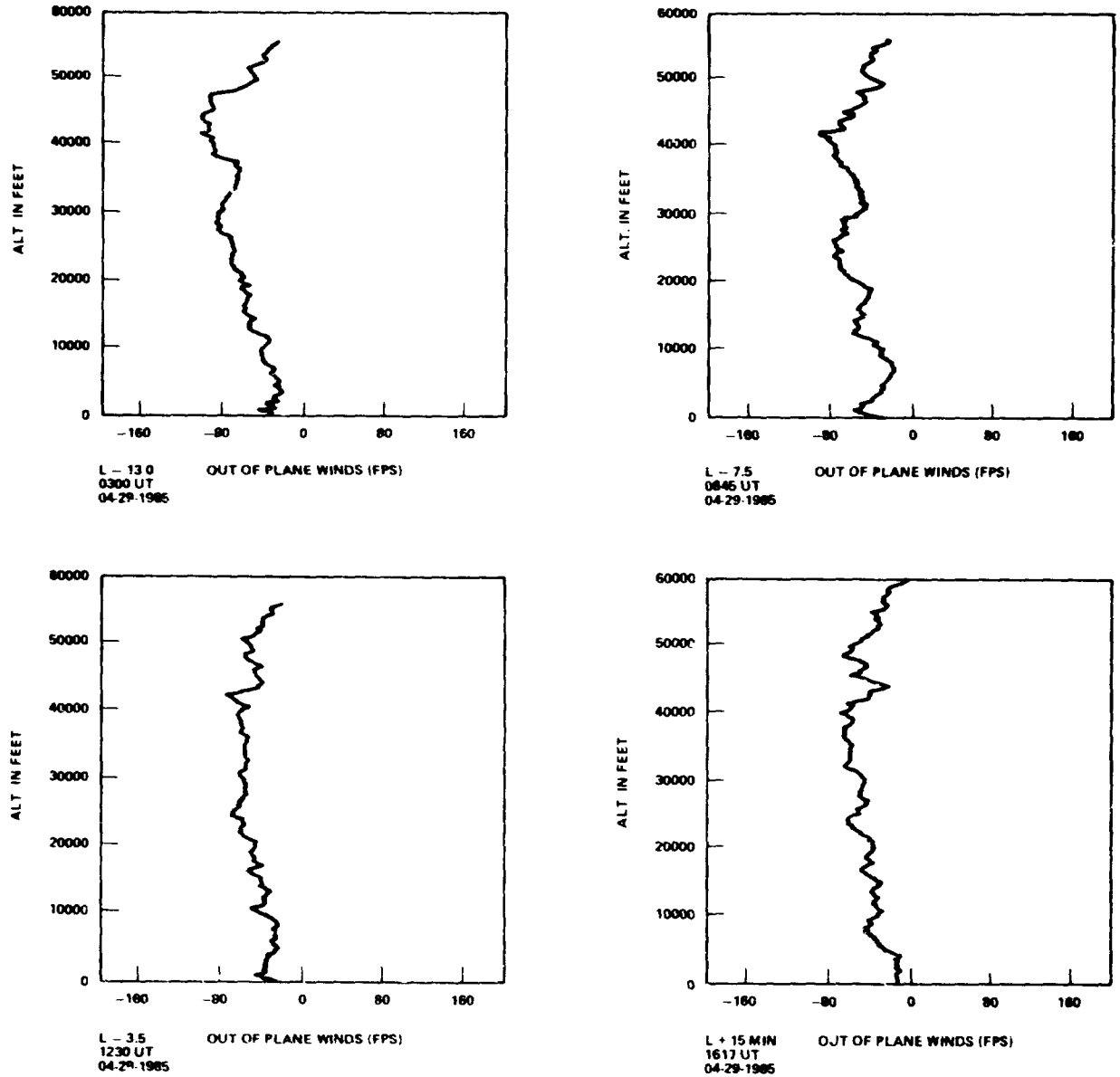

Figure 9. STS 51B prelaunch/launch Jimsphere-measured out-of-plane components winds (FPS). Flight azimuth = 38 degrees.

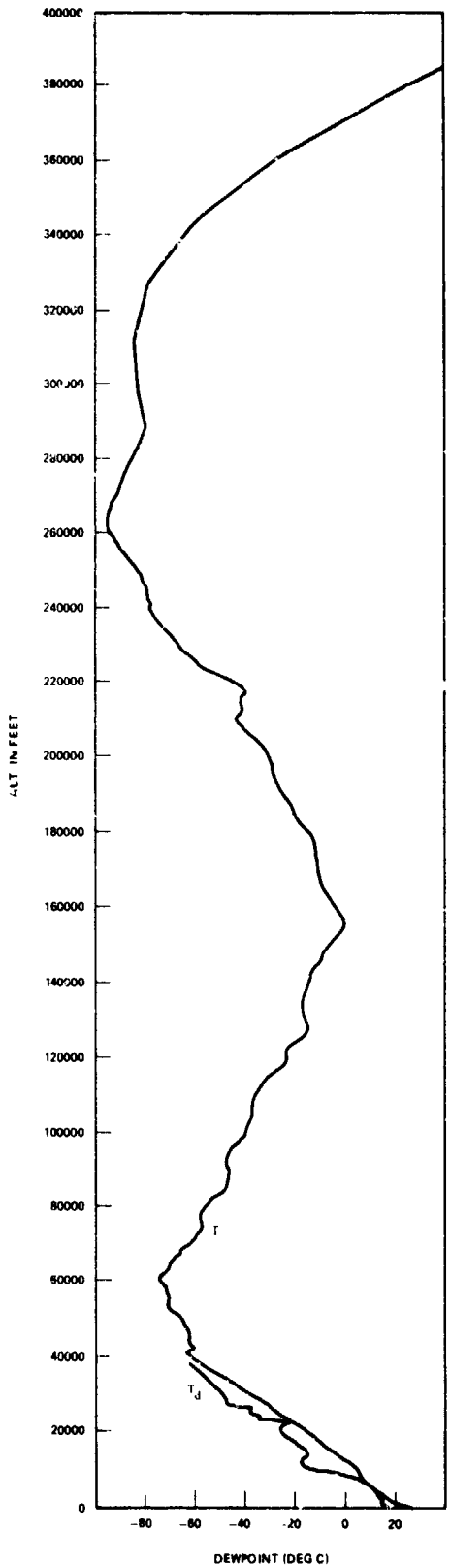

Figure 10. STS-51B temperature profiles versus altitude for launch (ascent).

REFERENCES

1. Saturn Flight Evaluation Working Group: Saturn Launch Vehicle Flight Evaluation Report — Appendix A — Atmosphere (A separate report is prepared for each Saturn vehicle launch operation). George C. Marshall Space Flight Center, Alabama.

2. Johnson, D. L.: Summary of Atmospheric Data Observations for 155 Flights of MSFC/ABMA Related Aerospace Vehicles. NASA TM X-64796, December 5, 1973.

3. Johnson, D. L.: Atmospheric Environment for ASTP (SA-210) Launch. NASA TM X-64990. February 1976.

4. Johnson, D. L., Jasper, G., and Brown, S. C.: Atmospheric Environment for Space Shuttle (STS-1) Launch. NASA TM 82436, July 1981.

5. Johnson, D. L. and Brown, S. C.: Atmospheric Environment for Space Shuttle (STS-2) Launch. NASA TM 82463, December 1981.

6. Johnson, D. L., Brown, S. C., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-3) Launch. NASA TM 82480, April 1982.

7. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-4) Launch. NASA TM 82498, July 1982.

8. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-5) Launch. NASA TM 82515, March 1983.

9. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-6) Launch. NASA TM 82529, May 1983.

10. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-7) Launch. NASA TM 82542, July 1983.

11. Johnson, D. L., Hill, C. K., Turner, R. E., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-8) Launch. NASA TM 82560, October 1983.

12. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-9) Launch. NASA TM 82572, January 1984.

13. Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-11) Launch. NASA TM 82580, March 1984.

14. Johnson, D. L., Hill, C. K., Jasper, G., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-13) Launch. NASA TM 82588, May 1984.

15. Johnson, D. L., Hill, C. K., Jasper, G., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-41D) Launch. NASA TM 84684, October 1984.

16. Johnson, D. L., Hill, C. K., Jasper, G., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-41G) Launch NASA TM 84686, November 1984.

17. Johnson, D. L., Jasper, G., Hill, C. K. and Batts, G. W.: Atmospheric Environment for Space Shuttle (S -51A) Launch. NASA TM 84697, December 1984.

18. Jasper, G. L., Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-51C) Launch. NASA TM 86508, April 1985.

19. Jasper, G. L., Johnson, D. L., Hill, C. K., and Batts, G. W.: Atmospheric Environment for Space Shuttle (STS-51D) Launch. NASA TM , June 1985.

20. Justus, C. G., et al.: The NASA/MSFC Global Reference Atmosphere Model — Mod 3 (with Spherical Harmonic Wind Model). NASA CR-3256, March 1980.

21. Smith, O. E. and Weidner, D. K.: A Reference Atmosphere for Patrick AFB, Florida, Annual (1963 Revision). NASA TM X-53139, September 23, 1964.

APPROVAL

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-51B) LAUNCH

By G. Jasper, D. L. Johnson, C. K. Hill, and G. W. Batts

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

William W. Vaughan

W. W. VAUGHAN
Chief, Atmospheric Sciences Division

C. F. McDonough

C. F. McDONOUGH
Director, Systems Dynamics Laboratory

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