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ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE *ATLANTIS* (STS-39) LAUNCH

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13. ABSTRACT *(Maximum 200 words)*

This report presents a summary of selected atmospheric conditions observed near space shuttle *Atlantis* STS-39 launch time on April 28, 1991, at Kennedy Space Center, Florida. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch 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-39 vehicle ascent has been constructed. The STS-39 ascent atmospheric data tape has been constructed by Marshall Space Flight Center's Earth Science and Applications Division to provide an internally consistent data set for use in postflight performance assessments and represents the best estimate of the launch environment to the 400,000-ft altitude that was traversed by the STS-39 vehicle.

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

TECHNICAL MEMORANDUM

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE *ATLANTIS* (STS-39) LAUNCH

I. INTRODUCTION

This report presents an evaluation of the atmospheric environmental data taken during the launch of the Space Shuttle *Atlantis*/STS-39 vehicle. This space shuttle vehicle was launched from pad 39A at Kennedy Space Center (KSC), Florida, on a flight azimuth of 90° east of north, at 1133 u.t. (0733 e.d.t.) on April 28, 1991.

This report presents a summary of the atmospheric environment at launch time (L+0) of the STS-39, together with the sequence of prelaunch Jimsphere-measured winds-aloft profiles from L–3 h 37 min 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 a ship was unavailable for STS-39 duty, the solid rocket booster (SRB) descent/impact atmospheric data were not taken. However, one can use the STS-39 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[2] has also been published 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-37 launch conditions are presented in references 3 through 35, respectively. Table 1 gives the atmospheric L+0 launch conditions for all the 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 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

An area of high pressure, just east of Southern Florida, dominated the Cape Kennedy region during the launch of STS-39. Light southerly winds were prevalent at the surface prior to the liftoff of STS-39. Figure 1 depicts the surface map 27 min after the launch. Westerly winds

dominated the flow aloft over the KSC region. Figure 2 shows the winds aloft condition at the 500-mb level 27 min after the launch of STS-39.

Clouds were scattered over the launch area prior to and during the launch of STS-39. Figure 3 depicts the GOES-7 visible satellite picture at 1131 u.t. (2 min before the liftoff) with 500-mb heights denoted in meters and wind barbs superimposed. Figure 4 gives an up-close shot of the Florida peninsula as recorded by GOES-7 also taken at 1131 u.t. with surface temperature wind barbs and pressure superimposed.

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-h period prior to launch of STS-39. Values for wind speed and direction are given for the 18-m (60-ft) pad light pole level.

V. UPPER AIR MEASUREMENTS DURING LAUNCH

The FPS-16 Jimsphere (1148 u.t.), MSS Rawinsonde (1031 u.t.), and Super-Loki Robin (1305 u.t.) were used to measure the upper level wind and thermodynamic parameters for STS-39 launch. At altitudes above the rocket-measured data, the Global Reference Atmosphere Model (GRAM)[36] parameters for April KSC conditions were used. A tabulation of the STS-39 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 12.8 ft/s (7.6 kn) at the 60-ft level and increased to a maximum of 48.4 ft/s (28.7 kn) at 800 ft (244 m). Wind speeds decreased above this level with a minimum of 2.9 ft/s (1.7 kn) recorded at 8,500 ft (2,591 m). The wind speeds increased consistently above the 8,500 ft (2,591 m) level, with a maximum of 102.9 ft/s (60.9 kn) occurring at 51,200 ft (15,606 m) and 51,300 ft (15,636 m). Wind speeds fluctuated above this level, and the last measurable maximum wind speed was 101.2 ft/s (59.9 kn) at 168,000 ft (51,206 m).

B. Wind Direction

At launch time, the 60-ft wind direction was from the south and shifted through the southeast and took on a west to northwest direction at the 8,400 ft (2,560 m) altitude. The winds were westerly above 21,700 ft (6,614 m) and remained westerly until the 57,000-ft (17,374-m) altitude where winds became northwesterly. The winds fluctuated from the northwest to the northeast throughout the last measurable wind speed direction which was 224,000 ft (68,275 m).

C. Prelaunch/Launch Wind Profiles

Prelaunch/launch wind profiles given in figures 6 through 9 were measured by the Jimsphere FPS-16 system. Data are shown for four measurement periods beginning at L–3.62 h and extending through L+15 min. The wind speed and direction profiles for the 3.62-h period prior to and including L+15 min are shown in figures 6 and 7.

The in-plane (head-tail wind) and out-of-plane (left-right crosswind) profiles are given in figures 8 and 9. The in-plane profiles (fig. 8) show a slight head wind component near and below 10,000 ft and a tail wind component for all other altitudes. The out-of-plane profiles (fig. 9) depict mostly left crosswind values with the exception of the altitudes near and below 10,000 ft where there were right crosswind values.

D. Thermodynamic Data

The thermodynamic data, taken at STS-39 launch time, consisted of atmospheric temperature, dew-point temperature, pressure, and density. These data have been compiled as the STS-39 ascent atmospheric data and are presented in table 5. Missing data are indicated by –9999.00 in table 5. The vertical structure of temperature and dew-point temperature for STS-39 ascent are shown graphically versus altitude in figure 10.

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[h]				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/s)	Dir. (°)	Alt. (ft)	Speed (ft/s)	Dir. (°)	
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.
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.

Table 1. Selected atmospheric observations for the flights of the space shuttle vehicles (continued).

Vehicle Data[h]				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/s)	Dir. (°)	Alt. (ft)	Speed (ft/s)	Dir. (°)	
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	
18	STS-51G Discovery	6/17/85	0733[f]	10.201	23	91	2.9 11.8	201 206	40,100 46,700	55 55	298 302	
19	STS-51F Challenger	7/29/85	1700[f]	10.174	28	72	14.9 13.4	101 113	48,000	53	035	
20	STS-51I Discovery	8/27/85	0658[f]	10.225	24	86	14.2 16.6	073 070	41,000	43	123	(20) 8/24 launch scrub due to unexceptable weather in launch area. Rain during countdown.
21	STS-51J Atlantis	10/3/85	1115[f]	10.185	28	79	17.0 13.7	213 171	48,000	48	283	(24) 1/7 launch scrub due to unexceptable weather at TAW sites. 1/10 launch scrub due to heavy rain in launch area.
22	STS-61A Challenger	10/30/85	1200	10.059	28	72	12.7 14.1	217 174	43,000	81	218	
23	STS-61B Atlantis	11/26/85	1929	10.202	23	81	10.1 10.4	165 112	49,300	75	270	(25) 1/26 launch scrub due in part to potential bad weather associated with frontal passage. 1/27 launch scrub due in part to strong cross winds at X68. 1/28 2-hr delay due in part to cold early morning temps.
24	STS-61C Columbia	1/12/86	0655	10.206	12	84	15.4 18.6	323 342	40,000	221	263	
25[j]	STS-51L[i] Challenger	1/28/86	1138	10.253	3	27	20.1 15.3	331 262	42,000	174	264	
26[j]	STS-26 Discovery	9/29/88	1137[f]	10.182	29	56	13.7 13.5	058 047	53,100	44	304	(26) 1-hr and 37-min delay due to light winds.
27[j]	STS-27 Atlantis	12/2/88	930	10.270	14	50	25.5 22.0	314 352	40,200	187	245	(27) 1-day delay due to excessive wind loads, calculated at high altitudes.
28[j]	STS-29 Discovery	3/13/89	957	10.190	18	78	16.9	242	45,200	105	283	(28) 2-hr delay due to fog and strong winds aloft.
29[j]	STS-30 Atlantis	5/4/89	1437[f]	10.200	26	57	21.6	106	44,200	157	255	(29) 59-min delay due to cloud cover over the launch area.

Table 1. Selected atmospheric observations for the flights of the space shuttle vehicles (continued).

Vehicle Data[h]				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/s)	Dir. (°)	Alt. (ft)	Speed (ft/s)	Dir. (°)	
30[j]	STS-28 Columbia	8/8/89	0837[f]	10.120	27	80	12.5	252	24,100	35	286	
31[j]	STS-34 Atlantis	10/18/89	1254[f]	10.152	30	52	13.5	193	45,800 47,100	61 61	287 294	(31) 1 day delay due to rain showers in launch area.
32[j]	STS-33 Discovery	11/22/89	1924	10.132	19	80	16.9	208	41,900	110	237	
33	STS-32 Columbia	1/9/90	0735	10.194	12	100	6.8	246	43,800	160	242	(33) 1-day delay due to cloud cover over the launch area.
34	STS-36 Atlantis	2/28/90	0250	10.268	18	71	23.6	72	41,600	177	289	(34) 6-day delay partially due to showers and cloud cover over the launch area.
35[j]	STS-31 Discovery	4/24/90	0834[f]	10.186	22	63	18.6	80	31,300	96	307	
36[j]	STS-41 Discovery	10/6/90	0747[f]	10.176	27	73	23.6	90	41,300	86	293	
37	STS-38 Atlantis	11/15/90	1848	10.254	21	63	28.7	84	41,500	148	273	
39[j]	STS-37 Atlantis	4/5/91	0923	10.256	23	84	18.6	74	46,400	149	262	
40	STS-39 Discovery	4/28/91	0733[f]	10.149	22	95	12.8	191	51,200 51,300	103 103	284 279	

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 winds measured above natural grade. 275-ft FSS wind measurements were not available after sequence No. 27.
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 LC 39A except where noted.
i. Shuttle exploded in flight.
j. Vehicle launched from 39B.

Table 2. Systems used to measure upper air wind data for STS-39 ascent.

Type of Data	Date: April 28, 1991		Portion of Data Used			
	Release Time		Start		End	
	Time (u.t.) (h: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	11:48	15	6 (21)	15	16,764 (55,000)	70
MSS Rawinsonde	10:31	−62	17,069 (56,000)	−6	30,175 (99,000)	37
Super-Loki Rocketsonde (Robin)	13:05	92	68,275 (224,000)	92	30,480 (100,000)	94

Table 3. KSC surface observations at STS-39 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/s (kt)	Direction (°)
NASA Space Shuttle Runway X68[e] Winds Measured at 10.4 m (34 ft)	0	10.163 (14.740)	297.0 (75.0)	295.9 (73.0)	93	16 (10)	1	Stratus	366 (1,200)	10.1 (6.0)	190
							4	Cirrostratus	6,401 (21,000)		
CCAFS XMR[c] Surface Measurements	0	10.163 (14.740)	298.7 (78.0)	296.5 (74.0)	88	16 (10)	1	Cumulus	427 (1,400)	10.1 (6.0)	190
							1	Altocumulus	4,572 (15,000)		
							1	Cirrus	6,401 (21,000)		
Pad 39A[d] Lightpole SE 18.3 m (60.0 ft)[b]	0	10.149 (14.720)	295.4 (72.0)	294.3 (70.0)	95	–	–	–	–	12.8 (7.6)	191

* 4/10 total sky cover at X68 and 3/10 total sky cover 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-39 sky observational site.

Table 4. STS-39 prelaunch through launch KSC pad 39A atmospheric measurements.[a]

Hourly Atmospheric Measurements[a]						Sky Condition[b]			
28 April 1991 Time u.t.	Temperature (°F)	Dew Point (°F)	Relative Humidity (%)	60' Level (SE)		Clouds	Total Sky Cover	Vis. (mi.)	Other Remarks
				WS Kt	WD°				
0600	76	73	90	14	166	Scattered at 5,000 and 21,000 ft	2/10	10	
0700	76	73	89	12	176	Scattered at 5,000 and 21,000 ft	2/10	10	
0800	76	73	89	11	172	Scattered at 5,000 ft	1/10	10	
0900	75	72	90	10	159	Scattered at 300 and 21,000 ft	2/10	10	
1000	75	72	91	9	181	Scattered at 5,500 and 21,000 ft	3/10	10	
1100	74	71	91	7	184	Scattered at 1,000, 2,500, 5,500 and 21,000 ft	4/10	10	
L+0[c] 1133	72	70	95	8	191	Scattered at 1,200 and 21,000 ft	4/10	10	

a. Hourly pad observations (obtained via MSFC/HOSC) averaged over 5 min, centered on the hour.

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

c. L+0 pad 39A wind and thermodynamic parameters obtained from HOSC strip charts. The SE anemometer was used at the 60-ft level for L+0 wind conditions (approximately 1-min average prior to L+0).

Table 5. STS-39 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)
21.	12.84	191.00	22.20	0.1015E+04	0.1186E+04	21.31
100.	13.85	194.00	22.31	0.1012E+04	0.1182E+04	21.29
200.	17.55	191.00	22.46	0.1009E+04	0.1177E+04	21.27
300.	21.26	190.00	22.60	0.1005E+04	0.1173E+04	21.25
400.	24.80	189.00	22.75	0.1002E+04	0.1168E+04	21.23
500.	28.51	188.00	22.89	0.9981E+03	0.1163E+04	21.21
600.	33.23	183.00	23.03	0.9946E+03	0.1159E+04	21.19
700.	33.43	185.00	23.18	0.9912E+03	0.1154E+04	21.17
800.	48.43	153.00	23.32	0.9877E+03	0.1149E+04	21.15
900.	36.12	183.00	23.47	0.9842E+03	0.1145E+04	21.13
1000.	33.23	187.00	23.61	0.9808E+03	0.1140E+04	21.11
1100.	35.27	186.00	23.44	0.9774E+03	0.1137E+04	21.08
1200.	33.23	185.00	23.27	0.9740E+03	0.1134E+04	21.05
1300.	31.73	188.00	23.10	0.9706E+03	0.1130E+04	21.02
1400.	33.43	191.00	22.93	0.9673E+03	0.1127E+04	20.99
1500.	29.69	189.00	22.76	0.9639E+03	0.1124E+04	20.96
1600.	28.87	196.00	22.59	0.9606E+03	0.1120E+04	20.93
1700.	27.00	195.00	22.42	0.9572E+03	0.1117E+04	20.90
1800.	25.66	196.00	22.25	0.9539E+03	0.1114E+04	20.87
1900.	26.51	198.00	22.08	0.9506E+03	0.1111E+04	20.84
2000.	26.51	194.00	21.91	0.9473E+03	0.1107E+04	20.81
2100.	21.95	202.00	21.80	0.9440E+03	0.1104E+04	20.45
2200.	21.42	202.00	21.69	0.9407E+03	0.1101E+04	20.09
2300.	18.90	192.00	21.58	0.9374E+03	0.1098E+04	19.73
2400.	17.72	199.00	21.47	0.9341E+03	0.1094E+04	19.37
2500.	20.93	198.00	21.36	0.9309E+03	0.1091E+04	19.01
2600.	22.28	192.00	21.25	0.9276E+03	0.1088E+04	18.65
2700.	21.42	196.00	21.14	0.9244E+03	0.1085E+04	18.29
2800.	25.13	195.00	21.03	0.9211E+03	0.1082E+04	17.93
2900.	24.48	187.00	20.92	0.9179E+03	0.1078E+04	17.57
3000.	22.44	189.00	20.81	0.9147E+03	0.1075E+04	17.21
3100.	22.44	179.00	20.67	0.9115E+03	0.1072E+04	17.05
3200.	21.59	165.00	20.53	0.9083E+03	0.1069E+04	16.89
3300.	21.78	168.00	20.39	0.9051E+03	0.1066E+04	16.73
3400.	23.62	163.00	20.25	0.9020E+03	0.1062E+04	16.57
3500.	22.44	159.00	20.11	0.8988E+03	0.1059E+04	16.41
3600.	21.59	168.00	19.97	0.8957E+03	0.1056E+04	16.25
3700.	23.95	165.00	19.83	0.8925E+03	0.1053E+04	16.09
3800.	21.95	158.00	19.69	0.8894E+03	0.1050E+04	15.93
3900.	19.23	158.00	19.55	0.8863E+03	0.1047E+04	15.77
4000.	22.11	152.00	19.41	0.8832E+03	0.1044E+04	15.61
4100.	21.10	144.00	19.16	0.8801E+03	0.1041E+04	15.64
4200.	19.59	144.00	18.91	0.8770E+03	0.1038E+04	15.67
4300.	22.11	139.00	18.66	0.8739E+03	0.1035E+04	15.70
4400.	20.77	133.00	18.41	0.8708E+03	0.1032E+04	15.73
4500.	20.77	131.00	18.16	0.8677E+03	0.1030E+04	15.76
4600.	21.59	134.00	17.91	0.8646E+03	0.1027E+04	15.79
4700.	19.91	132.00	17.66	0.8616E+03	0.1024E+04	15.82
4800.	22.11	139.00	17.41	0.8586E+03	0.1021E+04	15.85
4900.	20.93	138.00	17.16	0.8555E+03	0.1018E+04	15.88

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
5000.	20.60	136.00	16.91	0.8525E+03	0.1016E+04	15.91
5100.	22.11	141.00	16.75	0.8495E+03	0.1013E+04	15.45
5200.	19.42	135.00	16.59	0.8464E+03	0.1010E+04	14.99
5300.	20.60	137.00	16.43	0.8434E+03	0.1007E+04	14.53
5400.	19.75	143.00	16.27	0.8404E+03	0.1004E+04	14.07
5500.	17.88	131.00	16.11	0.8374E+03	0.1001E+04	13.61
5600.	19.91	133.00	15.95	0.8344E+03	0.9986E+03	13.15
5700.	16.37	133.00	15.79	0.8315E+03	0.9958E+03	12.69
5800.	18.04	132.00	15.63	0.8285E+03	0.9929E+03	12.23
5900.	17.22	133.00	15.47	0.8255E+03	0.9901E+03	11.77
6000.	14.17	132.00	15.31	0.8226E+03	0.9873E+03	11.31
6100.	15.03	137.00	15.19	0.8197E+03	0.9844E+03	10.81
6200.	11.32	138.00	15.07	0.8167E+03	0.9814E+03	10.31
6300.	13.16	139.00	14.95	0.8138E+03	0.9785E+03	9.81
6400.	13.52	149.00	14.83	0.8109E+03	0.9755E+03	9.31
6500.	10.63	153.00	14.71	0.8080E+03	0.9726E+03	8.81
6600.	13.32	153.00	14.59	0.8051E+03	0.9697E+03	8.31
6700.	10.63	157.00	14.47	0.8022E+03	0.9668E+03	7.81
6800.	12.66	151.00	14.35	0.7993E+03	0.9638E+03	7.31
6900.	13.68	157.00	14.23	0.7965E+03	0.9609E+03	6.81
7000.	11.65	157.00	14.11	0.7936E+03	0.9580E+03	6.31
7100.	13.68	164.00	13.96	0.7907E+03	0.9552E+03	5.88
7200.	11.15	167.00	13.81	0.7879E+03	0.9524E+03	5.45
7300.	9.61	158.00	13.66	0.7851E+03	0.9495E+03	5.02
7400.	10.63	166.00	13.51	0.7822E+03	0.9467E+03	4.59
7500.	7.41	167.00	13.36	0.7794E+03	0.9439E+03	4.16
7600.	10.14	164.00	13.21	0.7766E+03	0.9411E+03	3.73
7700.	9.28	172.00	13.06	0.7738E+03	0.9383E+03	3.30
7800.	7.25	169.00	12.91	0.7710E+03	0.9355E+03	2.87
7900.	11.32	185.00	12.76	0.7683E+03	0.9327E+03	2.44
8000.	11.65	209.00	12.61	0.7655E+03	0.9300E+03	2.01
8100.	7.78	219.00	12.54	0.7627E+03	0.9272E+03	0.39
8200.	6.92	210.00	12.47	0.7600E+03	0.9243E+03	-1.23
8300.	6.92	256.00	12.40	0.7572E+03	0.9215E+03	-2.85
8400.	4.56	293.00	12.33	0.7545E+03	0.9186E+03	-4.47
8500.	2.69	280.00	12.26	0.7517E+03	0.9158E+03	-6.09
8600.	4.72	286.00	12.19	0.7490E+03	0.9129E+03	-7.71
8700.	3.71	319.00	12.12	0.7463E+03	0.9100E+03	-9.33
8800.	2.85	279.00	12.05	0.7436E+03	0.9070E+03	-10.95
8900.	6.40	274.00	11.98	0.7409E+03	0.9041E+03	-12.57
9000.	5.05	290.00	11.91	0.7382E+03	0.9012E+03	-14.19
9100.	5.58	249.00	11.70	0.7355E+03	0.8986E+03	-14.38
9200.	8.27	269.00	11.49	0.7328E+03	0.8960E+03	-14.57
9300.	8.96	261.00	11.28	0.7301E+03	0.8934E+03	-14.76
9400.	9.45	243.00	11.07	0.7275E+03	0.8908E+03	-14.95
9500.	12.83	262.00	10.86	0.7248E+03	0.8882E+03	-15.14
9600.	11.15	261.00	10.65	0.7222E+03	0.8856E+03	-15.33
9700.	13.16	247.00	10.44	0.7195E+03	0.8831E+03	-15.52
9800.	14.70	259.00	10.23	0.7169E+03	0.8805E+03	-15.71
9900.	11.15	262.00	10.02	0.7143E+03	0.8779E+03	-15.90

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
10000.	11.48	241.00	9.81	0.7117E+03	0.8754E+03	-16.09
10100.	13.32	245.00	9.61	0.7091E+03	0.8728E+03	-15.93
10200.	13.32	252.00	9.41	0.7065E+03	0.8702E+03	-15.77
10300.	13.32	250.00	9.21	0.7039E+03	0.8676E+03	-15.61
10400.	17.06	259.00	9.01	0.7013E+03	0.8650E+03	-15.45
10500.	18.90	266.00	8.81	0.6987E+03	0.8624E+03	-15.29
10600.	18.24	271.00	8.61	0.6962E+03	0.8599E+03	-15.13
10700.	21.78	268.00	8.41	0.6936E+03	0.8573E+03	-14.97
10800.	24.15	270.00	8.21	0.6911E+03	0.8547E+03	-14.81
10900.	23.13	273.00	8.01	0.6885E+03	0.8522E+03	-14.65
11000.	20.93	268.00	7.81	0.6860E+03	0.8497E+03	-14.49
11100.	24.31	272.00	7.64	0.6835E+03	0.8470E+03	-14.46
11200.	23.62	278.00	7.47	0.6809E+03	0.8444E+03	-14.43
11300.	22.28	276.00	7.30	0.6784E+03	0.8418E+03	-14.40
11400.	22.44	277.00	7.13	0.6759E+03	0.8392E+03	-14.37
11500.	21.59	283.00	6.96	0.6734E+03	0.8366E+03	-14.34
11600.	18.73	282.00	6.79	0.6709E+03	0.8340E+03	-14.31
11700.	19.42	284.00	6.62	0.6685E+03	0.8314E+03	-14.28
11800.	19.91	301.00	6.45	0.6660E+03	0.8289E+03	-14.25
11900.	18.04	296.00	6.28	0.6635E+03	0.8263E+03	-14.22
12000.	20.93	295.00	6.11	0.6611E+03	0.8237E+03	-14.19
12100.	21.59	297.00	5.88	0.6586E+03	0.8214E+03	-14.34
12200.	20.77	299.00	5.65	0.6562E+03	0.8190E+03	-14.49
12300.	22.44	292.00	5.42	0.6537E+03	0.8166E+03	-14.64
12400.	24.31	299.00	5.19	0.6513E+03	0.8143E+03	-14.79
12500.	22.28	302.00	4.96	0.6489E+03	0.8119E+03	-14.94
12600.	24.31	296.00	4.73	0.6465E+03	0.8096E+03	-15.09
12700.	25.33	302.00	4.50	0.6441E+03	0.8072E+03	-15.24
12800.	23.79	301.00	4.27	0.6417E+03	0.8049E+03	-15.39
12900.	25.49	300.00	4.04	0.6393E+03	0.8026E+03	-15.54
13000.	26.15	305.00	3.81	0.6369E+03	0.8003E+03	-15.69
13100.	22.97	305.00	3.59	0.6345E+03	0.7979E+03	-16.06
13200.	26.31	302.00	3.37	0.6321E+03	0.7956E+03	-16.43
13300.	26.84	312.00	3.15	0.6298E+03	0.7932E+03	-16.80
13400.	24.31	307.00	2.93	0.6274E+03	0.7909E+03	-17.17
13500.	26.31	304.00	2.71	0.6250E+03	0.7886E+03	-17.54
13600.	25.98	309.00	2.49	0.6227E+03	0.7863E+03	-17.91
13700.	24.15	306.00	2.27	0.6204E+03	0.7840E+03	-18.28
13800.	26.67	303.00	2.05	0.6180E+03	0.7817E+03	-18.65
13900.	25.98	307.00	1.83	0.6157E+03	0.7794E+03	-19.02
14000.	24.31	298.00	1.61	0.6134E+03	0.7771E+03	-19.39
14100.	26.15	299.00	1.36	0.6111E+03	0.7748E+03	-18.95
14200.	25.13	306.00	1.11	0.6088E+03	0.7726E+03	-18.51
14300.	23.79	302.00	0.86	0.6065E+03	0.7703E+03	-18.07
14400.	24.80	292.00	0.61	0.6042E+03	0.7681E+03	-17.63
14500.	24.97	302.00	0.36	0.6019E+03	0.7659E+03	-17.19
14600.	23.95	299.00	0.11	0.5996E+03	0.7636E+03	-16.75
14700.	24.80	300.00	-0.14	0.5973E+03	0.7614E+03	-16.31
14800.	26.67	305.00	-0.39	0.5951E+03	0.7592E+03	-15.87
14900.	25.13	300.00	-0.64	0.5928E+03	0.7570E+03	-15.43

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
15000.	27.49	304.00	-0.89	0.5906E+03	0.7548E+03	-14.99
15100.	26.31	306.00	-1.19	0.5883E+03	0.7527E+03	-14.48
15200.	25.82	303.00	-1.49	0.5861E+03	0.7506E+03	-13.97
15300.	27.85	305.00	-1.79	0.5839E+03	0.7485E+03	-13.46
15400.	26.51	308.00	-2.09	0.5816E+03	0.7464E+03	-12.95
15500.	27.49	303.00	-2.39	0.5794E+03	0.7443E+03	-12.44
15600.	27.85	310.00	-2.69	0.5772E+03	0.7422E+03	-11.93
15700.	25.66	305.00	-2.99	0.5750E+03	0.7402E+03	-11.42
15800.	28.51	301.00	-3.29	0.5728E+03	0.7381E+03	-10.91
15900.	27.49	308.00	-3.59	0.5706E+03	0.7360E+03	-10.40
16000.	25.66	302.00	-3.89	0.5684E+03	0.7340E+03	-9.89
16100.	27.69	307.00	-4.17	0.5662E+03	0.7319E+03	-10.17
16200.	27.17	310.00	-4.45	0.5640E+03	0.7299E+03	-10.45
16300.	27.00	307.00	-4.73	0.5618E+03	0.7278E+03	-10.73
16400.	28.02	309.00	-5.01	0.5597E+03	0.7258E+03	-11.01
16500.	26.15	304.00	-5.29	0.5575E+03	0.7238E+03	-11.29
16600.	29.04	304.00	-5.57	0.5553E+03	0.7218E+03	-11.57
16700.	29.04	302.00	-5.85	0.5532E+03	0.7197E+03	-11.85
16800.	31.89	303.00	-6.13	0.5511E+03	0.7177E+03	-12.13
16900.	30.87	302.00	-6.41	0.5489E+03	0.7157E+03	-12.41
17000.	31.73	298.00	-6.69	0.5468E+03	0.7137E+03	-12.69
17100.	32.41	301.00	-6.90	0.5447E+03	0.7115E+03	-12.66
17200.	32.41	295.00	-7.11	0.5426E+03	0.7093E+03	-12.63
17300.	33.23	293.00	-7.32	0.5404E+03	0.7071E+03	-12.60
17400.	32.74	288.00	-7.53	0.5383E+03	0.7049E+03	-12.57
17500.	34.42	287.00	-7.74	0.5362E+03	0.7027E+03	-12.54
17600.	32.74	290.00	-7.95	0.5342E+03	0.7005E+03	-12.51
17700.	33.07	286.00	-8.16	0.5321E+03	0.6983E+03	-12.48
17800.	34.25	286.00	-8.37	0.5300E+03	0.6962E+03	-12.45
17900.	33.92	282.00	-8.58	0.5280E+03	0.6940E+03	-12.42
18000.	36.12	281.00	-8.79	0.5259E+03	0.6918E+03	-12.39
18100.	35.79	283.00	-8.98	0.5238E+03	0.6896E+03	-12.74
18200.	35.60	278.00	-9.17	0.5218E+03	0.6875E+03	-13.09
18300.	38.16	281.00	-9.36	0.5197E+03	0.6853E+03	-13.44
18400.	39.14	279.00	-9.55	0.5177E+03	0.6831E+03	-13.79
18500.	40.85	276.00	-9.74	0.5156E+03	0.6809E+03	-14.14
18600.	44.39	281.00	-9.93	0.5136E+03	0.6788E+03	-14.49
18700.	43.21	284.00	-10.12	0.5116E+03	0.6766E+03	-14.84
18800.	44.39	280.00	-10.31	0.5096E+03	0.6745E+03	-15.19
18900.	43.21	286.00	-10.50	0.5076E+03	0.6723E+03	-15.54
19000.	43.21	284.00	-10.69	0.5056E+03	0.6702E+03	-15.89
19100.	44.72	285.00	-10.80	0.5036E+03	0.6679E+03	-17.33
19200.	42.68	288.00	-10.91	0.5016E+03	0.6657E+03	-18.77
19300.	42.88	287.00	-11.02	0.4996E+03	0.6634E+03	-20.21
19400.	43.37	292.00	-11.13	0.4977E+03	0.6611E+03	-21.65
19500.	43.54	291.00	-11.24	0.4957E+03	0.6589E+03	-23.09
19600.	46.92	292.00	-11.35	0.4937E+03	0.6566E+03	-24.53
19700.	45.41	298.00	-11.46	0.4918E+03	0.6543E+03	-25.97
19800.	44.88	294.00	-11.57	0.4899E+03	0.6521E+03	-27.41
19900.	47.08	294.00	-11.68	0.4879E+03	0.6498E+03	-28.85

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
20000.	45.41	296.00	-11.79	0.4860E+03	0.6475E+03	-30.29
20100.	47.41	292.00	-12.00	0.4841E+03	0.6455E+03	-29.62
20200.	47.93	298.00	-12.21	0.4821E+03	0.6434E+03	-28.95
20300.	47.24	294.00	-12.42	0.4802E+03	0.6413E+03	-28.28
20400.	50.62	293.00	-12.63	0.4783E+03	0.6393E+03	-27.61
20500.	53.84	296.00	-12.84	0.4764E+03	0.6372E+03	-26.94
20600.	53.84	293.00	-13.05	0.4745E+03	0.6352E+03	-26.27
20700.	54.33	295.00	-13.26	0.4726E+03	0.6331E+03	-25.60
20800.	55.51	293.00	-13.47	0.4707E+03	0.6311E+03	-24.93
20900.	56.69	292.00	-13.68	0.4689E+03	0.6291E+03	-24.26
21000.	58.56	290.00	-13.89	0.4670E+03	0.6270E+03	-23.59
21100.	58.23	287.00	-14.01	0.4651E+03	0.6248E+03	-23.64
21200.	61.78	288.00	-14.13	0.4633E+03	0.6226E+03	-23.69
21300.	60.43	286.00	-14.25	0.4614E+03	0.6204E+03	-23.74
21400.	59.06	283.00	-14.37	0.4596E+03	0.6182E+03	-23.79
21500.	61.42	283.00	-14.49	0.4578E+03	0.6161E+03	-23.84
21600.	57.87	282.00	-14.61	0.4559E+03	0.6139E+03	-23.89
21700.	58.89	280.00	-14.73	0.4541E+03	0.6117E+03	-23.94
21800.	63.78	274.00	-14.85	0.4523E+03	0.6096E+03	-23.99
21900.	61.42	278.00	-14.97	0.4505E+03	0.6074E+03	-24.04
22000.	58.56	277.00	-15.09	0.4487E+03	0.6053E+03	-24.09
22100.	59.25	273.00	-15.21	0.4469E+03	0.6031E+03	-23.82
22200.	57.05	273.00	-15.33	0.4451E+03	0.6010E+03	-23.55
22300.	54.53	272.00	-15.45	0.4433E+03	0.5988E+03	-23.28
22400.	54.00	267.00	-15.57	0.4415E+03	0.5967E+03	-23.01
22500.	52.66	267.00	-15.69	0.4398E+03	0.5945E+03	-22.74
22600.	55.51	264.00	-15.81	0.4380E+03	0.5924E+03	-22.47
22700.	57.38	264.00	-15.93	0.4362E+03	0.5903E+03	-22.20
22800.	56.89	271 00	-16.05	0.4345E+03	0.5882E+03	-21.93
22900.	60.07	268.00	-16.17	0.4327E+03	0.5861E+03	-21.66
23000.	62.11	269.00	-16.29	0.4310E+03	0.5840E+03	-21.39
23100.	58.07	270.00	-16.52	0.4293E+03	0.5822E+03	-21.76
23200.	60.43	265.00	-16.75	0.4275E+03	0.5803E+03	-22.13
23300.	61.09	268.00	-16.98	0.4258E+03	0.5785E+03	-22.50
23400.	59.58	268.00	-17.21	0.4241E+03	0.5767E+03	-22.87
23500.	59.25	266.00	-17.44	0.4224E+03	0.5749E+03	-23.24
23600.	58.73	268.00	-17.67	0.4207E+03	0.5731E+03	-23.61
23700.	59.42	265.00	-17.90	0.4190E+03	0.5713E+03	-23.98
23800.	58.40	267.00	-18.13	0.4173E+03	0.5696E+03	-24.35
23900.	59.42	266.00	-18.36	0.4156E+03	0.5678E+03	-24.72
24000.	61.25	270.00	-18.59	0.4139E+03	0.5660E+03	-25.09
24100.	61.09	269.00	-18.79	0.4122E+03	0.5641E+03	-25.21
24200.	61.42	269.00	-18.99	0.4105E+03	0.5623E+03	-25.33
24300.	60.43	271.00	-19.19	0.4088E+03	0.5604E+03	-25.45
24400.	63.29	273.00	-19.39	0.4072E+03	0.5586E+03	-25.57
24500.	59.91	277.00	-19.59	0.4055E+03	0.5567E+03	-25.69
24600.	58.73	278.00	-19.79	0.4039E+03	0.5549E+03	-25.81
24700.	58.89	277.00	-19.99	0.4022E+03	0.5531E+03	-25.93
24800.	59.58	277.00	-20.19	0.4006E+03	0.5513E+03	-26.05
24900.	59.91	275.00	-20.39	0.3989E+03	0.5495E+03	-26.17

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
25000.	57.87	278.00	-20.59	0.3973E+03	0.5476E+03	-26.29
25100.	58.73	274.00	-20.78	0.3957E+03	0.5458E+03	-26.74
25200.	59.42	277.00	-20.97	0.3940E+03	0.5440E+03	-27.19
25300.	63.45	275.00	-21.16	0.3924E+03	0.5422E+03	-27.64
25400.	63.12	275.00	-21.35	0.3908E+03	0.5404E+03	-28.09
25500.	60.60	276.00	-21.54	0.3892E+03	0.5386E+03	-28.54
25600.	63.45	274.00	-21.73	0.3876E+03	0.5368E+03	-28.99
25700.	62.60	273.00	-21.92	0.3860E+03	0.5350E+03	-29.44
25800.	63.78	271.00	-22.11	0.3844E+03	0.5332E+03	-29.89
25900.	62.11	275.00	-22.30	0.3829E+03	0.5315E+03	-30.34
26000.	63.29	273.00	-22.49	0.3813E+03	0.5297E+03	-30.79
26100.	64.47	274.00	-22.71	0.3797E+03	0.5280E+03	-31.18
26200.	63.45	277.00	-22.93	0.3781E+03	0.5262E+03	-31.57
26300.	64.30	276.00	-23.15	0.3766E+03	0.5245E+03	-31.96
26400.	63.12	279.00	-23.37	0.3750E+03	0.5228E+03	-32.35
26500.	63.98	277.00	-23.59	0.3735E+03	0.5211E+03	-32.74
26600.	65.32	278.00	-23.81	0.3719E+03	0.5194E+03	-33.13
26700.	65.32	278.00	-24.03	0.3704E+03	0.5178E+03	-33.52
26800.	67.68	275.00	-24.25	0.3688E+03	0.5161E+03	-33.91
26900.	66.99	279.00	-24.47	0.3673E+03	0.5144E+03	-34.30
27000.	67.68	276.00	-24.69	0.3658E+03	0.5127E+03	-34.69
27100.	66.83	278.00	-24.93	0.3643E+03	0.5111E+03	-34.98
27200.	65.32	279.00	-25.17	0.3627E+03	0.5094E+03	-35.27
27300.	66.50	276.00	-25.41	0.3612E+03	0.5078E+03	-35.56
27400.	64.96	279.00	-25.65	0.3597E+03	0.5062E+03	-35.85
27500.	66.83	278.00	-25.89	0.3582E+03	0.5046E+03	-36.14
27600.	66.83	278.00	-26.13	0.3567E+03	0.5029E+03	-36.43
27700.	62.96	279.00	-26.37	0.3552E+03	0.5013E+03	-36.72
27800.	66.50	275.00	-26.61	0.3537E+03	0.4997E+03	-37.01
27900.	64.80	277.00	-26.85	0.3523E+03	0.4981E+03	-37.30
28000.	66.34	278.00	-27.09	0.3508E+03	0.4965E+03	-37.59
28100.	69.36	275.00	-27.36	0.3493E+03	0.4950E+03	-37.80
28200.	67.68	277.00	-27.63	0.3478E+03	0.4934E+03	-38.01
28300.	67.68	277.00	-27.90	0.3464E+03	0.4919E+03	-38.22
28400.	68.01	275.00	-28.17	0.3449E+03	0.4903E+03	-38.43
28500.	67.52	276.00	-28.44	0.3434E+03	0.4888E+03	-38.64
28600.	65.98	273.00	-28.71	0.3420E+03	0.4872E+03	-38.85
28700.	65.65	275.00	-28.98	0.3405E+03	0.4857E+03	-39.06
28800.	63.12	270.00	-29.25	0.3391E+03	0.4842E+03	-39.27
28900.	62.43	272.00	-29.52	0.3376E+03	0.4827E+03	-39.48
29000.	60.07	274.00	-29.79	0.3362E+03	0.4812E+03	-39.69
29100.	61.42	274.00	-30.05	0.3348E+03	0.4796E+03	-39.84
29200.	59.91	274.00	-30.31	0.3333E+03	0.4781E+03	-39.99
29300.	60.07	273.00	-30.57	0.3319E+03	0.4766E+03	-40.14
29400.	60.60	273.00	-30.83	0.3305E+03	0.4750E+03	-40.29
29500.	59.74	273.00	-31.09	0.3291E+03	0.4735E+03	-40.44
29600.	61.25	273.00	-31.35	0.3277E+03	0.4720E+03	-40.59
29700.	62.80	269.00	-31.61	0.3263E+03	0.4705E+03	-40.74
29800.	60.60	273.00	-31.87	0.3249E+03	0.4690E+03	-40.89
29900.	61.94	276.00	-32.13	0.3235E+03	0.4675E+03	-41.04

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
30000.	61.25	273.00	-32.39	0.3221E+03	0.4660E+03	-41.19
30100.	63.12	273.00	-32.66	0.3207E+03	0.4645E+03	-41.46
30200.	63.78	270.00	-32.93	0.3193E+03	0.4630E+03	-41.73
30300.	62.11	273.00	-33.20	0.3180E+03	0.4615E+03	-42.00
30400.	62.43	274.00	-33.47	0.3166E+03	0.4601E+03	-42.27
30500.	61.61	273.00	-33.74	0.3152E+03	0.4586E+03	-42.54
30600.	59.42	276.00	-34.01	0.3139E+03	0.4572E+03	-42.81
30700.	60.93	270.00	-34.28	0.3125E+03	0.4557E+03	-43.08
30800.	58.40	273.00	-34.55	0.3112E+03	0.4543E+03	-43.35
30900.	57.71	273.00	-34.82	0.3098E+03	0.4528E+03	-43.62
31000.	60.07	268.00	-35.09	0.3085E+03	0.4514E+03	-43.89
31100.	58.73	271.00	-35.34	0.3072E+03	0.4499E+03	-44.17
31200.	60.07	267.00	-35.59	0.3058E+03	0.4484E+03	-44.45
31300.	61.09	266.00	-35.84	0.3045E+03	0.4469E+03	-44.73
31400.	59.25	271.00	-36.09	0.3032E+03	0.4454E+03	-45.01
31500.	60.43	268.00	-36.34	0.3018E+03	0.4440E+03	-45.29
31600.	61.25	268.00	-36.59	0.3005E+03	0.4425E+03	-45.57
31700.	59.58	267.00	-36.84	0.2992E+03	0.4410E+03	-45.85
31800.	61.42	271.00	-37.09	0.2979E+03	0.4396E+03	-46.13
31900.	58.89	276.00	-37.34	0.2966E+03	0.4381E+03	-46.41
32000.	59.74	274.00	-37.59	0.2953E+03	0.4367E+03	-46.69
32100.	59.25	281.00	-37.83	0.2940E+03	0.4352E+03	-47.00
32200.	57.71	279.00	-38.07	0.2927E+03	0.4337E+03	-47.31
32300.	60.07	273.00	-38.31	0.2914E+03	0.4322E+03	-47.62
32400.	58.40	279.00	-38.55	0.2901E+03	0.4308E+03	-47.93
32500.	59.06	279.00	-38.79	0.2888E+03	0.4293E+03	-48.24
32600.	61.25	279.00	-39.03	0.2876E+03	0.4278E+03	-48.55
32700.	59.25	277.00	-39.27	0.2863E+03	0.4264E+03	-48.86
32800.	61.78	273.00	-39.51	0.2850E+03	0.4249E+03	-49.17
32900.	60.93	279.00	-39.75	0.2838E+03	0.4235E+03	-49.48
33000.	58.56	278.00	-39.99	0.2825E+03	0.4221E+03	-49.79
33100.	60.07	273.00	-40.24	0.2812E+03	0.4206E+03	-50.07
33200.	57.71	278.00	-40.49	0.2800E+03	0.4192E+03	-50.35
33300.	58.73	277.00	-40.74	0.2788E+03	0.4178E+03	-50.63
33400.	58.40	280.00	-40.99	0.2775E+03	0.4164E+03	-50.91
33500.	58.23	277.00	-41.24	0.2763E+03	0.4150E+03	-51.19
33600.	60.93	276.00	-41.49	0.2751E+03	0.4136E+03	-51.47
33700.	59.25	281.00	-41.74	0.2738E+03	0.4122E+03	-51.75
33800.	61.09	276.00	-41.99	0.2726E+03	0.4108E+03	-52.03
33900.	62.43	277.00	-42.24	0.2714E+03	0.4094E+03	-52.31
34000.	65.65	277.00	-42.49	0.2702E+03	0.4081E+03	-52.59
34100.	67.68	276.00	-42.74	0.2690E+03	0.4067E+03	-52.83
34200.	66.99	278.00	-42.99	0.2678E+03	0.4053E+03	-53.07
34300.	67.52	276.00	-43.24	0.2666E+03	0.4039E+03	-53.31
34400.	70.54	278.00	-43.49	0.2654E+03	0.4025E+03	-53.55
34500.	68.18	282.00	-43.74	0.2642E+03	0.4011E+03	-53.79
34600.	69.88	280.00	-43.99	0.2630E+03	0.3998E+03	-54.03
34700.	72.74	281.00	-44.24	0.2618E+03	0.3984E+03	-54.27
34800.	71.39	283.00	-44.49	0.2606E+03	0.3971E+03	-54.51
34900.	74.61	280.00	-44.74	0.2595E+03	0.3957E+03	-54.75

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
35000.	76.28	280.00	-44.99	0.2583E+03	0.3944E+03	-54.99
35100.	76.28	283.00	-45.23	0.2571E+03	0.3930E+03	-55.20
35200.	79.99	277.00	-45.47	0.2559E+03	0.3916E+03	-55.41
35300.	80.15	278.00	-45.71	0.2548E+03	0.3902E+03	-55.62
35400.	79.33	279.00	-45.95	0.2536E+03	0.3888E+03	-55.83
35500.	79.66	280.00	-46.19	0.2524E+03	0.3875E+03	-56.04
35600.	79.33	283.00	-46.43	0.2513E+03	0.3861E+03	-56.25
35700.	79.82	281.00	-46.67	0.2501E+03	0.3847E+03	-56.46
35800.	84.38	279.00	-46.91	0.2490E+03	0.3834E+03	-56.67
35900.	86.06	283.00	-47.15	0.2478E+03	0.3820E+03	-56.88
36000.	88.62	278.00	-47.39	0.2467E+03	0.3807E+03	-57.09
36100.	88.78	285.00	-47.61	0.2456E+03	0.3793E+03	-57.27
36200.	89.44	281.00	-47.83	0.2444E+03	0.3779E+03	-57.45
36300.	90.78	281.00	-48.05	0.2433E+03	0.3765E+03	-57.63
36400.	88.78	283.00	-48.27	0.2422E+03	0.3752E+03	-57.81
36500.	94.68	284.00	-48.49	0.2411E+03	0.3738E+03	-57.99
36600.	95.70	281.00	-48.71	0.2400E+03	0.3725E+03	-58.17
36700.	96.19	280.00	-48.93	0.2389E+03	0.3711E+03	-58.35
36800.	95.87	279.00	-49.15	0.2378E+03	0.3698E+03	-58.53
36900.	95.70	280.00	-49.37	0.2367E+03	0.3684E+03	-58.71
37000.	96.52	280.00	-49.59	0.2356E+03	0.3671E+03	-58.89
37100.	94.85	282.00	-49.83	0.2345E+03	0.3658E+03	-59.12
37200.	94.52	279.00	-50.07	0.2334E+03	0.3645E+03	-59.35
37300.	94.68	277.00	-50.31	0.2323E+03	0.3632E+03	-59.58
37400.	92.81	276.00	-50.55	0.2313E+03	0.3619E+03	-59.81
37500.	95.18	274.00	-50.79	0.2302E+03	0.3606E+03	-60.04
37600.	91.80	278.00	-51.03	0.2291E+03	0.3593E+03	-60.27
37700.	92.32	276.00	-51.27	0.2281E+03	0.3581E+03	-60.50
37800.	93.67	275.00	-51.51	0.2270E+03	0.3568E+03	-60.73
37900.	89.27	279.00	-51.75	0.2259E+03	0.3555E+03	-60.96
38000.	90.29	274.00	-51.99	0.2249E+03	0.3542E+03	-61.19
38100.	90.45	276.00	-52.26	0.2238E+03	0.3530E+03	-61.42
38200.	91.31	276.00	-52.53	0.2228E+03	0.3518E+03	-61.65
38300.	96.88	273.00	-52.80	0.2217E+03	0.3505E+03	-61.88
38400.	93.67	279.00	-53.07	0.2207E+03	0.3493E+03	-62.11
38500.	94.52	277.00	-53.34	0.2196E+03	0.3481E+03	-62.34
38600.	94.32	273.00	-53.61	0.2186E+03	0.3469E+03	-62.57
38700.	92.65	274.00	-53.88	0.2176E+03	0.3457E+03	-62.80
38800.	94.00	272.00	-54.15	0.2165E+03	0.3444E+03	-63.03
38900.	90.78	275.00	-54.42	0.2155E+03	0.3432E+03	-63.26
39000.	94.16	274.00	-54.69	0.2145E+03	0.3420E+03	-63.49
39100.	93.50	275.00	-54.94	0.2135E+03	0.3408E+03	-63.71
39200.	93.34	272.00	-55.19	0.2125E+03	0.3396E+03	-63.93
39300.	94.85	275.00	-55.44	0.2115E+03	0.3384E+03	-64.15
39400.	95.34	279.00	-55.69	0.2105E+03	0.3372E+03	-64.37
39500.	97.38	275.00	-55.94	0.2095E+03	0.3360E+03	-64.59
39600.	97.21	274.00	-56.19	0.2085E+03	0.3348E+03	-64.81
39700.	94.32	274.00	-56.44	0.2075E+03	0.3336E+03	-65.03
39800.	94.16	279.00	-56.69	0.2065E+03	0.3324E+03	-65.25
39900.	92.49	281.00	-56.94	0.2056E+03	0.3312E+03	-65.47

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
40000.	97.90	277.00	-57.19	0.2046E+03	0.3300E+03	-65.69
40100.	97.90	283.00	-57.37	0.2036E+03	0.3287E+03	-65.84
40200.	98.56	281.00	-57.55	0.2026E+03	0.3274E+03	-65.99
40300.	101.77	278.00	-57.73	0.2016E+03	0.3261E+03	-66.14
40400.	100.26	282.00	-57.91	0.2007E+03	0.3248E+03	-66.29
40500.	98.88	282.00	-58.09	0.1997E+03	0.3235E+03	-66.44
40600.	100.07	280.00	-58.27	0.1987E+03	0.3222E+03	-66.59
40700.	95.87	283.00	-58.45	0.1978E+03	0.3209E+03	-66.74
40800.	98.39	278.00	-58.63	0.1968E+03	0.3196E+03	-66.89
40900.	98.56	280.00	-58.81	0.1958E+03	0.3183E+03	-67.04
41000.	96.19	284.00	-58.99	0.1949E+03	0.3170E+03	-67.19
41100.	95.70	281.00	-59.21	0.1940E+03	0.3158E+03	-9999.00
41200.	97.90	288.00	-59.43	0.1930E+03	0.3146E+03	-9999.00
41300.	96.52	286.00	-59.65	0.1921E+03	0.3134E+03	-9999.00
41400.	96.36	282.00	-59.87	0.1912E+03	0.3122E+03	-9999.00
41500.	94.68	288.00	-60.09	0.1902E+03	0.3111E+03	-9999.00
41600.	92.81	287.00	-60.31	0.1893E+03	0.3099E+03	-9999.00
41700.	95.34	290.00	-60.53	0.1884E+03	0.3087E+03	-9999.00
41800.	93.50	292.00	-60.75	0.1875E+03	0.3075E+03	-9999.00
41900.	95.34	289.00	-60.97	0.1866E+03	0.3064E+03	-9999.00
42000.	92.98	293.00	-61.19	0.1857E+03	0.3052E+03	-9999.00
42100.	91.14	296.00	-61.39	0.1848E+03	0.3040E+03	-9999.00
42200.	92.65	295.00	-61.59	0.1839E+03	0.3028E+03	-9999.00
42300.	92.16	296.00	-61.79	0.1830E+03	0.3016E+03	-9999.00
42400.	89.80	300.00	-61.99	0.1821E+03	0.3004E+03	-9999.00
42500.	92.49	298.00	-62.19	0.1812E+03	0.2992E+03	-9999.00
42600.	91.96	296.00	-62.39	0.1803E+03	0.2980E+03	-9999.00
42700	91.31	298.00	-62.59	0.1794E+03	0.2969E+03	-9999.00
42800.	89.11	298.00	-62.79	0.1785E+03	0.2957E+03	-9999.00
42900.	87.76	297.00	-62.99	0.1777E+03	0.2945E+03	-9999.00
43000.	89.96	304.00	-63.19	0.1768E+03	0.2933E+03	-9999.00
43100.	86.42	301.00	-63.38	0.1759E+03	0.2922E+03	-9999.00
43200.	85.07	297.00	-63.57	0.1751E+03	0.2910E+03	-9999.00
43300.	84.22	303.00	-63.76	0.1742E+03	0.2898E+03	-9999.00
43400.	79.49	294.00	-63.95	0.1733E+03	0.2887E+03	-9999.00
43500.	79.66	301.00	-64.14	0.1725E+03	0.2875E+03	-9999.00
43600.	79.49	297.00	-64.33	0.1716E+03	0.2864E+03	-9999.00
43700.	78.81	303.00	-64.52	0.1708E+03	0.2852E+03	-9999.00
43800.	75.26	297.00	-64.71	0.1700E+03	0.2841E+03	-9999.00
43900.	73.75	298.00	-64.90	0.1691E+03	0.2829E+03	-9999.00
44000.	73.92	296.00	-65.09	0.1683E+03	0.2818E+03	-9999.00
44100.	73.92	295.00	-65.11	0.1675E+03	0.2804E+03	-9999.00
44200.	74.25	291.00	-65.13	0.1666E+03	0.2790E+03	-9999.00
44300.	77.30	287.00	-65.15	0.1658E+03	0.2777E+03	-9999.00
44400.	74.25	292.00	-65.17	0.1650E+03	0.2763E+03	-9999.00
44500.	74.44	283.00	-65.19	0.1641E+03	0.2750E+03	-9999.00
44600.	75.43	286.00	-65.21	0.1633E+03	0.2736E+03	-9999.00
44700.	75.95	288.00	-65.23	0.1625E+03	0.2723E+03	-9999.00
44800.	78.81	286.00	-65.25	0.1617E+03	0.2710E+03	-9999.00
44900.	78.81	291.00	-65.27	0.1609E+03	0.2696E+03	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
45000.	78.81	288.00	-65.29	0.1601E+03	0.2683E+03	-9999.00
45100.	82.87	286.00	-65.28	0.1593E+03	0.2670E+03	-9999.00
45200.	78.81	288.00	-65.27	0.1585E+03	0.2656E+03	-9999.00
45300.	77.30	279.00	-65.26	0.1577E+03	0.2643E+03	-9999.00
45400.	76.28	277.00	-65.25	0.1569E+03	0.2630E+03	-9999.00
45500.	75.79	270.00	-65.24	0.1562E+03	0.2616E+03	-9999.00
45600.	76.28	267.00	-65.23	0.1554E+03	0.2603E+03	-9999.00
45700.	74.93	267.00	-65.22	0.1546E+03	0.2590E+03	-9999.00
45800.	74.93	265.00	-65.21	0.1538E+03	0.2577E+03	-9999.00
45900.	73.59	268.00	-65.20	0.1531E+03	0.2564E+03	-9999.00
46000.	70.70	271.00	-65.19	0.1523E+03	0.2551E+03	-9999.00
46100.	69.19	270.00	-65.28	0.1515E+03	0.2540E+03	-9999.00
46200.	63.29	270.00	-65.37	0.1508E+03	0.2528E+03	-9999.00
46300.	70.37	261.00	-65.46	0.1500E+03	0.2517E+03	-9999.00
46400.	69.19	263.00	-65.55	0.1493E+03	0.2505E+03	-9999.00
46500.	67.16	261.00	-65.64	0.1486E+03	0.2494E+03	-9999.00
46600.	73.43	260.00	-65.73	0.1478E+03	0.2483E+03	-9999.00
46700.	67.52	269.00	-65.82	0.1471E+03	0.2471E+03	-9999.00
46800.	68.01	269.00	-65.91	0.1464E+03	0.2460E+03	-9999.00
46900.	73.59	265.00	-66.00	0.1456E+03	0.2449E+03	-9999.00
47000.	72.57	265.00	-66.09	0.1449E+03	0.2438E+03	-9999.00
47100.	75.26	264.00	-66.19	0.1442E+03	0.2427E+03	-9999.00
47200.	75.62	264.00	-66.29	0.1435E+03	0.2416E+03	-9999.00
47300.	78.31	262.00	-66.39	0.1427E+03	0.2405E+03	-9999.00
47400.	76.28	268.00	-66.49	0.1420E+03	0.2394E+03	-9999.00
47500.	78.31	262.00	-66.59	0.1413E+03	0.2383E+03	-9999.00
47600.	80.35	263.00	-66.69	0.1406E+03	0.2372E+03	-9999.00
47700.	77.62	265.00	-66.79	0.1399E+03	0.2362E+03	-9999.00
47800.	77.99	265.00	-66.89	0.1392E+03	0.2351E+03	-9999.00
47900.	74.77	268.00	-66.99	0.1385E+03	0.2340E+03	-9999.00
48000.	71.72	268.00	-67.09	0.1378E+03	0.2330E+03	-9999.00
48100.	69.19	270.00	-67.08	0.1371E+03	0.2318E+03	-9999.00
48200.	69.03	266.00	-67.07	0.1364E+03	0.2306E+03	-9999.00
48300.	67.16	268.00	-67.06	0.1358E+03	0.2295E+03	-9999.00
48400.	68.01	266.00	-67.05	0.1351E+03	0.2283E+03	-9999.00
48500.	65.32	266.00	-67.04	0.1344E+03	0.2272E+03	-9999.00
48600.	63.78	262.00	-67.03	0.1337E+03	0.2260E+03	-9999.00
48700.	65.16	258.00	-67.02	0.1331E+03	0.2249E+03	-9999.00
48800.	64.47	256.00	-67.01	0.1324E+03	0.2238E+03	-9999.00
48900.	64.96	254.00	-67.00	0.1318E+03	0.2226E+03	-9999.00
49000.	64.47	254.00	-66.99	0.1311E+03	0.2215E+03	-9999.00
49100.	64.47	253.00	-66.93	0.1304E+03	0.2204E+03	-9999.00
49200.	62.27	253.00	-66.87	0.1298E+03	0.2192E+03	-9999.00
49300.	63.12	254.00	-66.81	0.1291E+03	0.2180E+03	-9999.00
49400.	68.01	260.00	-66.75	0.1285E+03	0.2169E+03	-9999.00
49500.	72.24	265.00	-66.69	0.1279E+03	0.2157E+03	-9999.00
49600.	77.99	265.00	-66.63	0.1272E+03	0.2146E+03	-9999.00
49700.	77.99	271.00	-66.57	0.1266E+03	0.2135E+03	-9999.00
49800.	82.18	270.00	-66.51	0.1260E+03	0.2123E+03	-9999.00
49900.	83.89	270.00	-66.45	0.1253E+03	0.2112E+03	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
50000.	85.40	272.00	-66.39	0.1247E+03	0.2101E+03	-9999.00
50100.	85.07	276.00	-66.30	0.1241E+03	0.2090E+03	-9999.00
50200.	87.07	276.00	-66.21	0.1235E+03	0.2078E+03	-9999.00
50300.	88.78	277.00	-66.12	0.1228E+03	0.2067E+03	-9999.00
50400.	89.80	279.00	-66.03	0.1222E+03	0.2056E+03	-9999.00
50500.	90.98	281.00	-65.94	0.1216E+03	0.2045E+03	-9999.00
50600.	94.16	285.00	-65.85	0.1210E+03	0.2033E+03	-9999.00
50700.	97.38	284.00	-65.76	0.1204E+03	0.2022E+03	-9999.00
50800.	98.06	284.00	-65.67	0.1198E+03	0.2011E+03	-9999.00
50900.	96.19	287.00	-65.58	0.1192E+03	0.2000E+03	-9999.00
51000.	99.57	287.00	-65.49	0.1186E+03	0.1990E+03	-9999.00
51100.	101.94	286.00	-65.60	0.1180E+03	0.1981E+03	-9999.00
51200.	102.95	284.00	-65.71	0.1174E+03	0.1972E+03	-9999.00
51300.	102.95	279.00	-65.82	0.1168E+03	0.1963E+03	-9999.00
51400.	102.26	282.00	-65.93	0.1162E+03	0.1954E+03	-9999.00
51500.	101.25	279.00	-66.04	0.1157E+03	0.1946E+03	-9999.00
51600.	101.08	282.00	-66.15	0.1151E+03	0.1937E+03	-9999.00
51700.	99.57	284.00	-66.26	0.1145E+03	0.1928E+03	-9999.00
51800.	95.87	284.00	-66.37	0.1139E+03	0.1920E+03	-9999.00
51900.	96.72	285.00	-66.48	0.1134E+03	0.1911E+03	-9999.00
52000.	92.49	286.00	-66.59	0.1128E+03	0.1902E+03	-9999.00
52100.	92.49	289.00	-66.78	0.1122E+03	0.1895E+03	-9999.00
52200.	91.31	290.00	-66.97	0.1117E+03	0.1887E+03	-9999.00
52300.	88.25	290.00	-67.16	0.1111E+03	0.1879E+03	-9999.00
52400.	84.71	291.00	-67.35	0.1106E+03	0.1872E+03	-9999.00
52500.	83.37	292.00	-67.54	0.1100E+03	0.1864E+03	-9999.00
52600.	80.35	295.00	-67.73	0.1095E+03	0.1856E+03	-9999.00
52700.	76.12	290.00	-67.92	0.1089E+03	0.1849E+03	-9999.00
52800.	70.37	292.00	-68.11	0.1084E+03	0.1841E+03	-9999.00
52900.	67.68	293.00	-68.30	0.1078E+03	0.1834E+03	-9999.00
53000.	65.32	294.00	-68.49	0.1073E+03	0.1826E+03	-9999.00
53100.	62.11	294.00	-68.61	0.1068E+03	0.1818E+03	-9999.00
53200.	58.23	293.00	-68.73	0.1062E+03	0.1810E+03	-9999.00
53300.	56.04	290.00	-68.85	0.1057E+03	0.1802E+03	-9999.00
53400.	55.71	290.00	-68.97	0.1051E+03	0.1794E+03	-9999.00
53500.	54.17	289.00	-69.09	0.1046E+03	0.1786E+03	-9999.00
53600.	50.62	280.00	-69.21	0.1041E+03	0.1778E+03	-9999.00
53700.	49.28	281.00	-69.33	0.1036E+03	0.1770E+03	-9999.00
53800.	47.41	277.00	-69.45	0.1030E+03	0.1762E+03	-9999.00
53900.	44.88	276.00	-69.57	0.1025E+03	0.1754E+03	-9999.00
54000.	44.23	270.00	-69.69	0.1020E+03	0.1746E+03	-9999.00
54100.	43.86	264.00	-69.72	0.1015E+03	0.1738E+03	-9999.00
54200.	44.06	261.00	-69.75	0.1010E+03	0.1729E+03	-9999.00
54300.	47.24	258.00	-69.78	0.1005E+03	0.1721E+03	-9999.00
54400.	49.28	259.00	-69.81	0.9994E+02	0.1712E+03	-9999.00
54500.	48.95	263.00	-69.84	0.9944E+02	0.1704E+03	-9999.00
54600.	52.13	265.00	-69.87	0.9893E+02	0.1695E+03	-9999.00
54700.	53.51	267.00	-69.90	0.9843E+02	0.1687E+03	-9999.00
54800.	56.04	265.00	-69.93	0.9793E+02	0.1679E+03	-9999.00
54900.	57.22	266.00	-69.96	0.9743E+02	0.1671E+03	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
55000.	57.87	270.00	-69.99	0.9694E+02	0.1662E+03	-9999.00
56000.	52.17	282.00	-68.39	0.9214E+02	0.1568E+03	-9999.00
57000.	44.62	303.00	-68.79	0.8761E+02	0.1493E+03	-9999.00
58000.	39.37	324.00	-70.89	0.8327E+02	0.1434E+03	-9999.00
59000.	23.95	344.00	-71.39	0.7911E+02	0.1366E+03	-9999.00
60000.	5.25	344.00	-72.99	0.7515E+02	0.1308E+03	-9999.00
61000.	7.22	221.00	-73.99	0.7136E+02	0.1248E+03	-9999.00
62000.	6.56	228.00	-73.59	0.6775E+02	0.1183E+03	-9999.00
63000.	2.95	117.00	-72.59	0.6434E+02	0.1118E+03	-9999.00
64000.	10.17	97.00	-71.29	0.6112E+02	0.1055E+03	-9999.00
65000.	9.84	95.00	-69.69	0.5808E+02	0.9945E+02	-9999.00
66000.	20.67	52.00	-67.29	0.5523E+02	0.9346E+02	-9999.00
67000.	35.10	55.00	-66.69	0.5253E+02	0.8864E+02	-9999.00
68000.	36.09	71.00	-66.59	0.4997E+02	0.8428E+02	-9999.00
69000.	30.51	85.00	-64.39	0.4754E+02	0.7933E+02	-9999.00
70000.	22.97	99.00	-62.29	0.4526E+02	0.7478E+02	-9999.00
71000.	15.75	113.00	-59.69	0.4311E+02	0.7036E+02	-9999.00
72000.	10.50	76.00	-58.69	0.4108E+02	0.6673E+02	-9999.00
73000.	17.72	46.00	-57.99	0.3915E+02	0.6339E+02	-9999.00
74000.	21.33	43.00	-57.19	0.3732E+02	0.6020E+02	-9999.00
75000.	17.39	48.00	-56.69	0.3558E+02	0.5726E+02	-9999.00
76000.	13.45	51.00	-56.19	0.3393E+02	0.5448E+02	-9999.00
77000.	13.12	32.00	-55.09	0.3236E+02	0.5170E+02	-9999.00
78000.	20.34	18.00	-54.19	0.3087E+02	0.4911E+02	-9999.00
79000.	21.00	22.00	-53.79	0.2945E+02	0.4677E+02	-9999.00
80000.	20.34	30.00	-53.19	0.2810E+02	0.4450E+02	-9999.00
81000.	21.98	40.00	-53.19	0.2681E+02	0.4246E+02	-9999.00
82000.	22.97	58.00	-52.39	0.2559E+02	0.4038E+02	-9999.00
83000.	22.31	89.00	-51.79	0.2442E+02	0.3843E+02	-9999.00
84000.	21.00	114.00	-49.99	0.2331E+02	0.3639E+02	-9999.00
85000.	16.40	121.00	-48.79	0.2226E+02	0.3456E+02	-9999.00
86000.	10.50	128.00	-47.49	0.2127E+02	0.3284E+02	-9999.00
87000.	7.87	152.00	-47.59	0.2032E+02	0.3138E+02	-9999.00
88000.	6.23	169.00	-46.29	0.1941E+02	0.2981E+02	-9999.00
89000.	7.55	194.00	-44.59	0.1855E+02	0.2827E+02	-9999.00
90000.	8.20	221.00	-45.69	0.1773E+02	0.2715E+02	-9999.00
91000.	7.87	253.00	-46.19	0.1695E+02	0.2602E+02	-9999.00
92000.	12.80	295.00	-45.59	0.1619E+02	0.2479E+02	-9999.00
93000.	16.40	298.00	-44.39	0.1548E+02	0.2357E+02	-9999.00
94000.	14.11	290.00	-43.09	0.1480E+02	0.2241E+02	-9999.00
95000.	11.15	289.00	-42.59	0.1415E+02	0.2138E+02	-9999.00
96000.	11.81	299.00	-41.39	0.1354E+02	0.2035E+02	-9999.00
97000.	14.11	313.00	-41.49	0.1295E+02	0.1947E+02	-9999.00
98000.	10.50	292.00	-41.29	0.1239E+02	0.1862E+02	-9999.00
99000.	12.80	254.00	-40.79	0.1185E+02	0.1777E+02	-9999.00
100000.	15.19	245.00	-37.09	0.1148E+02	0.1694E+02	-9999.00
101000.	13.52	241.00	-36.88	0.1099E+02	0.1620E+02	-9999.00
102000.	11.81	237.00	-35.93	0.1052E+02	0.1545E+02	-9999.00
103000.	10.14	228.00	-35.00	0.1008E+02	0.1475E+02	-9999.00
104000.	10.14	218.00	-34.06	0.9653E+01	0.1406E+02	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
105000.	10.14	215.00	-33.08	0.9247E+01	0.1342E+02	-9999.00
106000.	11.81	214.00	-32.31	0.8860E+01	0.1282E+02	-9999.00
107000.	11.81	217.00	-32.23	0.8489E+01	0.1228E+02	-9999.00
108000.	11.81	229.00	-33.01	0.8134E+01	0.1180E+02	-9999.00
109000.	11.81	252.00	-33.81	0.7793E+01	0.1134E+02	-9999.00
110000.	13.52	279.00	-34.58	0.7464E+01	0.1090E+02	-9999.00
111000.	20.24	297.00	-34.72	0.7149E+01	0.1045E+02	-9999.00
112000.	23.62	294.00	-34.09	0.6848E+01	0.9979E+01	-9999.00
113000.	25.33	289.00	-33.47	0.6560E+01	0.9535E+01	-9999.00
114000.	27.00	296.00	-32.82	0.6285E+01	0.9110E+01	-9999.00
115000.	25.33	300.00	-33.57	0.6022E+01	0.8756E+01	-9999.00
116000.	20.24	289.00	-33.35	0.5769E+01	0.8381E+01	-9999.00
117000.	15.19	257.00	-32.45	0.5527E+01	0.7999E+01	-9999.00
118000.	16.86	233.00	-31.62	0.5297E+01	0.7640E+01	-9999.00
119000.	18.57	235.00	-30.76	0.5076E+01	0.7295E+01	-9999.00
120000.	16.86	230.00	-28.96	0.4866E+01	0.6942E+01	-9999.00
121000.	15.19	207.00	-26.51	0.4667E+01	0.6592E+01	-9999.00
122000.	10.14	181.00	-25.96	0.4477E+01	0.6309E+01	-9999.00
123000.	10.14	142.00	-24.93	0.4295E+01	0.6028E+01	-9999.00
124000.	11.81	138.00	-23.32	0.4122E+01	0.5748E+01	-9999.00
125000.	10.14	141.00	-21.78	0.3956E+01	0.5483E+01	-9999.00
126000.	11.81	153.00	-20.27	0.3798E+01	0.5232E+01	-9999.00
127000.	15.19	169.00	-18.85	0.3647E+01	0.4996E+01	-9999.00
128000.	16.86	182.00	-17.48	0.3504E+01	0.4774E+01	-9999.00
129000.	13.52	201.00	-16.38	0.3366E+01	0.4567E+01	-9999.00
130000.	11.81	234.00	-15.60	0.3234E+01	0.4374E+01	-9999.00
131000.	13.52	269.00	-14.87	0.3108E+01	0.4192E+01	-9999.00
132000.	15.19	299.00	-14.16	0.2987E+01	0.4018E+01	-9999.00
133000.	16.86	321.00	-13.43	0.2871E+01	0.3851E+01	-9999.00
134000.	16.86	333.00	-12.72	0.2760E+01	0.3692E+01	-9999.00
135000.	16.86	339.00	-12.34	0.2654E+01	0.3545E+01	-9999.00
136000.	18.57	349.00	-12.72	0.2551E+01	0.3412E+01	-9999.00
137000.	23.62	359.00	-12.98	0.2453E+01	0.3285E+01	-9999.00
138000.	28.67	5.00	-12.24	0.2358E+01	0.3148E+01	-9999.00
139000.	32.05	9.00	-11.49	0.2267E+01	0.3018E+01	-9999.00
140000.	38.81	14.00	-10.67	0.2180E+01	0.2893E+01	-9999.00
141000.	43.86	17.00	-9.93	0.2097E+01	0.2775E+01	-9999.00
142000.	47.24	19.00	-9.21	0.2017E+01	0.2662E+01	-9999.00
143000.	50.62	21.00	-8.51	0.1940E+01	0.2554E+01	-9999.00
144000.	59.06	29.00	-7.85	0.1867E+01	0.2452E+01	-9999.00
145000.	47.24	28.00	-7.22	0.1796E+01	0.2353E+01	-9999.00
146000.	43.86	23.00	-6.56	0.1728E+01	0.2258E+01	-9999.00
147000.	59.06	58.00	-5.91	0.1663E+01	0.2168E+01	-9999.00
148000.	70.87	90.00	-5.85	0.1600E+01	0.2085E+01	-9999.00
149000.	77.62	110.00	-7.09	0.1540E+01	0.2016E+01	-9999.00
150000.	67.52	112.00	-8.39	0.1482E+01	0.1950E+01	-9999.00
151000.	65.81	104.00	-8.07	0.1426E+01	0.1874E+01	-9999.00
152000.	75.95	108.00	-7.51	0.1372E+01	0.1799E+01	-9999.00
153000.	59.06	112.00	-7.02	0.1320E+01	0.1728E+01	-9999.00
154000.	33.76	106.00	-6.53	0.1270E+01	0.1659E+01	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
155000.	28.67	96.00	-6.11	0.1222E+01	0.1594E+01	-9999.00
156000.	50.62	96.00	-5.57	0.1176E+01	0.1531E+01	-9999.00
157000.	64.14	97.00	-5.13	0.1132E+01	0.1471E+01	-9999.00
158000.	60.76	93.00	-4.74	0.1090E+01	0.1415E+01	-9999.00
159000.	62.43	73.00	-4.30	0.1049E+01	0.1359E+01	-9999.00
160000.	67.52	72.00	-3.90	0.1010E+01	0.1307E+01	-9999.00
161000.	65.81	92.00	3.56	0.9723E+00	0.1256E+01	-9999.00
162000.	57.38	107.00	-3.11	0.9361E+00	0.1208E+01	-9999.00
163000.	47.24	99.00	-2.74	0.9013E+00	0.1161E+01	-9999.00
164000.	50.62	88.00	-2.45	0.8679E+00	0.1117E+01	-9999.00
165000.	64.14	88.00	-3.33	0.8356E+00	0.1079E+01	-9999.00
166000.	79.33	78.00	-4.24	0.8045E+00	0.1042E+01	-9999.00
167000.	94.52	73.00	-5.20	0.7744E+00	0.1007E+01	-9999.00
168000.	101.25	77.00	-6.22	0.7454E+00	0.9728E+00	-9999.00
169000.	96.19	87.00	-7.19	0.7173E+00	0.9396E+00	-9999.00
170000.	89.44	101.00	-8.07	0.6902E+00	0.9071E+00	-9999.00
171000.	86.06	113.00	-9.05	0.6640E+00	0.8759E+00	-9999.00
172000.	77.62	119.00	-9.57	0.6388E+00	0.8443E+00	-9999.00
173000.	60.76	119.00	-9.41	0.6145E+00	0.8117E+00	-9999.00
174000.	48.95	114.00	-9.32	0.5912E+00	0.7806E+00	-9999.00
175000.	40.52	99.00	-9.21	0.5687E+00	0.7506E+00	-9999.00
176000.	43.86	68.00	-9.17	0.5471E+00	0.7220E+00	-9999.00
177000.	55.71	50.00	-9.10	0.5263E+00	0.6944E+00	-9999.00
178000.	65.81	51.00	-8.98	0.5064E+00	0.6678E+00	-9999.00
179000.	64.14	66.00	-9.13	0.4871E+00	0.6427E+00	-9999.00
180000.	62.43	83.00	-9.50	0.4686E+00	0.6192E+00	-9999.00
181000.	60.76	90.00	-9.96	0.4508E+00	0.5967E+00	-9999.00
182000.	55.71	83.00	-10.38	0.4337E+00	0.5750E+00	-9999.00
183000.	55.71	80.00	-10.77	0.4171E+00	0.5538E+00	-9999.00
184000.	47.24	85.00	-11.24	0.4012E+00	0.5336E+00	-9999.00
185000.	35.43	91.00	-11.61	0.3858E+00	0.5139E+00	-9999.00
186000.	23.62	88.00	-11.97	0.3710E+00	0.4948E+00	-9999.00
187000.	16.86	52.00	-12.46	0.3568E+00	0.4768E+00	-9999.00
188000.	23.62	25.00	-12.86	0.3431E+00	0.4592E+00	-9999.00
189000.	38.81	33.00	-13.29	0.3299E+00	0.4423E+00	-9999.00
190000.	57.38	47.00	-13.78	0.3172E+00	0.4260E+00	-9999.00
191000.	77.62	59.00	-14.28	0.3049E+00	0.4103E+00	-9999.00
192000.	89.44	70.00	-14.54	0.2931E+00	0.3948E+00	-9999.00
193000.	94.52	83.00	-15.01	0.2818E+00	0.3803E+00	-9999.00
194000.	94.52	98.00	-15.66	0.2709E+00	0.3665E+00	-9999.00
195000.	92.81	114.00	-16.34	0.2603E+00	0.3531E+00	-9999.00
196000.	91.14	128.00	-17.08	0.2502E+00	0.3404E+00	-9999.00
197000.	91.14	136.00	-17.98	0.2404E+00	0.3282E+00	-9999.00
198000.	91.14	139.00	-18.70	0.2310E+00	0.3163E+00	-9999.00
199000.	91.14	143.00	-19.41	0.2219E+00	0.3047E+00	-9999.00
200000.	94.52	145.00	-19.99	0.2131E+00	0.2932E+00	-9999.00
201000.	91.14	150.00	-20.71	0.2047E+00	0.2825E+00	-9999.00
202000.	89.44	159.00	-21.62	0.1966E+00	0.2723E+00	-9999.00
203000.	89.44	166.00	-22.99	0.1888E+00	0.2629E+00	-9999.00
204000.	84.38	174.00	-24.67	0.1812E+00	0.2540E+00	-9999.00

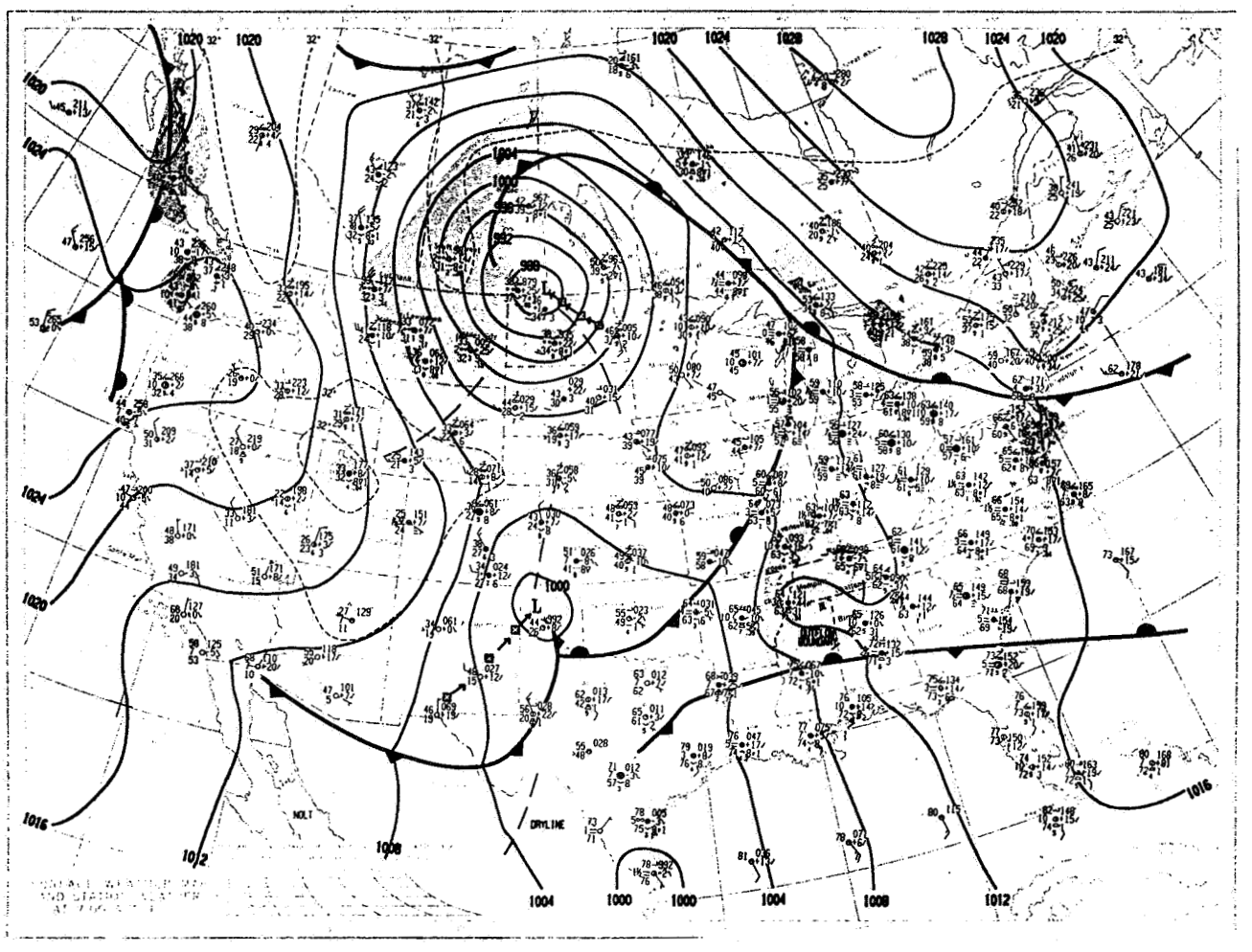
Table 5. STS-39 ascent atmospheric data tape (continued).

ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
205000.	79.33	183.00	-25.84	0.1739E+00	0.2450E+00	-9999.00
206000.	70.87	183.00	-27.64	0.1669E+00	0.2368E+00	-9999.00
207000.	60.76	180.00	-29.43	0.1600E+00	0.2287E+00	-9999.00
208000.	50.62	173.00	-30.05	0.1535E+00	0.2200E+00	-9999.00
209000.	37.14	162.00	-31.04	0.1472E+00	0.2118E+00	-9999.00
210000.	23.62	134.00	-32.17	0.1411E+00	0.2040E+00	-9999.00
211000.	27.00	78.00	-32.52	0.1353E+00	0.1959E+00	-9999.00
212000.	47.24	50.00	-32.04	0.1297E+00	0.1874E+00	-9999.00
213000.	64.14	37.00	-31.65	0.1243E+00	0.1793E+00	-9999.00
214000.	70.87	35.00	-32.22	0.1192E+00	0.1724E+00	-9999.00
215000.	74.25	38.00	-32.20	0.1142E+00	0.1651E+00	-9999.00
216000.	72.57	44.00	-32.22	0.1095E+00	0.1583E+00	-9999.00
217000.	65.81	55.00	-32.61	0.1050E+00	0.1521E+00	-9999.00
218000.	57.38	74.00	-32.24	0.1006E+00	0.1455E+00	-9999.00
219000.	54.00	98.00	-32.09	0.9650E-01	0.1395E+00	-9999.00
220000.	60.76	120.00	-32.47	0.9250E-01	0.1339E+00	-9999.00
221000.	67.52	134.00	-34.27	0.8860E-01	0.1292E+00	-9999.00
222000.	70.87	139.00	-35.24	0.8490E-01	0.1243E+00	-9999.00
223000.	69.19	142.00	-35.99	0.8140E-01	0.1196E+00	-9999.00
224000.	62.43	143.00	-36.94	0.7790E-01	0.1149E+00	-9999.00
226000.	51.82	143.50	-39.71	0.7028E-01	0.1049E+00	-9999.00
229000.	35.92	144.79	-43.87	0.6023E-01	0.9151E-01	-9999.00
232000.	20.06	148.14	-48.03	0.5161E-01	0.7987E-01	-9999.00
235000.	4.75	174.31	-52.19	0.4423E-01	0.6973E-01	-9999.00
238000.	12.27	308.16	-56.35	0.3790E-01	0.6090E-01	-3999.00
241000.	10.98	331.06	-58.41	0.3290E-01	0.5337E-01	-9999.00
244000.	11.69	355.17	-60.46	0.2850E-01	0.4668E-01	-9999.00
247000.	13.56	12.15	-62.41	0.2470E-01	0.4083E-01	-9999.00
250000.	15.02	21.80	-64.07	0.2140E-01	0.3566E-01	-9999.00
253000.	16.82	29.56	-65.60	0.1850E-01	0.3105E-01	-9999.00
256000.	18.90	35.68	-67.14	0.1590E-01	0.2689E-01	-9999.00
259000.	21.15	40.66	-68.67	0.1380E-01	0.2351E-01	-9999.00
262000.	23.50	44.60	-70.20	0.1190E-01	0.2043E-01	-9999.00
265000.	20.91	60.90	-71.27	0.1020E-01	0.1760E-01	-9999.00
268000.	20.01	83.60	-72.26	0.8770E-02	0.1521E-01	-9999.00
271000.	22.23	104.80	-73.24	0.7530E-02	0.1312E-01	-9999.00
274000.	26.78	120.55	-74.22	0.6460E-02	0.1131E-01	-9999.00
277000.	32.76	131.14	-75.17	0.5540E-02	0.9748E-02	-9999.00
280000.	35.18	132.54	-76.18	0.4760E-02	0.8419E-02	-9999.00
283000.	31.33	121.86	-77.33	0.4080E-02	0.7258E-02	-9999.00
286000.	28.80	108.81	-78.48	0.3500E-02	0.6263E-02	-9999.00
289000.	27.99	94.17	-79.64	0.3000E-02	0.5401E-02	-9999.00
292000.	29.08	79.67	-80.79	0.2570E-02	0.4654E-02	-9999.00
295000.	31.81	66.93	-81.95	0.2200E-02	0.4008E-02	-9999.00
298000.	21.98	75.30	-82.41	0.1870E-02	0.3415E-02	-9999.00
301000.	10.30	107.22	-82.80	0.1580E-02	0.2892E-02	-9999.00
304000.	12.76	204.46	-83.19	0.1340E-02	0.2457E-02	-9999.00
307000.	32.12	232.43	-83.58	0.1140E-02	0.2095E-02	-9999.00
310000.	58.72	243.66	-83.97	0.9640E-03	0.1775E-02	-9999.00
313000.	78.32	248.16	-83.65	0.8180E-03	0.1504E-02	-9999.00

Table 5. STS-39 ascent atmospheric data tape (continued).

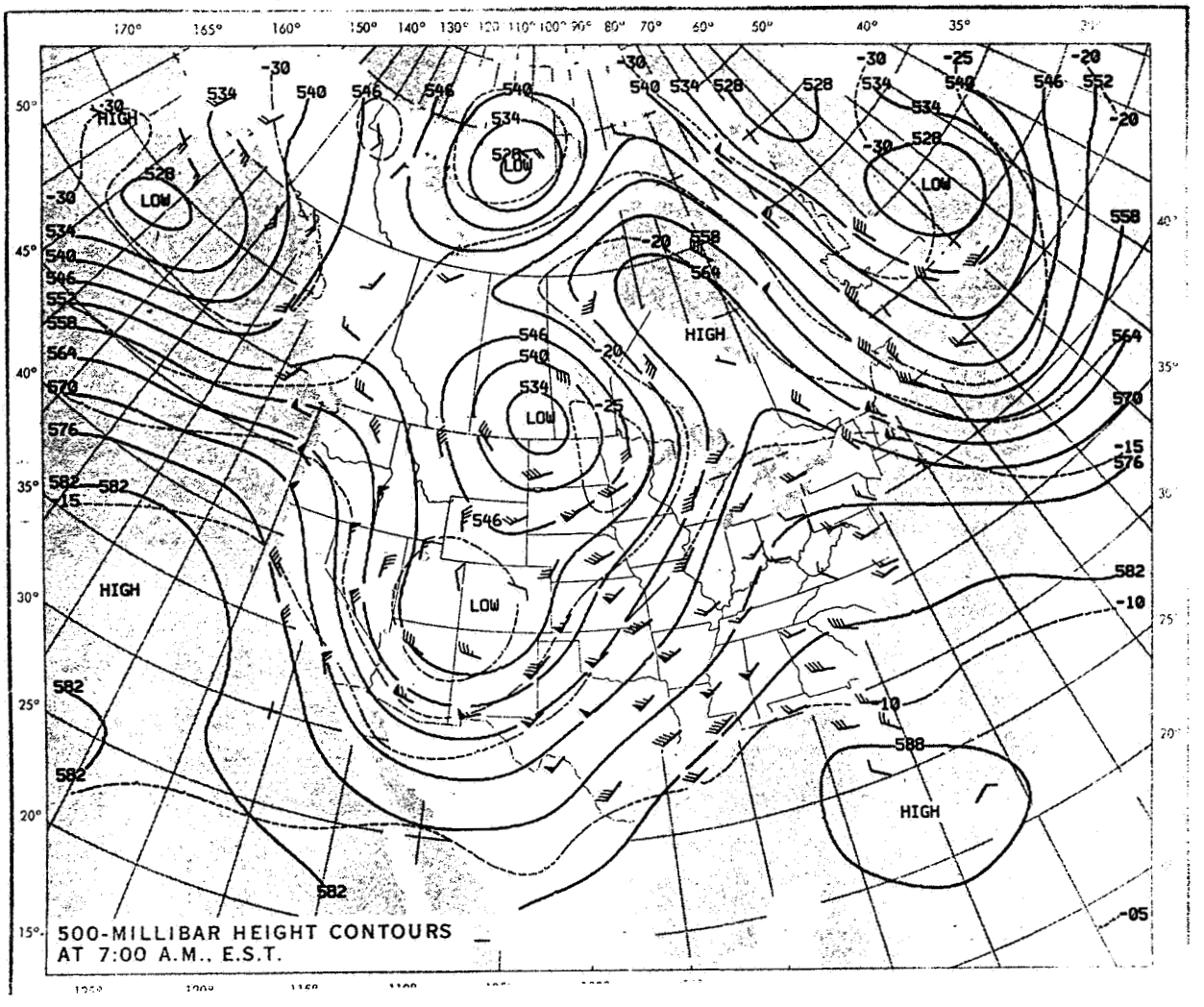
ALTITUDE (FT)	WIND SPEED (FT/SEC)	WIND DIRECTION (DEG)	TEMPERATURE (DEG C)	PRESSURE (MILLIBARS)	DENSITY (GRAM/M3)	DEW POINT (DEG C)
316000.	79.53	247.77	-82.42	0.6950E-03	0.1269E-02	-9999.00
319000.	78.39	247.22	-81.19	0.5900E-03	0.1071E-02	-9999.00
322000.	73.99	246.37	-79.95	0.5010E-03	0.9034E-03	-9999.00
325000.	65.15	244.94	-78.72	0.4250E-03	0.7615E-03	-9999.00
328000.	50.39	242.00	-77.49	0.3610E-03	0.6428E-03	-9999.00
331000.	54.29	243.51	-73.41	0.3090E-03	0.5389E-03	-9999.00
334000.	58.88	245.33	-69.26	0.2650E-03	0.4528E-03	-9999.00
337000.	63.33	247.55	-65.10	0.2270E-03	0.3801E-03	-9999.00
340000.	67.40	250.29	-60.94	0.1940E-03	0.3185E-03	-9999.00
343000.	70.93	253.80	-56.78	0.1660E-03	0.2673E-03	-9999.00
346000.	73.37	257.00	-51.00	0.1450E-03	0.2274E-03	-9999.00
349000.	75.10	256.74	-43.63	0.1270E-03	0.1928E-03	-9999.00
352000.	75.15	256.36	-36.25	0.1120E-03	0.1647E-03	-9999.00
355000.	72.91	255.86	-28.88	0.9840E-04	0.1403E-03	-9999.00
358000.	67.54	255.05	-21.50	0.8640E-04	0.1196E-03	-9999.00
361000.	57.08	259.40	-14.03	0.7590E-04	0.1020E-03	-9999.00
364000.	56.99	257.36	-4.16	0.6870E-04	0.8897E-04	-9999.00
367000.	55.73	254.64	5.71	0.6220E-04	0.7770E-04	-9999.00
370000.	52.99	250.77	15.58	0.5610E-04	0.6769E-04	-9999.00
373000.	48.60	244.87	25.46	0.5060E-04	0.5903E-04	-9999.00
376000.	42.69	235.24	35.33	0.4560E-04	0.5150E-04	-9999.00
379000.	31.88	245.62	45.84	0.4150E-04	0.4532E-04	-9999.00
382000.	30.77	241.47	57.12	0.3810E-04	0.4019E-04	-9999.00
385000.	29.85	236.89	68.73	0.3510E-04	0.3577E-04	-9999.00
388000.	29.18	231.80	80.64	0.3240E-04	0.3190E-04	-9999.00
391000.	28.78	226.39	92.82	0.3000E-04	0.2856E-04	-9999.00
394000.	28.64	220.59	105.26	0.2780E-04	0.2559E-04	-9999.00
397000.	28.87	214.63	117.91	0.2590E-04	0.2307E-04	-9999.00
400000.	29.41	208.60	130.73	0.2420E-04	0.2087E-04	-9999.00

SUNDAY, APRIL 28, 1991



Surface synoptic map at 1200 u.t. April 28, 1991—isobaric, frontal, and precipitation patterns are shown in standard symbolic form.

Figure 1. Surface synoptic chart 27 min after the launch of STS-39.



500-mb height
Contours at 1200 u.t.
April 28, 1991
Continuous lines indicate height contours at 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 27 min after the launch of STS-39.

Figure 3. GOES-7 visible imagery of cloud cover 2 min before the launch of STS-39 (1131 u.t., April 28, 1991). 500-mb heights (meters) and wind barbs are also included for 1200 u.t.

Figure 4. Enlarged view of GOES-7 visible imagery of cloud cover taken 2 min before the launch of STS-39 (1131 u.t., April 28, 1991). Surface temperatures, isobaric parameters, and wind barbs for 1100 u.t. are also included.

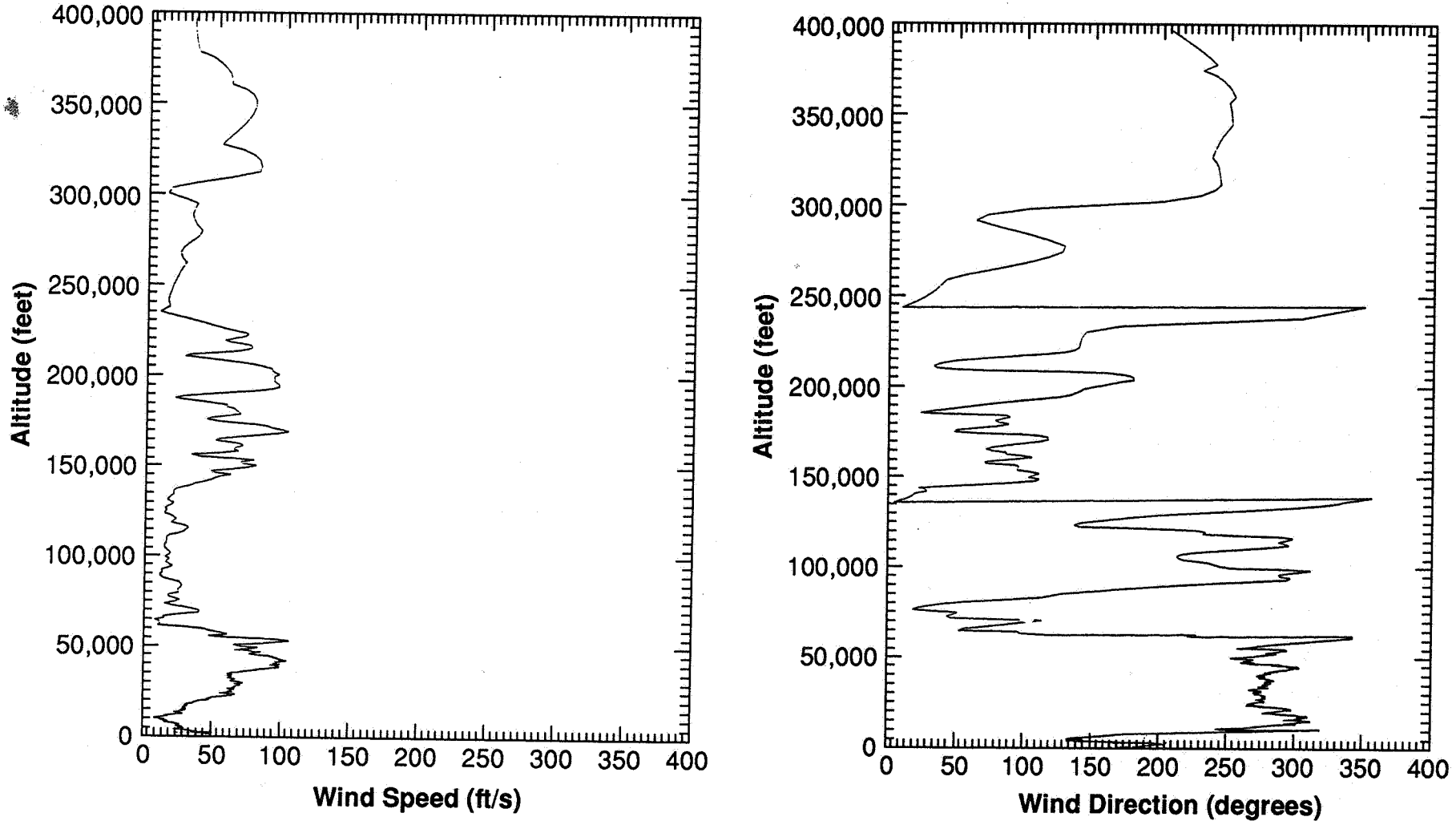


Figure 5. Scalar wind speed and direction at launch time of STS-39.

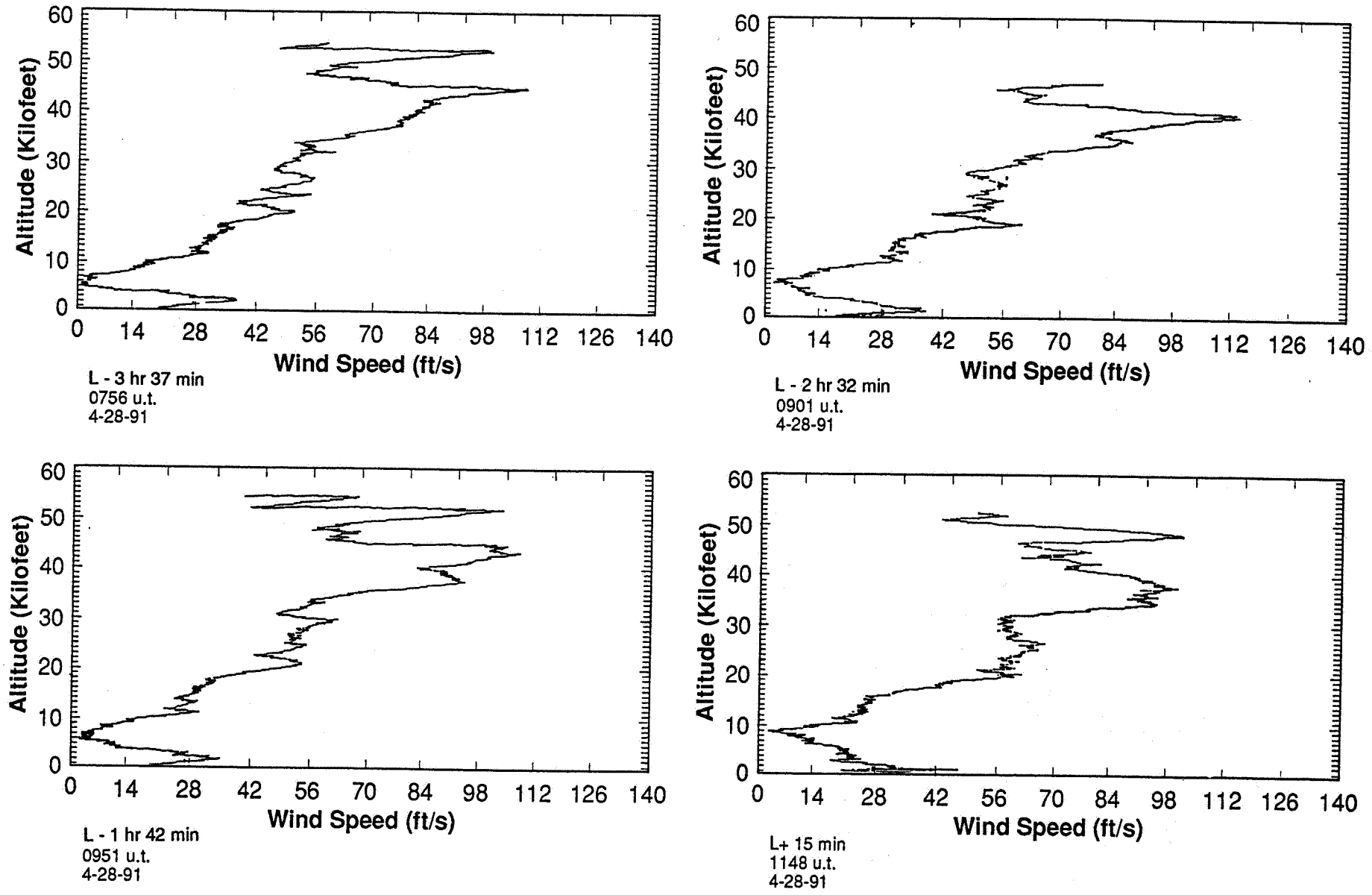


Figure 6. STS-39 prelaunch/launch Jimsphere-measured wind speeds (ft/s).

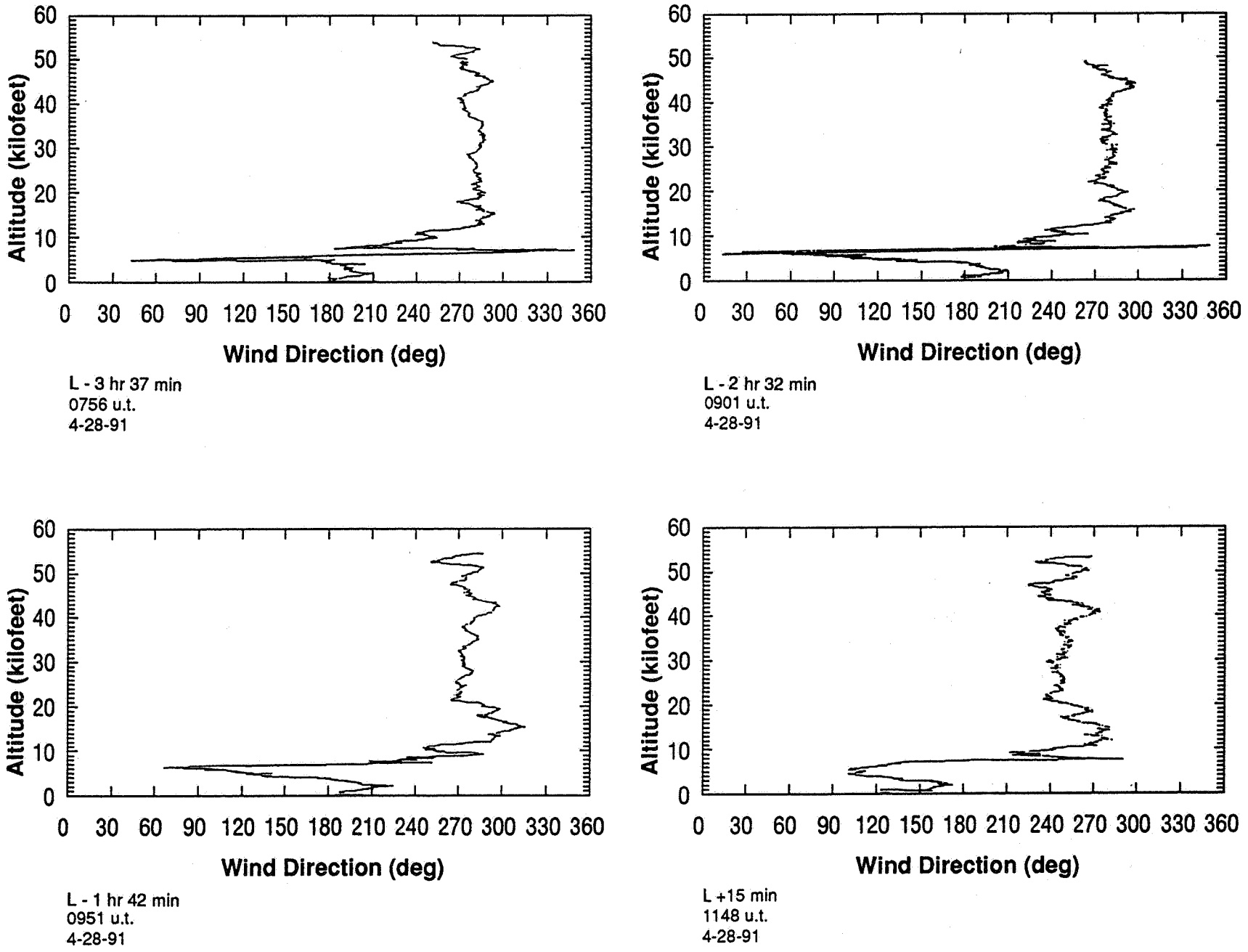


Figure 7. STS-39 prelaunch/launch Jimsphere-measured wind directions (degrees).

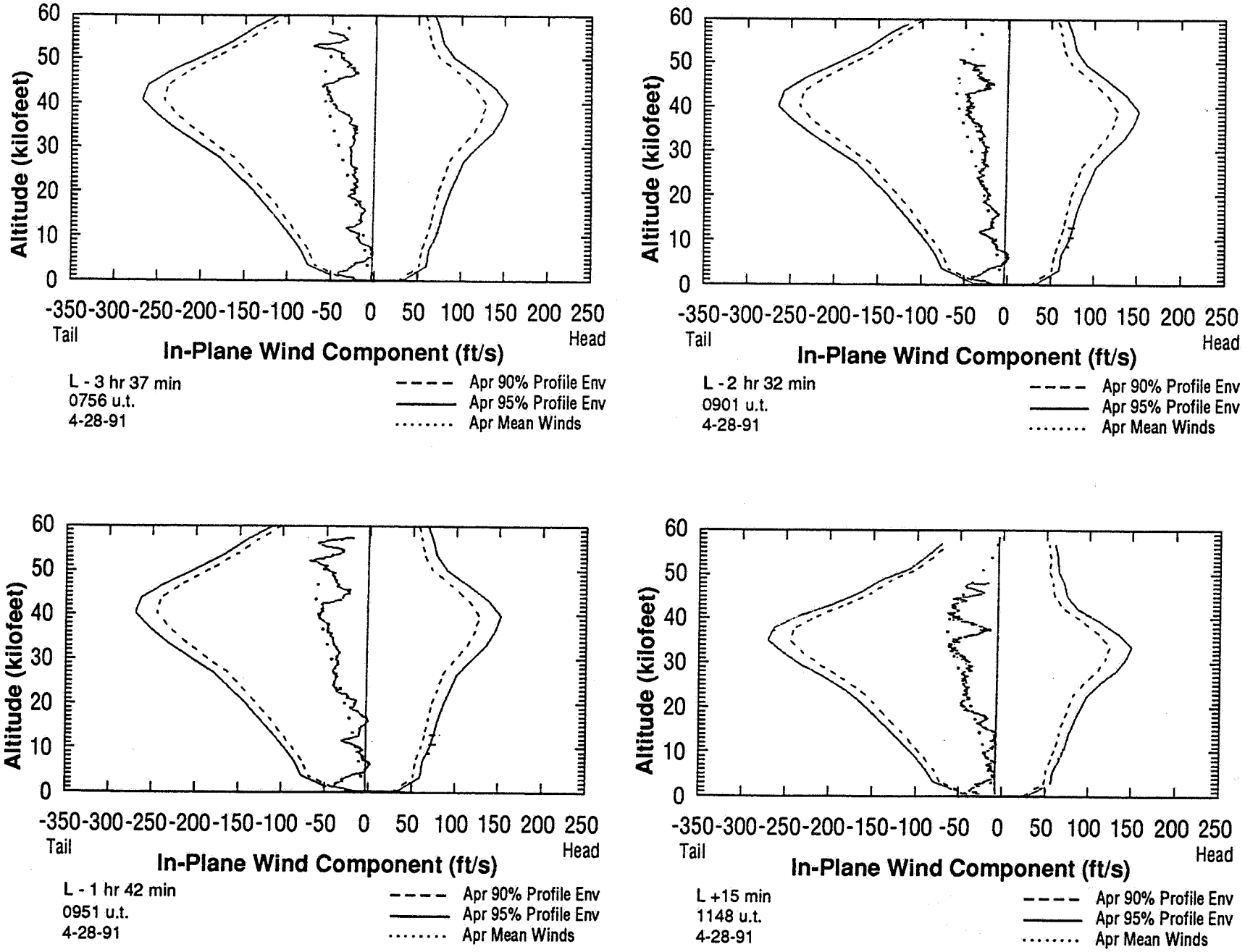


Figure 8. STS-39 prelaunch/launch Jimsphere-measured in-plane component winds (ft/s). Flight azimuth = 39°.

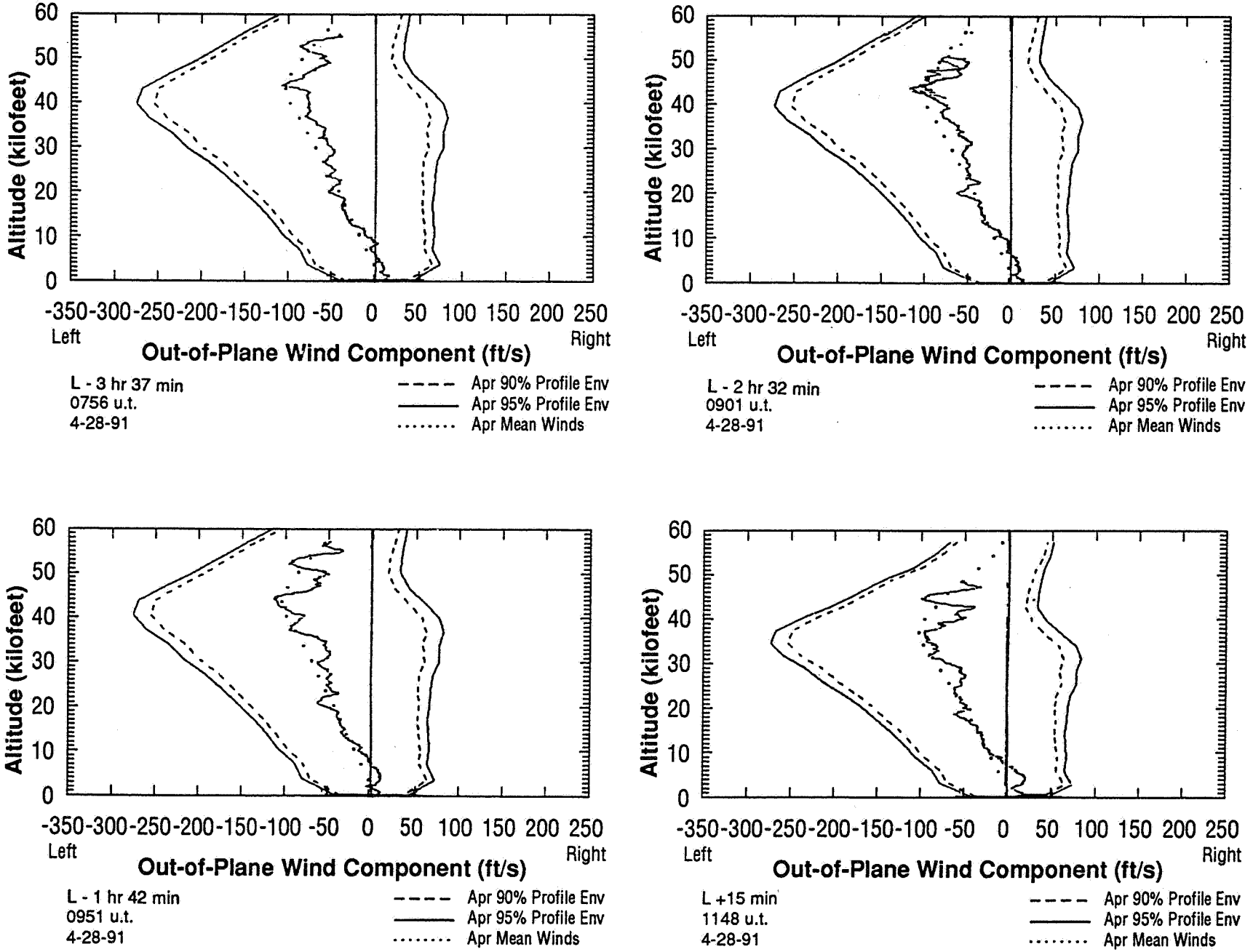


Figure 9. STS-39 prelaunch/launch Jimsphere-measured out-of-plane component winds (ft/s). Flight azimuth = 39°.

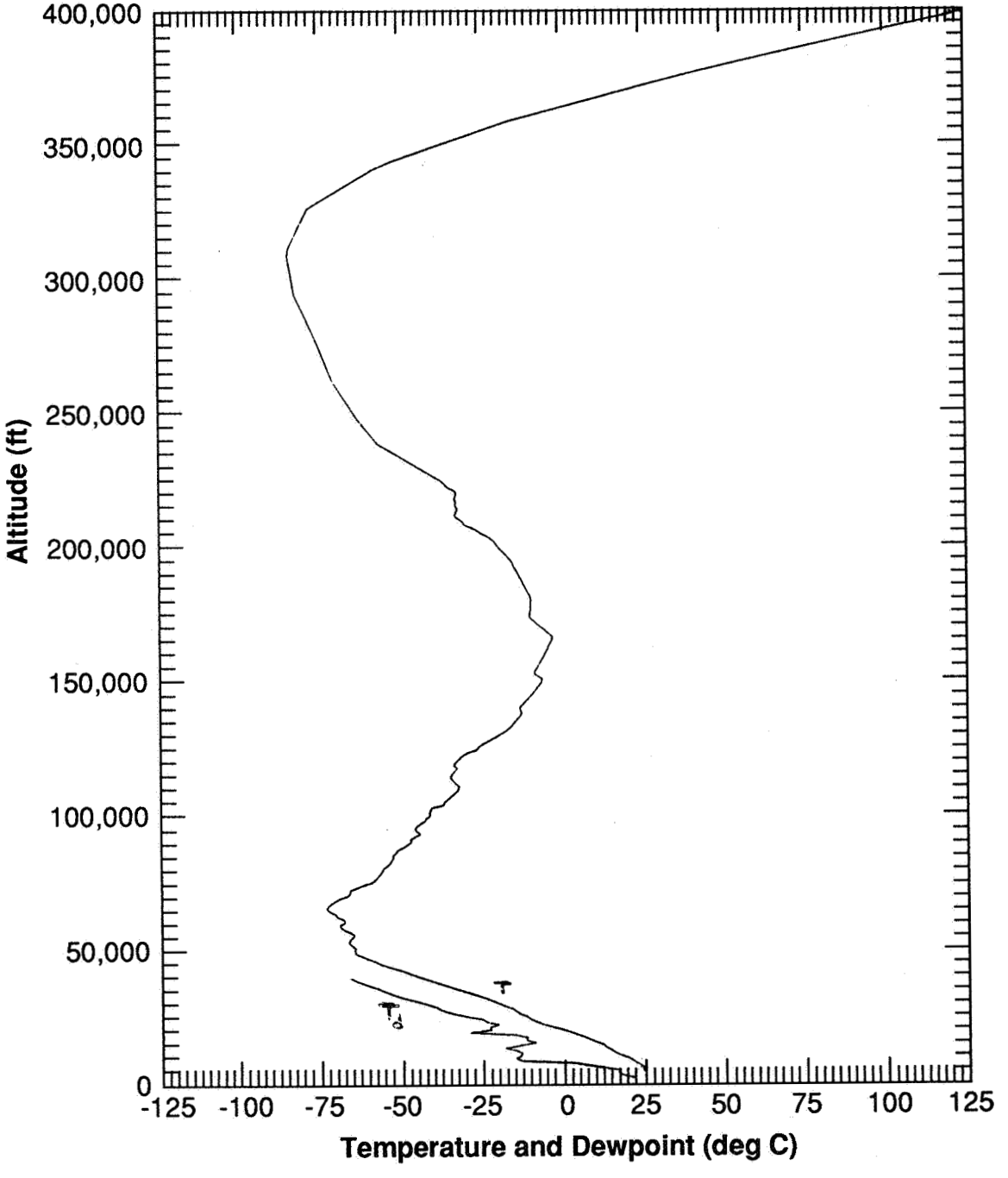


Figure 10. STS-39 temperature profiles versus altitude for launch (ascent).

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 86484, 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 86486, November 1984.

17. Johnson, D.L., Jasper, G., Hill, C.K., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-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 86524, June 1985.

20. Jasper, G.L., Johnson, D.L., Hill, C.K., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-51B) Launch." NASA TM 86525, July 1985.

21. Jasper, G.L., Johnson, D.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-51L) Launch." NASA TM 86577, December 1986.

22. Jasper, G.L., Johnson, D.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-26) Launch." NASA TM 100359, March 1989.

23. Jasper, G.L., Johnson, D.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-27) Launch." NASA TM 100370, May 1989.

24. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-29) Launch." NASA TM 100376, July 1989.

25. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-30) Launch." NASA TM 100381, July 1989.

26. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-28) Launch." NASA TM 100386, July 1990.

27. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-34) Launch." NASA TM 100396, December 1989.

28. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-33) Launch." NASA TM 100399, March 1990.

29. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-32) Launch." NASA TM 100400, March 1990.

30. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-36) Launch." NASA TM-100403, May 1990.

31. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-31) Launch." NASA TM 103508, June 1990.

32. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-41) Launch." NASA TM 103525, November 1990.

33. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-38) Launch." NASA TM 103530, February 1991.

34. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-35) Launch." NASA TM 103538, June 1991.

35. Jasper, G.L., and Batts, G.W.: "Atmospheric Environment for Space Shuttle (STS-37) Launch." NASA TM 103556, August 1991.

36. Justus, C.G., et al.: "The NASA/MSFC Global Reference Atmospheric Model—1990 Version (GRAM-90)." NASA TM 4268 Part I, April 1991.

APPROVAL

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE *ATLANTIS* (STS-39) LAUNCH

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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.

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