

#431

VIKING 1 & 2

METEOROLOGY PRESSURE TAPE  
METEOROLOGY WIND/TEMP TAPE  
WIND/TEMP CATALOG  
SOL AVERAGE PRESSURE DATA

75-075C-07D,07E,07H&07J

75-083C-07D,07E,07H&07J

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## **1. INTRODUCTION:**

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

## 2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

*When printing, special settings may be required to make the text box appear on the printed output.*

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

<http://nssdc.gsfc.nasa.gov/nmc/>

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

- a. Associated Documents      To find associated documents you will need to know the document ID number and then click here.  
<http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/>

- b. Core Catalog Materials

VIKING 1 & 2 LANDER

METEOROLOGY WNDTMP TAPE

75-075C-07E & 75-083C-07E

PSPA-00016

This data set has been restored. Originally there was one 7-track, 800 BPI tape, written in BCD. There is one restored tape written in ASCII. The original tape was created on an IBM 360 computer and was restored on an IBM 9021 computer. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The DR and DS number along with their corresponding D number and time span is as follows:

DR#	DS#	DD#	FILES	TIME SPAN
DR-005495	DS-005495	DD-031990	1-044	07/19/76 - 09/02/76 VIKING 1
			45-105	09/03/76 - 11/04/76 VIKING 2

VIKING LANDER 1 & 2  
METEOROLOGY PRESSURE TAPE

75-075C-07D, 75-083C-07D

PSPA-00360

THIS DATA SET HAS BEEN RESTORED. THERE WAS ORIGINALLY ONE 7-TRACK, 800 BPI TAPE, WRITTEN IN BCD. THERE IS ONE RESTORED TAPE WRITTEN IN ASCII. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN IBM 360 COMPUTER AND WAS RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	DD#	FILES	TIME SPAN
DR005308	DS005308	D031989	1-44 45-105	07/19/76 - 09/03/76 VIK 1 09/03/76 - 11/04/76 VIK 2

REQUEST AGENT  
CMP

RAND NO.  
R00811

ACQ. AGENT  
RWV

VIKING LANDER  
(Meteorology Pressure Tape)  
75-075C-07D, 75-083C-07D

75-075C-07E, 75-083C-07E  
(Meteorology WNDTMP Tape)

The Meteorology Pressure data set consists of one tape. It is even parity, 800 BPI, 7 track, unlabelled, external BCD, with 20 character fixed length records. Blocking factor is 10 records per block. 'D' and 'C' number and time span follow:

<u>D#</u>	<u>C#</u>
D-31989	C-20134

Files 1-44 Viking 1 Lander 07/19/76 - 09/02/76 (75-075C-07D)

Files 45-105 Viking 2 Lander 09/03/76 - 11/04/76 (75-083C-07D)

The WNDTMP data set consists of one tape. Its characteristics are the same as above except the records are 120 characters in length and are unblocked.

<u>D#</u>	<u>C#</u>
D-31990	C-20124

Files 1-44 Viking 1 Lander 07/19/76 - 09/02/76 (75-075C-07E)

Files 45-105 Viking 2 Lander 09/03/76 - 11/04/76 (75-083C-07E)

NOTE: On both tapes, times are given in SOLs (martian days) See attached for zero points and conversion factors.

Viking Lander Sol/Earth-day Conversions

<u>Spacecraft</u>	<u>SOL</u>	<u>Earth Time</u>	<u>Seconds of year</u>
Viking Lander 1	0 0:0:0.00	1976 201 19:39:54.04	17437194.04
Viking Lander 2	0 0:0:0.00	1976 247 12:48:45.07	21386925.07

Note: Sol 0 0:0:0.00 for Viking Lander 2 = Sol 44 11:47:32.94 for Viking Lander 1.

One Sol = 88775.25 seconds or approximately 24.66 terrestrial hours.

Documentation of Viking  
Meteorology Pressure Tape.  
(Primary mission)

A. Source These data are derived from the Intermediate Science Tapes. The data correspond identically to that information contained in the printed Viking Meteorology Pressure Catalog (VMPC)

The reader is referred to documentation of the VMPC for methodology used in generating the data.

B. Tape Contents

Data for both VL1 and VL2 are contained on this tape for the primary mission. An end of file mark is placed at the end of the data for each sol.

The Tape contains 105 files organized as follows:

- (1) Files 1 through 44 - data for sol 0 thru 43 for VL1
- (2) Files 45 through 105 - data for sol 0 thru 60 for VL2

C. Tape characteristics.

<sup>650</sup> ~~800~~ <sup>ASCII</sup> ~~BCD~~ 20  
Odd Even Parity, <sup>9</sup> BPI, unlabelled, External <sup>9</sup> track.  
character fixed length records, blocking factor 10 records/block, <sup>9</sup> track.

D. File Contents.

Each file contains two type of records.

- 1) A sol header record to be read as follows:

READ (5,1) FLAG, ID, ISOL, NG, NR, PMEAN  
1 FORMAT (I2, I1, I4, 2I3, F7.3)

and containing

FLAG	always -9
ID	Viking Lander no.
ISOL	Sol
NG	no. of groups in Sol
NR	no. of pts. rejected
PMEAN	mean pressure of the sol (MB)

- 2) The data are contained in NG records, each of which can be read as follows:

READ (5,2) FLAG, CLLT, NPTS, PRESS  
2 FORMAT (I2, F8.4, I3, F7.3)

and containing

FLAG	always +9
CLLT	local Lander time of record
NPTS	no. of points comprising group (record)
PRESS	mean pressure of the group (record)

15-110-7000  
75-0830-07E

PJR

07/14/78

Documentation for Viking  
Meteorology WNDTMP Tape  
(Primary Mission)

A. Source.

These data are derived from the Intermediate Science Tapes. The data are identically that of the printed Viking Meteorology WNDTMP Catalog.

The reader is referred to documentation of the Viking Meteorology WNDTMP Catalog for methodology used in generating data.

B. Tape Contents.

Data for both VL1 and VL2 are contained on this tape for the primary mission. An end of file mark is placed at the end of the data for each sol.

The tape contains 105 files organized as follows:

- (1) Files 1 through 44 - Data for sols 0 - 43 for VL1
- (2) Files 45 through 105 - Data for sols 0 - 60 for VL2

C. Tape Characteristics.

Even Parity, 800 BPI, unlabelled, External BCD, 120 character fixed length records, unblocked, 7-track.

D. File Contents.

Each file contains the data for one sol. Two types of records are contained on each file. Module header records followed by data records for the module.

Either record may be read with the following kind of statement:

```
READ (5,1) (FLAG, (I(N), N=1, 16), (F(N), N=1, 10))
1 FORMAT(I1, 16I4, F7.4, 9F5.1, 3X)
```

The contents of FLAG, Integer array I, and real array F will vary depending on the type of record specified by FLAG.

The contents of I and F are specified in the table below. The reader is again referred to various sections of Documentation of the printed WNDTMP Catalog (referred to in parentheses).

	MODULE HEADER	DATA RECORD
FLAG	2	3
I(1)	MODNO	IRECD
I(2)	MYRG	BR
I(3)	MDOYG	MAXV
I(4)	MHRG	MINV
I(5)	MNNG	MAXD
I(6)	LPOR	MIND
I(7)	LSOLR	CR
I(8)	LHRR	MAXTA
I(9)	LMNR	MINTA
I(10)	IDQI	DR
I(11)	IVHC	MAXRST
I(12)		MINRST
I(13)		KPTY
I(14)		KFLAG
I(15)		MIS
I(16)		SR
F(1)	SECMG	HOURS
F(2)	SECLR	SPEED
F(3)	RRATE	SIGV
F(4)		ANGLE
F(5)		SIGD
F(6)		AVTA
F(7)		SIGTA
F(8)		AVRST
F(9)		SIGRST
F(10)		AVPT

CONTENTS OF MODULE HEADER RECORD  
Reference to written WNDTMP documentation

MODNO - Module number                    (§ IV(A))

MYRG -  
MDOYG -  
MHRG -  
MNNG -

                  }            Module start time    (§ IV(B))

LEPOR - Lander epoch

LSOLR - sol number                        (§ III(B))

LITRR - Module start time (hours) (LLT) (ADDENDUM 2)

LMNR - Module start time (min) (LLT) (ADDENDUM 2)

IDQI - data quality indicator            (§ IV(E))

✓ IVHC - Lander number                    (§ III(A))

SECNG - module start time                (LLT) (ADDENDUM 2)

RRATE - sample interval                 (IV(D))

CONTENT OF DATA RECORD

IRECD - record number		(\$V(A))
BR - 1 if value deleted from wind speed, 0 otherwise		(\$ V(C))
MAXV - Maximum wind speed	}	(\$V(C) and (D))
MINV - Minimum wind speed		
MAXD - Maximum wind angle		
MIND - Minimum wind angle		
CR - 1 if value deleted from thermocouple temp., 0 otherwise	}	(\$V. (E))
MAXTA - Maximum thermocouple temp.		
MINTA - Minimum thermocouple temp.		
DR - 1 if value deleted from reference sensor temp., 0 otherwise	}	(\$V.(F))
MAXRST - Maximum reference sensor temp.		
MINRST - Minimum reference sensor temp.		
KPTY - sum of all parity flags		(\$V.H)
KFLAG - sum of all flags		(\$V.(F))
MIS - sum of all missings values (max. 16)		(\$V.(J))
SR - 1 if vector mean direction is from Lander, 0 otherwise		(\$V.(D))
HOURS - average time		(\$V.(B))
SPEED - average wind speed	}	(\$V.(C) and (D))
SIGV - standard deviation of wind speed		
ANGLE - vector mean wind direction		
SIGD - standard deviation of vector mean wind direction		
AVTA - average thermocouple temp.	}	(\$V.(E))
SIGTA - standard deviation of thermocouple temp.		
AVRST - average reference sensor temp.	}	(\$V.(F))
SIGRST - standard deviation of reference sensor temp.		
AVPT - average platinum resistance temp.		(\$V.(G))

SEX LIST BS

INPUT PARAMETERS ARE: BC FL=1=1

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	1	200
7	1	7.711 9 18.0140	4 7.619 9 18.9260
4	2	7.792 9 23.6217	2 7.705 9 24.4335
4	4	7.836>	

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	1	200
7	1	7.711 9 18.0140	4 7.619 9 18.9260
4	2	7.792 9 23.6217	2 7.705 9 24.4335
4	4	7.836>	

\*\*\*\*\* JOB DONE.

SAVF IN 45

SEX LIST BS

INPUT PARAMETERS ARE: BC FL=1=1

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	1	200
21	3	7.767 9 1.2126	4 7.819 9 2.6632
4	4	7.819 9 7.0149	4 7.819 9 8.4756
6	6	7.732 9 9.5821	4 7.732 9 9.7160
6	6	7.7	

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	3	200
4	4	7.819 9 24.4218	4 7.819

\*\*\*\*\* JOB DONE.

SAVF IN 43

SEX LIST BS

INPUT PARAMETERS ARE: BC SR=1=2

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	1	200
14	0	7.125 9 1.6025	13 7.194 9 3.9361
12	5	7.109 9 13.6103	5 7.109 9 13.7944
6	6	7.109 9 13.9599	6 7.109 9 14.1282
10	10	7.1	

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	2	200
12	12	7.14.8592	12 7.109 9 16.9292
12	12	7.024 9 19.2603	15 7.024 9 21.5958
12	12	7.159 9 23.9292	12 7.19

\*\*\*\*\* JOB DONE.

SAVF IN 44

SEX LIST BS

INPUT PARAMETERS ARE: BC SR=1=1

TAPE NO.	FILE NO.	RECORD	LENGTH
1	1	1	200
6	2	7.750 9 11.4275	2 7.819 9 12.3489
2	2	7.601 9 12.7017	1 7.732 9 17.0817
1	1	7.73	

\*\*\*\*\* JOB DONE.

SAVF IN 104

C-20134

D-31989

1-44 - 7/2/76 - 9/3/76 Viking 1  
 45-105 - 9/4/76 - 11/5/76 Viking 2

hander #

sol day

hander sol day

\$EXE LIST BS

INPUT PARAMETERS ARE: BC SR=1=2

TAPE NO.	1	FILE NO.	1																	
RECORD	1	LENGTH	200																	
-92	60	79	2	7.455	9	.1822	1	7.469	9	.4722	1	7.469	9	.7625	1	7.469	9	1.0505	3	7.46
9	9	1.3428	1	7.469	9	1.6328	1	7.469	9	1.9231	1	7.469	9	2.2131	1	7.469	9	2.5033	1	7.4
69																				

TAPE NO.	1	FILE NO.	1																	
RECORD	2	LENGTH	200																	
9	2.7931	1	7.469	9	3.0833	1	7.469	9	3.3733	1	7.469	9	3.6636	1	7.447	9	3.9536	1	7.40	
4	9	4.2439	1	7.404	9	4.5339	1	7.426	9	4.8242	1	7.426	9	5.1139	1	7.447	9	5.4042	1	7.4
69																				

\*\*\*\*\* JOB DONE.  
\$WEO LPS

VIKING 1 AND 2 LANDER  
WIND AND TEMPERATURE CATALOG

75-075C-07H PSPA-00164

75-083C-07H PSPA-00043

THESE DATA SETS HAVE BEEN RESTORED. ORIGINALLY THEY CONTAINED ONE 9-TRACK, 1600 BPI TAPE, WRITTEN IN ASCII, FOR EACH DATA SET. THERE IS ONE RESTORED TAPE FOR EACH DATA SET. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE ORIGINAL TAPES WERE CREATED ON A 1108 COMPUTER AND WERE RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND TIME SPANS ARE AS FOLLOWS:

VIKING 1 LANDER 75-075C-07H

DR#	DS#	D#	FILES	TIME SPAN
DR005429	DS005429	D043281	1-689	07/20/76 - 09/14/78

VIKING 2 LANDER 75-083C-07H

DR#	DS#	D#	FILES	TIME SPAN
DR005430	DS005430	D043282	1-726	09/04/76 - 12/05/78

REQ. AGENT

RD NO

ACQ. AGENT

LSM

V0093

WSC

VIKING 1 AND 2 LANDER  
WIND AND TEMPERATURE CATALOG

75-075C-07H

75-083C-07H

This data set catalog consists of 1 Viking 1 Lander and 1 Viking 2 Lander tape. The tapes are 1600 BPI, ASCII formatted, and 9 track. The Viking 1 tape has 689 files and the Viking 2 tape has 726 files. The 'D' and 'C' numbers and time spans are as follows.

<u>D#</u>	<u>C#</u>	<u>Files</u>	<u>Time Span</u>
<u>75-075C-07H</u> VIKING 1			
D-43281	C-21698	689	7/20/76-9/14/78
<u>75-083C-07H</u> VIKING 2			
D-43282	C-21699	726	9/4/76-12/5/78



February 3, 1981

National Space Science Data Center  
Code 601.5, attn: Ralph Post  
Goddard Space Flight Center  
Greenbelt, Md. 20771

Gentlemen:

I am sending you separately two magnetic tapes of Viking meteorological data for, respectively, landers 1 and 2. The data are means and statistics for each "record" of observation of wind and temperature. At lander 1, 765 sols\* of data are processed and recorded. At lander 2 it is 800 sols\*.

These tapes are to be included in the data record of the Viking Meteorology Team and made available to anyone wishing these data.

I enclose a copy of the documentation for these tapes.

Please note that there are two labels on each tape identifying and explaining the contents. I recommend that you duplicate these labels for any copies of these tapes that you generate.

Sincerely,

A handwritten signature in cursive script that reads "Seymour L. Hess".

Seymour L. Hess  
Professor and Chairman

SLH:vw

cc: Dr. Henry Brinton, SL-4  
Mr. James Tillman

\* VIKING 1 LANDER ACTUALLY HAS 689 SOLS OF RECORDED DATA  
VIKING 2 LANDER HAS 726 SOL OF RECORDED DATA

Documentation for Viking Wind and Temperature  
Tape Catalog

- I. Source: all the numerical information is read from or calculated from the Intermediate Science Tapes (IST) produced by the 1108 computers at JPL. The contents of these tapes are the same as is printed out by the program SANMET on the page labeled WNDTMP, with the addition of the reading of the platinum resistance thermometer, derived from the page labeled DATA 6. Thus these data can be found in detail on the microfiche of the SANMET output.
- II. Tape Contents: tapes labeled DWT contain wind and temperature data from Viking Lander I. Tapes labeled FWT contain similar data from Viking Lander II. The basic data presented are certain means and statistics for a "record" of observations, consisting usually of 16 samples. Missing data could cause a "record" to have less than 16 samples and it is possible for there to be as many as 17 samples. "Records" were gathered in groups called modules that share certain timing characteristics.
- III. Tape Characteristics: nine track, 1600 BPI, unlabeled, ASCII, 120 character fixed length lines, blocked to 3600 characters per record. An end-of-file mark separates individual sols and a double end-of-file mark denotes the end of a tape.
- IV. File Contents: each file contains the data for one sol.\* Two types of lines are contained on each file: Module header lines followed by data lines for the module.

Either line may be read with the following kind of statement:

```
READ (5,1) (FLAG, (I(N), N=1, 16), (F(N), N=1, 10))  
1 FORMAT (I1, 16I4, F7.4, 9F5.1, 3X)
```

The contents of FLAG, Integer array I, and real array F will vary depending on the type of record specified by FLAG.

The contents of I and F are specified in the table below and the meaning of each item is given in section V.

\* VIKING 1 LANDER ACTUALLY HAS 689 SOLS GIVEN THAT EACH FILE CONTAINS THE DATA FOR ONE SOL AND VIKING 2 HAS 726 SOLS GIVEN THE SAME INFORMATION.

	MODULE HEADER	DATA LINE
FLAG	2	3
I(1)	MODNO	IRECD
I(2)	MYRG	BR
I(3)	MDOYG	MAXV
I(4)	MHRG	MINV
I(5)	MMNG	MAXD
I(6)	LEPOR	MIND
I(7)	LSOLR	CR
I(8)	LHRR	MAXTA
I(9)	LMNR	MINTA
I(10)	IDQI	DR
I(11)	IVHC	MAXRST
I(12)	(blank)	MINRST
I(13)	(blank)	KPTY
I(14)	(blank)	KFLAG
I(15)	(blank)	MIS
I(16)	(blank)	SR
F(1)	SECMG	HOURS
F(2)	SECLR	SPEED
F(3)	RRATE	SIGV
F(4)	(blank)	ANGLE
F(5)	(blank)	SIGD
F(6)	(blank)	AVTA
F(7)	(blank)	SIGTA
F(8)	(blank)	AVRST
F(9)	(blank)	SIGRST
F(10)	(blank)	AVPT

V. Information provided:

MODNO - module number.

MYRG, MDOYG, MHRG, MMNG - GMT start time for a module consisting of year, day of year, hour and minute. Seconds are given later by SECMG.

LEPOR, LSOLR, LHRR, LMNR - start time of the module in local martian lander time. LEPOR is a lander epoch, normally blank, but available to avoid confusion if the number of sols exceeds 1000. The others here are sol, hour and minute. Seconds are given later by SECLR.

IDQI - data quality indicator. 4 means no adverse quality indicators while 1 means several adverse quality indicators were detected.

IVHC - lander from which the data derives (1 or 2).

SECMG - GMT seconds for the start of the module.  
SECLR - local-lander-time seconds for start of the module.

RRATE - time in seconds between samples

IRECD - the record number within a module

BR - this is 0 if no sample of wind speed has been deleted and is 1 if any deletions occurred in the "record." A sample of wind speed is deleted if it lies more than 3 standard deviations away from the arithmetic mean speed for the "record."

MAXV, MINV - the highest and lowest wind speeds expressed as deci-meters-per-second above/below the vector mean wind speed for the "record."

MAXD, MIND - the amount in deci-degrees by which the wind direction departs from the vector mean direction for the "record" for the two samples that have the maximum departures on either side of that mean.

CR - this is 0 if no sample of thermocouple temperature has been deleted and is 1 if any deletions have occurred in the "record." A temperature is deleted if it lies more than 3 standard deviations away from the mean for the "record."

MAXTA, MINTA - the amount in deci-degrees-Kelvin by which the maximum/minimum temperatures in the record are above/below the mean thermocouple temperature.

DR, MAXRST, MINRST - the same for reference sensor temperature as CR, MAXTA, MINTA for thermocouple temperature

KPTY - this gives information on a certain class of parity errors detected by SANMET. The WNDTMP output contains a column called PARITY which is 0 if no errors were detected and is 1 if either of the two following errors was found in the sample: P1 - parity errors in the 5-bit ID and somewhere in the remaining 11 bits; P3 - a parity error in the 10 bits of measurement information or in the parity bit itself. KPTY is the sum over all the samples in the record of the digits recorded under PARITY in WNDTMP. Thus, if KPTY is non-zero, that indicates the number of the defined parity errors detected in the record. To trace these it is necessary to examine the detailed SANMET output. If KPTY is zero, none of the defined parity errors was detected in the record.

KFLAG - this gives information on whether SANMET has rejected one or more measurement points and substituted a smoother value. The WNDTMP output contains a column called FLAG which is 0 if no smoothing occurred and is 1 if any smoothing took place for that sample. KFLAG is the sum over all the samples in the "record" of the

digits recorded under FLAG in WNDTMP. Thus, if KFLAG is non-zero, that indicates the number of smoothing substitutions found in the "record." To trace these it is necessary to examine the detailed SANMET output. If KFLAG is zero, no substitutions were made in the "record."

MIS - this gives the number of missing samples in the "record." It can range from 15 (only 1 sample acquired) to -1 (a 17th sample was acquired).

SR - this gives an indication of possible unrepresentativeness of the data because of flow from the lander body towards the meteorology sensors. SR=1 when flow is from the lander to the sensors, i.e., the vector mean wind direction for the "record" lies between 246° and 332° for VL-1, and between 126° and 212° for VL-2.

HOURS - this is the mean local lander time of the "record" in hours. It is calculated from the start time of the "record," the number of samples in the "record," and the sample interval. All time tags issued for meteorology on the landers are truncated, but the truncation is partially compensated in SANMET. The maximum error in this column is 0.0015 hours.

SPEED - the vector mean wind speed in meters per second, for the "record." It is derived from the columns labeled VQD and ANGPLT in WNDTMP.

SIGV - the arithmetic standard deviation of wind speeds in the "record" in meters per second derived from column VQD in the SANMET output.

ANGLE - all wind directions are given in the usual meteorological style where a wind from the north is 0° and one from the east is 90°. ANGLE is the vector mean wind direction for the "record" in degrees. It is derived from the columns labeled VQD and ANGPLT in WNDTMP. If any sample has been rejected because the speed was outside of the 3 standard deviation range, that sample is omitted in all the results for wind direction also.

SIGD - standard deviation of wind direction from the vector mean wind direction in the "record," in degrees.

AVTA, SIGTA - arithmetic mean thermocouple temperature for the "record" and standard deviation of that temperature for the "record." Both in degrees Kelvin.

AVRST, SIGRST - the same for reference sensor temperature as AVTA and SIGTA for thermocouple temperature.

AVPT - the mean for the record of the values from the platinum resistance thermometer in the boom housing, in degrees Kelvin. It is derived from the column labeled PTT in DATA 6. Statistics for this parameter are in the DATA 6 output, they are not on these tapes. These data have not been screened for samples with an excessive departure from the mean.

VI. Hardware failures: The thermocouple temperature system on VL-1 has functioned well and these temperatures are generally superior to the reference sensor temperatures. On VL-2 the thermocouple temperature system developed a fault on the launch pad. In that lander the reference sensor temperatures are generally superior.

On VL-1 an open circuit developed in the wind measuring system early in the mission. Therefore, no wind data is reported on the DWT tapes from sol 43 on. To avoid confusion, the following recognizable entries are placed on the tapes in lieu of the real data:

SIGD	-9.	MAXV	-9
SIGV	-9.	MINV	-9
SPEED	-9.	MAXD	-9
ANGLE	-9.	MIND	-9

BR blank (i.e. IH\_\_\_)



REQ. AGENT  
GLS  
DHG

RAND #  
V0270

ACQ. AGENT  
CYN

VIKING LANDER 1 & 2

SOL AVERAGE PRESSURE DATA

75-075C-07J (VIKING 1) PSPA-00251

75-083C-07J (VIKING 2)

This data set consists of 1 magnetic tape. It is 1600 BPI, ASCII, 9 track, with 4 files of data. The tape was created on a PRIME 9950 computer. File 1 contains data for Viking Lander 1. File 2 contains data for Viking lander 2. Files 3 and 4 are duplicates of files 1 and 2 respectively. The times are given in SOL's or Martian days. Each SOL is 24.66 hours long.

The D and C numbers and time spans are as follows:

<u>D#</u>	<u>C#</u>	<u>Time Span</u>	
D-64312	C-24278	07/20/76 - 11/12/82	VIKING 1
		09/04/76 - 07/21/79	VIKING 2

75-075C-07J  
75-083C-07J

UNIVERSITY OF WASHINGTON  
SEATTLE, WASHINGTON 98195

Department of Atmospheric Sciences, AK-40

September 25, 1985

Mrs. Carolyn Ng  
National Space Science Data Center  
Code 601  
NASA/Goddard Space Flight Center  
Greenbelt, MD 20771

Dear Mrs. Ng:

Enclosed you will find the revised tape and document for the Viking Landers 1 and 2 daily average atmospheric pressure statistics. The document has been updated to include a description of the plots as well as the numeric data. We are supplying a complete new set of documents as well as a tape, which should replace the earlier test versions.

The microfiche of the plots should be changed to add after Principal Investigator:

James E. Tillman, Director  
Viking Computer Facility  
Department of Atmospheric Sciences  
University of Washington, AK-40  
Seattle, WA 98195

As to the sets of products, I suggest that we use only two categories. The first would include the microfiche of the plots, the printed data and the descriptive document. The second product would include the first as well as the tape. Although this might waste a few sheets of microfiche in instances where machine readable format is desired, it would provide the ability to check computer retrieval against the hard copy.

We are providing both Lander 1 and 2 data in response to all inquiries for this pressure data for convenience since it is a small data volume. Descriptive information for these data include:

Spacecraft: Viking Landers 1 and 2  
Investigator: James E. Tillman  
Experiment Name: Viking Lander Meteorology Experiment  
Time Span of Data: Lander 1 20 July 1976 to 13 Nov 1982  
Lander 2 4 Sept 1976 to 18 Aug 1979

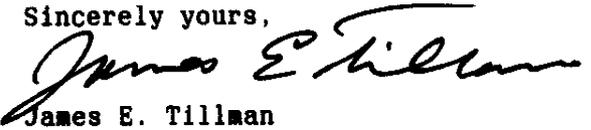
Please feel free to contact Neal Johnson or me if additional information is required, at (206)543-0500 or 543-4586. We would be happy to entertain suggestions which would make this product more useful.

To aid us in comparing archived data with our future data sets, could you please send copies of the Hess tapes 75-075C-07D and 75-083C-07D, 75-075C-07E and 75-083C-07E in either 800 or 1600 density, 9 track.

Also, would you please return two copies of the complete microfiche products.

Thank you for your assistance.

Sincerely yours,



James E. Tillman

Director

Viking Computer Facility

JETNG

cc: J. Boyce, NASA HQ  
H. Brinton, NASA HQ

75-015C-07J  
75-083C-07J

## INTRODUCTION

This document describes summary pressure data from the Viking Lander Meteorology Experiment throughout the mission from the Revision 2.0 pressure data files. These data consist of statistical functions and supporting measurements presented on a sol by sol basis for Viking Lander 1, the Thomas Mutch Memorial Station, and Viking Lander 2 for the complete mission. On a typical sol, pressure is periodically sampled with intervals between samples of 30 to 90 minutes. The results are presented in the form of averages of functions over a sol as well as supporting information. The data are provided on tape, on microfiche and on plots. The parameters as well as the format of the data are described in the following sections while papers describing the experiment and some of the analyses are contained in the bibliography.

## PARAMETER DESCRIPTION

The parameters provided for each sol are:

- Flags
- Sol number
- Average pressure
- Length of maximum time gap
- Minimum pressure
- Pressure range
- Standard deviation
- Starting and ending times of large gaps
- Bit error rate < if fiche available at U.W. >

A short description of each parameter is given below and greater detail will be included in future documents.

## DATA FORMAT

The order of the data for tape and microfiche are:

- This document
- Header for Lander 1
- 50 sols of data on one page or tape record
- 50 sols of data on each of the subsequent pages or tape records

Repetition of this structure until the end of Lander 1 data

End of file for tape or similar logical separator

This document repeated

Header for Lander 2

50 sols of data on one page or tape record

50 sols of data on each of the subsequent pages or tape records

Repetition of this structure until the end of Lander 2 data

End of file or similar data separator

For the medium of magnetic tape, the above data structure is repeated for redundancy

End of file for tape or similar logical separator

End of file for tape or similar logical separator

Data and text are written in 80 character lines with each page or tape record containing 55 lines.

The following sections provide descriptions of the parameters and their relation to the original data set. A more complete description will be provided with the publication of the point by point data set.

EDITING

Prior to inclusion in the data set, each measurement was subjected to a series of screening criteria designed to eliminate spurious points. Subsequent to the screening, the data were plotted and examined for meteorological consistency. Obviously bad points were removed and some questionable points also were removed. In some instances where the communications from Mars to Earth were moderately noisy, some sols probably have data with errors on the order of 0.088 to 0.176 millibars. After editing out the obvious spikes, the data were retained since they provide valuable daily average pressure estimates and they can be identified by their association with the highest bit error rates. At the present time, bit error rates have not been computed for part of the Lander 1 data. However, this parameter will be generated for the remaining data when the wind data are processed from the raw spacecraft data.

FLAGS (cols. 1-2)

Flags are provided to warn the user of potential biases in some or all of the statistics for a given sol. The character found in column 1 of each line indicates whether the entire line is data or text. A "C" or "F" in column 1 indicates the entire line contains only text. Any other character in column

1 indicates the presence of data on that line. The presence of a blank in column 1 indicates that the data for that sol has no interior gaps of 3 hours or more, and that the cross-midnight gaps at the start and end of that sol are less than 4 hours. The only other valid characters in column 1, a "." or a "I", are used in combination with a character in column 2. A ".I" in columns 1 and 2 signifies that the data from that sol contained at least one interior time gap of 3 hours or greater. A ".C" in columns 1 and 2 indicates that the data from that sol contained a cross-midnight gap of at least 4 hours at the start or end of that sol. A "IC" in columns 1 and 2 indicates that the data for that sol contained at least one interior time gap of 3 hours or greater, and a cross-midnight gap of at least 4 hours at the start or end of that sol. If gaps of greater than three hours are found during the sol, the time of the gap should be considered along with the presence of global or local dust storms in determining the validity of the data. For example, if there are significant dust storms, indicated by the continued sol to sol standard deviation of 0.15 millibars or greater, then the sol statistics would be especially sensitive to data loss in the late afternoon when the variation is most rapid. In these instances the MAXIMUM TIME GAP and the TIME GAP columns should be examined. In some instances, the point by point data for the sol should be examined to determine the reliability of the statistics or should be used instead of these data.

SOL (cols. 5-8)

One entry is provided for each sol regardless of whether any data were received for the sol. A Martian sol is 88775.25 seconds long or approximately 24.66 terrestrial hours. A line is provided for sol 0 for format consistency and to indicate that there are data for this sol which are available in the point by point data set. The line for sol 0 date has the "C" flag in column 1.

SOL MEAN PRESSURE (cols. 13-17)

The SOL MEAN PRESSURE is a time weighted daily average pressure with certain assumptions regarding gaps longer than three hours. Depending on the location of the gaps and their length, missing data are either filled in by interpolation or extrapolation or are excluded from the time weighted statistics. For gaps greater than four hours spanning midnight, interpolation is not used. Although interpolation is used for all intervals wholly within a sol, gaps longer than three hours can cause noticeable errors if the gap falls during the time of the diurnal pressure minimum for sols with strong diurnal variations especially during heavy atmospheric dust loading. Such instances can be excluded from analyses by using the information contained in the flags or the time gap parameters. Details of the interpolation or extrapolation will be presented in future documents.

The pressure transducers were produced by the Tavis Corporation and were calibrated to approximately 0.01 to 0.02 millibars accuracy over the ranges of Martian atmospheric pressure variation. Calibrations to accuracies greater than allowed by the digitizing system were accomplished by test support instrumentation. Repeatability from year to year of the daily average pressure indicates that they have remained stable to significantly better than 0.04 millibars throughout the mission, possibly maintaining stabilities on the order of 0.01 millibars.

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The pressure measurements were digitized into 255 approximately equal increments giving a basic pressure quantization interval of 0.087 to 0.088 millibars, depending on the lander and measured pressure. Thus, averages of the pressure would underestimate the true pressure by approximately 0.044 millibars. This is due to the fact that all pressures within the 0.088 millibar range would be registered as the lower bound of the interval even though half would generally be 0.044 millibars or more greater than the indicated value. To compensate for this, 0.044 millibars has been added to each individual pressure value which is reflected in all subsequent "recalibrated" data and all derivative products such as these "daily average" data.

Pressure data were converted from digitized to scientific units by Mission Operations software rather than Viking Meteorology Science Team software. In this operational software, the instrumental calibration was approximated by a piecewise linear approximation. The digital number 140, in the 0-255 DN range, was left out of the calibration table, producing maximum errors of 0.05 and 0.008 millibars for landers 1 and 2 respectively at pressures of 9.8 millibars. The errors in pressure decrease linearly to zero at pressures of 8.0 and 11.48 millibars for lander 1. The errors in lander 2 pressure decrease linearly to zero at pressures of 8.0 and 11.6 millibars. Pressure values previously submitted to NSSDC contain these errors. In producing the current data, corrections were made for the missing calibration point for each lander while recomputing the correct value for each pressure datum that was subsequently averaged.

For approximately the first 16 sols of Lander 1 operation, the wrong calibration constants were used in reducing the pressure data by the mission operations software. These errors are contained in the previously released NSSDC data and have been corrected prior to the calculation of these data.

#### MAXIMUM TIME GAP (cols. 23-27)

The MAXIMUM TIME GAP parameter provides an indication of the continuity of sampling during the sol and consequently, how well the statistics represent the true sol averages. For example, if several hours of data are missing around 17:00 local time especially during one of the intense dust storms, the pressure range and minimum probably will be in error by up to several tenths of a millibar.

#### MINIMUM PRESSURE (cols. 30-34)

The MIN. PRES. is the minimum pressure observed during the sol. Due to the quantization of the analog to digital converter, it changes by approximately 0.088 millibar increments.

#### RANGE (cols. 37-41)

The RANGE is the difference between the maximum and the minimum pressure for the sol. While it can indicate the magnitude of diurnal tidal harmonics, it also is significantly influenced by large sol to sol synoptic pressure variations.

STANDARD DEVIATION (cols. 44-49)

The STANDARD DEVIATION is computed as a time-weighted standard deviation around the daily average pressure. Although it is a better indicator of the atmospheric tides due to solar heating of dust than is the RANGE, especially at Lander 1, it also is significantly influenced by synoptic systems.

TIME GAP (cols. (from 54-61)-(to 64-71))

The time gap gives the starting and ending times of the longest interval without data during the sol. Since the atmospheric tides generally produce more rapid variations during late afternoon than other times of the sol, especially during intense dust storms, it helps to indicate the degree to which the daily average statistics approximate those of a continuously sampled sol.

BIT ERROR RATE (cols. 73-79)

The BIT ERROR RATE is an indicator of the reliability of the Spacecraft to Earth communications which is calculated from data in each Viking Meteorology Instrument frame. Due to system design, a portion of the data transmitted with each frame consists of all 1's, providing the ability to calculate the error rate for each frame. Although the VMIS and the pressure data are contained in different formats, sampled at different times and, in some instances, averaged over different portions of the sol, the bit error rate does provide a useful indication of the data quality. For Lander 2, they have been calculated for the complete mission while for Lander 1, they are currently available for only approximately one third of the mission. However, they will be available for the complete mission and at that time an updated version of this product will be made available. Values below 0.001 provide fairly good data while values below 0.0001 provide almost error free measurements with the exception of short bursts. Due to the extensive automated and manual editing, it is quite unlikely that individual pressure spikes greater than 0.176 millibars are included in the data and even 0.176 spikes are infrequent except in certain instances. In these instances, sols with high bit error rates are fairly noisy on the level of 0.088 to 0.176 millibars. These have been included to provide continuity of the daily average pressure values and the standard deviations and ranges for these sols should be viewed with caution.

This is the corrected format of the summary table. Lines that have been changed are shown with ==> in staring in column 1.

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### SUMMARY OF FORMAT

The table below lists the format of the pressure data. Giving the starting and ending columns where the actual data can appear and what type of data will be found in the given columns.

TABLE 1  
\*\*\*\*\*

cols. *****	var. name *****	var. type *****	var. format *****
1-2	FLAGS	CHAR	A2
5-8	SOL	INT	I4
==> 12-17	MEAN PRES.	REAL	F6.3
==> 23-27	MX. TIME GAP	REAL	F5.2
30-34	MIN. PRES.	REAL	F5.3
37-41	PRES. RANGE	REAL	F5.3
44-49	STD. DEV.	REAL	F6.4
54-61	TIME GAP (FROM)	INT	3 (I2,1X)
64-71	TIME GAP (TO)	INT	3 (I2,1X)
73-79	BIT ERR. RATE	REAL	F7.6

### PLOTS

Plots of the daily average pressure and the standard deviation around the daily average have been generated to assist in the selection of meteorological features and the interpretation of the numeric results. Data are presented in 100 sol blocks, and both landers are illustrated on the same plot. The timeline on the abscissa is indicated in Lander 1 sols. Note that the first Lander 2 data begin on sol 44, the delay of Lander 2's landing relative to Lander 1.

On the printouts and tape, time is given in with respect to local Lander time at each Landers. Midnight of Sol 0 at Lander 2, the end of the first day, was sol 0 24:39:35.25, GMT time 1976 day 248 13:28:20.32 and corresponds to Lander 1 sol 45 12: 7: 0.03, the same GMT time. Both the lower and the upper panel of the plot use the same time line.

On each 100 sol plot, the first point is plotted at local noon for sol XX00 while the last point is at local noon for sol XX99. The lower panel presents the daily average pressure values while the upper panel illustrates the standard deviation. The standard deviation provides a crude indication of the presence of dust generated tides and synoptic activity at Lander 1 while at Lander 2 it is generally indicative of synoptic activity. In all instances, the data are plotted with a maximum time gap of 6.0 hours, i.e., the sols with time gaps longer than 6.0 hours are excluded from the plotted data. Plots are generated for Lander 1 sols 0 through 2300 and the last data were received on sol 2,245.

The following illustrates the corrected format with a small portion of an actual data file. In the format descriptor shown below each 'a' represents one character in a character field, each 'i' represents one character in an integer field and each 'f' represents one character in a floating point number field.

FLAG	VL-1	SOL-MEAN	MAXIMUM	MIN.	RANGE	STANDARD	TIME GAP	BIT	
C	SOL	PRESSURE	TIME GAP	PRES.		DEVIATION	FROM	TO	ERR RATE
C									
	1	2	3	4	5	6	7	8	
	123456789	123456789	123456789	123456789	123456789	123456789	123456789	123456789	123456789
aa	iiii	ffffff	fffff	fffff	fffff	ffffff	ii ii ii	ii ii ii	ffffff
C	0	7.624	18.01	7.534	0.255	0.0637	0: 0: 0	18: 0:49	.000000
	1	7.629	2.28	7.534	0.169	0.0687			.00003

## OTHER PRODUCTS

In the near future, the complete recalibrated pressure data set will be released along with documentation and plots. Subsequent to these products, wind and temperature data sets will be released as well as a compact summary of the data.

## REFERENCES

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Leovy,C.B., Martian Meteorology, Ann. Rev. Astron. Astrophysics,17,387,1979.

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Ryan,J.A., R.M.Henry, S.L. Hess, C.B. Leovy, J.E. Tillman, and C. Walcek, Mars Meteorology: Three Seasons at the Surface, Geop. Res. Let.,5,715,1978.

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ACKNOWLEDGEMENTS

We would like to gratefully acknowledge the assistance of the following individuals: Charlie Strauss, Gary Selness, Karen Fitzgerald, Keith Bankston, Robert Henry, Neal Johnson, Harry Edmon and the late Seymour Hess. Also, the efforts of the dedicated mission operations staff at the Jet Propulsion Laboratory should be acknowledged, especially those of Al Britting, Paula Eshe, Jim Belton, and George Gianopulos. This work was accomplished with NASA funding for Viking Mission operations, Viking Science Team support, the Mars Data Analysis Program, and through JPL operations support.

D-64312

\$ASS IN TA1  
\$NOP  
\$NOP  
\$NOP  
\$NOP  
\$NOP \*\*\*\*\* DAVE \*\*\*\*\*  
\$EXEC TPLIST BS

Viking Lander 1  
7/20/76 - 11/12/82

Viking Lander 2  
9/4/76 - 7/21/79

INPUT PARAMETERS ARE: AS AL 4 1 1

TAPE NO. 1 FILE NO. 1  
RECORD 1 LENGTH 4400

1 sol = 24.66 hours.  
Sol 0 is beginning point for data.

ATMOSPHERIC PRESSURE STATISTICS  
from the SURFACE of MARS:

ing Meteorology Experiment

the Vik

James E. Tillman

king Meteorology Science Team

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Director

VIKING COMPUT

ER FACILITY

and

William R. Guest

s Department of Atmospheric Science  
University of Washington

98195

Seattle, Washington

Daily Average Pressure

Revision 2.2

85/08/12

TAPE NO. 1 FILE NO. 1  
RECORD 2 LENGTH 4400  
INTRODUCTION

See printed document  
file on 8 1/2 x 11" pages

pressure data from the Viking Lander Meteorology Experiment throughout the mission from th etc.



NO FICHE	2236	8.221	1.03	7.789	0.971	0.2602	NO FICHE	2238	NO FICHE	22	
37	8.216	2.31	7.789	0.882	0.2445		NO FICHE	2238	8.250	1.	
06	7.874	0.797	0.2506				NO FICHE	2239	8.236	1.03	
.2498							1.03	7.874	0.797	0.2401	
	NO FICHE	2241	8.338	1.03	7.959	0.801	0.2376		NO FICHE		
2242	8.395	1.03	7.959	0.801	0.2419			NO FICHE	2243	8.361	
1.03	7.959	0.801	0.2361					NO FICHE	2244	8.402	
1	0.2378							1.03	7.959	0.80	
47	24:39:35	NO FICHE.C	2245	8.533	11.35	8.223	0.626	0.2079		13:18:	
C	Sol 2245 is the last sol at Lander 1 for which daily								C	average pre	
ssure can be formed.											

*etc.*

*Sol 2245 = day 2306*

TAPE NO. 1 FILE NO. 2  
RECORD 1 LENGTH 4400

ATMOSPHERIC PRESSURE STATISTICS  
from the SURFACE of MARS:

ing Meteorology Experiment the Vik

James E. Tillman

king Meteorology Science Team V1

and

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VIKING COMPUT

ER FACILITY

and

William R. Guest

Department of Atmospheric Science  
University of Washington

s  
Seattle, Washington

98195

Daily Average Pressure

Revision 2.2

85/08/12

TAPE NO. 1 FILE NO. 2  
RECORD 2 LENGTH 4400  
INTRODUCTION

This document describes summary  
pressure data from the Viking Lander Meteorology Experiment throughout the mission from th