National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 3500 (DSI-3500)

Monthly Climatic Data for the World - Surface and Upper Air

September 8, 2006

National Climatic Data Center
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Table of Contents

Topic	Page Number
1. Abstract	3
2. Element Names and Definitions:	3
3. Start Date	5
4. Stop Date	6
5. Coverage	6
6. How to order data	6
7. Archiving Data Center.	7
8. Technical Contact	7
9. Known Uncorrected Problems	7
10. Quality Statement	7
11. Essential Companion Data Sets	7
12. References	7

1. Abstract: The National Climatic Data Center processes international electronic transmissions in CLIMAT (surface land station format), CLIMAT SHIP (ocean ship format) and CLIMAT TEMP (upper air format), for the purpose of building a surface/upper air database and publishing the Monthly Climatic Data for the World bulletin. Approximately 1500 surface and 500 upper air stations are processed. These data are used in agricultural and energy assessment activities, in crop yield model development, and in the analysis of global atmospheric and regional climatic variations. The National Center for Atmospheric Research (NCAR) produces the data sets DSI-9645 and TD9648 (obsolete), which are also archived at NCDC, from the MCDW annual. (This data set contains data from 1986 onward. However, the data sets listed above contain other data from as early as 1731.

2. Element Names and Definitions:

SURFACE & UPPER AIR DESIGNATOR: (Surface, Upper Air) The designator indicates whether the data are surface or upper air, and which of three types of reports the data represent. The designator has one of the following values:

1 = Surface current
2 = Surface late report
3 = Surface corrections
4 = Upper Air current
5 = Upper Air late report
6 = Upper Air corrections
7 = Unpublished station
8 = Unpublished late report
9 = Unpublished correction

WMO STATION NUMBER: (Surface, Upper Air) The WMO stations numbers are assigned by the World Meteorological Organization. A complete list is published in the WMO Publication Number 9, Volume A - Stations.

DATA PERIOD TYPE: (Surface, Upper Air) The data period type indicates whether the data is a single month or some average of months. The present system only allows a single month.

YEAR: (Surface, Upper Air) Year of record.

MONTH: (Surface, Upper Air) Month of record. Range = 01 - 12.

WMO REGION NUMBER: (Surface, Upper Air)

1 = Africa
2 = Asia
3 = South America
4 = North America
5 = South-West Pacific
6 = Europe
7 = Antarctica
8 = Ship Stations

NUMBER OF DAYS OBSERVATIONS TAKEN: (Surface) The number of days observations were taken during the month of data.

MEAN STATION PRESSURE: (Surface) Mean station pressure is the mean station atmospheric pressure for the month of record, expressed in millibars to the nearest tenth.

MEAN SEA LEVEL PRESSURE:(Surface) Mean sea level pressure is the mean sea level pressure for the month of record as computed for the station, expressed in tenths of a millibar. For high-altitude stations, the height of a standard pressure level (whole gpm) is normally given instead: If a Y appears at the right side of the value, the value is understood to be the height of the 850 millibar pressure level. If a Z appears, it is the 700 millibar level, instead.

MEAN TEMPERATURE: (Surface) Mean temperature is the monthly mean of temperature for the month of record. Mean temperature is expressed in tenths of a degree Celsius.

DEPARTURE OF MEAN TEMPERATURE FROM AVERAGE: (Surface) Temperature departure is the result of subtracting a long-term average temperature for the same month from the above mean temperature.

MEAN VAPOR PRESSURE: (Surface) Vapor pressure is the amount of atmospheric pressure due to water vapor alone. Mean vapor pressure is the mean for the month of record. Units are tenths of a millibar.

DEPARTURE OF MEAN VAPOR PRESSURE FROM AVERAGE: (Surface) Vapor pressure departure is the result of subtracting a long-term average vapor pressure for the month of record from the current mean value.

NUMBER OF DAYS WITH PRECIPITATION: (Surface) The number of days with precipitation of one millimeter or greater.

TOTAL PRECIPITATION: (Surface) All precipitation for the month is totaled. The total is expressed in whole millimeters.

DEPARTURE OF TOTAL PRECIPITATION FROM AVERAGE: (Surface) Precipitation departure is the result of subtracting a long-term average precipitation total for the month of record from the current total precipitation value.

PRECIPITATION QUINTILE: (Surface) All past precipitation totals for the month of record, and the current total, are listed in order of increasing amounts; the list is divided into five equal sections; precipitation quintile is the section number, 1 - 5, that the current total appears in. However, a current total lower than any other total is assigned 0; and a current total higher than any other total is assigned 6.

SUNSHINE DURATION: (Surface) Sunshine duration is given in whole hours.

SUNSHINE PERCENT OF LONG-TERM AVERAGE: (Surface) Sunshine percent of long-term average is the result of dividing sunshine duration by a long-term average sunshine duration for the month of record, and multiplying the result by 100 percent.

MEAN SEA SURFACE TEMPERATURE: (Surface) The mean sea surface temperature is the monthly mean air temperature from the present month and year.

Temperatures are expressed in tenths of a degree Celsius.

DEPARTURE OF MEAN SEA SURFACE TEMPERATURE FROM AVERAGE: (Surface) The temperature departure is the result of subtracting a long-term average temperature for the month from the mean temperature.

OBSERVATION TIME CODE: (Upper Air)

1 = 00 Hours GMT
2 = 12 Hours GMT
3 = Both
/ = Other
Blank = Unknown

NUMBER OF LEVELS: (Upper Air) The number of levels can be up to 12. The ten standard levels are SFC, 850, 700, 500, 300, 200, 150, 100, 50, and 30 millibars. The upper air records for unreported levels are blank and filled up to 12 levels.

LEVEL QUALITY INDICATOR: (Upper Air) Level quality indicator is not used. This space is reserved for a future quality control module.

PRESSURE LEVEL AT THE SURFACE: (Upper Air) The pressure level at the surface is expressed in the standard pressure levels, SFC, 850, 700, 500, 300, 200, 150, 100, 50, and 30 millibars.

HEIGHT OF PRESSURE LEVEL: (Upper Air) The height of pressure level is the station elevation if the pressure level is SFC. Otherwise it is the height (gpm) of a standard pressure level.

NUMBER OF MISSING DAYS OF TEMPERATURE: (Upper Air) Number of missing days of temperature is the number of days in the data month in which no temperature data are available for each pressure level.

MEAN TEMPERATURE FOR UPPER AIR: (Upper Air) Mean temperature is the monthly mean temperature for the present month and year at each pressure level. Units are tenths of a degree.

MEAN DEW POINT TEMPERATURE DEPRESSION: (Upper Air) Mean dew point temperature depression is the difference between the monthly mean temperature and the monthly mean dew point temperature at each pressure level.

NUMBER OF DAYS WIND OBSERVATIONS MISSING: (Upper Air) The number of missing days of mean vector wind is the number of days in the data month for which no wind data are available at each level.

WIND STEADINESS FACTOR: (Upper Air) The wind steadiness factor is the ratio of the monthly mean vector wind speed to the monthly mean scalar wind speed for the current month and year.

MEAN VECTOR WIND DIRECTION: (Upper Air) The direction of the mean vector wind is the compass direction, in degrees zero to 359, from which the wind blew, of the resultant wind for the month.

MEAN VECTOR WIND SPEED: (Upper Air) The mean vector wind speed is the

speed of the month's resultant wind.

3. **Start Date**: 19860101

4. **Stop Date**: Ongoing.

5. **Coverage**: Global Coverage

   a. Southernmost Latitude: 90S
   b. Northernmost Latitude: 90N
   c. Westernmost Longitude: 180W
   d. Easternmost Longitude: 180E

6. **How to Order Data**:

   Ask NCDC's Climate Services about the cost of obtaining this data set.
   Phone: 828-271-4800
   FAX: 828-271-4876
   e-mail: **NCDC.Orders@noaa.gov**

7. **Archiving Data Center**:

   National Climatic Data Center
   Federal Building
   151 Patton Avenue
   Asheville, NC 28801-5001
   Phone: (828) 271-4800.

8. **Technical Contact**:

   National Climatic Data Center
   Federal Building
   151 Patton Avenue
   Asheville, NC 28801-5001
   Phone: (828) 271-4800.

9. **Known Uncorrected Problems**: Currently, there are no known uncorrected problems in the DSI-3500 data set.

10. **Quality Statement**: No quality control is performed on the 3500 data set.

11. **Essential Companion Datasets**: None.

12. **References**:

World Meteorological Organization (WMO) Publication No. 9, Volume A (digital version).

NOTES ON THE USE OF MCDW SURFACE AND UPPER AIR TAPE

The tapes are ASCII, 9-track, 6250 density, with 500 bytes per record and 10 records per block. Surface and upper air data are in the same file.

SURFACE DATA

For surface data, each 500-byte physical record contains five 100-byte logical records. There may be several empty surface records (filled with M's) in the last tape containing surface data.

In the format description that follows:

All elements are character string variables.

An element is filled with all M's if the data are missing or deleted.

Each byte is a number, a blank or an M unless stated otherwise in brackets in "Contents."

"Flag #" refers to a flag in one of the bytes 77-84. Flag #1 is in byte 77, #2 is in byte 78, etc.

"Note #" refers to one of the numbered, explanatory notes that follow the format.

Surface logical record (100 bytes)

FORMAT

Byte#	Contents	Flag #	Note #
1	surface/upper air designator		1
2-7	WMO station number (6th char normally blank)		
8	data period type		2
9-12	data year		3
13-14	data month		3
15-18	blank		3
19-20	blank		3
21	WMO region number		
22-23	number of days observations taken		
24-28	mean station pressure (mb)	1	4
29-33	mean sea level pressure (mb) OR height of 850 or 700 mb level (gpm)	2	4
34	Indicator for 29-33 [blank, Y or Z]		5
35-38	mean temperature (C)	3	4
39-43	departure of mean temp from avg (C)		4
44-46	mean vapor pressure (mb)	4	4
47-50	departure of vapor press from avg (mb)		4
51-52	number of days with precip 1 mm or greater	5	
53-56	total precipitation (mm)	6	
57-61	departure of precip from average (mm)		
62	precipitation quintile		6

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63-65	sunshine duration (hrs)	7	
66-68	sunshine percent of long-term average (%)		
69-72	blank or mean sea surface temperature	8	4, 7
73-76	blank or departure of mean sea surface from average		4, 7
77-84	flags [blank, * or #1]		8
85-100	(not used)		

NOTES:

Most variables are based on monthly means. Exceptions are precipitation and sunshine duration, which are based on totals.

1. Indicates surface or upper air and whether current, late report or correction.
   1 = surface current, 2 = surface late report, 3 = surface correction.

2. Indicates whether the data is a single month or some average of months. If data period type = 1, the record is a single month of data. (This is the only data period type created by this system at this time.)

3. There is space for a beginning year and month and an ending year and month of the data. For data period type 1, the beginning year and month are sufficient, therefore bytes 15-20 are blank.

4. Measured to the nearest 1/10 of a unit. The decimal point is omitted from the field. Actual value = variable/10.

5. Blank if mean sea level pressure is actually used. If the sea level pressure field is used for the height of the 850mb pressure surface, the indicator is Y. If 700mb, the indicator is a Z.

6. Quintile is a number from 0 to 6. A brief explanation follows:
   Past precipitation totals for a particular month are listed in increasing order, regardless of date. The list is partitioned equally into 5 sections and quintiles. Top section (lowest totals) is quintile 1. Bottom is 5. A precipitation total from a new data record is compared with the list.

   If the new precip total is lower or higher than any total on the list, it is assigned quintile number 0 to 6, respectively.

   Otherwise, the new total is given the quintile number of the section it would be placed in. When the past data are such that it is not clear what section to place it in, the highest candidate section if chose.

7. Most often available from ocean ships reporting in CLIMAT SHIP format. These spaces are usually blank.

8. Indicate the current condition of each element in the record. Blank means the value is presumed good. Asterisk (*) means the value is considered suspect. Pound symbol (#) means the original value was deleted. Any value now given is presumed good.

UPPER AIR

In an upper air record, the first 32 characters comprise the header information group. Afterwards is up to 12 flight levels, each represented by a 39-character group. The groups normally consist of the surface level and 9 upper air pressure levels: SFC, 850, 700, 500, 300, 200, 150, 100, 050, and 030 millibars.

Format for an upper air record follows:

All elements are character string variables.

Each byte is a number, blank or M unless otherwise indicated in brackets under "Contents."

"Flag #" refers to one of the flags in bytes 32-39 (Flag #1 is in byte 32, etc.)

"Note #" refers to a numbered explanatory note that follows the format.

Upper air record (500 bytes)

FORMAT

Header information group (first 32 bytes of record)

Byte#	Contents	Note#
1	surface/upper air designator	1
2-7	WMO station number	
8	data period type	2
9-12	data year	3
13-14	data month	3
15-18	blank	3
19-20	blank	3
21	WMO region number	
22	observation time code [1, 2, 3 / or blank]	4
23-24	number of levels	5
25-32	(not used)	5

Level group (level 1 is bytes 33-71, level 2 is 72-110, etc. out to maximum of 12 levels)

Byte#	Contents	Flag #	Note #
1	level quality indicator		6
2-4	pressure level [at surface then SFC]		
5-9	height (gpm) of pressure level, but of 2-4 is SFC then surface pressure (mb)	1	
10-11	number of days temp observation missing	2	
12-16	mean temperature (C)	3	7
17-20	mean dew point temp depress (C)	4	7
21-22	number of days wind observation missing	5	
23-25	wind steadiness factor (%)	6	
26-28	mean vector wind direction (deg)	7	
29-30	mean vector wind speed (mps)	8	
31-39	flags [blank, *, or #1]		8

NOTES:

All variables are based on monthly means, except for precipitation which is based on a monthly total.

1. Indicates surface or upper air data and current, late report or correction for each.
4 = upper air current, 5 = upper air report, 6 = upper air correction.

2. Indicates that the data represent a single month or some average of months. If data period type = 1, a single month is represented. (This is the only data period type created by this system at this time.)

3. There is space for a beginning year and month and an ending year and month of the data. For data period type 1, the beginning year and month are sufficient, therefore bytes 15-20 are blank.

4. 1 = 00 hours GMT, 2 = 12 GMT, 3 = both, / = other, blank = unknown.

5. Number of levels can be up to 12 is normally 1-10. The 10 standard levels are SFC, 850, 700, 500, 300, 200, 150, 100, 050, and 030mb. The records for the unreported levels are blank filled (up to 12 levels).

6. Not used yet. The space is reserved for a later quality control module.

7. Measured to the nearest 1/10 of a unit. The decimal point is omitted from this field. Value = variable /10.

8. Indicate the current condition of each element in the record. Blank means value is presumed good. Asterisk (*) means value is suspect. Pound symbol (#) means original value was deleted, any value now given is presumed good.

READING THE TAPE

Here is a suggested FORTRAN 77 code fragment to read the tape and set the data up for eash interpretation:

```
      CHARACTER*32 UPHEDR
      CHARACTER*39 UPLEVEL (12)
      CHARACTER*100 SFCDAT (5)
      CHARACTER*500 DATA
      EQUIVALENCE (DATA, SFCDAT, UPHEDR)
      EQUIVALENCE (DATA (33:33), UPLEVL)

      READ (1, 1001, END = 999) DATA
1001  FORMAT (A500)
```

One can test DATA(1:1), which is a surface/upper air indicator, after doing READ.

If DATA (1:1) is '1', '2', or '3', all the data in the physical record are surface; variable SFCDAT can be used. There will be a separate surface record in each of the 5 array elements of SFCDAT. But note that the last 500-byte record that contains surface data on the tape may have all M's in 1 or more logical records.

If DATA(1:1) is '4', '5', or '6', the data are a single upper air record; the variables UPHEDR and UPLEVL can be used. UPHEDR contains the 32-character header information group, while the 12-element array UPLEVL contains the levels. Note that bytes 23-24 in UPHEDR say how many elements of UPLEVL actually contain data. The remaining of the 12 levels are blank filled.

Data are merged on any tape that contains more than a month of data. Late reports and corrections will be feewer than might be expected because, if their dates are within the time span of current data on the tape, they become current data.

A final note: The Annual for the MCDW (TD3500) is sent to NCAR at the end of each data year. These data are used to create TD9645 - Surface data and TD9648 - Upper Air data.