Tethersonde system data provided by the University of Utah measured on the East Slope of Granite

TB-ES

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1.0 Data Set Overview

Tethersonde data were obtained at the foot of the East Slope of Granite Mountain (40.096°N, -113.240°E, 1343 m) at Dugway Proving Ground, UT during three nights of the spring 2013 MATERHORN experiments. The data were obtained using DPG's Vaisala ground receiving station with a sonde (ser. no. x4124143) provided by Prof. Eric Pardyjak.

1.1 Time period covered by the data

Dates/times (UTC) of ascents:

IOP2 0135-0202 UTC 05 May 2013 (02 soundings)

IOP4 0031-1532 UTC 12 May 2013 (42 soundings)

IOP9 1214-1447 UTC 26 May 2013 (13 soundings)

1.2 Physical location (latitude, longitude, elevation)

40.096000, -113.23999999999999, 1343

1.3 Instrument type

Tethersonde

1.4 Data provider

University of Utah

1.5 Web address references

http://www3.nd.edu/~dynamics/materhorn/

https://www.eol.ucar.edu/field_projects/materhorn-x

2.0 Instrument Description

Tethered balloon system sited on the east slope of Granite mountain.

[No Photo is Available]

2.1 Instrument website

http://home.chpc.utah.edu/~whiteman/homepage/

2.2 Table of specifications

Accuracy	Range	Frequency	Resolution

3.0 Data Collection and Processing

3.1 Description of data collection

3.2 Description of derived parameters and processing techniques used

Original data files are provided.

3.3 Description of quality assurance and control procedures

This dataset was not subject to any quality control. The original tethersonde data files were then hand-processed to remove the data before each ascent began and after the tethersonde had reached its highest altitude. The downsoundings were discarded entirely as the balloons were retrieved too quickly to get good downsounding data. A few bad data lines were also manually removed. The removal of the pre- and post-sounding data involved some subjectivity, as the sonde pressure drifted and it was sometimes rather difficult to figure out what should be the first valid data line of the sounding (for example , it might be a negative or positive value of altitude rather than a line with a 0 m altitude). These basic data files were further processed with a fortran program to produce the data files that are the final result of the processing. This program adjusts the starting height of the sounding so that it is at 0 m, computes times in decimal hours for both UTC and MST, and calculates the u and v components of the wind using the reported wind direction and speed. It writes the headers and the data out into the final text files. The times are computed from the starting time and the elapsed time.

Scanned field notes for IOPs 4 and 9 are provided as an addendum to this ReadMe file. They allow comparison between the sonde and Kestrel handheld weather station values of meteorological variables at the start of each ascent, as well as other relvant information about cloudiness, sunset times, etc.

3.4 Data intercomparisons

4.0 Data Format

4.1 Data file structure

ASCII tab separated, the exact structure provided by the file description.

4.2 File naming convention

dataProvider_instrument_instrumentType_startDateAndTime_endDateAndTime.extension

4.3 Data format

tab delimited ASCII

4.4 Data layout

Header lines were added to each of the soundings in the resulting files, as exemplified below:

sn nnn yyyy mm dd hh mn ss tim lat(°) lon(°) alt(m) sonde_sn p0(mb) et0(s)

01 279 2013 05 05 01 35 41 UTC 40.096 -113.240 1343 x4124143 859.90 28.0

Time Press Temp Rh Alt Speed Dir Batt P.Temp Dew S.H. M.R. Et Ozone O3Curr O3Temp AD1 AD2 AD3 AD4 AD5 AD6

UTC mb °C % m mps deg v °C °C g/kg s ppb µA °C v v v v v v

01:35:41 859.90 18.2 16.1 -1 2.1 359 7.3 31.1 -7.9 0.69 2.27 28.0 0.00 0.00 0.0 0.001 0.006 0.010 0.051 0.004 0.014

01:35:42 859.73 18.2 16.2 5 2.0 357 7.3 31.1 -7.8 0.70 2.29 29.0 0.00 0.00 0.0 0.001 0.006 0.010 0.051 0.004 0.014

The first line contains information on the site and sounding. It includes the serial ascent number for that IOP, the number of lines of data in the ascent, the year, month, day, hour, minute and second of the start of the sounding, the time zone (UTC) used for the data, the latitude, longitude, and elevation of the sounding site, the sonde serial number, the starting pressure and the elapsed time in seconds between the initialization of the software and the actual time of the start of the ascent.

The second line provides the initialization data called for in the first line.

The third line labels the columns of data in the ascent while the fourth line gives the units.

The lines following these headers provide the basic sounding data, which is output from the receiver approximately every second. The calculations of secondary variables are done in the receiving station software.

4.5 List of parameters with units, sampling intervals, frequency, range

column example More info

Time (UTC) 01:35:41 UTC time in hh:mm:ss

Press (mb) 859.90 Atmospheric pressure in mb

Temp (°C) 18.2 Air temperature in deg C

Rh (%) 16.1 Relative humidity in %

Alt (m) -1 Altitude above ground in m. Because of pressure drift, this value can be negative

Speed (mps) 2.1 Wind speed in m/s.

Dir (deg) 359 Wind direction in deg true. (Magnetic declination is accounted for in the sonde setup procedure)

Batt (v) 7.3 Voltage of the 9V battery used to power the sonde

P.Temp (°C) 31.1 Potential temperature in deg C. Add 273.16 if you want it in Kelvins.

Dew (*C) -7.9 Dewpoint temperature (deg C).

S.H. 0.69 Specific humidity, apparently in g/kg. But the numerical values do not make sense. Ignore this column.

M.R. (g/kg) 2.27 Mixing ratio (g/kg)

Et (s) 28.0 Elapsed time in seconds, from the time the ground station was initialized to the current time.

The remaining columns are not utilized and are filled with numbers that drift but do not make sense.

4.6 Data version number and date

raw, v1.0, October 2016

4.7 Description of flags, codes used in the data, and definitions

To separate the individual soundings, a line of 8's between the soundings have been inserted. The file ends with a line of 9's.

4.8 Data sample

```
sn nnn yyyymmdd hhmmss tim lat(°)    lon(°) z0(m)    sonde_sn p0(mb)
et0(s)
01 279 20130505 013541 UTC 40.096 -113.240 1343.    x4124143 859.90
28.0
    Time      Time   Press    Temp      Rh     Alt   Speed     Dir    Batt
P.Temp    Dew    S.H.   M.R.       u       v
     UTC       MST      mb       C       %       m     mps     deg       v
C       C           g/kg    m/s    m/s
 1.59472 18.59472 859.90   18.20   16.10    0.00    2.10 359.00    7.30
31.10  -7.90   0.69   2.27   0.04  -2.10
```

```
 1.59500 18.59500 859.73   18.20   16.20    6.00    2.00 357.00    7.30
31.10  -7.80   0.70   2.29   0.10  -2.00
 1.59528 18.59528 859.61   18.30   16.10   10.00    2.10   1.00    7.30
31.10  -7.80   0.70   2.28  -0.04  -2.10
```

5.0 Data Remarks

5.1 PI's assessment of the data

5.2 Missing data periods

5.3 Software compatibility

6.0 References

[1] Fernando, H. J. S., E. R. Pardyjak, S. Di Sabatino, F. K. Chow, S. F. J. DeWekker, S. W. Hoch, J. Hacker, J. C. Pace, T. Pratt, Z. Pu, J. W. Steenburgh, C. D. Whiteman, Y. Wang, D. Zajic, B. Balsley, R. Dimitrova, G. D. Emmitt, C. W. Higgins, J. C. R. Hunt, J. G. Knievel, D. Lawrence, Y. Liu, D. F. Nadeau, E. Kit, B. W. Blomquist, P. Conry, R. S. Coppersmith, E. Creegan, M. Felton, A. Grachev, N. Gunawardena, C. Hang, C. M. Hocut, G. Huynh, M. E. Jeglum, D. Jensen, V. Kulandaivelu , M. Lehner, L. S. Leo, D. Liberzon, J. D. Massey, K. McEnerney, S. Pal, T. Price, M. Sghiatti, Z. Silver, M. Thompson, H. Zhang, T. Zsedrovits, 2015: The MATERHORN – Unraveling the Intricacies of Mountain Weather, BAMS, doi: http://dx.doi.org/10.1175/BAMS-D-13-00131.1.