Phoenix (PHX) Mission

PHOENIX MARS METEOROLOGICAL PRESSURE/TEMPERATURE EDR V1.0

Revision and History Page

Description	Date
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PHOENIX MARS METEOROLOGICAL PRESSURE / TEMPERATURE EDR V1.0
PHX MET pre-processed Pressure and Temperature Data

Introduction

The PHX METEOROLOGICAL DATA product contains pre-processed (Digital Numbers) temperature and pressure data. The temperature data was collected at 250, 500 and 1000mm above the Phoenix Lander deck, and the pressure data was collected at (nearly) the height of the Lander deck. Nominally the data was collected at 2 sec resolution, but is also provided at 512 sec averages (with distribution statistics).

Data Set Overview

The Phoenix Mars Lander arrived at 68.2184N, 234.2487E on May 25, 2008.

The PHX METEOROLOGICAL EDR DATA product contains unprocessed values of pressure and temperature data. Each product is approximately 24 hour sat a data rate of 2 sec. The Data are organized into 'High Resolution' (2 sec) and 'Low Resolution' (512 sec). There are three temperature sensors along the vertical 1.0 m MET Mast (250, 500 and 1000mm), a reference Platinum Resistance Thermometer (PRT) at the base, and a pressure sensor on the Lander Deck on the Payload Electronic Box. [TAYLOR2008]The collection of High Resolution Data is determined by the setting of P & T threshold values ranging zero (constantly triggering, creating continuous 2 sec data) to essentially infinity (never triggering, creating no 2 sec data). Owing to favorable transmission bandwidth, the unit was operated over the entire mission in triggered (2 sec) mode. The Data is organized by a unique identifier (Token) in keeping with the other Phoenix instruments. The token for the PT was nominally set each sol, when the PT instrument stopped recording to allow for transfer of data to the Lander (and hence telemetry to Earth). The token is provided as a 4 byte hex value.

Parameters

Each EDR file contains time as the MET Frame count since instrument power on (1 count is 2 sec). The MET P&T threshold was commanded each sol, to trigger constantly, creating 2 sec data. The calibration constants used internally onboard the unit were determined prior to launch, and outlined in the CCC report. The pre-processed EDR temperature data for each of the three thermocouples and the PRT were stored as a 16-bit value. For the lower resolution 512 sec data the min, max and standard deviation were also stored at 16 bit. All pressure values (avg, min, max, var) are given as 32 bit values. The temperature data is sent as a DN, which is converted in the MET Ground Data Segment into values of Kelvin (EDR -> RDR), while the pressure is send in units of PA. The MET PT instruments were nominally operated 24 hours of each Martian sol. Once each sol, the instrument was transitioned out of RECORD to allow for transfer of

data from MET flash to the Lander. Thus there will nominally be a ~20 min gap each sol. During surface operations the MET PT was operated continuously, with a gap early in the mission (Sol 19/20) owing to a spacecraft event. Smaller data gaps exist, from dropouts in telemetry, but these were often recovered owing to use of the MET PT internal flash and data retransmits.

Processing

The EDRs are essentially identical to the telemetry messages sent from the MET-PT instrument to the Lander computer, converted to ASCII and with the addition of a Lander timestamp (there is no onboard MET clock, so the instrument relies on an internal Frame Count. Matching of this frame count and the Lander clock are made using the MET GDS) Commanded parameters, such as threshold values, are also added to the EDR products. Finally, the data were converted to PDS format, converting the tab-delimited fields to fixed-width fields, and exchanging the multiple packet headers for a single session header by the MET GDS.

Address: Cameron Dickinson
            Dept. of Earth and Space Science Engineering
            York University
            4700 Keele St
            Toronto, ON M3J 1P3
Phone: (416) 736-2100 X 23870
Email: cameron.dickinson@gmail.com

For science related questions about the data, please contact the MET Instrument Science Team Lead:
Address: James Whiteway
            Dept. of Earth and Space Science Engineering
            York University
            4700 Keele St
            Toronto, ON M3J 1P3
Phone: (416) 736-2100 X 22310
Email: whiteway@yorku.ca

Data

All of the data in this data set are contained in ASCII tabular files with detached PDS labels. Data is stored in a separate directory relating to the sol in which the recording of data commenced (i.e. data acquired from 003 10:00 local to 004 10:15 will be in the sol3 directory

Individual filenames are constructed as follows:

MS000EMH_00896227243_10CCM0.LBL

1: The first character will always be an 'M', representing MET data.
2: The second character will be an 'S', signifying surface data (versus 'C' for Cruise)
3-5: The next three characters provide the sol number of the data file.
6-8: The next three characters describe the type of MET data,
      EML - EDR MET LOW (Resolution)
      EMH - EDR MET HIGH (Resolution)
      RML - RDR MET LOW (Resolution)
      RMH - RDR MET HIGH (Resolution)
      RMC - RDR MET Corrected (Pressure Corrected Values)
      RMA - RDR MET Ancillary (Pressure Sensor Temperatures)
9: Blank
10-20: SCLK - Spacecraft clock
21: Blank
22-25: Operations Token
26: Producer (M for MET Team)
27: Version
28: Period
29-31: Extension, LBL or TAB

The tabular files are formatted so that they may be read directly into many database management systems (DBMS) or spreadsheet programs on various computers. Each of the files contains two tables. The first is the header table, and is only a single record in length. The second table contains all of the data records for a session and varies in length. All fields in the tables are stored in columns of fixed width and are right justified. The records are of fixed length; since the header records are shorter than the data records, they have been padded with blank spaces at the end of the record. The last two bytes of each record contain the ASCII carriage return and line feed characters. This allows the tables to be treated as fixed length record files on computers that support this file type and as normal text files another computers.

References

TAYLOR2008
Taylor, P. et al., Meteorology Station MET on the Phoenix Mars Lander: Pressure, Temperature and Wind Speed, J. Geophys. Res. E00A10, doi:10.1029/2007JE003015, 2008."