



Analysis of Unpublished Mars Viking Lander Met-Data

W.Schmidt , O.Kemppinen

Finnish Meteorological Institute, Helsinki, Finland (walter.schmidt@fmi.fi / Fax: +359-9-1929 3146)

Abstract

The first long-term in-situ measurements of meteorological parameters on a different planet were recorded by the NASA Viking Landers 1 and 2 at the end of the 1970s. While many data from the core mission were analyzed and published already by 1982, the major part of the meteorological data collected during the extended mission until end of 1982 and those data affected by instrumental problems were never made available to the public due to lack of resources.

In 2007 the Finnish Meteorological Institute in Helsinki agreed to re-analyze all meteorological data with the software improved until 2004, and to provide an as complete as possible data set with optimized calibration for the whole mission. This resulted in nearly doubling of the available parameters and removal of artifacts introduced by changing calibration factors. Some details will be presented here.

1. Introduction

The NASA Mars Lander missions Viking 1 and Viking 2 were operational on the Martian surface for more than 6 Earth years. Viking Lander 1 landed on July 20, 1976, at Chryse Platina (22.48° N, 49.97° W), followed by Viking Lander 2 on September 3, 1976, at Utopia Planitia (47.97° N, 225.74° W). Viking Lander 2 ended communication on April 11, 1980, after 1281 sols, following a few power failures before. Viking Lander 1 continued until November 13, 1982, for a total of 2245 sols. [1], [2]

During the initial nominal mission the Landers with all instruments were controlled by NASA/JPL. Thereafter the meteorological instruments were under the direct operational responsibility of the University of Washington, Seattle. While all data of the nominal mission which could be handled by the original routine analysis software, were published via the

Planetary Data System (PDS), many later data were never made available to the public.

When the Viking Computing Facility was closed at the University of Washington end of 2005, the long standing cooperation partner in Martian atmospheric research, the Finnish Meteorological Institute in Helsinki (FMI), agreed to port all developed software into a modern computational environment, to re-analyze the meteorological data from the whole mission and to provide an updated data set to the PDS.

1.1 Software transfer

All data retrieval, sorting and analysis programs including the processing environment were optimized for a PRIME computer built in the late 70s. These were ported into a Linux environment with Perl scripts to control the routine processing of all data. As input all original binary mission data were made available on two DVDs.

2. Results

The software is now running in the FMI computing environment able to automatically process all meteorological data from both Landers. It is using a special data base to control different aspects of the decoding and analysis for each sol, accommodating partial instrument failures and changing of instrument calibration with time. This database has still to be cross-checked against the original mission logbooks before the data can be published. The table 1 below gives a summary of the meteorological data currently available via the PDS compared with the total amount of data available, though not all of these gaps can be filled due e.g. to system failures at the end of the Lander 2 life time.

As can be seen from the table, data from more than half of the sols were never published. Most of these data will be available once the re-analysis is

completed. Some of the already published data will be corrected, as the original analysis was based on ground calibration, superseded later by calibration information gained from the operational data themselves. This is especially valid for the wind velocity data.

Table 1: Comparison of published and measured data

Sensor	PDS	Missing
VL1 pressure	Sol 1-2245	374 gaps
VL1 temp.	Sol 1-116 Sol 134-350	1912 sols
VL1 wind	Sol 1-40	2205 sols
VL2 pressure	Sol 1-1204	157 gaps 112 sols at end
VL2 temp.	Sol 1-1050	85 gaps 266 sols at end
VL2 wind	Sol 1-1050	85 gaps 266 sols at end
Total	5221 sols	5462 sols

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References

[1] Scientific Results of the Viking Project, Journal of Geophysical Research, 82, 28, September 1977.

[2] Web site, checked on 26.5.2010:
<http://nssdc.gsfc.nasa.gov/planetary/viking.html>.