Phoenix Project

Archive Generation, Validation and Transfer Plan

Initial Release

February 28, 2008
Phoenix PHX-214-096
JPL D-29392
Initial Release

JPL

Jet Propulsion Laboratory
California Institute of Technology

Phoenix Project

Archive Generation, Validation and Transfer Plan

Prepared by:

_____   Date_____
Ray Arvidson, Phoenix Co-Investigator

Approved by:

_____   Date_____
Peter Smith, Principal Investigator

_____   Date_____
Leslie Tamppari, Project Scientist

Concurred by:

_____   Date_____
Robert Fogel, Program Scientist

_____   Date_____
Barry Goldstein, Project Manager

_____   Date_____
Edwin Grayzeck, Program Manager, Planetary Data System

JPL

Jet Propulsion Laboratory
California Institute of Technology

DOCUMENT CHANGE LOG

DATE	PAGES / SECTIONS AFFECTED	REASON FOR CHANGE	VERSION/ REVISION
1/27/05	All	Preliminary Release	PRELIMINARY
9/30/05	Table 4	ECR 104339 - Updated list of data products	Initial Release (dated 2/28/200*)
9/30/05	Table 3	ECR 104339 - Added V&V and CCC reports	Initial Release (dated 2/28/200*)
1/9/08	Table 1, Table 4	MCR 107872 - Updated list of data products and producers	Initial Release (dated 2/28/200*)
1/9/08	Acronyms, Section 3.2	MCR 107872 - Added EADR	Initial Release (dated 2/28/200*)
1/9/08	Table 5	MCR 107872 - Reflect known Sol 1 date	Initial Release (dated 2/28/200*)
1/17/08	Sections 1.2, 2.1, 2.4, 3.1,Table 1, Table 4, Table 5	MCR 107872 - Removed MARDI as data producer; revised data delivery dates in Table 5; minor edits elsewhere	Initial Release (dated 2/28/200*)
2/8/08	Section 3.1	MCR 107872 - Properly reflect who is generating and validating data products	Initial Release (dated 2/28/200*)
2/8/08	Table 3	MCR 107872 - Reflect changes to radio science data	Initial Release (dated 2/28/200*)
2/26/08	All	MCR 107872 - Edited by Principal Co-Investigator	Initial Release (dated 2/28/200*)
2/28/08	Table 4	MCR 107872 - Edits from Phoenix Team Meeting	Initial Release (dated 2/28/200*)

ITEMS TO BE DETERMINED

SECTION	TBD ITEM	RESPONSIBILITY
	None	

CONTENTS

FIGURES

TABLES

ACRONYMS

ASTG	Atmospheric Science Theme Group
DAWG	Data and Archives Working Group
DTE	Direct To Earth
EADR	Engineering Archive Data Records
EDR	Experiment Data Record
FOV	Field of View
GDS	Ground Data System
JPL	Jet Propulsion Laboratory
LIDAR	Laser Ranging System (part of MET)
MARDI	Mars Descent Imager
MECA	Microscopy, Electrochemistry, and Conductivity Analyzer
MIPL	Multi-mission Image Processing Laboratory
MPS	Max Planck Institute for Solar System Research
NAIF	Navigation and Ancillary Information Facility
NSSDC	National Space Science Data Center
PDS	Planetary Data System
RA	Robotic Arm
RAC	Robotic Arm Camera
RDR	Reduced Data Record
SIS	Software Interface Specification
SOC	Science Operations Center
SPICE	Spacecraft, Planet, Instrument, Pointing C-matrix, and Event kernels (historical acronym for navigation and ancillary data)
SSI	Solid State Imager
TECP	Thermal and Electrical Conductivity Probe
TEGA	Thermal and Evolved-Gas Analyzer

1. INTRODUCTION

1.1 Purpose

The purpose of this document is to provide a plan for generation, validation, and transfer to the Planetary Data System (PDS) of archives from the 2007 Phoenix Mission. The archives will contain raw and reduced data, documentation, and algorithms or software.

1.2 Scope

The plan covers archiving of raw and reduced data sets and related information to be acquired or derived during the Phoenix mission.

Specific aspects addressed in this plan are:

- Generation of high-level mission, spacecraft and instrument documentation, instrument calibration reports, and documentation of algorithms and/or software used to produce reduced data records.

- Reduction of science packet data to experiment data records and reduced data records, including generation of data sets expressed in geophysical units, with associated documentation that records when and where the data were acquired and for what purpose.

- Generation of SPICE archives for use with software from the Jet Propulsion Laboratory's Navigation and Ancillary Information Facility (NAIF).

- Generation and validation of archive volumes containing Phoenix science and engineering data, software, algorithms, documentation, and ancillary information.

- Delivery to the PDS of validated Phoenix archives.

1.3 Contents

This plan begins with a summary of Phoenix mission phases and an overview of the archiving flow. This section is followed by a description of the roles and responsibilities for organizations and personnel associated with generation, validation, and archiving of Phoenix data.

1.4 Applicable Documents and Constraints

This Archive Generation, Validation, and Transfer Plan is responsive to the following Mars Exploration Program and Phoenix documents

1. Mars Exploration Program Data Management Plan, R. E. Arvidson and S. Slavney, Rev. 3, March 20, 2002.

2. Phoenix Project Mission Plan, Phoenix document 407-211-020, JPL D-27254, October 8, 2004.

3. Program-Level Requirements for the Phoenix Lander – 2007 (Scout '07) Project, Appendix B-7 to the Mars Exploration Program Plan, September 2004.

The plan is consistent with the principles delineated in the following National Academy of Sciences reports:

4. Data Management and Computation, Volume 1, Issues and Recommendations, 1982, National Academy Press, 167 p.

5. Issues and Recommendations Associated with Distributed Computation and Data Management Systems for the Space Sciences, 1986, National Academy Press, 111 p.

The plan is also consistent with the following Planetary Data System document:

6. Planetary Data System Standards Reference, Version 3.7, JPL D-7669, Part 2, March 20, 2006.

The plan requires the generation of the following Project documents:

7. Data Product Software Interface Specification (SIS) for all Standard Products.

8. Archive Volume Software Interface Specification (SIS) for all Standard Products.

9. Interface Control Document (ICD) specifying relationships between Phoenix Project, Science Teams, and PDS Nodes.

Finally, the plan is meant to be consistent with the Level 1 Requirements, the contract negotiated between the Phoenix Principal Investigator (PI) and NASA, in which reduced data records and documentation are explicitly defined as deliverable products.

2. PHOENIX ARCHIVE GENERATION, VALIDATION, AND TRANSFER

2.1 The Mission

The Phoenix Mission consists of one launch in August 2007 of an improved model of the 2001 Mars Surveyor Program Lander, with placement of the lander at high northern latitudes on May 25, 2008 where ice is accessible for sampling. Table 1 summarizes the Phoenix payload. Accelerometer data will be acquired during descent and used to infer atmospheric profiles. The descent imager (MARDI) will not be turned on during descent so there will not be any data. The lander will be equipped with a robotic arm (RA) to excavate soils and ices for delivery to the TEGA and MECA instruments for in-situ analyses. RA telemetry will be archived at the Jet Propulsion Laboratory with other spacecraft engineering data and will not be available through the PDS. Mast-mounted (SSI) and RA-mounted (RAC) imaging systems will support RA activities and map surface materials and landforms. Thermal and electrical conductivity probes (TECP) on the RA scoop will be inserted into soil and ice to determine key physical properties. The SSI will also conduct studies of the atmosphere, including optical depth and cloud dynamics. A meteorology package (upward looking LIDAR, together with mast-based pressure and temperature systems) will track atmospheric dynamics. Phoenix will have a 90-sol primary mission focused on RA work, delivery, and analyses of samples, and potentially an extended mission for continued remote sensing and meteorological measurements.

2.2 Data Flow

Phoenix standard data products are raw and derived products generated in "pipeline" fashion during mission operations using well-understood procedures. Each type of Phoenix standard product will be described in a Data Product Software Interface Specification (SIS) document. Definitions of processing levels for science data products are found in Table 2.

In addition to the standard products, special products may be generated by some data suppliers as time and other resources permit. Those special products that are completed and validated in time for a scheduled release to PDS may be delivered along with the standard products. PDS will continue to accept special products after the end of the mission as long as they are documented and validated according to PDS standards.

Figure 1 shows the flow of science data products from the Phoenix downlink through mission operations and science team operations to their ultimate delivery to the Planetary Data System. Downlink telemetry is received at Mission Operations at JPL. The JPL Multi-Mission Image Processing Laboratory (MIPL) generates raw data products (EDRs) and some derived data products (RDRs) for the imaging instruments. EDR and RDR products for other instruments will be generated under the cognizance of the relevant Science Teams. Both MIPL and the Science Teams will transfer their EDR and RDR products to the Science Operations Center (SOC) at the University of Arizona to make them available to other Science Team members.

Complete archive volumes including data products, documentation, and ancillary materials are assembled, validated under Phoenix Project auspices, and then delivered to the designated PDS Nodes. PDS personnel will work closely with science team members to ensure a smooth transfer. Table 3 lists the elements that comprise the Phoenix archives, and Table 4 provides a detailed list of all the data sets and their producers. All Phoenix archive collections will be assembled according to designs specified in Archive Volume Software Interface Specification (SIS) documents.

When data products have been delivered to the PDS, they are regarded as publicly available. It is expected that the data will be made available to the public online through the PDS online distribution system, the Planetary Image Atlas, and in the form of an Analyst's Notebook (section 2.6).

2.3 Data Volume

For planning purposes, the expected downlinked data volume from Phoenix is at least 50 megabits per sol via UHF during the primary mission, and about 25 megabits per sol during the extended mission. Under the best circumstances the UHF link could provide a data rate between 100 and 150 megabits per sol. At 50 Mb/sol, the total downlink volume for the 90-sol primary mission would be 3,950.88 megabits (493.86 megabytes or about half a gigabyte) of compressed data. The total volume of science data products, raw and derived, is estimated to fall between 100 and 1000 times the downlink volume (50 to 500 gigabytes), based on evaluation of mission scenarios and the experience of the MER missions. These estimates will be refined based on further mission scenario development and data product definitions.

2.4 Data Validation and Peer Review

Phoenix science archives will be validated before being released to the PDS. Validation is accomplished in two parts: validation for scientific integrity and validation for compliance with PDS standards. Science team members are expected to conduct validation for scientific integrity in the course of their analysis of EDRs and their production of RDRs. The details of the science validation process are the responsibility of the Instrument Co-Investigators.

Validation for compliance with PDS standards is also the responsibility of each Instrument Co-Investigator, with help from the PDS Node that will receive the data products. PDS will provide software tools, examples, and advice to help make this part of the validation as efficient as possible. This validation includes a peer review of the design and labeling of data products as laid out in the Data Product Software Interface Specification (SIS) documents, and validation of the PDS labels using sample data. The review committee will consist of a small group of scientists who represent typical users of the data. The science team and the relevant PDS node will also be represented on the review committee. The review period will last approximately one month and will be conducted mostly by email, culminating in a teleconference if needed. The result of the review will be a list of liens, or problems, that the team must resolve before the product can pass the review. Another month (or more depending on the nature of the liens) will be allowed for the science team to address the liens. All reviews will be completed and liens resolved by six months before the start of operations. The goal is to allow the teams enough time to correct any problems before systematic generation of standard products begins. After the start of operations, when generation of products has begun, each individual product will be validated to see that it conforms to the design specified in the SIS. Validation of individual products will be automated as much as possible.

2.5 Data Delivery Schedule

The Phoenix Project Level 1 requirements state that Level 0 and Level 1 imaging data shall be archived with PDS within six months of the end of the mission, and all other Level 0 and Level 1 data shall be archived within 12 months of the end of the mission [Applicable Document 3]. The actual delivery schedule will exceed these requirements: the Phoenix Project will make at least two deliveries to the PDS, the first one no later than six months after Sol 30 data are received on Earth, and the second one no later than six months after Sol 90 data are received on Earth. In the event of an extended mission, subsequent data releases will occur for every 90 sols; for example, Sol 180 plus six months, then Sol 270 plus six months, with the final delivery occurring no later than six months after the last data have been received on Earth. Table 5 shows the dates for archive data acquisition and release.

2.6 Online Access to Phoenix Archives

The Phoenix Science Teams and the general science community will require access to science data archives that are integrated across instruments by time, location, and observation target, at a minimum (see http://pds.jpl.nasa.gov). Two complementary systems will provide detailed access to the archives: the Planetary Image Atlas and Analyst's Notebook.

2.6.1 Planetary Image Atlas

PDS will offer a Web-based system of access to Phoenix science data products. It will allow selection based on various search criteria, browsing of data, and downloading in various formats. The system can be used both by mission personnel and by the general science community to view and download data products that have been made public. The Planetary Image Atlas is a tool for locating and downloading image and other data from planetary missions and is developed, maintained and operated by the PDS Imaging Node at JPL.

2.6.2 The Analyst's Notebook

The Analyst's Notebook is a Web-based tool for correlating data products from various Phoenix instruments based on time, location, observation target, and other criteria. The Notebook will provide detailed views into operational decisions, results, and access to raw and derived data and instrument calibration information. Using the Notebook, a scientist can virtually replay mission events to better select and understand data products of interest. The Analyst's Notebook will be designed and implemented at PDS Geosciences Node at Washington University, based in part on a similar Notebook built to support analyses of data collected during Mars Exploration Rover missions. The Analyst's Notebook is a deliverable to the Phoenix Project and will contain additional archive materials such as documentation, software, calibration data, engineering data, and SPICE kernels.

The PDS Atlas and the Analyst's Notebook are intended to be complementary tools. The Atlas will probably be used to satisfy most requests for locating and downloading data products by Phoenix mission personnel and the general science community. The Analyst's Notebook will probably be used by a smaller set of scientists who need access to the most detailed information available about the data.

3. ROLES AND RESPONSIBILITIES

In this section the roles and responsibilities for personnel and organizations involved in Phoenix archive generation, validation, transfer, and distribution are summarized.

3.1 Phoenix Project Responsibilities

The Phoenix Project has overall responsibility for generation and validation of archives for release to the PDS. The Project is also responsible for distribution of data and associated information to Phoenix personnel.

The Principal Investigator, working with the Project Scientist, provides oversight of the archiving process. They will review data analysis plans to assure timely and adequate analysis of spacecraft data and delivery of documented, complete data to the PDS. They are responsible for the administrative management of data archive planning and implementation.

The Phoenix Archives Working Group (PAWG) will coordinate the planning of the generation, validation, and release of PDS-compliant archives to the PDS. The PAWG is a subgroup of the Phoenix Science Team and reports to the Phoenix Project Scientist. The PAWG Chair is a designated Phoenix Co-Investigator who will, under the direction of the Principal Investigator and Project Scientist, ensure that archives are planned, validated, and delivered. PAWG membership includes the Principal Investigator, the Project Scientist, the Project Science Systems Engineer, the Instrument Co-Investigators, representatives from NAIF and MIPL, and project personnel selected to ensure that raw packets, engineering data sets, and documentation are included in archives. Representative PDS personnel will be liaison members of the PAWG. During the active mission the PAWG will provide the coordination needed to ensure that archives are assembled, validated, and delivered according to schedule.

MIPL is responsible for generating PDS-compatible data products containing NASA Level 0 Experiment Data Records (EDRs) and NASA Level 1 Reduced Data Records (RDRs) for the

Phoenix imaging science instruments, as specified in Table 4. The Phoenix Instrument Co-Investigators are responsible for validating the data products.

The Phoenix Instrument Co-Investigators are responsible for generating validated, PDS-compatible archives containing EDRs and derived data products for their instruments as specified in Table 4. PDS-compatible archives include documentation, algorithms or software for generating derived data products, calibration data and reports, and other supporting materials in addition to science data products. In particular, the camera archive volumes will be assembled by Phoenix Science Team members at Washington University.

3.2 Planetary Data System Responsibilities

The PDS is the designated point of contact for Phoenix on archive-related issues. The PDS is also the interface between Phoenix and the National Space Science Data Center (NSSDC). The PDS will work with the PAWG to ensure that the Phoenix archives are compatible with PDS standards and formats. Personnel from the PDS Geosciences, Imaging, Atmospheres, NAIF and Engineering Nodes will be liaison PAWG Members.

The PDS will provide funds for generation, distribution, and maintenance of Phoenix archives for the NASA planetary science community once the archives have been delivered by Phoenix.

The Geosciences Node will provide overall coordination of PDS activities for Phoenix. The Geosciences, Imaging, Atmospheres, NAIF, and Engineering Nodes will archive Phoenix data sets as designated in Table 4.

The Mars Data Engineer from the PDS Engineering Node will work with the PDS Discipline Nodes involved with Phoenix throughout the archive planning, generation, and validation phases.

The PDS NAIF Node will archive SPICE data, and will archive telemetry packet data and certain mission operations engineering files as organized by the Phoenix Data Management Team in Engineering Archive Data Records (EADRs).

3.3 National Space Science Data Center Responsibilities

The National Space Science Data Center will maintain an archive of Phoenix data for long-term preservation and for filling large delivery orders to the science community. The PDS will deliver at least one copy of Phoenix archive volumes to NSSDC. NSSDC may also provide support for distribution of Phoenix data to the general public, although this is beyond the domain of this Phoenix Archive Generation, Validation, and Transfer Plan.
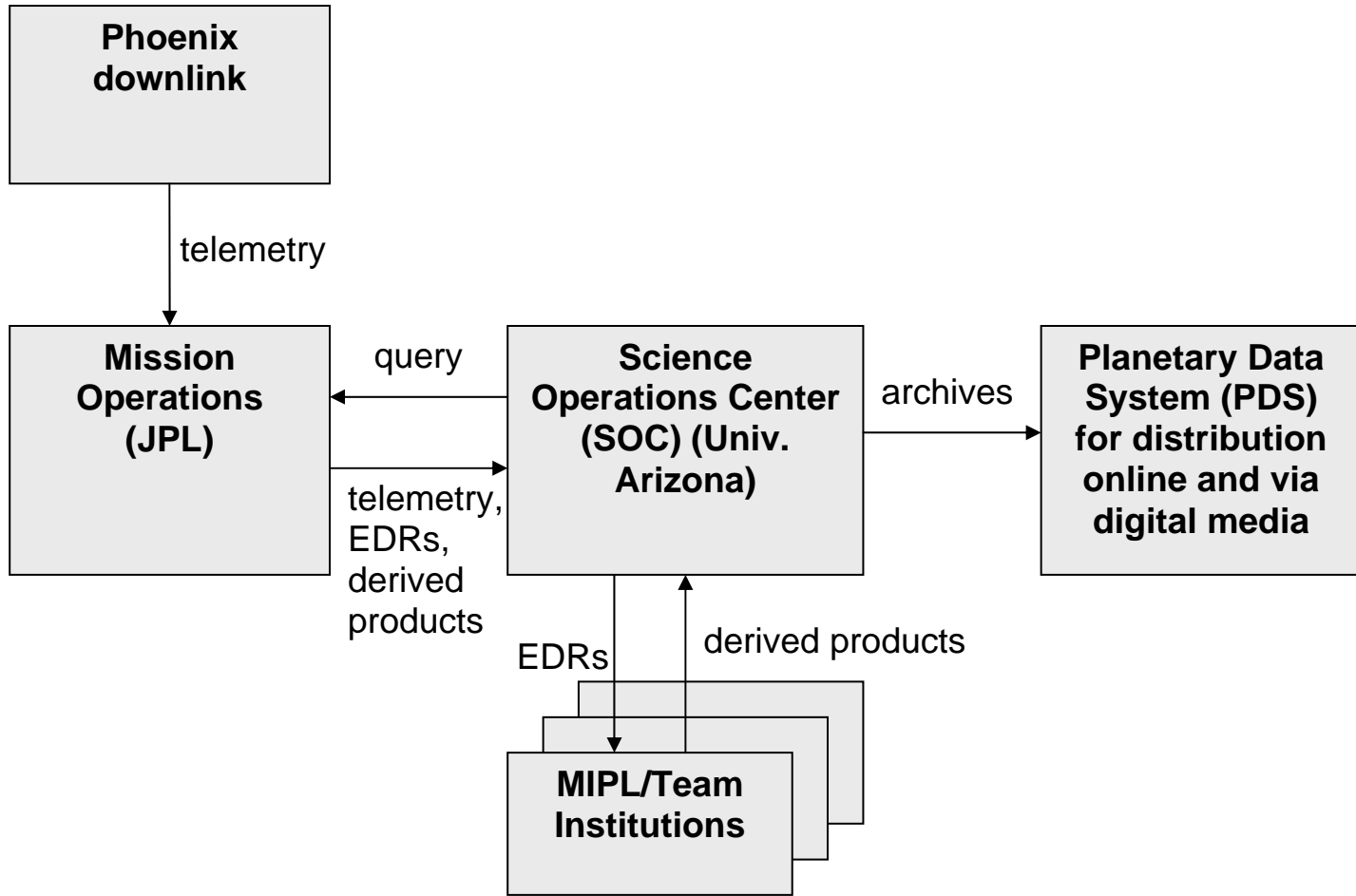
Figure 1. Data flow from Phoenix downlink to Planetary Data System.

Table 1. Phoenix Payload

Instrument	Instrument Co-I	Key Parameters
Entry Descent Landing Accelerometry	David Catling, University of Washington, Seattle	Accelerometer time series determined during entry and descent and used to retrieve atmospheric profiles
Lander-Based Instruments		
Surface Stereo Imager (SSI)	Mark Lemmon, Texas AM University	12 band (0.4 to 1.0 micrometer) stereo imaging system with 0.25 mrad/pixel resolution
Thermal and Evolved-Gas Analyzer (TEGA)	William Boynton, University of Arizona	Thermal analyses of soils and ices delivered by RA to determine phases, together with mass spectrometry to determine isotopic composition of evolved gases
Microscopy, Electrochemistry, and Conductivity Analyzer (MECA)	Michael Hecht, Jet Propulsion Laboratory	Microscopy and aqueous chemistry of soils and ices delivered by RA
LIDAR	Jim Whiteway, York University, Toronto	Optical scattering properties of Martian dust/ice at altitudes <10 km (532 & 1064 nm)
Meteorology Suite (MET)	Jim Whiteway, York University, Toronto	Pressure and Temperature at lander/MET mast
Robotic Arm and Associated Instruments		
Robotic Arm (RA)	Robert Bonitz, Jet Propulsion Laboratory	RA with scoop to trench up to one meter in depth and acquire and deliver samples, support RAC and TECP measurements
Robotic Arm Camera (RAC)	Mark Lemmon, Texas AM University	Color imaging system
Thermal and Electrical Conductivity Probe (TECP) [Part of MECA]	Michael Hecht, Jet Propulsion Laboratory	Probes on scoop to determine soil and ice thermal and electrical properties

Table 2. Definitions of Processing Levels for Science Data Sets

NASA	CODMAC	Description
Packet data	Raw – Level 1	Telemetry data stream as received at the ground station, with science and engineering data embedded.
Level 0	Edited - Level 2	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed.
Level 1A	Calibrated - Level 3	NASA Level 0 (CODMAC Level 2) data that have been located in space and may have been transformed (e.g., calibrated, rearranged) in a reversible manner and packaged with needed ancillary and auxiliary data (e.g., radiances with the calibration equations applied).
Level 1B	Resampled - Level 4	Irreversibly transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances, magnetic field strength).
Level 2	Derived - Level 5	Geophysical parameters, generally derived from NASA Level 1 data (CODMAC Levels 3 and 4) , and located in space and time commensurate with instrument location, pointing, and sampling.
Level 3	Derived - Level 5	Geophysical parameters mapped onto uniform space-time grids.

Table 3. Components of Phoenix PDS Archives

Component	Contents	Supplier
SPICE Archives	SPICE Kernels NAIF Software	NAIF
Instrument Data Archives	Science Experiment Data Records and Reduced Data Records Operations Experiment Data Records and Reduced Data Records	Science Teams MIPL
Atmospheric Structure Data Archive	Raw data collected by the Inertial Measurement Units during entry and descent through the atmosphere	MIPL
Supporting Materials	High-level mission, spacecraft, instrument, data set, software, and personnel descriptions for the PDS Catalog Data Product Software Interface Specification (SIS) Documents Archive Volume Software Interface Specification Documents Processing Descriptions, Algorithms, and Software (to use in understanding reduced data product generation) Instrument Calibration Plans and Reports and associated data needed to understand level 1 product generation Verification and Validation (V&V) Reports Characterization, Calibration, Cataloging (CCC) Reports SOWG and other notes that describe uplink and downlink results	Science Teams
Interface Tools	Planetary Image Atlas and Analyst's Notebook for primary and extended missions	PDS

Table 4. Phoenix Standard and Special Data Products

Instrument or Data Source	NASA Proces-sing Level	Standard or Special	Data Set	Producer	PDS Curator	Controlling Documents
EDL accelerometer	0	Standard	Time series of raw accelerometer data	Catling / U. Washington	Atm	EDL Data Product SIS, Archive Volume SIS
EDL accelerometer	1	Standard	Atmospheric profiles	Catling / U. Washington	Atm	
SSI	0	Standard	Raw images (Full frame EDR, Subframe EDR, Downsampled EDR, Reference pixels)	MIPL	Img	
SSI	1A	Standard	Operations radiometrically corrected images	MIPL	Img	
SSI	1B	Standard	Operations linearized images	MIPL	Img	
SSI	1C	Standard	Operations stereo disparity images	MIPL	Img	Camera EDR & RDR Ops & Science SIS, Archive Volume SIS
SSI	1C	Standard	Operations XYZ images	MIPL	Img	
SSI	1C	Standard	Operations range (distance) images	MIPL	Img	
SSI	1C	Standard	Operations mosaic images	MIPL	Img	
SSI	2	Standard	Science radiometrically calibrated images	Lemmon / Texas A&M	Img	
SSI	2	Standard	Science radiometrically calibrated images (I over F (IOF) RDR)	Lemmon / Texas A&M	Img	
SSI	2	Standard	Atmospheric opacity	Lemmon / Texas A&M	Atm	Atmospheric Opacity SIS
SSI	2	Special	Wind velocity	Lemmon / Texas A&M or Phoenix ASTG	Atm	Wind Velocity SIS
LIDAR	0	Standard	Uncompressed time-tagged sequence of LidarCyclic Msg telemetry messages, in ASCII format	Whiteway/ York U.	Atm	LIDAR / MET EDR & RDR Data Product SIS,

Instrument or Data Source	NASA Proces-sing Level	Standard or Special	Data Set	Producer	PDS Curator	Controlling Documents
LIDAR	1A	Standard	Equation processed data derived from EDRs, in ASCII format	Whiteway/ York U.	Atm	Archive Volume SIS
MET	0	Standard	Uncompressed low-resolution time-tagged sequence of PTAvgCyclicMsg telemetry messages, in ASCII format	Whiteway/ York U.	Atm	LIDAR / MET EDR & RDR Data Product SIS, Archive Volume SIS
MET	0	Standard	Uncompressed high-resolution time-tagged sequence of PTEventMsg and PTFullCyclicMsg telemetry messages, in ASCII format	Whiteway/ York U.	Atm	
MET	1A	Standard	Equation processed (if required) low-resolution pressure/temperature data derived from the EDR, in ASCII	Whiteway/ York U.	Atm	
MET	1A	Standard	Equation processed (if required) high-resolution pressure/temperature data derived from the EDR, in ASCII	Whiteway/ York U.	Atm	
RAC	0	Standard	Raw images	MIPL	Img	Camera EDR & RDR Ops & Science SIS
RAC	1A	Standard	Operations rad-corrected images	MIPL	Img	
RAC	1B	Standard	Operations linearized images	MIPL	Img	
RAC	1C	Standard	Operations mosaic images	MIPL	Img	
RAC	2	Standard	Science radiometrically calibrated images	MPS	Img	
TEGA	0	Standard	ENGEDR: Engineering data from instrument sensors as time series (engineering values from EGA and TA)	Boynton / U. Arizona	Geo	TEGA EDR & RDR Data Product SIS, Archive Volume SIS
TEGA	0	Standard	SCEDR: SC oven heating time series of raw values of oven and shield power, current, voltage and pulse	Boynton / U. Arizona	Geo	
TEGA	0	Standard	EGAEDR: EGA detector currents (time series of counts), selected scanned peaks	Boynton / U. Arizona	Geo	
TEGA	0	Standard	EGHEDR: EGA Mass hopping counts (time series of counts)	Boynton / U. Arizona	Geo	

Instrument or Data Source	NASA Proces-sing Level	Standard or Special	Data Set	Producer	PDS Curator	Controlling Documents
TEGA	0	Standard	LEDEDR: Oven fill data (time series of raw and integrated LED readings)	Boynton / U. Arizona	Geo	
TEGA	0	Standard	MSGEDR: Instrument message log	Boynton / U. Arizona	Geo	
TEGA	1A	Standard	ENGRDR: Engineering data converted to engineering units as time series	Boynton / U. Arizona	Geo	
TEGA	1B	Standard	SCRDR: SC oven heating (watts) as a time series	Boynton / U. Arizona	Geo	
TEGA	1B	Standard	EGSRDR: EGA counts at each mass swept by the mass spectrometer	Boynton / U. Arizona	Geo	
TEGA	1B	Standard	EGHRDR: Times and counts at masses scanned in mass hopping mode	Boynton / U. Arizona	Geo	
MECA-OM	0	Standard	Raw images	MIPL	Imaging	Camera EDR & RDR Ops & Science SIS
MECA-OM	1B	Standard	Radiometrically calibrated images	MECA (MPS)	Imaging	
MECA-ELEC	0	Standard	Miscellaneous data from MECA electronics	MIPL	Geo	
MECA-WCL	0	Standard	Raw sensor and voltammetry / potentiometry data	MECA	Geo	
MECA-WCL	1	Standard	Calibrated sensor and voltammetry / potentiometry data	MECA	Geo	
MECA-WCL	2	Special	Derived concentration time series	MECA	Geo	MECA Non-Imaging EDR SIS; MECA Non-Imaging RDR SIS
MECA-TECP	0	Standard	Time series of raw T, electrical conductivity, permittivity, humidity data	MIPL	Geo	
MECA-TECP	1	Standard	Time series of T, electrical conductivity, permittivity, humidity in physical units	MECA	Geo	
MECA-TECP	2	Special	Derived time series of thermal conductivity, diffusivity, and wind speed	MECA	Geo	
MECA-AFM	0	Standard	Raw scans (signal and error) and engineering data	MIPL	Geo	
MECA-AFM	1	Standard	Calibrated topographs	MECA (Univ. of Neuchatel)	Geo	

Instrument or Data Source	NASA Proces-sing Level	Standard or Special	Data Set	Producer	PDS Curator	Controlling Documents
MECA-AFM	1	Standard	Calibrated derivative and other special images	MECA (Univ. of Neuchatel)	Geo	
MECA-AFM	2	Special	Derived solid and eroded models	MECA (Univ. of Neuchatel)	Geo	
SPICE Kernels	6	Standard	Derived kernels	NAIF	NAIF	Standard SPICE SIS

Atm = PDS Atmospheres Node, New Mexico State University   Img = PDS Imaging Node, JPL/USGS
Geo = PDS Geosciences Node, Washington University   NAIF = Navigation and Ancillary Information Facility, JPL
MPS = Max Planck Institute for Solar System Research

Table 5. Phoenix Archive Generation, Validation, and Release Schedule

Date	Event
October 2004	PAWG meetings begin
March 2005	PDR Draft Archive Plan complete Draft Interface Control Document complete
September 2005	CDR Draft Data Product SIS documents complete Draft Archive Volume SIS documents complete Final Archive Plan complete Final Interface Control Document complete Peer review begins
August 2007	Launch window opens Final Data Product SIS documents complete Final Archive Volume SIS documents complete Peer review is complete
May 25, 2008	Sol 1: Start of operations
June 24, 2008	Sol 31
August 23, 2008	Sol 91: Start of extended mission
November 20, 2008	Sol 180
~ December 9, 2008	Delivery of data from Sols 1 to 30 to PDS two weeks before first release
~ December 23, 2008	First data release 6 months after sol 30
~ February 8, 2009	Delivery of data from Sols 31 to 90 to PDS two weeks before second release
~ February 22, 2009	Second data release 6 months after sol 90
TBD	Subsequent data releases for every 90 sols through end of mission, with data delivered to PDS two weeks in advance of release date.