The Space Department of
The Johns Hopkins University
Applied Physics Laboratory

TIMED Project Data Management Plan

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Version 3

Revision A

7/24/08

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Change History

Date of Change	Description of Change
1 December 1997	Version 1
16 July 2001	Version 2 updated following sections: Signature Pages: Updated names to reflect changes in personnel. Add names of Ground Based Investigators Change History: Added Change History information. Section 2 References: Updated document dates. Removed unreferenced documents Section 4.1 SDS facilities: Updated Table 1 to reflect changes in personnel. Added entries for all IDS DAFs. Section 5.3.1 Data formats: Replace GIF as an image format with PNG. Section 5.3.2 Communications methods: Eliminated removable media as a supported communications method. Section 5.3.3 Removable (transport) media: Dropped support of removable media. Section 5.3.7.3 Attitude and pointing: Reworded the specification of earth referenced line of sight. Section 5.3.10.2 Change management: Added requirement that changes in TIMED Data Products be reflected in SDS documentation and be governed by change management. Added in Table 3 the conditional requirement for giving the problem report number when a change is in response to a problem report. Section 5.3.10.3 Change notification: Added in Table 4 the conditional requirement for giving the problem report number when a change is in response to a problem report. Section 5.3.11 Data quality assurance: Eliminated provision for a semi-automated process for data quality assurance. Section 5.4.2 Data Availability: Changed wording from “goal rate of data transfers” to “goal bandwidth for data transfers” with respect to the public. Section 5.4.3 Access statistics: Eliminated provisions for tracking and reporting file download statistics per Action Item TSDSPDR-2-99-006, Preliminary Design Review, 10 February 1999. Section 7.2 Data sources: Conditionalized data distribution as not applying to GBIs who deliver data

	to CEDAR. Section 7.3.2.4 Responsibilities of other DAFs: Added provision for GBI to deliver data products to CEDAR. Added responsibility of supplying the MDC with information on data collection activities. Section 7.3.4 Provisions for early on-orbit operations: Add that no special requirements for on-orbit operations have been identified and that SDS will be on-line and tested prior to launch. Section 8.3 Shared software: Eliminated provision that software be selectable through keyword searches and software type. Section 8.4 Instrument/science teams: Eliminated provision about expectation of uniformity. Section 8.7 Mission Related Publications: Revised publication tracking to be a citation list that is communicated to the SDS Manager via e-mail. Section 9.1.2 Instrument teams requirements: Added GUVI requirements for Ap and F10.7. Section 9.2 Product specifications: Reoriented Table 7 for actual TIMED Data Products and to present data parameters in the Product Description field. Updated to reflect currently identified Data Products. Section 10 Ground based data: Updated provisions for ground based observers and cite relevant sections of DMP pertinent to policies and procedure for management of data facilities. Added Table 10 which lists Ground Based Investigators Appendix A Guidelines for Data Use (Rules of the Road): Upgraded from Draft status. Appendix B Data Product Specification: Expanded list of Fields in Table 10 of Product Information. Added descriptions of Field Value choices. Appendix D Acronyms and Abbreviations: Expanded list. Appendix E Glossary: Expanded list. Appendix F Guidelines and Standards for Shared Software: Added appendix that contains elements of shared software. Appendix G Data Policy Statement for TIMED GBIs: Added appendix that contains the data policy statement from the NASA Research Announcement NRA-99-OSS-01, Appendix A.
6 April 2005	Version 3 updated following sections: Section 1.1.1 Purpose and scope of this document: Removed references to the Space Physics Data System (SPDS), which is

	no longer in existence. Section 1.1.2 Document lifecycle: Changed timing to reflect extended mission. Section 3.1 Relationship of SDS to the mission: Removed reference of delivery to the SPDS. Section 3.3 SDS lifecycle: Changed duration of Mission operations phase to include extended mission. Changed duration of Post-orbital data analysis and mission closeout phase Replaced delivery to the SPDS and with retrieval to MDC. Table 1: Updated names to reflect changes in personnel. Section 5.1 Data access policy: Replaced delivery to the SPDS and with retrieval to MDC. Section 7.3.2.1 MDC responsibilities: Replaced delivery to the SPDS and with retrieval to MDC. Section 7.3.5 Long term archive preparation: Replaced delivery to the SPDS and with retrieval to MDC. Changed timing of Prototype delivery to reflect the extended mission. Appendix D – Acronyms and Abbreviation: Removed "SPDS."
24 July 2008	Version 3 Revision A updated following sections: Section 3.3 SDS lifecycle: Changed duration of Mission operations phase to include extended mission. Table 1: Updated names to reflect changes in personnel. Section 7.3.5 Long term archive preparation: Updated wording to reflect the beginning of the Virtual Observatories and the VITMO. Appendix D – Acronyms and Abbreviation: Changed "VIO" to "VITMO."

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1 Introduction

1.1 Purpose of the TIMED program

The Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) Program is the first science mission in the Solar Connections Program, as detailed in NASA's Strategic Plan. TIMED will explore the Earth's mesosphere and lower thermosphere (60-180 kilometers), the least explored and least understood region of the atmosphere. It is known that the global structure of this region can be perturbed during periods of stratospheric warming and solar-terrestrial events, but the overall structure and dynamics responses of these effects are not understood. Advances in remote sensing technology employed by TIMED instrumentation will enable us to explore this region on a global basis from space.

The primary objective of the TIMED mission is to investigate and understand the structure, energetics and chemistry of the mesosphere and lower thermosphere/ ionosphere (MLTI) region. The MLTI is a region of transition within the upper atmosphere in which many important processes change dramatically. It is a region where energetic solar radiation is absorbed, energy input from the aurora maximizes, intense electrical currents flow, and upwardly propagating waves and tides break; and yet, this region has never been the subject of a comprehensive, long-term, global investigation. TIMED will, for the first time, provide a core subset of measurements defining the basic state (density, pressure, temperature, winds) of the MLTI region and its thermal balance.

In order to achieve the goals of the mission, data collected, generated, and analyzed as part of the TIMED program must be shared among TIMED investigators, the scientific community and the general public. The TIMED Science Data System (SDS) will provide the mechanism through which this sharing will take place.

1.1.1 Purpose and scope of this document

This document, the TIMED Project Data Management Plan (DMP), describes the TIMED Science Data System, its structure, its policies and its products. This document provides

- Information to the users of the SDS, including an overview of what products are available and how access is provided.
- Guidelines and specific technical information to the SDS implementation teams to aid in construction of the data system.
- Information useful for evaluation of the SDS by program management.

Much of the detail required for the use, implementation and evaluation of the SDS is referenced rather than repeated here.

1.1.2 Document lifecycle

This is a working document. The amount of detail contained in this document will increase as the SDS is developed and the TIMED program matures. We plan five major versions of this document.

- Preliminary version - This version was used as a planning tool during mission design. The SDS manager made changes during this time when necessary. Signatures were required for the preliminary version.
- Version 1 - This was the first signed version of this document. This version is subject to the change control procedures described in 5.3.9 and 5.3.10. This version was available for signature at the spacecraft Critical Design Review.
- Version 2 - This version will be signed and available in coordination with announcement of selection of the Ground Based Investigators, approximately 6 months before the TIMED spacecraft is launched.
- Version 3 - This version will be signed and available 3 years after the TIMED spacecraft is launched. It will reflect any changes made to accommodate flight operations.

- Version 4 - This version will be signed and available 3 months after termination of spacecraft operations phase. The main purpose of this version is to provide mission closeout refinements.

2 References

1. TIMED System Requirements Document, JHU/APL, 7363-9001, 12/1997.
2. TIMED Mission Data Center System Specification, JHU/APL, 7363-9363, 12/29/1997.
3. TIMED General Instrument Interface Specification (GIIS), Section 8, JHU/APL, 7363-9050.
4. GUVI Specific Instrument Interface Specification (SIIS), JHU/APL, 7363-9046, 5/21/1998.
5. SABER Specific Instrument Interface Specification (SIIS), JHU/APL, 7363-9047, 7/28/1998.
6. SEE Specific Instrument Interface Specification (SIIS), JHU/APL, 7363-9048, 5/22/1998.
7. TIDI Specific Instrument Interface Specification (SIIS), JHU/APL, 7363-9049, 5/1998.
8. 1993 Earth Observing System reference handbook, NASA-NP-202, Mar 01, 1993.

3 SDS Overview

3.1 Relationship of SDS to the mission

The TIMED Science Data System (SDS) is responsible for the generation, acquisition, distribution, and archive of science data necessary to support the TIMED mission. In this capacity, the SDS will provide useful data products to the TIMED program elements, the scientific community, K-12 educators and the general public.

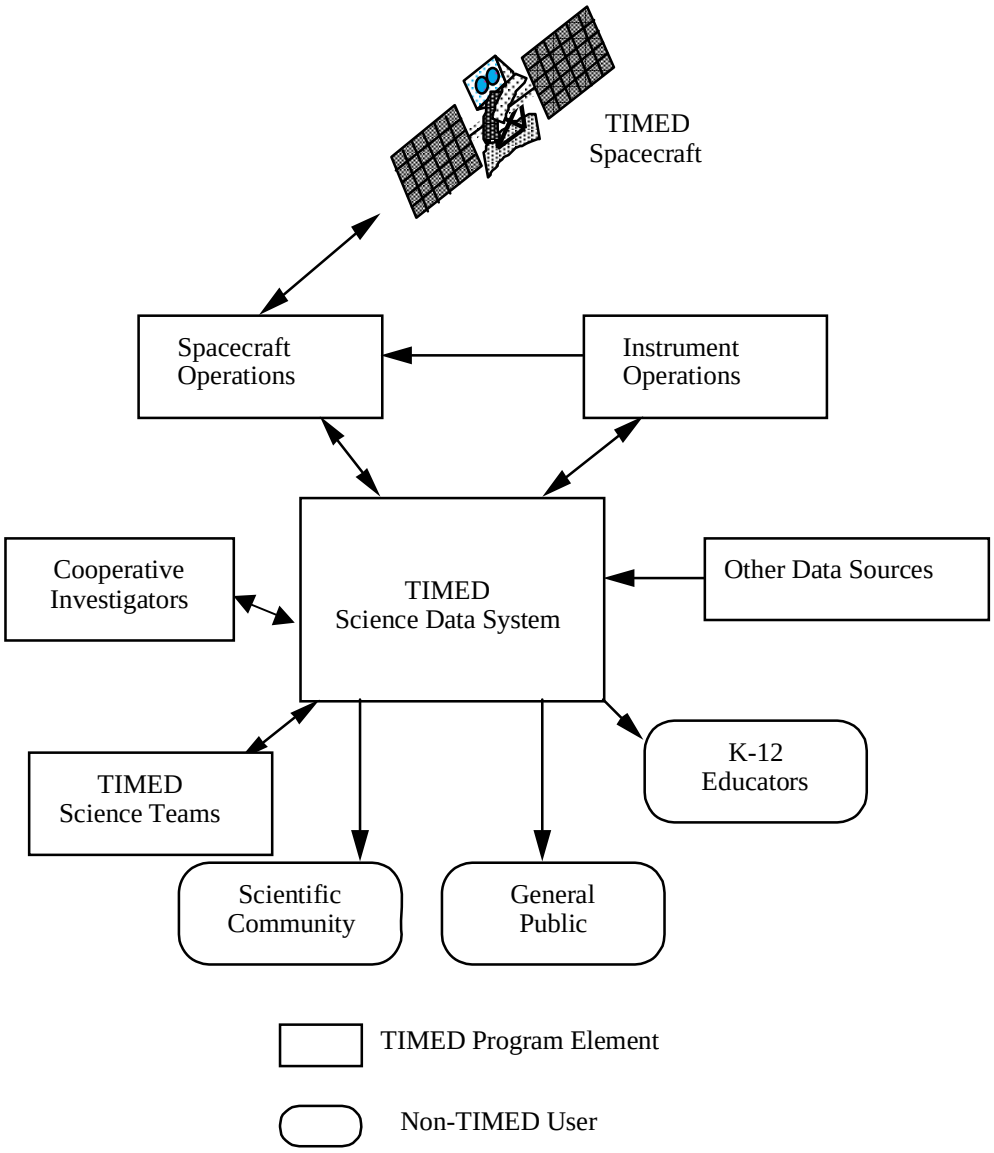

Figure 1. SDS in Context

Figure 1 shows the various TIMED program elements and external users of the SDS. The SDS is required to supply data to both TIMED program elements and external users. TIMED program elements require science data products as input to instrument operations and data analysis. For external users, the TIMED SDS is the principal means of access to TIMED data products during the course of the mission.

Final delivery to a NASA and tasks associated with delivery standards will be conducted post mission..

3.2 SDS scope

The functions of the TIMED Science Data System are distributed over several facilities (see 4.1). The SDS manager at JHU/APL coordinates these functions. Many of the facilities that are part of the SDS support functions that are not related to the data system. Only functions that are directly related to the routine production, acquisition, archive or distribution of data are within the scope of the SDS.

The SDS manager is responsible for coordinating the development and operations of SDS functions resident at the various facilities. Each facility is responsible for developing the portion of the SDS that it will operate, subject to the standards, policies and interface constraints supplied by the SDS manager. The SDS manager will not monitor

details of facility implementations unless they impact the development or operations of other SDS facilities or the operations of the data system as a whole.

3.3 SDS lifecycle

The will be three major phases of the SDS lifecycle.

- Pre-launch phase – During this phase, the SDS will be fully defined and implemented. Some early capabilities will be put into place, though this should be regarded as a system development phase rather than an operational phase.

- Mission operations phase – This phase is defined as the time during which the TIMED instruments are acquiring data on orbit and consists of a two-year span for the primary mission and a subsequent nine-year span of extended mission operations. During this period, it is the program's responsibility to supply data to TIMED program elements, the scientific community, general public and K-12 educators. The bulk of this document describes the SDS during spacecraft operations.

- Post orbital data analysis and mission closeout phase – This phase begins at the end of TIMED mission operations and continues for one year through mission closeout. During this period data products will be refined, and the Mission Data Center (MDC) will retrieve all TIMED data held at the POC sites for central retention. During this phase, the TIMED program will continue to supply data to the various user communities.

4 SDS organization

4.1 SDS facilities

The TIMED Science Data System (SDS) is a distributed system with elements that are part of several different facilities. These facilities are listed in Table 1. The SDS manager at JHU/APL coordinates the SDS elements at these facilities.

Table 1. TIMED SDS facilities

Facility Name	Location	Data System Lead
TIMED Mission Data Center (MDC)	JHU/APL	S. Nylund
SEE Payload Operations Center (POC)	LASP	D. Woodraska
TIDI Payload Operations Center (POC)	University of Michigan	M. Cooper
SABER Payload Operations Center (POC)	NASA Langley	L. Gordley
GUVI Payload Operations Center (POC)	JHU/APL	R. Schaefer
TIMED Project Science Data Analysis Facility (DAF)	JHU/APL	J.H. Yee
Energy Transfer IDS Data Analysis Facility (DAF)	NCAR	S. Solomon
Tides, Planetary Waves and Eddy Forcing IDS Data Analysis Facility (DAF)	University of CO	J. Forbes
Studies of Gravity Wave Forcing, Energetics and Variability IDS Data Analysis Facility (DAF)	Northwest Research	D. Fritts
Solar and Magnetosphere Inputs IDS Data Analysis Facility (DAF)	University of Michigan	J. Kozyra
Theoretical and Empirical Models IDS Data Analysis Facility (DAF)	NASA GSFC	H. Mayr
Model of Chemical Radioactive Interactions IDS Data Analysis Facility (DAF)	NCAR	A. Smith

The Mission Data Center (MDC) is the central facility responsible for telemetry distribution and other central functions as outlined in 4.2. The MDC falls completely within the SDS.

The Payload Operations Center (POC) facilities are responsible for TIMED instrument operations and assessment as well as data operations, i.e., data reduction, processing and distribution of data analysis products. Only the portions of the POCs involved in data operations fall within the scope of the SDS.

The Data Analysis Facilities (DAFs) are responsible for producing and distributing data analysis products for the SDS (see 4.2) as well as providing support for active data analysis. Only the portions of the DAFs involved in the

production and distribution of data products fall within the scope of the SDS. Data production and distribution undertaken by co-investigators are considered to be part of their respective PI's or IDS's facility. Additional DAFs may be added as the program proceeds.

4.2 Facility responsibilities

The MDC is responsible for

- Distributing spacecraft and instrument telemetry
- Providing mission summary information to experimenters and the public
- Developing and hosting the common elements of the user interface for TIMED
- Hosting and/or developing program-wide SDS functions (e.g., support data acquisition)

Each POC is responsible for

- Routine data production for its instrument
- Archive and distribution (during the mission) of data generated at its facility and data analysis products generated by its science team
- Hosting and developing instrument specific portions of the TIMED user interface
- Providing instrument operations summary data to the MDC

Each DAF is responsible for

- Production, archive and distribution (during the mission) of data analysis products generated by investigators not associated with a single instrument (e.g., IDSs or the mission scientist)

5 SDS standards and policies

5.1 Data access policy

No data products generated by the TIMED mission and listed in section 9.2 of this document are to be considered proprietary. All data will reside in the public domain, and no access restrictions shall be placed on the data to prevent its use by anyone. It is recognized that providing documentation, media and electronic transmission capability requires funding. Therefore, access to data products not described in this document will be at the discretion of the project or PI.

Section 9.2 of this document contains a list of higher-level data products that have been submitted to NASA Headquarters for peer review and approval. Furthermore, the complete level 0 data set shall be made available to the public, along with sufficient documentation, to use this data independently. A timetable for the release of these products is provided in this DMP and has likewise been subjected to the peer review and Headquarters approval process.

During the life of the TIMED mission, the program will be responsible for distributing data to the scientific community and the general public. During this period, level 2 and higher products will routinely be made available to the public and independent researchers. At the end of the mission, the TIMED program will assemble a complete and documented centralized set of data products (including level 0).

The SDS policies regarding allocation of resources to public data distribution are described in 5.4.2 of this document.

Any publication incorporating TIMED data products must acknowledge the contribution of the TIMED program.

Scientific users of TIMED data should register as users of the project database so that they may be kept informed of changes and enhancements that may affect their use of the data.

It is recommended that independent researchers work with TIMED investigators to ensure a full understanding of each instrument's performance and to ensure correct interpretation of the basic observations.

5.2 Guidelines for data use

In addition to the above data access policy, the TIMED program requests that users of the data respect the guidelines for collegial and orderly scientific relationships. These guidelines are found in Appendix A.

5.3 SDS internal standards and policies

This section describes the standards and policies relevant to the internal interfaces of the SDS. These policies and standards are meant to apply to communications between SDS facilities. They do not apply to the internal interfaces within individual facilities or communication between PIs and their Co-investigators.

5.3.1 Data formats

All data products exchanged between SDS facilities shall be in netCDF format. The exceptions to this policy are as follows:

1. Level 0 (see 6.3) and raw telemetry
2. Command loads and command histories
3. Status reports and other small products that are best represented in text should be transmitted in well formatted ASCII files as negotiated
4. Survey products containing images may be represented in PDF, PNG, JPEG or TIF
5. Survey products containing animation may be represented in MPEG format

Other exceptions will be considered on a case-by-case basis. The format of all routinely transmitted products must be pre-negotiated (see 5.3.5). A template for describing the content of data products is given in Appendix B.

5.3.2 Communications methods

This section lists the communications methods that the SDS facilities are expected to support. Communications for routine interfaces must be pre-negotiated (see 5.3.5). Note that this list may change as the project evolves. The currently supported communications methods are:

1. File Transfer Protocol (FTP) over the internet
2. WWW document transfers
3. Socket transmissions over the internet
4. Electronic mail over the internet
5. Point-to-point implementations of FTP and socket transmissions via 28.8 modem

5.3.3 Removable (transport) media

As of the release of Version 2 of this DMP the TIMED project is not supporting removable media.

5.3.4 Protection against data loss

SDS facilities are responsible for protecting the data that they archive from loss or corruption. For this reason, each facility should maintain a copy of its data holdings on a stable off-line medium. No off-site backups are required.

5.3.5 Interface control

All routine interfaces between SDS facilities must be documented with an interface control document (ICD). Each document will require the signatures of

1. The manager of each facility governed by the ICD
2. The TIMED project scientist
3. The TIMED program manager
4. The TIMED SDS manager

The contents of these documents must include, but are not limited to

1. Identification of the facilities supporting the interfaces
2. Identification and qualitative descriptions of the interfaces to be supported
3. The communications methods to be used
4. Detailed description of the data products to be transferred
5. Data delivery schedules
6. Qualification methods
7. Requirements traceability

These documents will be subject to the corrective action process (5.3.10) and the configuration management process (5.3.9).

Note that for MDC/POC interfaces the General Instrument Interface Specification (reference 3) and Specific Instrument Interface Specification documents (references 4, 5, 6, 7) will serve as interface control documents between these facilities.

5.3.6 Computer system standards

There will be no official TIMED standard computer platform.

5.3.7 Time and geometry representation standards

Data products exchanged among TIMED facilities, and with external users shall represent the following quantities in a standard manner:

- Time
- Coordinate systems
- Attitude and pointing

These quantities may also be represented in other ways provided that the product also contains the standard representations.

5.3.7.1 Time representation

Two representations of time will be supported: a text format and a binary format. The text format is intended for use in filenames and human readable files (e.g. text files). The binary representation will be used for computer readable files.

The text time representation is as follows:

YYYYDOYHHMMSS_XXXXXX

Where:

YYYY – Four-digit year
DOY – day of year
HH – hour of day
MM – minute of hour
SS – second of minute
XXXXXX – microsecond of second

All text times are given in UTC. Portions of the format can be used when all fields are not necessary, though the use of two digit year fields is strongly discouraged.

The binary time representation consists of a 32-bit integer containing the number of seconds elapsed since January 6, 1980 (the epoch used by GPS). A millisecond (16 bit) or microsecond (32 bit) vernier shall be supplied to the extent that the resolution is available and necessary.

5.3.7.2 Coordinate systems

Inertial coordinates will be referenced to the ECI J2000 coordinate system with X, Y, and Z specified in km. For positions on the celestial sphere, right ascension and declination will be given in decimal degrees.

Earth referenced positions should be given in longitude (0-360 degrees east), latitude and altitude (km). Latitude and altitude should reference the WGS 84 ellipsoid where

Mean radius = 6378.1370 km

Flatness Parameter = 1/(298.25722356)

The preferred vertical coordinate is altitude in km, but pressure in millibars may be substituted.

5.3.7.3 Attitude and pointing

The following are the standard methods for specifying pointing. In general, data products should contain both inertial and earth referenced attitude/pointing information.

Inertial Quaternion: A quaternion that will transform coordinates in the instrument/spacecraft frame to the ECI J2000 system. Conventions for the quaternion will be the same as those employed by the TIMED guidance and control subsystem.

Earth fixed attitude: Yaw, pitch and roll angles referenced to the coordinate system given below under 'Earth referenced line of sight'.

RA and DEC of line of sight: Right ascension and declination of the intersection of the line of sight with the celestial sphere. A roll angle in degrees may also be supplied if necessary.

Unit vectors: a unit vector specifying the line of sight direction in J2000 coordinates

Earth referenced line of sight: The earth referenced line of sight is defined in the topocentric local tangent frame (North-East-Down) defined with origin at the spacecraft center of mass. The reference plane is the plane normal to the line from the earth center to the spacecraft, the local horizontal plane. The x axis is in the reference plane pointing north, the y axis is in the reference plane pointing east, and the z axis is normal to the reference plane pointing towards the earth center.

The line of sight direction is defined by an azimuth angle and an elevation angle. The azimuth angle is the angle in the reference plane measured from the x axis to the projection of the line of sight on the local horizontal plane. It increases in a right hand sense about +z, that is it increases from the x-axis towards the y. The elevation angle is the angle from the reference plane to the line of sight. The elevation angle is zero when the line of sight is in the reference plane and 90 degrees when the line of sight points towards the earth center.

Earth referenced look point: The longitude, latitude and altitude of the point where the line of sight either intersects the Earth's surface, or the position of the minimum ray height to the geoid (the 'look point'). This cannot be used for observations above the local horizon. Intersections of the line of sight with a surface that is a fixed distance above the geoid may also be used if the fixed distance is clearly specified.

5.3.8 Internal delivery schedules

Internal delivery schedules will be documented in the ICDs described in 5.3.5. There are, however, some constraints on these negotiated schedules

1. Level 0 data will be available to the POCs 30 hours after its acquisition on orbit
2. An initial version of a facility's routine products should be available to other TIMED users within 54 hours after its acquisition on orbit.
3. During the first 6 months of the mission, delivery timelines for routine level 1 and higher products will not apply.

5.3.9 Configuration management

The SDS is expected to change over the life of the TIMED mission. For this reason, we will implement a configuration management process to control the changes of key aspects of the SDS. These aspects are as follows:

- Data product specifications
- Data product requirements (section 9.1 of this document)
- ICDs and other data system documents (including this document)
- Final archive products
- URLs that are part of the common user interface

A baseline configuration will be developed for each one of these aspects, and changes to the baseline will be tracked and managed. As a result of this process, at any point during the program we will be able to describe the current state of these items, as well as past states. Changes to the configuration will be made through the corrective action process (5.3.10) below. The configuration management of each aspect of the system is described in the sections that follow.

5.3.9.1 Data product specifications

For TIMED, the configuration of data product specifications will be controlled, rather than the data products themselves. Each data product managed by the SDS will have a data product specification. These specifications will be used as aids for data location, data product descriptions and as an aid to interface control. See Appendix B for a discussion of the data product specifications.

The configuration of product specifications is controlled via the Data Product Version and Version Description fields in the specification. Conventions for version numbers are given in Appendix C. Only changes that require a modification of the Data Product Version number are subject to the corrective action process that is described below.

5.3.9.2 Data product requirements

Data product requirements (given in 9.1) will be placed under configuration management as well. Upon full signature of this document, the requirements described in this DMP will be considered the initial baseline. Changes will be managed through the corrective action process. A full description of the requirements will be available from the SDS manager. Subsequent releases of this document will contain the most recent version of the requirements available at the publication.

5.3.9.3 ICDs and other SDS documents

In view of the distributed nature of the SDS, we expect that various facilities will produce documents that are important for the SDS to track. The facility that originates the document should conduct version management. Naming conventions will be adopted from the originating facility, though for SDS purposes, the name of the originating facility will be placed before the facility specific version number. This allows the documents that are relevant to the SDS to be tracked uniquely without having to rename or re-version documents. The SDS manager will maintain a library of these documents.

5.3.9.4 Final archive products

Each delivered release of the final archive will be placed under configuration management. Master copies will be kept by the Mission Data Center. No changes to the archives will be made between releases. The version naming convention will be developed as part of final archive planning.

5.3.9.5 Common user interface URLs

URLs that are part of the common user interface will be tracked by the MDC to assure clean connectivity within the interface. Only accounting for the most current configuration is required; historical URLs will not be tracked. As user interface sites come on line, facilities will submit a list of controlled URLs to the MDC (reference 3). The MDC will maintain a list of the current controlled URLs. Changes will be made according to the corrective action process below. Note that for URLs, the corrective action process is directed toward notification of users rather than SDS content or revision control.

5.3.10 Corrective action process

When problems are found with data products, documents or other configuration items of the SDS, the corrective action process will be used to address them. The corrective action process is used to make modification to any of the items under configuration management. This process is closely tied to the configuration management process described above. For TIMED, corrective action will take place in three stages

- Problem Reporting
- Change Management
- Change Notification

The details of the corrective action process will depend on the type of configuration item that is being changed. During the entire process, the SDS manager will track the status of the change.

5.3.10.1 Problem reporting

In general, the problem reporting system will be used to signal problems in data products or the user interface. Upon identifying a problem (or a suspected problem), the user should complete a Problem Report Form. This form will be available for electronic submission through the common user interface, and contain the data items listed in Table 2.

Table 2. Problem Reporting Fields

Field Name	Required/ Optional	Description
Submitted by	R	Name of the person filing the problem report
Date	R	Date submitted
Email Address	O	Email address where problem status should be sent
Phone	O	Phone number of person submitting the problem report
Data Product Name	O	Name of the offending Data Product
Problem URL	O	URL of the offending interface page
Problem Description	R	Detailed text description of the problem

Problem reports are submitted to the SDS manager. Upon receipt of the problem report, the SDS manager will assign a tracking number to it. If the person that submitted the report included an email address, the tracking number will be sent to that address. The SDS manager will maintain a list of open problem reports. The manager of the facility responsible for the configuration item in question will be informed of the problem and a response date will be negotiated. The facility manager must respond with a change request (initiating change management), a change notification (initiating change notification) or a brief written reason why no change is necessary. A status message will then be sent to the email address on the original problem report. If no change is necessary, the problem report will be closed. Otherwise, the corrective action process will continue.

5.3.10.2 Change management

Change management will be practiced on configuration items that need to be reviewed before modifications are made. Thus, this process will apply only to

- Changes in content to ICDs and other SDS documents
- Major data product version changes
- Changes to controlled requirements

Additions and deletions to the list of TIMED Data Products require a change to SDS documentation and are governed by this process.

Note that minor changes to data product software and calibrations do not need to undergo change management at the SDS level. Only changes that modify the format of a data product or reflect substantial changes in processing algorithms or calibrations are subject to this process.

Changes to ICDs and other documents will be done in accordance with the revision and signature processes particular to their originating facility. Major data product version changes and the modification of SDS requirements will be made via the change request process, as described below.

The initiator of a change will fill out and submit a change request form to the SDS manager. This change form will be available electronically. The contents of the form are described in Table 3.

Table 3. Change Request Fields

Field Name	Required/ Optional	Description
Submitted by	R	Name of the person filing the problem report
Submission date	R	Date submitted
Email address	R	Email address where problem status should be sent
Phone	O	Phone number of person submitting the problem report
Problem report	O (R)	If this change is in response to a problem report, its number becomes required and goes here
Item to be changed	R	Data product specification or requirement to be changed
Description of change	R	Detailed description of change, may include references
Justification for change	R	Reason that this change should be made
Proposed date of change	O	Date when this change should go into effect
Impact of change	O	Approximate cost or other resource impacts of the change

Upon receipt of the change request, the SDS manager will assign a tracking number and report this number to the requestor. The change will then be presented to the Change Control Board, which will consist of a representative of each SDS facility, the SDS manager and the TIMED project scientist. Though this board may have periodic meetings, the review of change requests will be done via email, telephone or conference calls. The SDS manager will coordinate change request reviews. Board members will review change requests for possible program and/or facility impact. Board members will be encouraged to submit written opinions. These opinions will be sent to the initiator of the change and recorded by the SDS manager. The decision on whether to proceed with a change will be made by board consensus. The TIMED project scientist will have final approval on all changes.

Change request reviews will not exceed one week per change. Failure of the board to act within one week will be equivalent to approval of the change.

5.3.10.3 Change notification

Before any change is made to configuration items, SDS facilities and users will be notified via the change notification process. Facilities are also encouraged to use this process for minor releases of data product versions as well. At least one week before a change goes into effect, the facility responsible for making the change should submit a change notification to the SDS manager. This form will be available electronically. The contents of this form are described in Table 4.

Table 4. Change Notification Contents

Field Name	Required/ Optional	Description
Submitted by	R	Name of the person filing the problem report
Submission date	R	Date submitted
Email address	R	Email address where problem status should be sent
Phone	O	Phone number of person submitting the problem report
Problem report	O (R)	If this change is in response to a problem report, its number becomes required and goes here
Item being changed	R	Data product specification or requirement to be changed
Description of change	R	Detailed description of change, may include references
Justification for change	O	Reason that this change should be made
Date of change	R	Date when this change goes into effect
Impact of change	O	Description of what should be done to accommodate this change

Upon receipt of the change notification, the SDS manager will assign a tracking number and report this number to the requestor. The SDS manager will then forward this notification to all appropriate parties. The SDS manager will also track all change notifications during the life of the program.

5.3.11 Data quality assurance

The SDS manager will routinely sample data product format, content, transmission method and timing. Data products will be selected and audited at random. The SDS manager will track the results of these audits. Problems encountered during these audits will be reported to the responsible facility, and, if necessary, a problem report will be filed.

5.4 SDS external standards and policies

These standards and policies govern the interfaces that all SDS facilities maintain with facilities that are not part of the SDS.

5.4.1 Distribution formats

Public distribution formats will be the same as those listed in 5.3.1.

5.4.2 Data availability

Each facility will maintain an on-line (or near-line) area for public distribution of data products. If this area is not large enough to keep the entire publicly accessible data archive on-line, provisions for staging shall be made. However, all publicly available survey products should be maintained on-line.

Each POC shall maintain at least 40GB of storage for data service. Data analysis facilities shall allocate at least 20GB. The goal bandwidth for data transfers to the public should be at least 1 MB/sec. Facilities shall budget 2 hours of transfer time per day. Larger orders may need to be separately negotiated.

We expect that from time to time, circumstances will not permit the above availability requirements to be met, due to

- Network availability or bandwidth problems
- System administration problems
- Hardware failures

- High priority events

In these events, the requirements will be relaxed. We do not budget for redundancy.

We expect each facility to plan for downtime and reprocessing. We suggest less than 4 hours/day of routine processing. For data distribution purposes, each facility can be down for 1 day/month. Distribution to the public is expected to run unattended and be available continuously. However the minimum up-time requirement is 12 hours/day.

During the first six months of the mission, timelines for the release of level 1 and higher products do not apply.

6 TIMED data product classification

6.1 Product classification matrix

There are two important attributes to be captured by the classification scheme:

- How the data is generated
- What information is contained

Although loosely correlated, these attributes are roughly independent. Table 5, below, will be used to classify the TIMED data products.

Table 5. Product Classification Matrix

	Routine	**Analysis**	**Automatic**
Raw Telemetry			√
Level 0		√	
Level 1		√	
Level 2		√	
Level 3		√	
Level 4		√	

	Routine	**Analysis**	**Automatic**
Support			√
Survey	√		
Collaborative		√	
Educational		√	
Status	√		

Each product will have one data content class and generation method. Definitions of the various generation method and data content classifications are given below.

6.2 Generation method classification

The Product Generation Classification is used to determine delivery schedules and aid in system monitoring

Routine Products: Produced regularly and systematically with a minimum of human intervention

Analysis Products: Produced as the result of data analysis or other human intensive process

Automated Products: Produced on demand from a user request (e.g., SEE's planned spectral selections)

6.3 Data content classification

Data Content Classes are used to refer to the type of data contained in the product. Data levels are adapted from the EOS Handbook (reference 8). The data levels are supplemented with additional product content classes for products that are not easily classified by the data level scheme.

- Raw Telemetry: Unprocessed digital telemetry
- Level 0: unprocessed instrument data at full resolution that has been separated by instrument or subsystem
- Level 1a: unprocessed instrument data at full resolution, time-referenced and annotated with ancillary information including geometric parameters as well as information necessary for conversion of the data into radiometric units
- Level 1b: Level 1a data that have been processed to radiometric units (e.g. photons/furlong^2/fortnight)

- Level 2: Derived geophysical variables at the resolution of retrieval
- Level 3: Variables mapped on a uniform, earth referenced, space-time grid
- Level 4: Model output or results from analyses of lower level data (e.g., variables derived from multiple measurements)
- Survey: Summary or low fidelity data used for quicklook or data location
- Support: Data acquired from non-TIMED sources to supplement data analysis (e.g., NMC data)
- Collaborative: Data acquired through collaborative sources, e.g., the results of TIMED/CEDAR collaborations
- Educational: Data products and other information intended for use by K-12 educators and students
- Status: Data products that contain information about the TIMED spacecraft or data products

7 SDS concept

7.1 Required products and product types for each user

The SDS supports multiple users with different requirements. We have classified users into User Types based on their data requirements. Table 6 presents a list of the user types and their various data requirements.

Table 6. User types and content classes

User type	User Facility	Data Content Class
Mission Operations	MOC	Raw Telemetry Level 0 Status
Instrument Team	POC	Level 0 Status
TIMED Science Teams	POC DAF Co-I facility	Level 1a-4 Survey Status Support Collaborative
Scientific Community	N/A	Level 2-4 Survey Products Status
General Public	N/A	Survey Products Status
K-12 Educators	N/A	Educational Survey Status

A more detailed list of data product requirements for each user type is given in section 9.1.

7.2 Data sources

Except for Ground Based Investigators (GBIs) who deliver their data to the Coupling Energetics and Dynamics of Atmospheric Regions (CEDAR) database, data will be distributed from the SDS facility from which it is generated or acquired. For this reason, all of the SDS facilities will be responsible for distributing data. The distribution points of the various content classes are listed in Table 7. Note that navigating these various sources of data should be transparent to the user.

Table 7. Data distributed by SDS facilities

SDS Facility	Data Distributed
MDC	Raw telemetry

	Level 0 Support Status
POCs	Level 1-4 Survey Status
TIMED Project Science DAF	Level 2-4 Survey Status Educational Collaborative
Other DAFs	Level 2-4 Survey Status

7.3 System architecture

7.3.1 Functional data flow

The TIMED Science Data flow is shown in Figure 2. In this figure, the heavy line separates the functions of the SDS (inside) from its environment (outside). Note that the figure does not include the data flow for the long-term archive functions.

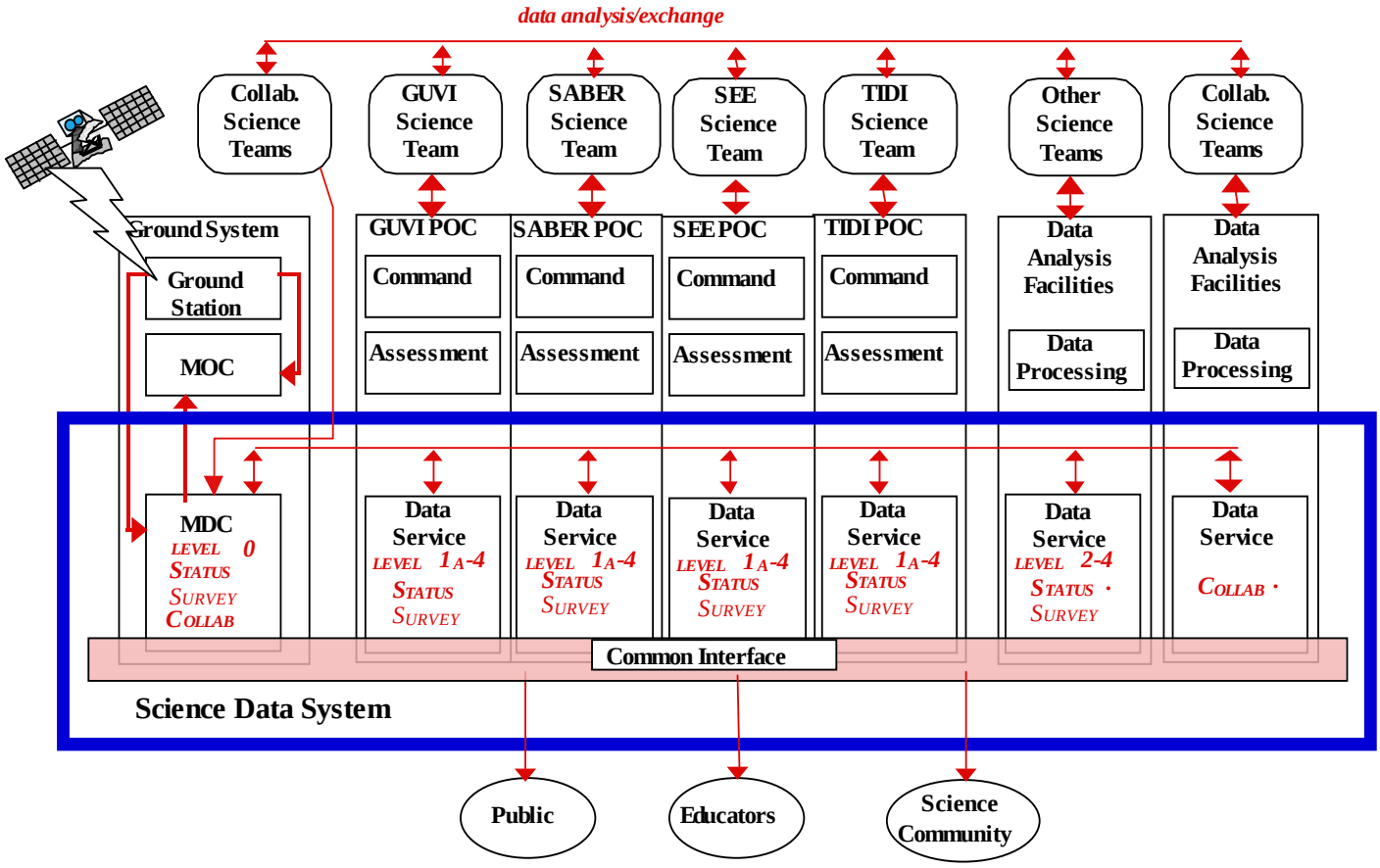

Figure 2. SDS functional data flow

The following actions take place after data are received at the ground station:

1. The telemetry service function (at the MDC) distributes portions of the telemetry (Level 0 data) to the POCs and mission operations. This distribution can take place in both near-real time and in playback mode.
2. The Level 0 data are used at the POCs and mission operations for planning, command and assessment purposes. These functions are not within the scope of the SDS, however results of planning and assessment activities will serve as input to the SDS. Communications between mission operations and the command and assessment function of the POCs are not within the scope of the SDS.
3. Level 0 data, as well as planning and assessment products, are used to generate routine data products. This takes place at the MDC, the POCs and the DAFs. These products are served by their producers. All communications required for product generation are within the scope of the SDS.
4. The products resulting from product generation are archived at the various facilities. These archives are used by the science teams for data analysis. Data analysis activities are not within the scope of the SDS. However, results of data analysis (data analysis products) will be transferred from the science teams into the appropriate archive.
5. Access to TIMED data by the science community (including TIMED users), K-12 educators, and the general public will be provided via a common interactive interface. Elements of this interface will be hosted at the various facilities.

7.3.2 Facility responsibilities

Facilities (4.1) are responsible for producing and serving the data products list in Table 8. A more detailed summary of responsibilities is listed here.

7.3.2.1 MDC responsibilities

- Initial processing (time order and resolve overlaps) and distribution of spacecraft and instrument telemetry (Level 0)
- Playback distribution of spacecraft and instrument telemetry (Level 0)
- Archive (during the mission) of all telemetry data (Raw telemetry and/or Level 0)
- Maintaining planned and as flown timelines for spacecraft and instruments (Status)
- Maintaining information about available data products and data quality (Status)
- Providing support data for general use within the program (Support)
- Developing and hosting the core portion of the common user interface
- Production of the long-term archive and retrieval of all TIMED data held at the POC sites for central retention at mission closeout

7.3.2.2 POC responsibilities

- Production, service and archive of level 1-3 products for the instrument (Level 1-3). This includes calibrated radiance data and retrieved atmospheric parameters.
- Production, service and archive of survey products for their instrument. (Survey)
- Supplying the MDC with instrument planning and as flown status information (Status)
- Supplying the MDC with data product generation status information (Status)
- Development and support of the portion of the interface that relates to the instrument and/or data products
- Data service and archive of analysis products generated by the science team associated with the instrument (Level 2-4)
- Supplying data product holdings to the MDC for inclusion in the final archive
- Participating in the review of the final archive
- Providing necessary data processing support for the science team associated with their instrument

7.3.2.3 Project Science DAF responsibilities

- Production, service and archive of educational products for the mission (Educational)
- Acquisition, service and archive of collaborative products for the mission (Collaborative)
- Production, service and archive of survey products related to mission science (Survey)
- Production, service and archive of processed data relating to mission science (Level 2-4)
- Supplying the MDC with data product generation status information of above products (Status)
- Development and support of the portion of the interface that relates to data products generated at the DAF
- Supplying data product holdings to the MDC for inclusion in the final archive
- Participating in the review of the final archive

- Providing necessary data processing support for the mission scientist

7.3.2.4 Responsibilities of other DAFs

DAFs other than the project science DAF will be associated with IDS investigations or GBIs. They will be responsible for

- Production, service and archive of products generated by the associated science team (Level 2-4, survey). Note that GBI may choose to deliver their data products to CEDAR for service and archive.
- Supplying the MDC with information on planned and actual data collection activities (Status)
- Supplying the MDC with data product generation status information (Status)
- Development and support of the portion of the interface that relates to data products generated at the DAF
- Supplying data product holdings to the MDC for inclusion in the final archive
- Participating in the review of the final archive
- Providing necessary data processing support for the associated science team

7.3.3 Integration and test architecture

During the Integration and Test (I&T) phase of mission development, the MDC will be required to supply telemetry to each instrument test POC, which will be functionally equivalent to its POC. Data systems capabilities to be used during flight operations will be tested during this time, but no other SDS functions will be used during I&T.

Both the MDC and the POCs will work to ensure that telemetry services can be used with little change to an instrument GSE during I&T and its POC during flight operations.

7.3.4 Provisions for early on-orbit operations

No special requirements for early on-orbit operations have been identified at this time. The SDS activities supporting routine operations will be on-line and tested prior to launch.

7.3.5 Long term archive preparation

The long-term archive for the TIMED mission awaits definition by NASA. NASA currently operates domain-specific Virtual Observatories as active archives, and TIMED is participating in the Virtual Ionosphere Thermosphere Mesosphere Observatory (VITMO) for the ITM community. By mission closeout data products from the various remote sites will be identified and centrally collected by the MDC. The TIMED Science Working Group will determine the contents of the archive.

The baseline long-term archive contents are as follows:

- Mission documentation and status data products
- The most current version of the routine data products
- Delivered software for the production of the most current version of the routine data products
- The most current version of the data analysis products
- Support products available only through the TIMED program
- Utility software for data display and processing
- Bibliography of TIMED related publications

There will be three versions of the central MDC archive. Only the final version will be retained; the other deliveries will serve as test beds for the archive production process. The deliveries are

1. **Prototype version**, 1 year before close of spacecraft operations. This version will contain only a subset of the final required products. This version will be used to evaluate data format compatibility and communications paths necessary for final archive production.
2. **Interim version**, at the close of spacecraft operations. This version will contain all of the required archival products that exist at the close of spacecraft operations. This version will test the overall readiness of the program to assemble an archive.
3. **Final version**, 4 months before mission closeout. This version will be retained at the MDC..

7.3.6 Shared software

The sharing of software among program elements is encouraged, particularly software for reading and processing data products. To this end, the SDS will provide a facility for shared software. While formal delivery of software will not be required, it is suggested that the authors of data products provide basic utilities for reading and processing their data products. These software products will generally be hosted by their author's facility.

The program will provide a set of guidelines for software to be shared, including a minimum documentation standard. The program will provide a structure for the exchange of software, submission guidelines and instructions for users. Authors of the software will identify the software to be shared and submit it for exchange. Guidelines and standards for shared software will be listed in Appendix F in this document when they are formulated.

It should be kept in mind that users of this shared software depend upon the good will of the supplier for support.

8 World wide web services

TIMED program information will be disseminated to the community primarily through the World Wide Web. Each SDS facility will maintain a site on the Web with information and data products described below. The primary entry and coordination point will be hosted at the MDC. The major areas of the TIMED Web site are described below.

8.1 Mission planning and operations

This area will contain low fidelity coverage plots, the ability to query spacecraft and instrument timelines as well as contact plans and reports. Coverage plots will be produced by the MDC using the spacecraft position and attitude supplemented by nominal instrument pointing. These plots will display the TIMED ground track and a color-coded nominal field of regard for each of the instruments. The data used to produce these plots will be available in text format as well. Users will also be able to query spacecraft and instrument timelines. These timelines contain information about planned instrument modes and events. Contact plans and reports will also be served from this area, though the principle users of these reports will be the TIMED instrumenters.

8.2 Data products

This area will be used to distribute data to TIMED users. This area will also allow users to browse and order data products. This area will be integrated with the Mission Planning area to allow users to locate data that is of use to them. Selection criteria will include

- Time range
- Data product description
- Instrument coverage
- Instrument modes, events and anomalies

Results of the selection will be a list of products that can be submitted as a data order. Instrument coverage selections will include the geographic coverage of the field of regard of the instruments, as well as the position of the spacecraft and solar position relative to the orbital plane.

8.3 Shared software

The shared software area will allow users to browse and order software submitted by SDS teams. This software should be used carefully and may not be supported by the SDS or its author. It should serve as a guideline for a user's own software development.

8.4 Instrument/science teams

Each POC and DAF will be represented in this area of the Web site. Pages in this area will be hosted and maintained by the POC or DAF. At minimum, each facility should provide a tutorial for using their data products, provide direct access to their product archives, and provide reprocessing status. In addition, each POC should provide a description of their instrument. There will be no formal 'look and feel' standards for these areas.

8.5 Student Projects and Activities

Materials generated by the TIMED educational outreach effort will be hosted here. These materials may include K-12 directed mission descriptions and results, suggested student activities and student projects and curriculum enhancements based on the TIMED mission and its data. These and other materials will be generated by the outreach subcommittee of the TIMED Science Working Group.

8.6 Personnel Directory

A directory of TIMED personnel will be hosted on the site, including email addresses and phone numbers. Only the information approved for publication will be placed here.

8.7 Mission Related Publications

A reference list of publications related to the TIMED mission will be cataloged here. Authors should email the reference citation information to the SDS Manager at TIMEDsdsmgr@jhuapl.edu to include their publications in this bibliography.

9 Data Products

9.1 Data Product requirements

In this section, we outline specific product requirements for each of the users given in Table 6.

9.1.1 Mission operations requirements

- 9.1.1-1: TIMED mission operations requires access to both raw telemetry and level 0 data on demand and within 30 seconds from the time of receipt of data at the MDC.

9.1.2 Instrument teams requirements

- 9.1.2-1: Each TIMED instrument POC requires the level 0 data from their instrument, as well as level 0 data from the spacecraft subsystems.
- 9.1.2-2: Each POC requires 8 week advanced predicted spacecraft ephemerides and satellite ground track. Each POC requires as flown spacecraft ephemerides and ground track data.
- 9.1.2-3: The GUVI POC requires a proxy for the Ap and Kp index and F10.7 for daily routine processing.
- 9.1.2-4: The SABER and TIDI POCs require meteorological data (geopotential height and temperature as a function of pressure) for daily routine processing.

9.1.3 Science teams requirements

- 9.1.3-1: Each science team requires access to processed instrument data (level 1b-4).
- 9.1.3-2: Each science team requires a list of data products available from the TIMED mission
- 9.1.3-3: Each science team requires survey data products to aid in the location of data that are useful for analysis.
- 9.1.3-4: Each science team requires a summary of the data products produced and a basic description of instrument states for each day of TIMED on orbit operations.
- 9.1.3-5: The GUVI science team requires:
  - TIDI winds and 630nm radiance
  - SEE daily solar spectra
- 9.1.3-6: The SABER science team requires:
  - Daily temperatures from TIDI
  - Daily atomic oxygen density from GUVI
- 9.1.3-7: The Tides, Planetary Waves and Eddy Forcing Data Analysis Facility (DAF) requires:
  - Monthly/Seasonal zonal mean winds and temperatures
  - Weekly TIDI winds and temperatures
  - Weekly SABER temperatures
  - Ground based zonal and meridional winds

9.1.4 Scientific community requirements

- **9.1.4-1**: The scientific community requires access to processed instrument data (level 2-4).
- **9.1.4-2**: The scientific community requires a list of data products available from the TIMED mission.
- **9.1.4-3**: The scientific community requires survey data products to aid in the location of data that are useful for analysis.
- **9.1.4-4**: The scientific community requires a summary of the data products produced and a basic description of instrument states for each day of TIMED on orbit operations.

9.1.5 General public requirements

- **9.1.5-1**: The general public requires access to processed instrument data (level 2-4)
- **9.1.5-2**: The general public requires a list of data products available from the TIMED mission
- **9.1.5-3**: The general public requires survey data products to provide a basis for the understanding of the mission
- **9.1.5-4**: The general public requires a relevant description of research results of the TIMED mission

9.1.6 K-12 educators requirements

- **9.1.6-1**: K-12 Educators require a list of data products available from the TIMED mission
- **9.1.6-2**: K-12 Educators require survey data products to provide a basis for an understanding of the mission
- **9.1.6-3**: K-12 Educators require a relevant description of research results from the TIMED mission
- **9.1.6-4**: K-12 Educators require materials that can be used in the classroom to aid in the understanding of the TIMED mission and space-based earth observations in general

9.2 Product specifications

Table 8 provides a list of all data products available within the SDS. The columns of the table are as follows:

Product Name: A unique name for the product.

Product Description: A short textual description of the product.

Source: The facility responsible for the generation and distribution (during the mission) for the product.

Generation Class and Content Class: See 6.2.

Time Available: The amount of time required to generate and distribute the product. The times given here are measured from the time of data acquisition of the spacecraft. Note that the times given here may not apply during the first 6 months of the mission.

Available to: The list of user types and SDS facilities that the data is made available to on a regular basis.

Requirement: The requirements (from 9.1) that this product satisfies.

Reference: The number of the reference (from section 2) where the details of this products format and contents are described.

Table 8. TIMED Data Products

Product Name	Product Description	Source	Generation Class	Content Class	Time Available	Available to	Require-ment	Reference
Tlm Playback	Original telemetry packets	MDC	Automatic	Level 0	30 sec	MOC	9.1.1-1	3
Tlm Playback	Original telemetry packets	MDC	Automatic	Level 0	30 hours	POCs	9.1.2-1	3
Tlm Files	Original telemetry packets	MDC	Routine	Level 0	30 hours	POCs	9.1.1-1 9.1.2-1	3
Spacecraft position (predict)	Spacecraft Ephemerides and ground track	MDC	Routine	Status	8 wks before	All	9.1.2-2	3
Orbit ASCII files (predict)	Two line Orbit Element set	MDC	Routine	Status	8 wks before	All	9.1.2-2	3
Orbit Numbers (predict)	Predicted orbit numbers and orbit start times	MDC	Routine	Status	8 wks before	All	9.1.2-2	3
Spacecraft position (actual)	Spacecraft Ephemerides and ground track	MDC	Routine	Status	12 hours	All	9.1.2-2	3
Orbit ASCII files (actual)	Two line Orbit Element set	MDC	Routine	Status	12 hours	All	9.1.2-2	3
Orbit Numbers (actual)	Predicted orbit numbers and orbit start times	MDC	Routine	Status	12 hours	All	9.1.2-2	3
Geomag. indices	K_p, A_p, F 10.7	MDC	Routine	Support	12 hours	All	9.1.2-3	3
NMC data	Pressure and Temperature data near the ground track	MDC	Routine	Support	24 hours	All	9.1.2-4	3
Instrument status (planned)	Planned instrument states and events	POCs	Routine	Status	2 wks before	MDC	9.1.3-4	
Instrument status (as-flown)	As-flown instrument states, events and anomalies	POCs	Routine	Status	54 hours	MDC	9.1.3-4 9.1.4-4	
Mission history database	Combined instrument status and spacecraft position	MDC	Automatic	Status	72 hours	All	9.1.3-4 9.1.4-4	3
Data Product Catalog	Program wide listing of available data products	MDC	Automatic	Status	72 hours	All	9.1.3-2 9.1.4-2 9.1.5-2 9.1.6-1	This Document
GUVI Level 1A data	Compressed pixels. Unprocessed instrument data at full resolution, time-tagged, s/c location specified and tagged with a preliminary data quality flag. Created aperiodically. Three separate files: ➢ Imaging file ➢ Static Imaging file ➢ Spectrograph file	GUVI POC	Automatic	Level 1a	54 hours	Science Teams	9.1.3-1	TBD
GUVI Imaging Disk data	Radiance data from disk mode. Gridded in GUVI-based viewing coordinates. Full 2-D resolution at 5 colors. Contains the following parameters: ♦ Proton auroral boundaries ♦ Mixed auroral boundaries	GUVI POC	Routine	Level 1c	54 hours	Science Teams	9.1.3-1	TBD

Product Name	Product Description	Source	Generation Class	Content Class	Time Available	Available to	Require-ment	Reference
GUVI Imaging Limb data	Radiance data from limb mode. Gridded in GUVI-based viewing coordinates. Full 2-D resolution at 5 colors	GUVI POC	Routine	Level 1c	54 hours	Science Teams	9.1.3-1	TBD
GUVI Spectro-graph Data	Radiance data, geolocated but not gridded or binned. Contains the following parameters: ♦ Spectrograph counts	GUVI POC	Routine	Level 1c	54 hours	Science Teams	9.1.3-1	TBD
GUVI Level 2B Imaging Disk Dayside	Radiance data, geolocated, gridded and binned to a 100 km x 100 km resolution. Contains the following parameters: ♦ Proton auroral boundaries ♦ Mixed auroral boundaries ♦ O/N_2 ratio	GUVI POC	Routine	Level 2b	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
GUVI Level 2B Imaging Disk Nightside	Radiance data, geolocated, gridded and binned to a 100 km x 100 km resolution. Contains the following parameters: ♦ Proton auroral boundaries ♦ Mixed auroral boundaries ♦ TEC	GUVI POC	Routine	Level 2b	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
GUVI Level 2B Imaging Limb Dayside	Radiance data, geolocated, gridded and binned to a 100 km x 100 km resolution. Contains the following parameters: ♦ O NDP ♦ O_2 NDP ♦ N_2 NDP ♦ Qeuv ♦ Temperature profile	GUVI POC	Routine	Level 2b	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1 9.1.3-6	TBD
GUVI Level 2B Imaging Limb Nightside	Radiance data, geolocated, gridded and binned to a 100 km x 100 km resolution. Contains the following parameters: ♦ Qeuv ♦ EDP	GUVI POC	Routine	Level 2b	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
GUVI Level 2B Imaging Disk Aurora	Radiance data, geolocated, gridded and binned to a 25 km x 25 km resolution. Contains the following parameters: ♦ Proton auroral boundaries ♦ Mixed auroral boundaries ♦ Column ionization rate ♦ Height of peak in ionization rate ♦ Total vertical column density at the peak of the ionization rate ♦ Q ♦ <E> ♦ EDP	GUVI POC	Routine	Level 2b	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
GUVI Survey	GUVI survey products	GUVI POC	Routine	survey		All	9.1.3-3 9.1.4-3 9.1.5-3 9.1.6-2	TBD
SABER Level 1b Data	Calibrated radiance profiles converted to radiance units with instrument effects removed, geolocated and gridded to uniform angle spacing.	SABER POC	Routine	Level 1b	54 hours*	Science Teams	9.1.3-1	TBD
SABER Level 2a Data	Profiles of kinetic temperature, pressure, density; Profiles of emission rates of NO, OH, O_2; ♦ Contains the following parameters:O_3, H_2O, CO_2, O, H mixing ratio ♦ O_2, NO, OH VER	SABER POC	Routine	Level 2a	54 hours*	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD

Product Name	Product Description	Source	Generation Class	Content Class	Time Available	Available to	Require-ment	Reference
SABER Level 2b Data	Profiles of CO_2, O and H mixing ratio Profiles of cooling rates from CO_2, NO, O_3 and H_2O Profiles of heating rates from O_3, O_2 and CO_2 Profiles of cooling rates from CO_2, NO, O_3 and H_2O Profiles of heating rates various reactions Profiles of emission and heating efficiency from OH and O_2 Profiles of geotropic wind	SABER POC	Analysis	Level 2b		All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
SEE EGS Level 2 Data	EGS daily averaged solar irradiance (calibrated, at 1-Angstrom resolution, degradation correction applied)	SEE POC	Routine	Level 2	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
SEE XPS Level 2 Data	XPS daily averaged solar irradiance (calibrated, at instrument resolution, degradation correction applied)	SEE POC	Routine	Level 2	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1	TBD
SEE Level 3 Data	Daily averaged solar irradiance 1nm bins with degradation applied	SEE POC	Analysis	Level 3	3 month	All	9.1.3-1 9.1.4-1 9.1.5-1 9.1.3-5	TBD
SEE Educationa l data	Solar XUV indices	SEE POC	Routine	Edu-cational	54 hours	All	9.1.6-4	TBD
TIDI LOS quantities	Line OF Sight quantities for each spectrum	TIDI POC	Routine	Level 1b	54 hours	Science Teams	9.1.3-1	TBD
TIDI Profiles	Retrieved profiles of each geophysical quantity	TIDI POC	Routine	Level 2	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1 9.1.3-5 9.1.3-6	TBD
TIDI Vectors	Vector wind profiles formed on uniformly spaced grid points	TIDI POC	Routine	Level 3	54 hours	All	9.1.3-1 9.1.4-1 9.1.5-1 9.1.3-7	TBD
GSWM winds	Global Scale Wave Model zonal and meridional tidal winds for each month	Tides, planetary waves and eddy forcing DAF	Routine	Level 4	every 6 months	All	9.1.3-1 9.1.4-1	TBD
GSWM temper-ature	Global Scale Wave Model tidal temperatures for each month	Tides, planetary waves and eddy forcing DAF	Routine	Level 4	every 6 months	All	9.1.3-1 9.1.4-1	TBD
GSWM vertical velocities	Global Scale Wave Model tidal vertical velocities	Tides, planetary waves and eddy forcing DAF	Routine	Level 4	every 6 months	All	9.1.3-1 9.1.4-1	TBD
GSWM planetary winds	Global Scale Wave Model zonal and meridional planetary wave winds	Tides, planetary waves and eddy forcing DAF	Analysis	Level 4		All	9.1.3-1 9.1.4-1	TBD

Product Name	Product Description	Source	Generation Class	Content Class	Time Available	Available to	Require-ment	Reference
GSWM planetary temper-atures	Global Scale Wave Model planetary wave temperatures	Tides, planetary waves and eddy forcing DAF	Analysis	Level 4		All	9.1.3-1 9.1.4-1	TBD
GSWM planetary vertical velocities	Global Scale Wave Model planetary wave vertical velocities	Tides, planetary waves and eddy forcing DAF	Routine	Level 4		All	9.1.3-1 9.1.4-1	TBD
Millstone Hill Radar Neutral Wind	Horizontal neutral wind (meridional and zonal components in the E-region, meridional component in the F-region), F-region electric field.	MHR GBI	Analysis	Collab-orative	After 4 or 5-day campaigns (2-3 per year)	All		TBD
Millstone Hill Radar Basic Te, Ti, Ne, Vi	Model-calibrated ion and electron temperature, electron density and line-of-site ion drift velocity from combined local E- and F-region measurements.	MHR GBI	Routine	Collab-orative	After 4 or 5-day campaigns (2-3 per year)	All		TBD
Millstone Hill Radar Refined Te, Ti, Ne, Vi	Manually calibrated ion and electron temperature, electron density and line-of-site ion drift velocity from combined local E- and F-region measurements.	MHR GBI	Analysis	Collab-orative	After 4 or 5-day campaigns (2-3 per year)	All		TBD
MLTR Harmonic Fits	Mean amplitude, 12 hour and 24 hour amplitude and phase determined from a weighted least squares fit to 4 consecutive days of data. Available from 32 worldwide sites	MLTR GBI	Routine	Collab-orative	bimonthly	All		TBD
MLTR and TIDI Overpasses	Ground-based radar and TIDI wind data for times when the TIDI measurement is within 1000km of the ground-based radar location. All radar data within +/- 1 hour of the overpass is included for the ground-based radar. Available from 32 worldwide sites	MLTR GBI	Routine	Collab-orative	bimonthly	All		TBD
Super-DARN Global Convection Maps	10-minute resolution global Ionospheric convection maps	Super-DARN GBI	Routine	Survey	daily	All		TBD

*SABER will provide these products with a delay of 2 weeks during the first three months, then 1 week during the next three months. After six months the delay becomes 54 hours.
** Effective assumes precipitating particles are pure electrons

9.3 Requirements allocation

A cross-reference between requirements and data products is given in Table 9. Products containing the research results of TIMED have not been defined yet.

Table 9. Product requirement allocations

Requirement	Products
9.1.1-1	Tlm Playback Tlm Files
9.1.2-1	Tlm Playback Tlm Files
9.1.2-2	Spacecraft Position (predict) Spacecraft Position (actual)
9.1.2-3	Geomag. indices
9.1.2-4	NMC Data

Requirement	Products
9.1.3-1	GUVI Level 1A data GUVI Disk Data GUVI Limb Data GUVI Proton auroral boundaries GUVI Mixed auroral boundaries GUVI Spectrograph Data GUVI TEC, nightside disk GUVI EDP, nightside limb GUVI O/N2 ratio, dayside disk GUVI O NDP, dayside limb GUVI O2 NDP, dayside limb GUVI N2 NDP, dayside limb GUVI Temperature, dayside limb GUVI Q, aurora GUVI <E>, aurora GUVI E-Region EDP, aurora SABER level 1b Data SABER level 2 parameters SABER level 2 emission rates SABER abundances SABER cooling rates SABER solar heating rates SABER chemical heating rates SABER airglow SABER geostrophic wind SEE level 1b data SEE level 2 data SEE level 3 data TIDI LOS quantities TIDI profiles TIDI mapped data
9.1.3-2	Data Product Catalog
9.1.3-3	GUVI Survey
9.1.3-4	Instrument status (planned) Instrument status (actual) Mission history database
9.1.3-5	TIDI profiles SEE level 3
9.1.3-6	TIDI profiles GUVI O NDP, dayside limb
9.1.3-7	TIDI mapped data

Requirement	Products
9.1.4-1	GUVI TEC, nightside disk GUVI EDP, nightside limb GUVI O/N2 ratio, dayside disk GUVI O NDP, dayside limb GUVI O2 NDP, dayside limb GUVI N2 NDP, dayside limb GUVI Temperature, dayside limb GUVI Q, aurora GUVI <E>, aurora GUVI E-Region EDP, aurora SABER level 2 parameters SABER level 2 emission rates SABER abundances SABER cooling rates SABER solar heating rates SABER chemical heating rates SABER airglow SABER geostrophic wind SEE level 2 data SEE level 3 data TIDI profiles TIDI mapped data GSWM winds GSWM temperatures GSWM vertical velocities GSWN planetary winds GSWM planetary temperatures GSWM planetary vertical velocities
9.1.4-2	Data Product Catalog
9.1.4-3	GUVI Survey
9.1.4-4	Mission history database Instrument status (planned) Instrument status (actual)

Requirement	Products
9.1.5-1	GUVI TEC, nightside disk GUVI EDP, nightside limb GUVI O/N2 ratio, dayside disk GUVI O NDP, dayside limb GUVI O2 NDP, dayside limb GUVI N2 NDP, dayside limb GUVI Temperature, dayside limb GUVI Q, aurora GUVI <E>, aurora GUVI E-Region EDP, aurora SABER level 2 parameters SABER level 2 emission rates SABER abundances SABER cooling rates SABER solar heating rates SABER chemical heating rates SABER airglow SABER geostrophic wind SEE level 2 data SEE level 3 data TIDI profiles TIDI mapped data GSWM winds GSWM temperatures GSWM vertical velocities GSWN planetary winds GSWM planetary temperatures GSWM planetary vertical velocities
9.1.5-2	Data Product Catalog
9.1.5-3	GUVI Survey
9.1.5-4	
9.1.6-1	Data Product Catalog
9.1.6-2	GUVI Survey
9.1.6-3	
9.1.6-4	SEE educational data

10 Ground based data

The TIMED program has established formal collaborations with ground based observers as given in Table 10. The management of the data resulting from these collaborations is the responsibility of the SDS. The selected collaborators have various types of facilities for data acquisition and handling. Those facilities with infrastructures that are suitable for distributing and archiving data will function as Data Analysis Facilities (DAFs). As such, the policies and procedures for the management of these facilities are described in sections 7.2 and 7.3.2.4 and Appendix G of this document. Chief among these are hosting a Web site for data distribution and providing the MDC with descriptions of these data, notifications of availability of new data files as they are generated, and information of planned and actual data collection activities. Those facilities that do not have sufficient infrastructure will supply their data to the CEDAR database for central archive and distribution of the ground-based data.

Table 10. TIMED Ground Based Investigators

PI	Instruments	Proposal Title	Archive Facility (during TIMED Mission)
Susan Avery	Antarctic MLT radars	Dynamics of the Antarctic MLT region	MLTR DAF

PI	Instruments	Proposal Title	Archive Facility (during TIMED Mission)
Bill Bristow	HF radars	SuperDARN contributions to TIMED/CEDAR	SuperDARN DAF
Mark Conde	ASI-FPI + FPI	Thermospheric vertical wind observations	CEDAR
Geoff Crowley	AMIE/TIME-GCM models	Global Joule heating and atmospheric response	CEDAR
Ray Greenwald	HF radars	SuperDARN contributions to TIMED/CEDAR	SuperDARN DAF
Maura Hagan	GSWM/TIME-GCM models	TIMED/CEDAR global scale ITM interactions	CEDAR
Jim Hecht	4 channel photometers	Lower thermospheric composition studies	CEDAR
Ruth Lieberman	low-middle lat MLT radars, models	Tidal, planerary and mean wind variability	MLTR DAF
Scott Palo	high-lat NH MLT radars	Coordinated analysis of the MLT	MLTR DAF
Joe Salah	IS radars	Geomagnetic storm effects on the lower thermosphere	MHR DAF
Brad Sandor	models	Chemical-dynamical interaction in the mesosphere	CEDAR
Joe She	lidar	Two-beam sodium lidar for CEDAR-TIMED	CEDAR
Abas Sivjee	Michelson Interferometers, CCD spectrometers	Energetics and dynamics of the MLT region	CEDAR
Gary Swenson	All-sky imager, Michelson Interferometer, MF radar	Gravity wave studies at Albuquerque, NM	CEDAR
Mike Taylor	All-sky imagers, Mesospheric Temperature Mapper	Collaborative all-sky image measurements	CEDAR

See Appendix G for an excerpt from the NASA Research Announcement.

The determination of data product types for ground-based data will be completed before launch.

11 Educational outreach

Educational outreach is an important part of the TIMED mission. A large part of the outreach effort is the generation of educational materials and data products for use by teachers and students both inside and outside the classroom. A subcommittee of the TIMED SWG is currently studying the generation of these products. It will be the responsibility of the SDS to manage the products generated by the educational outreach effort. An area of the common user interface (section 8.5) shall be dedicated to outreach products. This area will be hosted and maintained by the MDC. Its structure, content and implementation will be the responsibility of the outreach subcommittee of the SWG.

Appendix A – Guidelines for Data Use (Rules of the Road)

Users of TIMED data are asked to respect the following guidelines

- Mission scientific and model results are open to all.
- Users should contact the PI or designated team member of an instrument or modeling group early in an analysis project to discuss the appropriate use of instrument data or model results. This applies to TIMED mission team members, guest investigators, and other members of the scientific community or general public.
- Users that wish to publish the results derived from TIMED data should normally offer co-authorship to the PI or his/her designated team member. Co-authorship may be declined. Appropriate acknowledgement to institutions, personnel, and funding agencies should be given.
- Users should heed the caveats of investigators as to the interpretation and limitations of data or model results. Investigators supplying data or models may insist that such caveats be published, even if co-authorship is declined. Data and model version numbers should also be specified
- Pre-prints of publications and conference abstracts should be widely distributed to interested parties within the mission and related projects.

Appendix B - Data Product Specification

Data Product Specification Purpose

The goal of the Data Product Specifications is to provide a uniform description of all the data products being exchanged for TIMED. There should be a data product specification for each product that is generated and/or exchanged among TIMED entities. These specifications will be assembled and made available as a data location aid, as well as assisting in interface definition.

Table 11. Data Product Specification Information

The table below lists the information to be specified for each product.

Field Name	Optional/ Required	Notes
Product Name	R	A unique name for the product
Source	R	The facility that produces the product
File Naming Convention	R	
Description/Purpose	R	Free text describing what the product is for
Data Product Version	R	Required for SDS controlled products only
Data Generation Classifier	R	[Routine | Analysis | Automated]
Data Content Classifier	R	[Level n | Survey | Support | Education | Status | Collaborative]
Generation Trigger	O	Event that causes this product to be generated
Frequency	O	Only required for regularly delivered products
File Size	O	Approximate upper limit of file size
File Type	R	[netCDF | ASCII | Other]
Contents	O	ASCII files - description of field contents and formats netCDF - CDL file for this product Other - format/content definition
Intended Recipient	O	See section 7.1 for supported users.
Comments	O	Free text, any additional description
Data Product Version Description	R	Required for SDS products if no reference is available
Product Format Version Description	R	Required for SDS products if no reference is available
Software Major Version Description	R	Required for SDS products if no reference is available
Input/Cal Major Version Description	R	Required for SDS products if no reference is available
DQ-Confidence	R	Confidence level of quality of data product type [High | Reasonable | Low]
DQ-Version	R	[Current | Preliminary | Supercede | Test | Special]
DQ-Review	R	Level of review product version has undergone [Full | Partial | Inference | None]
DQ-Uses	R	Appropriate audience for data type [Survey | Quicklook | Detail | Trend | Educational]
Parameters	R	List of science parameters contained in this file
Instrument Mode	R	Instrument modes in effect in this file
Max Altitude Covered	R	Maximum value of altitude coverage
Min Altitude Covered	R	Minimum altitude coverage
Reference	O	reference to another document describing this product

Descriptions of Field Value choices:

Data Generation Classifier:

See 6.2.

Data Content Classifier:
See 6.3.

DQ-Confidence:
- High - The investigator feels that this is an excellent measurement with little or no spurious artifacts
- Reasonable - The investigator feels that this is a good measurement; however, it should be handled with the same care as most other remote sensing data sets. It is recommended that you consult with the investigator before using this data set.
- Low - There may be important problems with this data set. Contact the investigator before using this data.

DQ-Version:
- Current - This version represents the best data available.
- Preliminary – This version is verified and is intended to become the current version.
- Supercede - This version has been superceded by a more recent version.
- Test - This version is new, but not completely verified.
- Special - This version has limited applicability.

DQ-Review:
- Full - Data set has been examined and validated. Its overall quality and contents are well known
- Partial - Data set has had a cursory examination and has been partially validated. Its overall quality and contents are known, but a full review has not been conducted.
- Inference - Data set has been validated by a process that has been demonstrated to produce data of a known quality. No review of this individual product has been done.
- None - Data set has not been reviewed and its quality is not know.

DQ-Uses:
- Survey - Appropriate for data location and qualitative purposes only.
- Quicklook - Appropriate for exploratory analysis but not intended to be used for high precision analyses.
- Detail - Appropriate for most forms of quantitative analysis.
- Trend - Appropriate for tracking geophysical trends. Data set, which generally covers long periods of time, and will be processed from a large set of quantitatively accurate data sets with stable calibration.
- Educational - Appropriate for use by K-12 educators and students.

Submission format

Each data product specification should be contained in a separate ASCII file containing the information given above. For each field, specify the field name, followed by a colon, followed by the field content. Fields should be separated by a blank line.
Example file:

---

product name: NMC atmospheric state data
File-naming convention: MDC__yyyydddhh.nmc
description/purpose: report meteorological variables (pressure, temperature and altitude)
data generation classifier: routine
data content classifier: support
frequency: 2 times/day
file size: ~10 MB
file type: netCDF

Appendix C - TIMED Versions and Revisions

Data Product Revision Number

A data product revision number should be part of the file naming convention for all products. This should be a 2-digit number, beginning at 01, that indicates how many times the product has been regenerated with the same processing software and input data files. This number does not indicate processing version, rather, it indicates how many times a particular file has been produced. In most cases, this number is expected to be 01, however, data entry errors, transmission problems or other types of failures may cause a product to be re-released.

Data Product Version Number

The data product version number should be part of the file naming convention as well. This will be a 3-digit number, beginning at 001 that indicates how many times the content or format for the product type has changed. The data product version number should be incremented whenever one or more of the following version numbers change:

- Product Format Version
- Major Software Version
- Major Input/Cal Version

Product Format Version Number

The data product version will be a 3-digit number, beginning at 001, that indicates how many times the format of the product type has changed. In practice, any changes to a product that might require alterations of the software that reads the product should cause an increment in the format version. These changes include, but are not limited to, addition or modification of global attribute types, changes in data type, new variables and changes of units.

Software Version Number

The software version will be two sets of 2 numbers, beginning at 01, delimited by a period (e.g. 03.04). These numbers are incremented each time the processing software that generates this data product type changes. The first two numbers represent the Major software version; the second 2 numbers represent the Minor software version.

The Major software version is incremented each time there are major changes in processing algorithms that are likely to affect the quality of the data.

The Minor software version is incremented for bug fixes, input interface changes, or other software changes that do not substantially affect the quality of the resulting data. This is included to allow users to track bugs that may be introduced by minor software changes that most likely will not alter data quality.

Input/Cal Version Number

The Input/Cal version will be two sets of 2 numbers, beginning at 01, delimited by a period (e.g. 03.04). These numbers are incremented each time the version of the calibration files or other data products that are used to generate the data products are changed. Major and Minor versions are used here in the same way as the Software version number.

Appendix D - Acronyms and Abbreviations

APL	Applied Physics Laboratory
CCB	Change Control Board
CDF	Common Data Format (see netCDF)
CEDAR	Coupling Energetics and Dynamics of Atmospheric Regions
CI	Collaborative Investigator
Co-I	Co-investigator
DAF	Data Analysis Facility
DEC	Declination
DMP	Data Management Plan
DQ	Data Quality
ECI	Earth-Centered Inertial
EOS	Earth Observing System
EUV	Extreme Ultraviolet
FTP	File Transfer Protocol
GB	Gigabyte
GBI	Ground Based Investigator
GSFC	Goddard Space Flight Center
GIIS	General Instrument Interface Specification
GPS	Global Positioning System
GUVI	Global Ultraviolet Imager
I&T	Integration and Test
ICD	Interface Control Document
IDS	Interdisciplinary Scientist
ITM	Ionosphere, Thermosphere Mesosphere
JHU	the Johns Hopkins University
K-12	Kindergarten through secondary education
LASP	Laboratory for Atmospheric and Space Research
MB	Megabyte
MDC	Mission Data Center
MHR	Millstone Hill Radar
MLTI	Mesosphere and lower thermosphere/ ionosphere
MLTR	Mesosphere and Lower Thermosphere Radar
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
netCDF	Network Common Data Format
NMC	National Meteorological Center
PI	Principle Investigator
POC	Payload Operations Center
RA	Right Ascension
SABER	Sounding of the Atmosphere using Broadband Emission Radiometry
SDS	Science Data System
SEE	Solar EUV Experiment
SuperDARN	Super Dual Auroral Radar Network
SWG	Science Working Group
TBD	To Be Determined
TIDI	TIMED Doppler Interferometer
TIMED	Thermosphere Ionosphere Mesosphere Energetics and Dynamics
TLM	Telemetry
VITMO	Virtual ITM Observatory
Web	World Wide Web (also WWW)
WWW	World Wide Web (also Web)

Appendix E - Glossary

Analysis Data Products: Data products that are generated as the result of data analysis or other human intensive process.

Automated Data Products: Data products that are generated on demand from a user request.

CEDAR Database: An existing data processing facility that archives and distributes data funded by CEDAR programs.

Common User Interface: User interface for the SDS. The interface is developed and hosted by multiple facilities but provides a single point of entry for all users. See section 8.

Data Analysis Products: Data products that result from focused data analysis. These products are generally not produced on a regular basis. These are to be contrasted with routine data products.

Data Parameters: Data items such as time, pressure, temperature.

Data Product Type: Data of a specific content class for a defined time span, such as the NMC data product generated by the MDC every 24 hours.

Data Product File: A specific instance of a data product type, such as the NMC data file for May 24, 1999.

Experiment Plan: Documented activities of the TIMED and Ground-based instruments for the purpose of collecting data to support scientific study.

Routine Data Production: The process of building routine data products.

Routine Data Products: Data products that are generated regularly and systematically with a minimum of human intervention. These are to be contrasted with data analysis products.

Test POC: Payload Operations Center employed during integration and test.

TIMED Science Working Group: This group is responsible for scientific direction of the TIMED mission. It is composed of the project scientist, the principal investigators of each of the four TIMED instruments, the interdisciplinary scientists (IDSs), and one representative from the ground based observation community.

Appendix F - Guidelines and Standards for Shared Software

Languages

Coding Styles

README files

Hardware platforms

Maintenance

Technical Support

Appendix G - Data Policy Statement for TIMED GBIs

This data policy statement is taken from the NASA Research Announcement NRA-99-OSS-01, Appendix A.

Data Policy

The TIMED program data policy calls for complete and immediate public access to all of the TIMED mission data. Commensurately prompt public access to CI data is also important for effective collaborative efforts; therefore, the speed and appropriateness of the data distribution plans will be an important element in the evaluation of proposal merit. Therefore, those CI's proposing to provide data in support of CEDAR/TIMED science must consider the following guidelines relating to data access and distribution:

- CI's have the option of hosting a Web site to distribute their data files or delivering the files as soon as possible to the CEDAR database. Proposals should describe plans for implementing one or both of these procedures and indicate the expected time required for data delivery.
- CI data files should be produced in netCDF format via the Web or delivered to CEDAR in a format compatible with the CEDAR database. Other data formats will be acceptable provided the proposals make a convincing case that the data can be easily accessed by other users.
- CI proposals should identify the type and quantity of data that will be contributed as part of the CEDAR/TIMED collaborative project. Proposals should describe whether the data will be obtained routinely in a standard data-taking mode, or only during selective campaigns or satellite overpasses necessitating advanced planning of operating modes and instrument configurations.
- Data providers will be expected to provide a text description of the contents, version and quality of the data in each type of data file they produce. This description (called a Data Product Specification) will be under configuration control.
- Data providers will send to the TIMED Mission Data Center a notification of the availability of each data file. This Product Availability Notice is a short fixed format text file describing each data file, including the file's URL. This information will be included in the mission data catalog that allows data users to identify and search mission data products.
- CI's will also be expected to provide information about planned and actual data collection activities in the form of text timeline files.
- CI's who also host Web sites containing the data are expected to provide reliable web access to the data for the life of the TIMED mission with minimal site down-time. These CI's will also support the bulk transfer of all data files for final archiving. These transfers will occur one year after launch, at the end of mission operations, and four months before mission close-out. In addition, these sites should provide site access statistics and share a common user registration database.
- All CI's will be expected to participate in pre-launch data system testing in late 1999 and early 2000, which will involve Web distribution of sample data file.