TIMED Mission Archive Plan

1. Purpose and Scope

This document provides a plan for creation of the final archive of the science products, ephemerides, documentation, and tools created for the TIMED mission. In this plan we; 1) capture an assessment of the current state of products and documentation and 2) discuss new products that will be generated. This plan lists the individual data products and documents that will constitute the mission archive for the TIMED program. In this plan we will also summarize steps necessary for electronic transport of all products and documentation for inclusion in a Final Archive. Portions of this plan have been tested in development of a test archive of SEE data products that were transmitted to SPDF for final archive. Products and documents listed here include products developed by five centers 1) the TIMED Science Data System (SDS), and the Mission Data Center (MDC) at the Johns Hopkins University Applied Physics Laboratory; 2) the Global Ultraviolet Imager (GUVI) Payload Operations Center (POC) at the Johns Hopkins University Applied Physics Laboratory; 3) the TIMED Doppler Interferometer (TIDI) POC at the University of Michigan; 4) the Solar EUV Experiment (SEE) POC at the University of Colorado; and 5) the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) POC at Hampton University, Virginia.

2. Mission Archive Contents

2.1. Science Data

2.1.1. GUVI Current Products

Table 1 Current GUVI Data Products

Data Product	Description	Format
Level 1A - spectrograph	Raw detector count data	NetCDF
Level 1B – disk & limb	5 color calibrated and geolocated UV radiance image data.	NetCDF
Level 1B - spectrograph	Single pointed full wavelength calibrated and geolocated	NetCDF
Level 1C – disk, limb	5 color radiance data binned onto a uniform grid	NetCDF
Level2B – limb NDP	Neutral density data derived from limb data	IDL saveset
Level2B – limb EDP	Electron density profiles derived from limb data	NetCDF and IDL saveset
Level 3 - Aurora	Daily derivations of auroral region mean energy (E_0) and energy flux (Q)	NetCDF and IDL saveset
Level 3 - O/N_2	Daily O/N_2 ratios	NetCDF and IDL saveset
Level 3 - O/N_2 vs. CODE-TEC	3 day combined monatomic O/N_2 ratio data compared to CODE-TEC	NetCDF and IDL saveset
Level 3 - EDP	Electron Density Profile parameters: HmF2, NmF2, and TEC	NetCDF and IDL saveset
Survey Images L1B imaging data	All GUVI limb images for one day on a single plot one plot; all GUVI disk	PNG
Survey Images L1C disk data by orbit	GUVI L1C data plotted for single orbits.	PNG
Survey Images L1C Auroral disk data by orbit	GUVI L1C polar region images for a single orbit	PNG
Nightside Cylindrical Composite Disk Images	GUVI Level 1C nightside multicolor disk image for a complete day	PNG
Strip Disk Composite Images	GUVI Level 1C dayside multicolor disk image for a complete day	PNG
Strip Limb Composite Images	GUVI Level 1C dayside and nightside multicolor limb image for a complete day	PNG
Survey Images level 3 Auroral	Orbit by orbit plots of Q and E_0	PNG, postscript

Survey Images Level 3 Thermospheric	Global plots of O/N_2	GIF, postscript
Survey Images Level 3 O/N_2 and CODE-TEC	Global plots of O/N_2 compared with CODE-TEC	GIF, postscript
Survey Images Level 3 EDP	Global plots of daily Electron Density Profile data (HmF2, NmF2, TEC)	PDF, postscript
Housekeeping	Instrument parameters	ASCII text

The GUVI POC data processing is current and creates a variety of products, files for data in levels 1-3 and summary images as well. Data format and content definitions for all GUVI products and files are provided on the GUVI website. These are all available from the GUVI website (http://guvi.jhuapl.edu/) and are currently addressable through the Virtual ITM Observatory (VITMO).

2.1.2. GUVI Future Products

A new GUVI calibration has been produced and a new data processing pipeline derived from the DMSP SSUSI instrument has been developed. This new pipeline will be used to reprocess all GUVI data and produce new versions of existing products with existing science content as well as new science products originally produced by the SSUSI instrument processing software. This is expected to be the final instrument calibration and will produce Version 12 Level 1B radiance products. It is expected that a complete reprocessing of all GUVI data products will be complete within one year. Due to the failure of the instrument scan mirror GUVI is now operating in spectrographic mode and new data products are being developed for this instrument mode. New products produced from the new pipeline are listed in Table 2 below.

Table 2. New GUVI Data Products to be Produced using new Processing Pipeline

Data Product	Description	Format
Level 1B Expanded - imaging	Level 1B combined disk and limb with added information: TIMED ephemeris and Calibration responsivities in a SSUSI-like format	NetCDF
Level 1B Expanded - spectrograph	Level 1B with added information: 5 imaging colors plus NO color, plus TIMED ephemeris and more detailed error information	NetCDF
Survey Images - L1B spectrograph	Interpolated GUVI strip spectrograph radiance data	PNG
Survey Images – L1B spectrograph time series	Derived 6 color GUVI radiances orbit by orbit	PNG
Level 1C – spectrograph	6 color radiances binned onto a uniform strip	NetCDF
Level1C – radiance map	Google Maps images of the level 1C radiances	Google KMZ
Level2B – limb NDP	Neutral density data derived from limb data	NetCDF
Level2B – 3D ionosphere	3 dimensional electron density data and detected ionospheric bubble properties	NetCDF
Level2B – Aurora	Auroral imagery, boundaries, Q, E0, hemispheric power, proton precipitation regions	NetCDF
Level2B – auroral images	Google Maps images of the auroral products	Google KMZ
Level1C – 3D ionosphere	Google Maps images of the electron densities and ionospheric bubbles	Google KMZ
Level 3 - O/N_2	Daily O/N_2 ratios	NetCDF
Level 3 – Column NO from spectrograph	Column NO derivcd from spectrographic data	NetCDF
Level 3 – TEC	TEC derived from disk imager and spectrograph data.	NetCDF
Level 3 - Qeuv	Derived integrated solar flux from 5-50 nm from disk imager and spectrograph data	NetCDF
Level 3 –aurora	Summary of auroral parameters (boundaries, hemispheric power, Q, E0) over a day	NetCDF
Level 3 – Equatorial anomaly (EIA) crest/trough	Location and crest/trough ratio of equatorial anomaly from nightside disk data	NetCDF

ratio and location		

2.1.3. TIDI Science Products

Table 3. TIDI Data Products

Product	Description	Dates	Geophysical Quantities	Available from TIDI SDS
Level 0	Telemetry data that has been reconstructed. The product is unprocessed instrument data at full resolution.	2001348-present	1) raw spectra	Yes
Level 1 (Line of Sight)	Level 0 data that have been processed into sensor units. The product is time referenced and annotated with ancillary information including tangent point position, solar zenith angle, and local solar time. Geophysical data have been fully corrected for instrumental effects.	2002050 – present	1) calibrated spectra 2) line of sight winds 3) airglow brightness	Yes
Level 2 (Profile)	Level 1 spectra that have been processed into vertical profiles of geophysical quantities on a uniform altitude grid. These vertical profiles are at the highest available horizontal and temporal resolution.	2002050 – present	1) inverted wind profiles along a line of sight 2) inverted volume emission rate profiles	Yes
Level 3 (Vector)	Level 2 data that have been mapped onto a uniform time and position grid.	2002050– present	1. inverted vector wind profiles 2. O_2 atmospheric band volume rate	Yes

The TIDI data processing is current and consists of Level 1 version 11, Level 2 version 11 and Level 3 version 11. TIDI provides example IDL and Fortran readers for the data on their web site and will make them available for the VITMO data support tools catalog. All levels of the data except L0 exist in NetCDF format and are available through VITMO.

2.1.4. SEE Science Products

Table 4. SEE Data Products

Product Name	Description	Availability from the TIMED SDS
Level 2 EGS	Daily averaged EGS irradiance, fully calibrated at 0.1 nm sampling (full wavelength resolution)	YES
Level 2A EGS	Observation averaged (3 min) EGS irradiance, fully calibrated at 0.1 nm sampling (full wavelength resolution)	YES
Level 2 XPS	Daily averaged XPS irradiance, fully calibrated broadband measurements	YES
Level 2A XPS	Observation averaged (3 min) XPS irradiances, fully calibrated broadband measurements	YES
Level 2B EGS Occultations	Atmospheric transmission measurements from the EGS at 0.1 nm sampling (full wavelength resolution)	YES
Level 3	Daily averaged, fully calibrated solar irradiance from EGS and XPS merged at 1 nm	YES
Level 3A	Observation averaged (3 min) fully calibrated solar irradiance from EGS and XPS merged at 1 nm	YES
Space Weather (Level 2A)	8 solar indices from SEE measurements are provided with an emphasis on providing data as fast as possible. These are not fully	YES

	calibrated.	
Level 4 Model	0.1 nm model spectrum from 0.1-40 nm based on XPS diode measurements (usually 10 sec).	YES
Level 4A Model	Observation averaged 0.1 nm model spectrum from 0.1-40 nm based on XPS diode measurements	YES
Composite Lyman-alpha	A long-term daily record of H I 121.5 nm dating from 1947 to present incorporating models and many instrument measurement.	No

All of the products and tools are available from the TIMED-SEE FTP site at ftp://laspftp.colorado.edu/pub/SEE_Data and that can also be accessed from the TIMED-SEE web site at http://lasp.colorado.edu/see/. Many of these are also available from the TIMED SDS at JHU-APL and are also available through VITMO.

Version 11 is the current version of the SEE data products and contains the final degradation corrections and incorporates the cross-calibration from EVE, an instrument launched on the Solar Dynamics Observatory in February 2010.

2.1.5. SABER Science Products

Table 5. SABER Data Products

Product	**Description**	**Geophysical Quantities**	**Available from SABER / TIMED SDS**
Level 0	Telemetry data that has been reconstructed. The product is unprocessed instrument data at full resolution.	raw sensor data	No
Level 1b	Level1 software reads in Level 0 file and ancillary files, converts instrument parameters (temperature, current, etc) to engineering units, performs signal processing and correction, converts signal to radiance units, remove instrument and spacecraft twist and motion effects, geolocates data and generates a Level1B netCDF file for an orbit.	calibrated radiances	Yes
Level 2a (Profile)	Level 1 spectra that have been processed into vertical profiles of geophysical quantities on a uniform altitude grid. These vertical profiles are at the highest available horizontal and temporal resolution.	routine products including T(P), CO_2, O_3, H_2O, and the volume emission rates	Yes
Level 2b	Level 2a data that have been further processed to produce higher level products.	heating and cooling rates	Yes
Custom	Extract parameters of interest from level 2 products	O_3, T(P), etc	SABER

The list of SABER data products are available and described at http://saber.gats-inc.com/. This includes products available through both the SABER website and the TIMED SDS. In addition, custom data products (reduced size) are also available. SABER data is available through VITMO. Data is currently at Version 2 but custom data products will be produced at Version 1.07.

2.1.6. TIMED SDS Mission

Table 6. TIMED SDS Mission Data Products

Product Name	Description	Download availability from the TIMED SDS (Web Site)
Actual PVAT	Definitive spacecraft position, velocity, attitude, attitude rates and time (PVAT) data in 1-minute resolution	Yes
Actual Orbit Number	Definitive spacecraft orbit numbers and orbit start times	Yes

Solar and Geo-magnetic Indices	*Validated* index values of Ap, Kp and f10.7.	Yes
Solar and Geomagnetic Indices (full set)	Index values of ap, Ap, Kp, F10.7, Dst, Ri, interplanetary B, and solar wind number density & speed	Yes (interactively through SDS web site)
Daily Beta Angle	Daily spacecraft beta angle measurement	Yes
NCEP	National Centers for Environmental Prediction (NCEP) *predicted* temperature and height data for 18 constant-pressure surfaces, spanning from 1000 mb to 0.4 mb, in a horizontal world-wide 1˚x1˚ grid.	Yes
Mission Telemetry Archive	Mission catalog (custom) of all telemetry frames indexed by ground-receipt and spacecraft-receipt times	Yes (interactively through SDS web site)
Data Product descriptions	Mission data product table (Oracle) of each data product type: name, description, purpose, contact, …	Yes
Data Product descriptions of all files	Mission data product catalog (Oracle) of each data product created: file name, storage location, description, start/end times, versions, …	Yes (interactively through SDS web site)
Modes, Events & Anomalies	Mission timeline catalog (Oracle) of status and configuration of modes, events and anomalies for spacecraft and instruments	Yes (interactively through SDS web site)
Mission Publications list	Entries of authors, title, journal and date.	Yes

2.1.7. Summary

All of the science products from each of the instruments are being produced on a continual basis. As such, with the exception of reprocessing GUVI data through its new pipeline it is not expected that there will be any large scale reprocessing of any data necessary to produce final versions of any instrument data sets other than those already described above. The GUVI reprocessing is expected to take approximately one year. Within 60 days after the end of mission, all products (assuming GUVI products have been reprocessed) should be ready for placement in a final archive at SPDF. The volume of TIMED data products is shown in Table 7.

Table 7. Data Volume Levels

Data Product	Total Volume	Old Version	Current Version
GUVI Level 1a	996 GB	10	12
GUVI Level 1b	5666 GB	9	12
GUVI Level 1c	733 GB	4	4
GUVI Level 2b	63 GB	1	
GUVI Level 3	26 GB		
SABER Level 1b	873 GB	1.07	2.0
SABER Level 2	1770 GB	1.07	2.0
SABER Level 2a	434 GB	1.07	2.0
SABER Level 2b	678 GB	1.07	2.0
SEE Level 2	2.9 GB	10	11
SEE Level 3	0.9 GB	10	11
SEE Level 4	1.5 GB	10	11
SEE Space Weather Products	9 MB	10	11
TIDI Level 1b LOS	714 GB	10	11
TIDI Level 2 Profiles	4.7 GB	10	11
TIDI Level 3 Vectors	3.4 GB	10	11
TOTAL	11.7 TB		

2.2. Documentation

2.2.1 GUVI

Documents describing each GUVI data product are available from the GUVI POC web page (http://guvi.jhuapl.edu).

The following documentation is now currently available and is up-to-date:

- Separate documents for each data product can be found at the “Info” links on the GUVI data page (http://guvi.jhuapl.edu/site/data/guvi-dataproducts.shtml)
- Data Product versions are clearly indicated in the GUVI filenames. Information about the differences between the data product versions and the software that produce them is also available from the GUVI web site (http://guvi.jhuapl.edu/site/data/guvi-versions.shtml).

- A detailed description of the calibration procedures for both on-orbit and ground, the results of the calibrations, calibration tables, points of contact, and an on-orbit stellar calibration log are all available on the GUVI website at (http://guvi.jhuapl.edu/site/data/guvi-calibration.shtml).

2.2.2 TIDI

Documentation for TIDI exists on the TIDI web site at http://tidi.engin.umich.edu/html/go?/scripts/info/docs.pl&menu_home-new.html. Documentation is complete for the data formats and data processing algorithms. A complete set of references can be found on the TIDI web site at http://tidi.engin.umich.edu/html/go?scripts/info/bib.pl&menu_docs.html. Key papers dealing with the instrument, operations and algorithms are found on the TIDI website.

2.2.3 SEE

The SEE POC provides an ASCII file for download from the FTP site containing release notes for each major data product version. All SEE-specific data products are updated with the same major version number. The current version number is 11, and the release notes are available at ftp://laspftp.colorado.edu/pub/SEE_Data/SEE_v11_releasenotes.txt. All previous release notes are also available for download from the same directory.

Each product has an associated README ASCII file that contains useful descriptions and additional notes. These are available for download from each directory that contains the data files and. In addition, most of the SEE data products are NetCDF files that also contain metadata that briefly describe the file contents.

2.2.4 SABER

Documentation for the SABER data formats exists on the SABER web site (http://saber.gats-inc.com/documentation.php).

2.2.5 TIMED SDS Mission Documentation

Table 8. Mission Documentation

Product Name	Description
GUVI SIIS	GUVI Specific Instrument Interface Specification, SIIS_GUVI_4_98.doc
SABER SIIS	SABER Specific Instrument Interface Specification, SIIS_SABER_11_97.doc
SEE SIIS	SEE Specific Instrument Interface Specification, SIIS_SEE_6_98.doc
TIDI SIIS	TIDI Specific Instrument Interface Specification, SIIS_TIDI_12_96.doc
Johns Hopkins APL Technical Digest, TIMED Technology Advances Vol. 24, No. 2 (2003):	TIMED Technology Advances: Guest Editor's Introduction
	TIMED: From Concept to Realization
	TIMED Mission Science Overview
	TIMED Science: First Light
	An Overview of the TIMED Spacecraft
	TIMED Instruments
	TIMED Mission System Engineering and System Architecture
	TIMED Launch Operations
	TIMED GPS Navigation System (GNS): Design, Implementation, and Performance Assessment
	TIMED Integrated Electronics Module (IEM)
	TIMED Autonomy System
	TIMED Ground System and Mission Operations
	It's About TIMED: APL's Education and Public Outreach Initiative
GIIS, Section 8	TIMED General Instrument Interface Specification, Section 8 - Describes the interfaces between the TIMED Ground System and the POCs & the user community.
Data Management Plan	TIMED Data Management Plan - Describes the TIMED Science Data System, its structure, its policies and its products.
SRS-98-157	TIMED Position and Attitude Geometry Description - Details the coordinate systems, attitude specification and timing conventions and summarizes the major modes and states of the Navigation and Attitude systems aboard TIMED.

2.2.6 TIMED Spacecraft Documentation

Table 9 Spacecraft Documentation

Program Doc. No.	Title
7363-9001	TIMED Requirements Document

7363-9010	TIMED Component Environmental Specification
7363-9020	TIMED Test Plan
7363-9021	Mission Operations Requirements Document
7363-9022	TIMED Spacecraft Harness Specification
7363-9028a	TIMED Product Assurance Implementation Plan
7363-9029a	TIMED Procurement Product Assurance Requirements
7363-9030	TIMED Launch Vehicle Interface Document
7363-9031	TIMED Spacecraft Contamination Control Plan
7363-9035	,Mission Operations Center Software Development Plan
7363-9036	Mission Operations Center Preliminary Software Design Specification
7363-9037	Concept of Operations Document
7363-9038	TIMED EMC Control Plan and EMI Performance Requirements Specification
7363-9048	SEE Instrument Specific Instrument Interface Specification
7363-9050	TIMED Spacecraft General Instrument Interface Specification
7363-9065	TIMED Program Safety Plan
7363-9068	TIMED Orbital Debris Assessment
7363-9101	TIMED Software Quality Assurance Plan
7363-9102	TIMED Mission Data Center Software Development Plan
7363-9103	TIMED Attitude S/W Development Plan
7363-9111	TIMED C & DH 1553 Bus Specification
7363-9300	TIMED Command & Data Handling Computer Software Development Plan
7363-9318	TIMED Ground Station Requirements Document
7363-9329	TIMED Tailored EWR-127-1
7363-9331	S/W Development Plan for the GPS Navigation Subsystem
7363-9333	Software Requirements Specification for the GPS Navigation Subsystem
7363-9348	Software-Hardware Interfaces for the GPS Navigation System (GNS)
7363-9354	TIMED Boot Program, Software Requirements Document (SRS).
7363-9355	TIMED Boot Program, Detailed Design Document (SDD).

In addition to the documentation in Table 9 above all of the mission design reviews are available. There are also numerous TIMED assembly and component drawings that constitute part of the mission Archive.

2.3 Analysis Tools

2.3.1 TIMED SDS

Table 10 SDS Support Tools

Tool Name	Description	Type	Download availability from the TIMED SDS (Web Site)
ncdump	The ncdump tool generates the CDL text representation of a netCDF file on standard output.	Reader	Yes
eci2geo.pro	Convert vectors in ECI coordinates to geocentric (cartesian) Coordinates	Pointing/Attitude	Yes
geoc2geod.pro	Convert geocentric latitude and altitude to geodetic altitude and latitude	Pointing/Attitude	Yes
geod2geoc.pro	Convert geodetic latitude and altitude to geocentric altitude and latitude	Pointing/Attitude	Yes
sc2eci_mat.pro	build rotation matrix from quaternions	Pointing/Attitude	Yes
sun.f	Calculate the position of the sun (RA,DEC, sidereal time)	Pointing/Attitude	Yes
sun.pro	Calculate the position of the sun (RA,DEC, sidereal time)	Pointing/Attitude	Yes
tanhgt.pro	Calculate tangent point height and latitude	Pointing/Attitude	Yes

	given an observer's position vector and a unit pointing vector (both ECI). Optionally returns pierce point		
timeconv.pro	Convert gps -> UTC time	Time	Yes
Coincidence Calculator	Determine coincidences of observation of the TIMED instruments and ground-based observations from Mission TLE files	Pointing/Attitude	Yes, downloadable applet
Orbit Plotter	Provide spacecraft ground tracks from Mission TLE files	Orbit	Yes, downloadable applet
Data Catalog Searches	Provide lists of data product files based upon selection criteria (time, s/c position, space weather)	Data products	No, local RA service
Telemetry Archive Download Utility	Provide output file of telemetry data	Telemetry	No, local RA service
Telemetry Archive Map Utility	Provide lists of contiguous telemetry data	Telemetry	No, local RA service

2.3.2 SEE

Table 11 SEE Support Tools

Tool Name	Description	Type	Availability from the TIMED SDS
Read_netcdf.pro	An IDL procedure to read any NetCDF file with less than 4 nested structures.	Reader	YES
Read_dat.pro	An IDL procedure to read the ASCII data files produced by the SEE POC.	Reader	No
Plot_see_code.zip	A zip file containing a bundle of IDL functions and procedure to perform basic reading and plotting of SEE data with time conversions. Works with the level 3 merged data file.	Analysis	No
Plot_see_spwx.zip	A zip file containing a bundle of IDL code to perform reading and plotting of SEE space weather products.	Analysis	No
Plot_occ_alt.pro	An IDL procedure to read the EGS Level 2B occultation file and find the closest transmission measurement to a specified date and plot it.	Analysis	No
Plot_xps4.pro	An IDL procedure to read the level 4 data and create a plot.	Analysis	No
Plotegs_2a_sp.pro	An IDL procedure to read level 2a EGS data and plot the spectrum.	Analysis	No
Plotegs_2a_ts.pro	An IDL procedure to read level 2a EGS data and plot a time series.	Analysis	No
Plotegs_sp.pro	An IDL procedure to read level 2 EGS data and plot the spectrum.	Analysis	No
Plotegs_ts.pro	An IDL procedure to read the level 2 EGS data and plot a time series.	Analysis	No
Plotxps_2a.pro	An IDL procedure to read the level 2a XPS data and plot a time series.	Analysis	No
Plotxps_ts.pro	An IDL procedure to read the level 2 XPS data and plot a time series.	Analysis	No
Plot_see3a.pro	An IDL procedure to read the level 3a merged file and make plots.	Analysis	No
Plot_see.pro	An IDL procedure to read the level 3 merged file and make plots.	Analysis	No

2.3.3 GUVI

The GUVI POC supplies a variety of tools for reading and analysis. The tools described in this section are all publicly available through the GUVI Web site at http://guvi.jhuapl.edu/aboutdata/guvi_software.html.

A general IDL tool for reading NetCDF files is supplied for reading any and all GUVI NetCDF products (**read_ncdf.pro**). This will read any NetCDF file and return the data in an IDL structure for easy access to all NetCDF fields. In addition, a tool to interpolate PVAT data onto the GUVI time grid is available (**guvi_pvat.pro)**.

The GUVI web site also provides an interface (http://guvi.jhuapl.edu/site/gallery/guvi-gallerydaily.shtml) to browse daily summary plots for disk and limb scan data, and also orbit by orbit level 1C disk images. These images have been made available to VITMO which also provides a means to rapidly browse of daily summary plots as well select science data by simply selecting the appropriate browse images.

3 Mission Archive Delivery and Timeline

3.1. Archive Contents

All of the products, tools, and documentation listed above will constitute the TIMED archive. The TIMED program is producing updated products and documentation on a continual basis. The archive includes all of the latest versions of all products, tools, and documentation and does not include prior versions unless an instrument team has decided that earlier versions have scientific relevance. It also includes all summary and browse products as well as the highest resolution routinely produced products for the archive. Also included will be the web pages from the instrument and TIMED SDS websites as the websites themselves constitute part of the mission documentation.

3.2. Archive Delivery Schedule

As illustrated above, the data sets, the documentation, and the tools are all in a state that are ready to archive with little additional work required. Therefore, we expect that within approximately 60 days after either an instrument or the mission programmatic shutdown all products, tools, and documentation will be available for archiving with the exception of the GUVI instrument whose reprocessing has been discussed above. The steps and timeline for delivery of all products to the final archive at Goddard SPDF are shown below and in Figure 2.

- T_0 – Programmatic Shutdown (could apply to entire mission or single instrument)
- T_1 – 60 days duration – No reprocessing of data, minimal document updates. Products moved to Zip files or checksums produced (to facilitate error checking of file transfer).
- T_2 – 90 days duration – Download all Zip files or raw data files to TIMED MDC. Move SABER data by shipping disk drives. Verify file integrity. Retransmit any files with transmission errors. Download or otherwise receive documentation, algorithms, software.
- T_3 – 90 days duration – starts 30 days after T2 - Distribute data and documents to SPDF. Retransmit any products with transmission errors.
- T_4 – unlimited duration – starts 30 days after T3 ends - SPDF starts distribution of TIMED data from archive. VITMO and HPDP use SPDF as source for TIMED products and documentation.

The TIMED program has been coordinating with the SPDF and testing this architecture for archiving data. Tests have been successfully carried out using the SEE instrument as a test data set. Redistribution of data from SPDF has not been tested at this time.

4. Integration of Mission Archive with the Virtual ITM Observatory and Heliophysics Data Portal

The TIMED SDS and instrument POCS are currently integrated into the Virtual ITM Observatory (http://vitmo.jhuapl.edu). VITMO provides uniform access to TIMED data sets from each instrument team (bypassing the instrument team websites). Presentation and selection of TIMED software tools and documentation is currently integrated with VITMO, allowing the tools and documentation to be easily located without the user having to navigate various instrument websites. Because VITMO is already designed to integrate with distributed data systems like TIMED, where each instrument data set is located in a different location it can connect just as easily to the Final Archive in a single location as opposed to the current distributed architecture of the TIMED data system. Since the TIMED program predates the SPASE metadata activities the TIMED program does not provide any SPASE compliant metadata for TIMED data products. The production of SPASE compliant metadata for TIMED products has been undertaken by VITMO. VITMO currently delivers the SPASE metadata to the Heliophysics Data Portal.

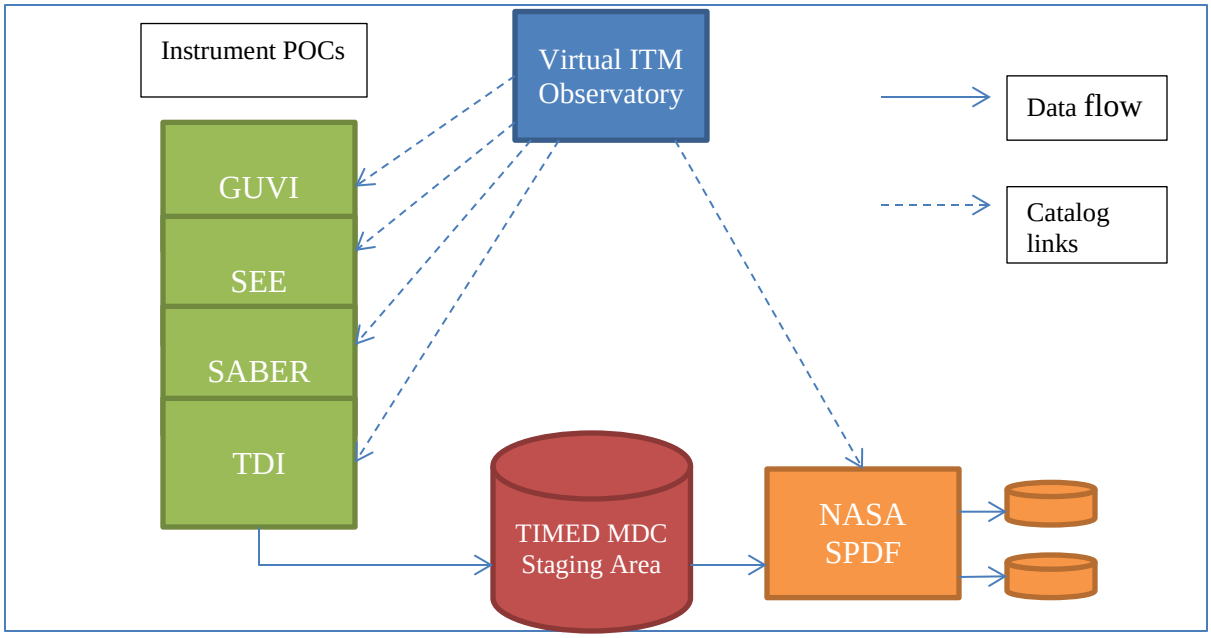

Figure 1. TIMED Archival Data Flow

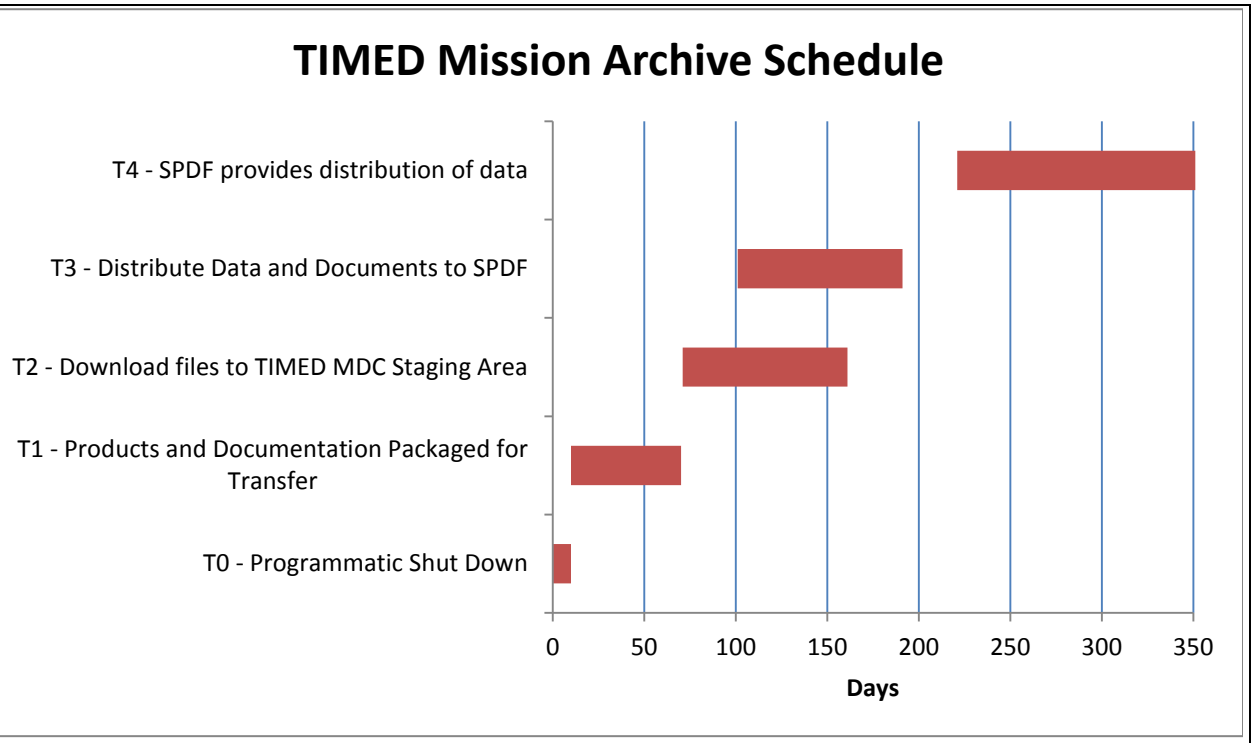

Figure 2. TIMED mission archive production and delivery schedule.

ACRONYM LIST

ASCII	American Standard Code for Information Interchange
APL	Applied Physics Laboratory
CDL	Common Data Language
CO_2	Carbon Dioxide
DMSP	Defense Meteorological Satellite Program
ECI	Earth Centered Inertial
EIA	Equatorial Ionization Anomaly
EGS	EUV Grating Spectrometer (part of SEE)
EUV	Extreme Ultraviolet
GB	Gigabyte
GIIS	General Instrument Interface Specification
GNS	GPS Navigation System
GPS	Global Positioning System
GUVI	Global Ultraviolet Imager
H	Atomic Hydrogen
H_2O	Water Vapor
IDL	Interactive Data Language
IEM	Integrated Electronics Module
JHU	[The] Johns Hopkins University
LBH	Lyman-Birge-Hopfield
LOS	Line-of-Sight
MB	Megabyte
MDC	Mission Data Center
MOC	Mission Operations Center
N	Atomic Nitrogen
N_2	Molecular Nitrogen
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NetCDF	Network Common Data Format
nm	Nanometer
NmE	Number density at the peak of the E-layer
NO	Nitric Oxide
O	Atomic Oxygen
$O(^1D)$	Excited–State Singlet Atomic Oxygen
O_3	Ozone
OH	Hydroxyl
POC	Payload Operations Center
PVAT	Position, velocity, attitude, time
QEUV	Integrated EUV/XUV energy flux below 45 nm
RA	Resident Archive
SABER	Sounding of the Atmosphere Using Broadband Emission Radiometry
SDS	Science Data System
SEC	Sun-Earth Connection
SEE	Solar EUV Experiment
SH	Southern Hemisphere
SIIS	Specific Instrument Interface Specification
SPASE	Space Physics Archive Search and Extract
SPDF	Space Physics Data Facility

SSUSI	Special Sensor Ultraviolet Spectrographic Imager
TB	Terabyte
TEC	Total Electron Content
TIDI	TIMED Doppler Interferometer
TIMED	Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics
URL	Uniform Resource Locator
UTC	Universal Time Code
UV	Ultraviolet
VITMO	Virtual ITM Observatory
W	Watt
XPS	XUV Photometer System (part of SEE and instrument on SORCE)
XUV	Soft X-Ray [Ultraviolet]