

The Multimission Archive at Space Telescope

Damian Christian, Faith Abney, Thomas Comeau, Robert Hanisch, Jill Harrison, Catherine Imhoff, Richard Kidwell, Timothy Kimball, Karen Levay, Paolo Padovani, Marc Postman, Joel Richon, Myron Smith, Randall Thompson

Space Telescope Science Institute, Baltimore MD, 21218

Abstract. We present an overview of the recently created Multimission Archive at Space Telescope (MAST). The Hubble Data Archive has expanded to provide easy access to non-HST data sets. MAST includes the following: the International Ultraviolet Explorer (IUE), the Extreme Ultraviolet Explorer (EUVE), Copernicus (OAO-3), ASTRO HUT, WUPPE and UIT data sets, and VLA FIRST data. The Digitized Sky survey is also accessible through MAST. Data from the Far Ultraviolet Spectroscopic Explorer (FUSE) currently scheduled for launch in early 1999, ORFEUS 1 & 2 EUV spectrometer data, and Voyager-1,2 UVS data will be added in the near future. Two 480-platter Plasmon CD-ROM jukeboxes provide data storage and easy access to the MAST data. Data hierarchy, ingest and retrievals, plans for expansion, and features of the web interface are also presented. Users can access data via a WWW interface at <http://archive.stsci.edu/mast.html>.

1. Introduction to MAST

The Space Telescope Science Institute (STScI) holds the Hubble Data Archive (HDA), which includes all Hubble Space Telescope (HST) observations. As of November 1998, the HDA contains over 5.8 Terabytes of science and engineering data representing over 250,000 exposures of more than 20,000 targets. In the past few months the volume of archived data has reached average rates of about 4 – 5 GB/day, with an average of 20 GB/day retrieved by archive users.

The STScI archive recently expanded by providing access to non-HST data sets. STScI was chosen as one of three major science archive research centers created to provide users with easy access to archival data. The Multimission Archive at Space Telescope (MAST) focuses on the optical, UV and near-IR wavelength ranges, and complements the High Energy Astrophysics Science Archive Research Center (HEASARC) at GSFC and the Infrared Science Archive (ISRA) at IPAC. MAST data sets include extreme ultraviolet, ultraviolet, and selected radio data sets listed below. These data sets may be accessed at the MAST homepage¹ and include:

¹<http://archive.stsci.edu/mast.html>

International Ultraviolet Explorer (IUE) Contains over 104,000 spectral images of 10,000 individual astronomical sources in the wavelength range 1200–3350 Å.

Copernicus (OAO-3) Far- (900–1,560 Å) and near- (1,650–3,150 Å) ultraviolet spectra of 551 objects.

Extreme Ultraviolet Explorer (EUVE) Extreme UV (70–760 Å) spectroscopic observations 400 sources, mostly galactic.

ASTRO Missions Various UV data sets from the ASTRO 1 and 2 shuttle missions, including

- the Hopkins Ultraviolet Telescope (HUT)
- the Wisconsin Ultraviolet Photo-Polarimeter Experiment (WUPPE)
- the Ultraviolet Imaging Telescope (UIT)

Faint Images of the Radio Sky at Twenty-centimeters (FIRST) A 20 cm (1.4 GHz) radio survey covering over 10,000 square degrees to a flux limit of 1 mJy. Access is provided to the radio images and the source catalog, currently having approximately 437,000 entries.

Digitized Sky Survey (DSS) Digitized photographic Sky Survey plates from the Palomar and UK Schmidt telescopes.

1.1. MAST Interface

The MAST resources are available via a simple WWW interface at the URL given above. A user may choose to search a region of the electromagnetic spectrum for images or spectra, or may go directly to the search page for a specific mission. Archival holdings may be searched by:

- Name (with SIMBAD or NED as a name resolver)
- Position (α , δ , and radius)
- Object category
- Observation specifics: date, instrument, filters, etc.

1.2. MAST Cross-Correlations with Astronomical Catalogs

The potential use of the MAST archive is greatly improved by allowing users to search more than one data set at a time and to also allow the archive holdings to be compared with astronomical catalogs. Cross correlations can be performed using:

- The Hipparcos stellar catalog (1997, ESA SP-1200)
- The Active galactic nuclei catalog (Veron-Cetty & Veron 1996; Padovani, Giommi, & Fiore 1997)
- The Abell galaxy cluster catalog (Abell, Corwin, & Odowin 1989)
- User supplied catalogs

2. MAST Holdings

2.1. Data Storage and Access

Currently, most of the MAST data is available over the web and selected data sets can be quickly down-loaded. The IUE and EUVE data sets currently reside at NSSDC and HEASARC, respectively. The IUE data sets are currently being ingested at STScI and will be stored on 2 Plasmon CD-ROM jukeboxes. WORM media was chosen for its cost effectiveness and ready user access. The CD-ROM option is about 50% cheaper than a DLT library, but provides enough space for the current non-HST MAST archive and anticipated expansion. The MAST data network consists of a SUN Enterprise 450 server, a large RAID disk array, and 2 Plasmon 480 slot CD-ROM jukeboxes.

2.2. Data Organization

MAST has made every attempt to include sufficient documentation and background information to make data products as useful as possible. The MAST holdings for specific missions generally include:

Project Description General descriptions of the mission and instrumentation.

Data Processing How the data were reduced and calibrated.

Data Description Documentation on data characteristics: wavelength coverage, resolution, field of view, and anomalies. Data uncertainties and database field descriptions.

Data Format All data are in FITS (Flexible Image Transport System) format. Documentation includes a general description of the file contents and header information.

Mission-specific analysis software IUEDAC IDL, UIT BDR software written in C and Fortran-77, HUT IRAF software, and EUVE EUV1.8 IRAF software.

3. Future Plans

Additional ultraviolet and optical data sets will be incorporated into MAST in the future, including data from the Far Ultraviolet Spectroscopic Explorer (FUSE) currently scheduled for launch in early 1999. FUSE will cover the wavelength range of 905–1195 Å with a resolution of 30,000. MAST will archive Voyager-1 and Voyager-2 UVS data, which covers the 950 to 1350 Å range. MAST also anticipates expanding its support of ground-based archiving with the addition of data from the National Optical Astronomy Observatories Mosaic Imager. As demonstrated by Valdes et al. in their poster at this conference, the Mosaic Imager will perform sub-arcsec imaging of large fields of view and perform surveys in standard photometric bands.

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