

Sailing the Archival Seas with MAST



Scott W. Fleming

STScI

on behalf of the MAST team

Outline – Mining Archival Data

- Overview of MAST missions
- The MAST Discovery Portal
 - Cone Search
 - Advanced Search
 - Cross-Matching
 - Access to the Virtual Observatory
- MAST-led Enhanced Data Products
 - gPhoton: GALEX photon events
 - HSC: The Hubble Source Catalog

MAST Missions: Past, Present and Future

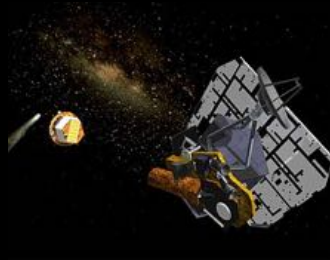
Legacy Missions



Astro



Copernicus



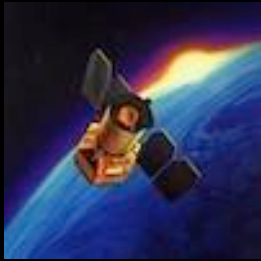
EPOCH



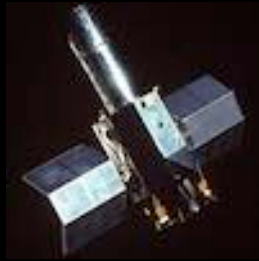
EUVE



FUSE



GALEX



IUE



Kepler

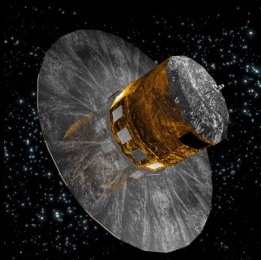


ORFEUS



VLA - FIRST

Active Missions



Gaia



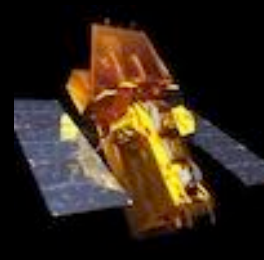
Hubble



K2



Pan-STARRS



Swift UVOT



XMM OM

MAST Missions: Past, Present and Future

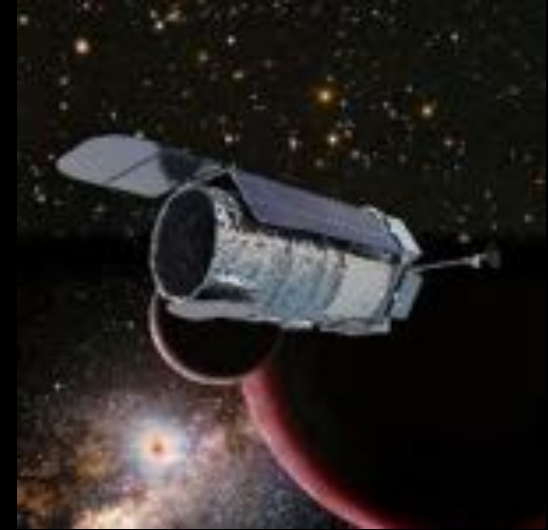
Upcoming Missions



TESS – Mar. 2018



James Webb – Oct. 2018



WFIRST – mid-2020s

Cross-Mission Discovery

MAST Portal: Cone Search

Select a collection... All MAST Observations and enter target: M60

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page MAST: M60 MAST: M60 MAST: M60 MAST: M60

Displaying 30 of 316 Total Rows of Observations MESSIER 060, radius: 0.06167°

Filters

Mission

- HST (30 of 283)
- SWIFT (0 of 12)
- GALEX (0 of 7)
- IUE (0 of 7)
- HUT (0 of 4)
- PUSE (0 of 3)

Instrument

- STIS/CCD (0 of 146)
- WFPC2/PC (0 of 39)
- WFPC2/WFC (0 of 37)
- ACS/WFC (30 of 30)
- UVOT (0 of 12)

Project

- HST (12 of 181)
- HLA (18 of 102)

	Actions	Mission	Instrument	Project	Filters	Waveband	Target Name
1		HST	ACS/WFC	HLA	F475W	OPTICAL	VCC1971
2		HST	ACS/WFC	HLA	F850LP	OPTICAL	VCC1971
3		HST	ACS/WFC	HLA	DETEC...		VCC1971
4		HST	ACS/WFC	HST	F850LP	OPTICAL	VCC1971
5		HST	ACS/WFC	HST	F475W	OPTICAL	VCC1971
6		HST	ACS/WFC	HLA	F475W	OPTICAL	NGC464
7		HST	ACS/WFC	HLA	DETEC...		NGC464
8		HST	ACS/WFC	HLA	F850LP	OPTICAL	NGC464
9		HST	ACS/WFC	HST	F475W	OPTICAL	NGC464
10		HST	ACS/WFC	HST	F850LP	OPTICAL	NGC464
11		HST	ACS/WFC	HLA	F475W	OPTICAL	NGC464
12		HST	ACS/WFC	HLA	DETEC...		NGC464

AstroView

12:43:39.974 +11:33:09.76
12:43:39.974 +11:33:09.76 RA DEC
hhmmss/deg

Three red arrows point to the search input field, the table, and the visualization.

MAST Portal: Advanced Search

Select a collection...
All MAST Observations

and enter target:
M60

[About Collections...](#) [Show Examples...](#) [Random Search](#) [Advanced Search](#)

[Upload Target List](#) My Download Basket: 0 files [User Manual/Help](#) | [Leave Feedback](#) | [About This Site](#)

Home Page MAST: M60 MAST: M60 MAST: M60 MAST: M60

Displaying 30 of 316 Total Rows of Observations

MESSIER 060, radius: 0.06167°

Footprints: All

Filters

Clear Filters Edit Filters... Help...

Mission

Name	Quantity
<input checked="" type="checkbox"/> HST	(30 of 283)
<input type="checkbox"/> SWIFT	(0 of 12)
<input type="checkbox"/> GALEX	(0 of 7)
<input type="checkbox"/> IUE	(0 of 7)
<input type="checkbox"/> HUT	(0 of 4)
<input type="checkbox"/> PUSE	(0 of 3)

Instrument

Name	Quantity
<input type="checkbox"/> STIS/CCD	(0 of 146)
<input type="checkbox"/> WFPC2/PC	(0 of 39)
<input type="checkbox"/> WFPC2/WFC	(0 of 37)
<input checked="" type="checkbox"/> ACS/WFC	(30 of 30)
<input type="checkbox"/> UVOT	(0 of 12)

Show 10 More

Project

Name	Quantity
<input type="checkbox"/> HST	(12 of 181)
<input type="checkbox"/> HLA	(18 of 102)

List View Album View

Edit Columns... Table Display: All Show Preview: Show Cutout:

	Actions	Mission	Instrument	Project	Filters	Waveband	Target Name
1		HST	ACS/WFC	HLA	F475W	OPTICAL	VCC1971
2		HST	ACS/WFC	HLA	F850LP	OPTICAL	VCC1971
3		HST	ACS/WFC	HLA	DETEC...		VCC1971
4		HST	ACS/WFC	HST	F850LP	OPTICAL	VCC1971
5		HST	ACS/WFC	HST	F475W	OPTICAL	VCC1971
6		HST	ACS/WFC	HLA	F475W	OPTICAL	NGC464
7		HST	ACS/WFC	HLA	DETEC...		NGC464
8		HST	ACS/WFC	HLA	F850LP	OPTICAL	NGC464
9		HST	ACS/WFC	HST	F475W	OPTICAL	NGC464
10		HST	ACS/WFC	HST	F850LP	OPTICAL	NGC464
11		HST	ACS/WFC	HLA	F475W	OPTICAL	NGC464
12		HST	ACS/WFC	HLA	DETEC...		NGC464
13		HST	ACS/WFC	HLA	F850LP	OPTICAL	NGC464

AstroView

12:43:39.974 +11:33:09.76
12:43:39.974 +11:33:09.76

RA DEC
hhmmss/deg

MAST Portal: Advanced Search

Select a collection... and enter target:

MAST Advanced Search

Records Found: 355

Flame Nebula r=2d

Search

Resolved Name: NAME Flame Nebula
RA: 85.4279 Dec: -1.912
Radius: 2 deg

[Show Examples...](#)

Applied Filters

Clear All

Product Type: image

Mission: HST

Waveband: INFRARED

Position: 85.4279, -1.912, 2

Columns

Defaults Hide All

Filter columns: Column name

- Filters
- Waveband
- Target Name
- Target Classification
- Observation ID
- RA
- Dec
- Proposal ID
- Principal Investigator
- Calibration Level
- Start Time
- End Time

Filters

Proposal ID

Enter text here

This column must be searched via the text box at the top of this panel

Principal Investigator

Enter text here

This column must be searched via the text box at the top of this panel

Start Time

1978-02-25 00:29 2016-12-26 11:58

End Time

Exposure Length

HLA (18 of 102)

MAST Portal: Advanced Search



Select a collection...

All MAST Observations

[About Collections...](#)

and enter target:

Orion B

Search

[Show Examples...](#) [Random Search](#) [Advanced Search](#)

Upload Target List

My Download Basket: 0 files

[User Manual/Help](#) | [Leave Feedback](#) | [About This Site](#)

Home Page | MAST: Advanced Search 1

355 Total Rows of Observations

Filters

Clear Filters Edit Filters... Help...

Keyword/Text Filter

Filter All Columns

Instrument

Name	Quantity
<input type="checkbox"/> NICMOS/NIC1	(148 of 148)
<input type="checkbox"/> NICMOS/NIC2	(85 of 85)
<input type="checkbox"/> NICMOS/NIC3	(60 of 60)
<input type="checkbox"/> WFC3/IR	(60 of 60)
<input type="checkbox"/> WFPC2/WFC	(1 of 1)
<input type="checkbox"/> WFPC2/PC	(1 of 1)

Project

Name	Quantity
<input type="checkbox"/> HST	(281 of 281)
<input type="checkbox"/> HLA	(74 of 74)

Filters

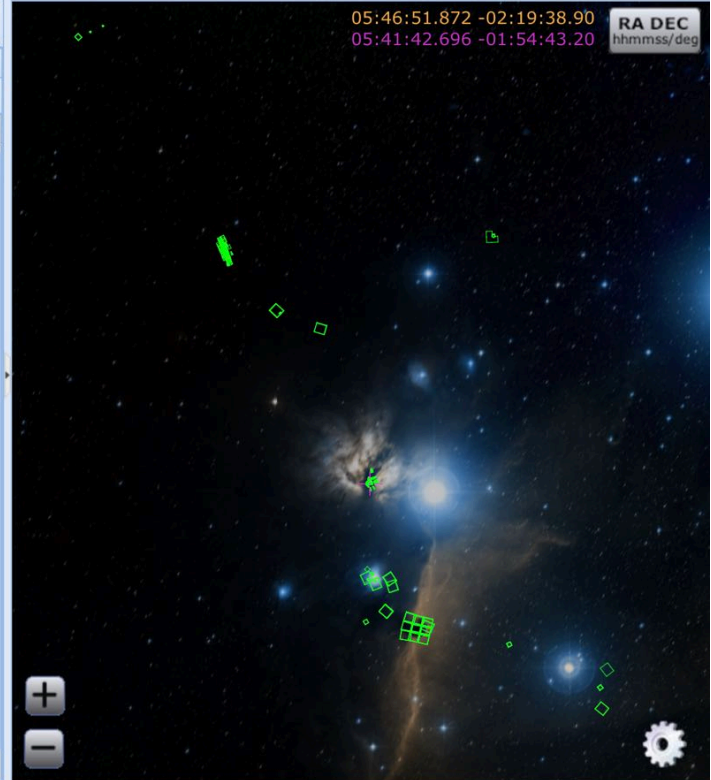
Name	Quantity
<input type="checkbox"/> F187N	(74 of 74)
<input type="checkbox"/> F190N	(69 of 69)
<input type="checkbox"/> F212N	(57 of 57)

List View Album View

Edit Columns... Table Display: All Show Preview: Show Cutout:

	Actions	Mission	Instrument	Project	Filters
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F187N
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F190N
<input type="checkbox"/>	...	HST	NICMOS/NIC3	HST	F212N
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F187N
<input type="checkbox"/>	...	HST	WFC3/IR	HLA	F160W
<input type="checkbox"/>	...	HST	WFC3/IR	HLA	F160W
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F164N
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F164N
<input type="checkbox"/>	...	HST	NICMOS/NIC3	HST	F212N
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F187N
<input type="checkbox"/>	...	HST	NICMOS/NIC1	HST	F187N
<input type="checkbox"/>	...	HST	WFC3/IR	HST	F140W
<input type="checkbox"/>	...	HST	NICMOS/NIC3	HST	F212N

AstroView



MAST Portal: Cross-Match

The screenshot displays the MAST Portal interface. At the top, there is a navigation bar with a logo on the left, a search area in the center, and user account options on the right. The search area includes a dropdown menu for 'Select a collection...' (currently set to 'MAST Catalogs'), a text input field for 'Enter object name or RA and Dec to cone search', and a 'Search' button. Below the search bar, there are links for 'About Collections...', 'Mission: TESS Input', and 'Show Examples... Random Search Advanced Search'. A red circle highlights the 'Upload Target List' button. To the right of the search bar, there are links for 'User Manual/Help', 'Leave Feedback', and 'About This Site'. The main content area is titled 'MAST: Barbara A. Mikulski Archive for Space Telescopes' and contains a 'Quick Start' section with three numbered steps. To the right of the 'Quick Start' section is a 'Currently available data collections:' list. Below this list is a 'Featured tutorial: Conducting a search' section with a video player titled 'Positional Search'. On the far right, there is an 'AstroView' panel showing a star field with a central star and a crosshair, along with RA and DEC coordinates.

Select a collection...
MAST Catalogs

and enter target:
Enter object name or RA and Dec to cone search Search

About Collections... Mission: TESS Input Show Examples... Random Search Advanced Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page

MAST: Barbara A. Mikulski Archive for Space Telescopes

The MAST Portal lets you search multiple collections of astronomical datasets all in one place. Use this tool to find astronomical data, publications, and images.

Quick Start:

1. Select a collection and enter a new search target OR upload an existing list of targets.
2. Use the filters and analysis tools to find the exact data you're looking for.
3. Add files to the download basket to control your download options.

See the [User's Guide](#) for more detailed documentation and [video tutorials](#).

Currently available data collections:

- MAST Observations: Millions of observations from Hubble, Kepler, GALEX, IUE, FUSE, and more.
- Virtual Observatory: Search thousands of astronomical data archives from around the world for images, spectra, and catalogs.
- Hubble Source Catalog: A master catalog with a hundred million measurements of objects in Hubble images.

Featured tutorial: Conducting a search

Positional Search

AstroView
11:45:45.361 +02:48:37.55 RA DEC
11:45:42.290 +02:49:17.29 hhmms/deg

MAST Portal: Cross-Match

Select a collection...
MAST Catalogs

and enter target:
Enter object name or RA and Dec to cone search

Search

About Collections... Mission: TESS Input Show Examples... Random Search Advanced Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page kepler_00_search.txt AstroView

2330 Total Rows Footprints: All

Edit Columns... Table Display: All

	Actions	Kepler ID	RA (J2000)	Dec (J2000)
<input type="checkbox"/>		757450	19:24:33.024	+36:34:38.57
<input type="checkbox"/>		1432789	19:25:59.861	+37:03:33.41
<input type="checkbox"/>		1718189	19:22:54.881	+37:15:09.54
<input type="checkbox"/>		1718189	19:22:54.881	+37:15:09.54
<input type="checkbox"/>		1724719	19:28:49.130	+37:13:16.38
<input type="checkbox"/>		1725016	19:29:03.098	+37:14:13.17
<input type="checkbox"/>		1865042	19:22:43.740	+37:21:18.40
<input type="checkbox"/>		1871056	19:28:10.709	+37:22:34.46
<input type="checkbox"/>		1871056	19:28:10.709	+37:22:34.46
<input type="checkbox"/>		1873513	19:30:19.166	+37:22:35.08
<input type="checkbox"/>		1995519	19:04:36.036	+37:24:40.93
<input type="checkbox"/>		1996180	19:05:22.632	+37:24:43.08
<input type="checkbox"/>		2142522	19:06:30.182	+37:32:14.28
<input type="checkbox"/>		2165002	19:20:52.742	+37:34:04.05

19:59:18.632 +40:59:23.20
19:29:03.098 +37:14:13.17

RA DEC
hhmmss/deg

MAST Portal: Cross-Match

Select a collection... MAST Catalogs and enter target: Enter object name or RA and Dec to cone search Search

Mission: TESS Input Show Examples... Random Search Advanced Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page kepler_cp_search.txt

2330 Total Rows

Actions	Kepler ID	RA (J2000)
1	757450	19:24:33.0
2	1432789	19:25:59.8
3	1718189	19:22:54.8
4	1718189	19:22:54.8
5	1724719	19:28:49.1
6	1725016	19:29:03.0
7	1865042	19:22:43.7
8	1871056	19:28:10.7
9	1871056	19:28:10.7
10	1873513	19:30:19.1
11	1995519	19:04:36.036 +37:24:40.93
12	1996180	19:05:22.632 +37:24:43.08
13	2142522	19:06:30.182 +37:32:14.28
14	2165002	19:20:52.742 +37:34:04.05

Cross-Match (Select catalog from list below)

Catalog	Description
MAST	Mikulski Archive For Space Telescopes
All Observations	Observations from all MAST Missions (HST, GALEX, KEPLER, etc.)
HSCv1.0 (MagAper2)	Hubble Source Catalog (v1.0, MagAper2)
HSCv2.0 (MagAper2)	Hubble Source Catalog (v2.0, MagAper2)
HSCv2.0 (MagAuto)	Hubble Source Catalog (v2.0, MagAuto)
GALEX	GALEX (GR6+7) Source Catalog from all Surveys (AIS, DIS, MIS)
SDSS	Sloan Digital Sky Survey (DR12) Source Catalog
2MASS	Two Micron All Sky Survey (2MASS) Catalog
Gaia	Gaia Catalog
TGAS	Tycho-Gaia Astrometric Solution (TGAS) Catalog
CDS	Strasbourg astronomical Data Center
SIMBAD	SIMBAD Astronomical Database
2MASS	2MASS All-Sky Catalog of Point Sources (Cutri+ 2003)
2MASS6X	2MASS 6X Point Source Working Database / Catalog (Cutri+ 2006)
CFHTLS Deep	The CFHTLS Deep Survey, fields D1--D4: (T0007 release) (Hudelot+ 2012)
CFHTLS Wide	The CFHTLS Wide Survey, fields W1--W4: (T0007 release) (Hudelot+ 2012)
CMC14	Carlsberg Meridian Catalog 14 (CMC14) (CMC 2006)

Catalog: None Selected
Radius (arcseconds): 3

Cross-Match Cancel

19:59:18.632 +40:59:23.20 RA DEC
19:29:03.098 +37:14:13.17 hhmmss/deg

MAST Portal: Cross-Match

Select a collection...
MAST Catalogs

and enter target:
Enter object name or RA and Dec to cone search

Upload Target List

My Download Basket: 0 files

Home Page | kepler_cp_search.txt | MAST Crossmatch [Gaia]

2385 Total Rows

Filters

Keyword/Text Filter

Filter All Columns

astrometric_n_obs_ac

Name	Quantity
<input type="checkbox"/> 0	(2,015 of 2,015)
<input type="checkbox"/> 9	(42 of 42)
<input type="checkbox"/> 107	(15 of 15)
<input type="checkbox"/> 97	(13 of 13)
<input type="checkbox"/> 79	(12 of 12)

Show 68 More

astrometric_n_good_obs_ac

Name	Quantity
<input type="checkbox"/> 0	(2,016 of 2,016)
<input type="checkbox"/> 8	(29 of 29)
<input type="checkbox"/> 89	(17 of 17)
<input type="checkbox"/> 79	(10 of 10)
<input type="checkbox"/> 80	(10 of 10)

Show 78 More

Actions	Kepler ID	RA (J2000)	Dec (J2000)	MatchID	MatchRA	MatchDEC	distance
<input type="checkbox"/>	6310636	19:53:55.466	+41:36:55.23	2075389014168396672	298.4811028...	41.61526284...	0.00
<input type="checkbox"/>	6471021	19:56:29.386	+41:52:00.34	2075377675451477632	299.1224634...	41.86679402...	0.00
<input type="checkbox"/>	6471021	19:56:29.386	+41:52:00.34	2075377675451477632	299.1224634...	41.86679402...	0.00
<input type="checkbox"/>	7132798	19:43:47.138	+42:39:32.11	2077236709100409728	295.9463867...	42.65883482...	0.00
<input type="checkbox"/>	6964929	19:44:55.877	+42:28:22.04	2077219048190581120	296.2328094...	42.47279662...	0.00
<input type="checkbox"/>	7134976	19:45:56.023	+42:39:48.34	2077203723748146688	296.4834010...	42.66338211...	0.00
<input type="checkbox"/>	7134976	19:45:56.023	+42:39:48.34	2077203723748146688	296.4834010...	42.66338211...	0.00
<input type="checkbox"/>	7047824	19:42:56.484	+42:34:34.49	2077144487563291904	295.7353897...	42.57623231...	0.00
<input type="checkbox"/>	6878240	19:43:34.584	+42:22:49.62	2077138410188489728	295.8940372...	42.38051560...	0.00
<input type="checkbox"/>	6878240	19:43:34.584	+42:22:49.62	2077138410188489728	295.8940372...	42.38051560...	0.00
<input type="checkbox"/>	4478168	19:40:46.414	+39:32:22.81	2076245950343273600	295.1931559...	39.54043869...	0.04
<input type="checkbox"/>	4478168	19:40:46.414	+39:32:22.81	2076245946040887168	295.1933632...	39.53969399...	0.00
<input type="checkbox"/>	8260902	19:59:51.761	+44:09:39.20	2076102631573024896	299.9656621...	44.16088155...	0.00

Footprints: All

AstroView

54.349 +44:52:55.84
55.466 +41:36:55.23

RA DEC
hhmmss/deg

MAST Portal: Access to the Virtual Observatory

The screenshot shows the MAST Portal interface. At the top, there is a navigation bar with links like TESS Wiki, ARCH*, MAST, ASTRO, CSC, STSci Internal, YouTubeSub, and AOL Radio. Below this is a search area with a dropdown menu for 'All Virtual Observatory Collections' and a search input field containing 'Abell 2744'. A red arrow points to the search input field. Below the search area are links for 'About Collections...', 'Show Examples...', and 'Random Search'. There are also buttons for 'Upload Target List' and 'My Download Basket: 0 files'. The main content area shows a table of search results for 'Abell 2744' with a radius of 0.07500 degrees. The table has columns for Actions, Short Name, Type, Title, Waveband, Records Found, FITS Images, and Other Images. The results list various astronomical databases and surveys, including VIKING DR3, II/343, Spitzer Level 1, ESO Science Archive Catalog, SuperCOSMOS, NED(sources), HSC, HSC_SUM, NED/SED, Simbad, J/A+A/389/787, EHST/HST/SIAP, and HLA.

MAST Portal

Select a collection... and enter target:
All Virtual Observatory Collections Abell 2744 Search

About Collections... Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page VO: Abell 2744

216 Total Rows ABELL 2744, radius: 0.07500°

Filters List View

Clear Filters Edit Filters... Help...

Keyword/Text Filter
Filter All Columns

Type
Name Quantity
 Catalog (165 of 165)
 Image (49 of 49)
 Spectra (2 of 2)

Waveband
Name Quantity
 Optical (100 of 100)
 X-ray (74 of 74)
 Infrared (46 of 46)
 Radio (24 of 24)
 UV (17 of 17)
Show 4 More

Publisher
Name Quantity
 CDS (98 of 98)
 NASA/CFSC HEADARC (68 of 68)

Actions	Short Name	Type	Title	Waveband	Records Found	FITS Images	Other Images
1	VIKING DR3		VIKING - VISTA Kilo-degree Infrared Galaxy survey Data...		13285	0	0
2	II/343		VIKING catalogue data release 2 (Edge+, 2016)	Infrared	13284	0	0
3	Spitzer Level 1		Spitzer Level 1 / Basic Calibrated Data	Infrared	5000	5000	0
4	B/eso		ESO Science Archive Catalog (ESO, 1991-2016)		3933	0	0
5	SuperCOSMOS		SuperCOSMOS Science Archive (SSA)	Optical	3155	0	0
6	NED(sources)		The NASA/IPAC Extragalactic Database	Radio, Millim...	2170	0	0
7	HSC		Hubble Source Catalog Detailed Search	UV,Visible	2000	0	0
8	HSC_SUM		Hubble Source Catalog Summary Search	UV,Visible	2000	0	0
9	NED/SED		The NASA/IPAC Extragalactic Database SED Data Discov...	Radio, Millim...	1443	0	0
10	Simbad		The SIMBAD astronomical database	Radio, Millim...	1236	0	0
11	J/A+A/389/787		VRI Photometry of Galaxies in AC118 Field (Busarello+, ...	Optical	1069	0	0
12	EHST/HST/SIAP		European HST SIAP service		509	509	0
13	HLA		Hubble Legacy Archive	Optical, Infra	433	433	0

Enhancing Data Products: gPhoton

gPhoton: A 1.1 Trillion Row Database of GALEX Photon Events

GALEX Overview

- Launched 28 April 2003
- FUV + NUV (simultaneously)
- FUV = 1350-1750 Å
- Phot. (5-6" resolution)
- Microchannel Plate Detector
- Retired 28 June 2013
- 1.2 deg. diameter FoV
- NUV = 1750-2750 Å
- Spec. (R ~ 100-250)
- 77% of the Sky at Diff. Depths

gPhoton

- Database of 1.1 trillion photon events
- Open-source Python software: create cal. images and light curves
- Photon events meas. with 5 millisecond precision
- Light curves with few second sampling for any GALEX image

gPhoton page: <https://archive.stsci.edu/prepds/gphoton/>

Paper: Million, C; Fleming, S.W., Shiao, B., et al. 2016, *ApJ*, 833, 292

gPhoton Design Considerations

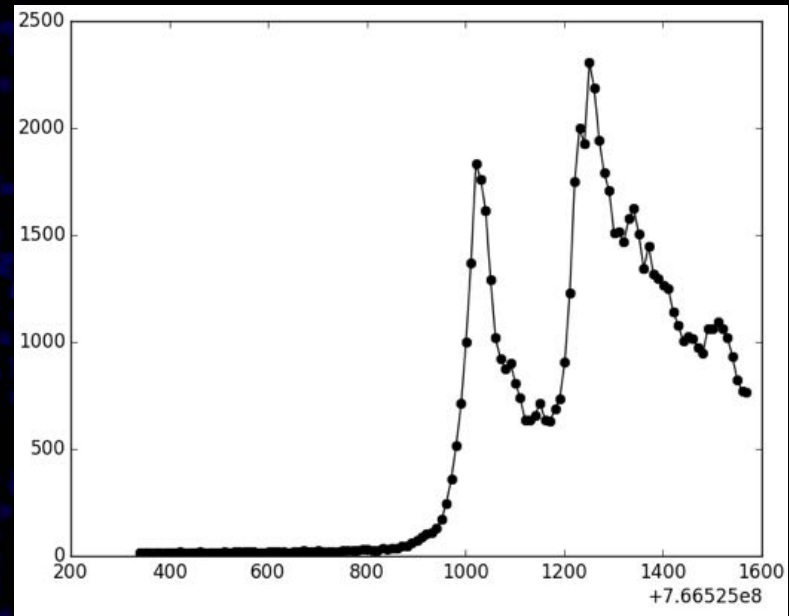
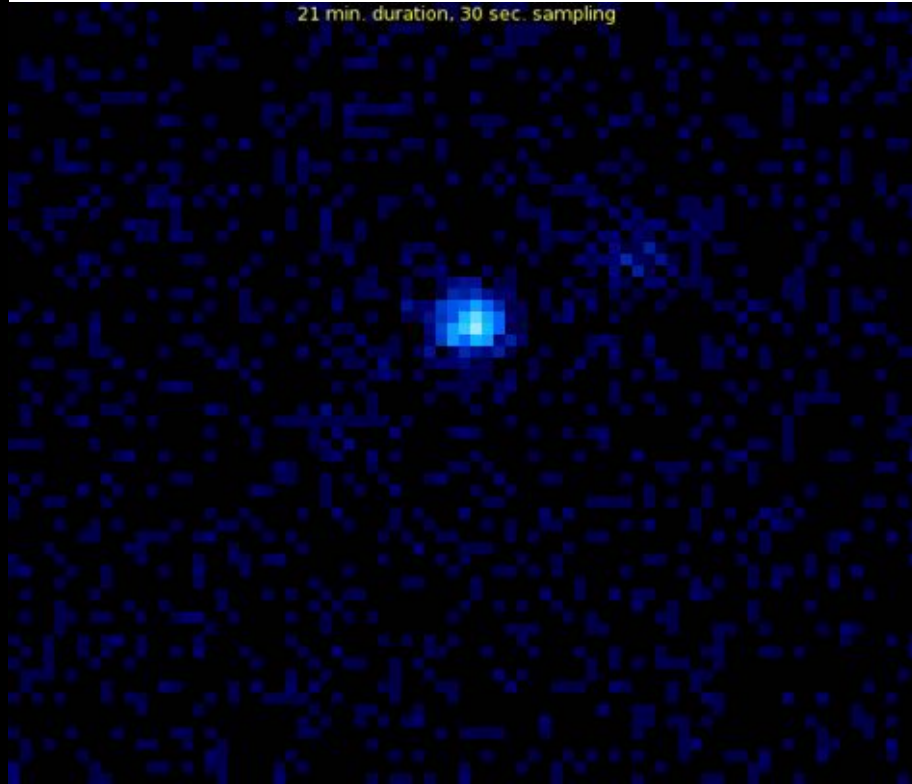
```
import gPhoton
```

```
def main():
```

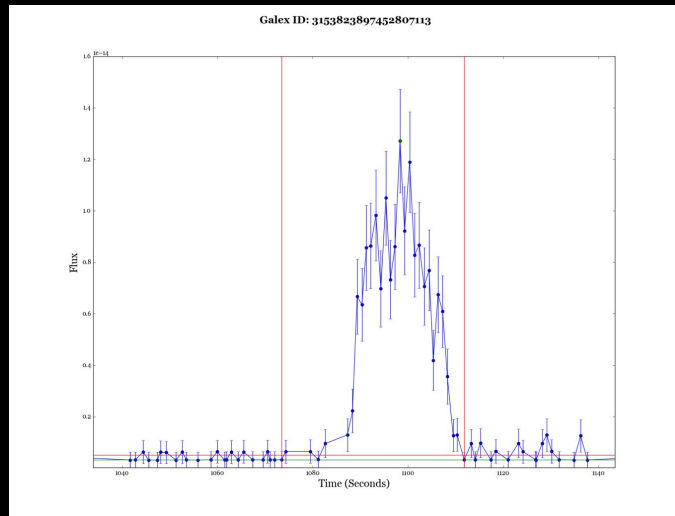
```
    gPhoton.gMap(band='NUV', skypos=[176.91975, 0.25561], stepsz=30., skyrange=[0.0333, 0.0333], cntfile='gj_3685a_movie.fits')
```

```
if __name__ == '__main__':  
    main()
```

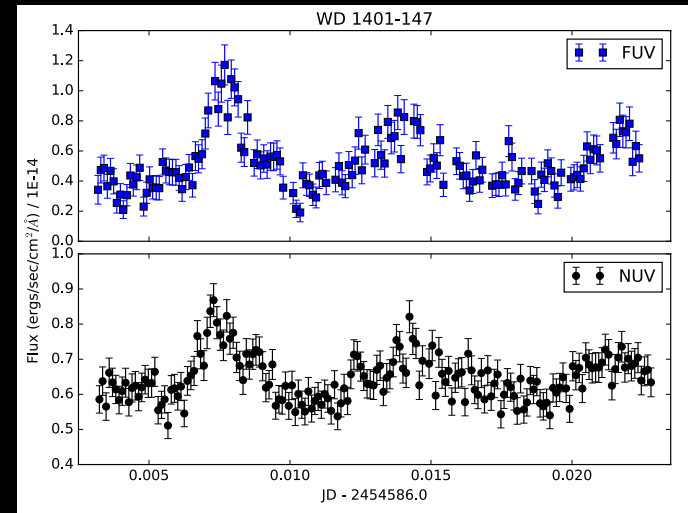
21 min. duration, 30 sec. sampling



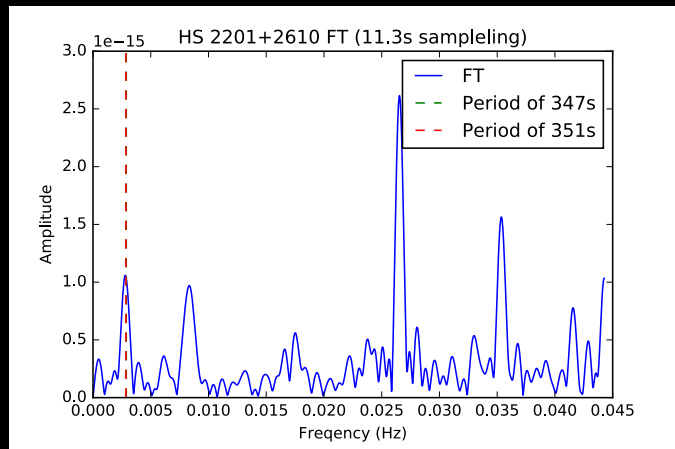
gPhoton – Early Science Examples



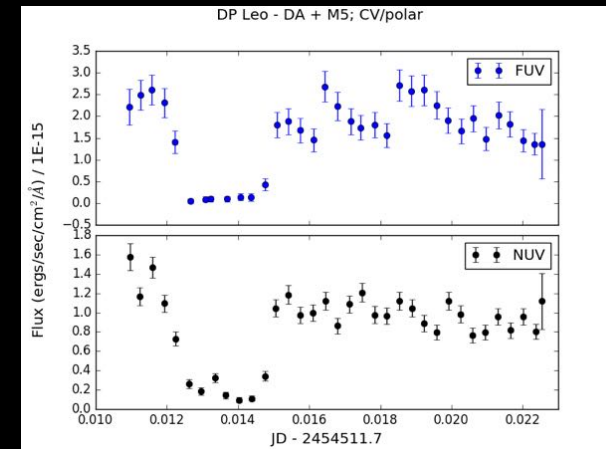
Stellar flares at low energies, w/
Rachel Osten and Clara Brasseur



White dwarf pulsations, with
Michael Tucker (2015 REU)



sdB pulsation survey, with
Thomas Boudreaux (2016 REU)



Eclipsing objects, including
polars and WD exoplanets

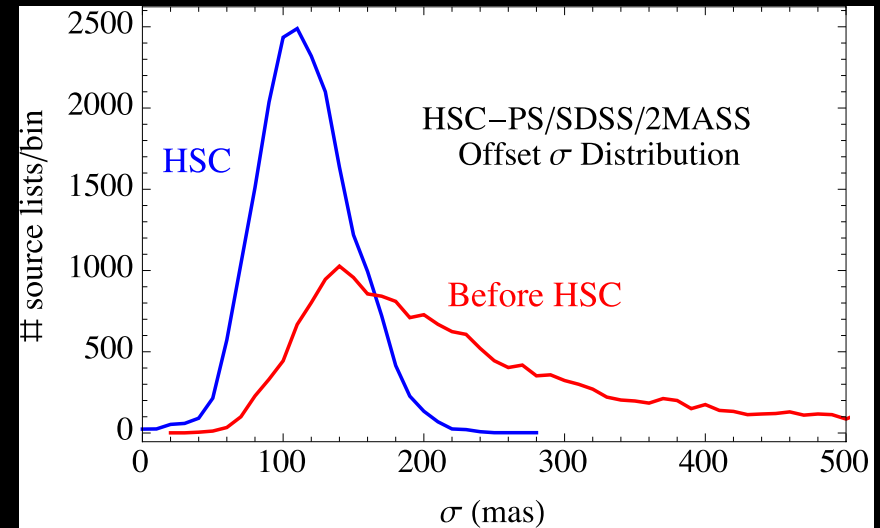
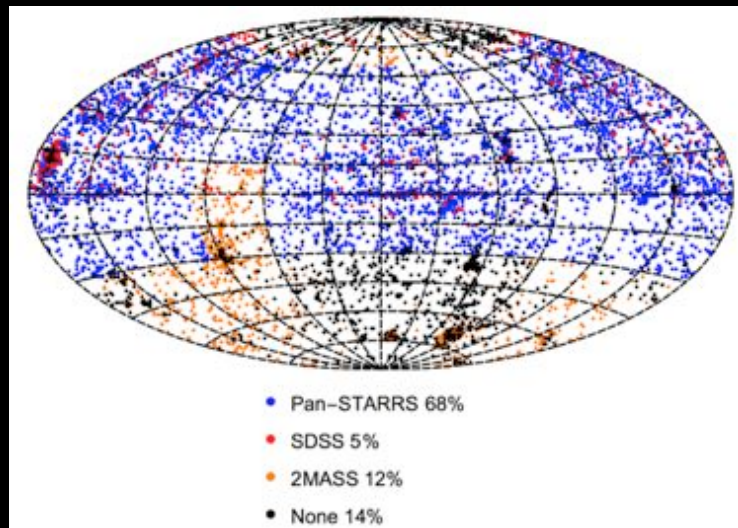
Enhancing Data Products: Hubble Source Catalog

The Hubble Source Catalog (HSC)

<https://archive.stsci.edu/hst/hsc/>

Paper: Whitmore, B.C, et al. 2016, *AJ*, 151, 134

1. Combines tens of thousands of SourceExtractor HLA source lists into a single master catalog. Uses matching algorithm from Budavari and Lubow 2012.
2. Includes WFPC2, ACS/WFC, and WFC3.
3. Absolute astrometry is good to ~ 100 mas (calibrated using PanSTARRS and 2MASS). This can eventually be improved to ~ 10 mas using Gaia observations).



HSC: Science Use Case

There are several Science Use Cases with step-by-step instructions and screen shots on the HSC webpage.

2. Are there Use Cases available for the HSC?

Yes. We have a variety of Use Cases:

[HSC Use Case #1](#) - Using the Discovery Portal to Query the HSC - (Stellar Photometry in M31 - Brown et al. 2009)

[HSC Use Case #2](#) - Using CASJOBS to Query the HSC - (Globular Clusters in M87 and a Color Magnitude Diagram for the SMC)

[HSC Use Case #3](#) - Using the Discovery Portal to search for Variable Objects in the HSC - (Time Variability in the dwarf irregular galaxy IC 1613)

[HSC Use Case #4](#) - Using the Discovery Portal to perform cross-matching between an input catalog and the HSC - (Search for the Supernova 2005cs progenitor in the galaxy M51)

NOTE: This use case was made using version 1. However, most of the changes are relatively minor, hence it is still quite useful.

[HSC Use Case #5](#) - Using the Discovery Portal and CasJobs to search for Outlier Objects in the HSC - (White dwarfs in the Globular Cluster M4)

[HSC Use Case #6](#) - Using the Discovery Portal to study the Red Sequence in a Galaxy Cluster - (The Red Sequence in the Galaxy Cluster Abell 2390)

NOTE: This use case was made using version 1. However, most of the changes are relatively minor, hence it is still quite useful.

[HSC Use Case #7](#) - Comparing HSC "Sloan" filter magnitudes and SDSS magnitudes - (using the field around GRB110328A)

NOTE: This use case was made using version 1. However, most of the changes are relatively minor, hence it is still quite useful.

[HSC Use Case #8](#) - Combining HSC magnitudes and HST spectra to Investigate Objects in the HSC (using objects in the LMC Cluster R136)

[HSC Use Case #9](#) - Searching for Objects with both HST Imaging and Spectroscopic Data

HSC: Science Use Case, Variables in IC 1613

Select a collection... **Hubble Source Catalog (HSCv2)** and enter target: **01:04:28 2:09:36 r=0.5m** Search

About Collections... HSC DB: **MagAper2** Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231

2416 Total Rows of Objects Equatorial Coord 01:04:28 +2:09:36 J2000, radius: 0.00833°

Filters List View

Clear Filters Edit Filters... Help...

Keyword/Text Filter Filter All Columns

Match ID

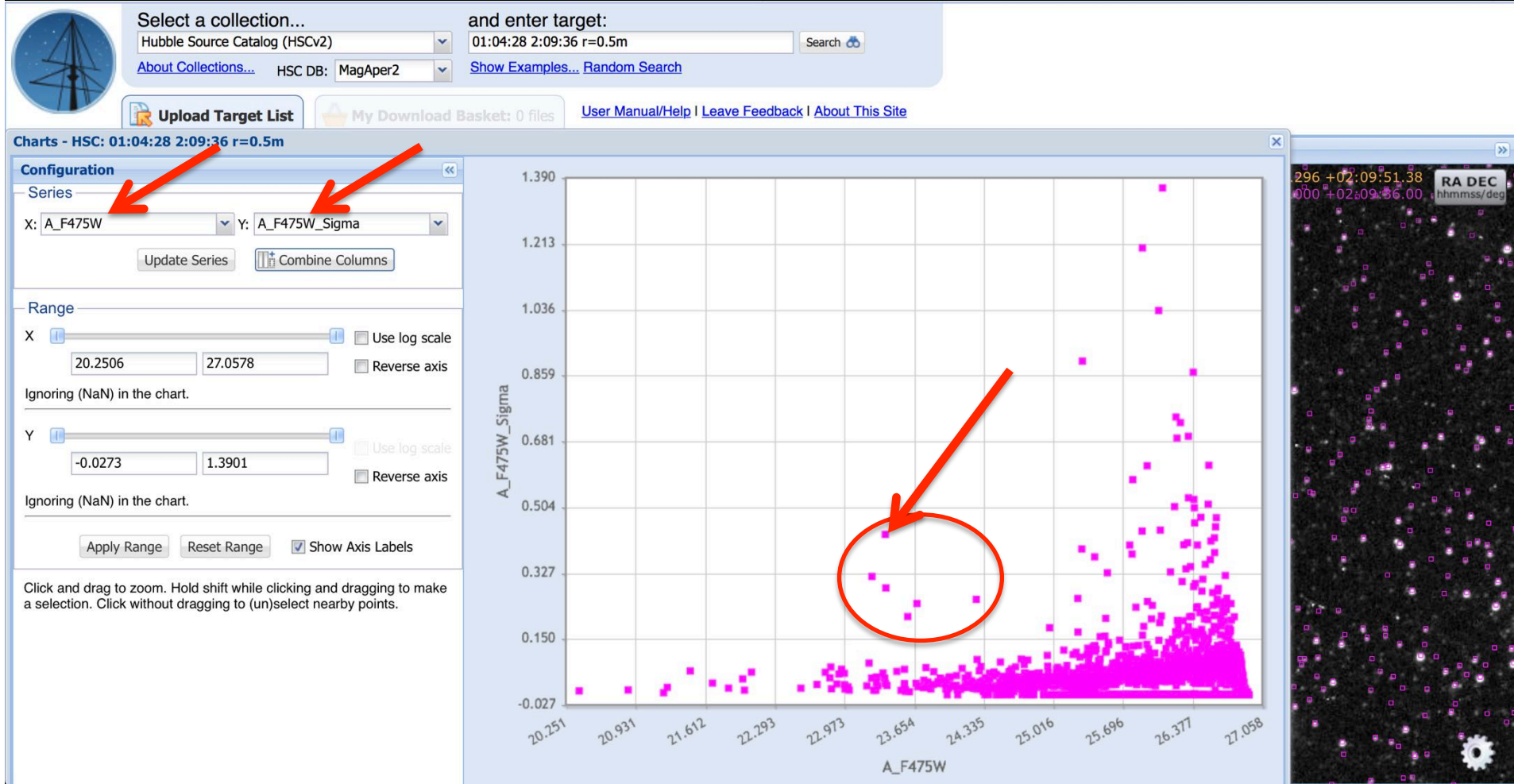
Distance

	Actions	Match ID	Distance	Match RA	Match Dec
1		87416231	0.0209300446210454	01:04:27.958	+02:09:34.
2		87418391	0.0227336760824004	01:04:27.916	+02:09:35.
3		87416241	0.0379670283468321	01:04:27.897	+02:09:37.
4		87416171	0.0412776078346797	01:04:27.949	+02:09:33.
5		87428772	0.042604457732627	01:04:27.861	+02:09:34.
6		87415845	0.0441243272632123	01:04:27.973	+02:09:33.
7		87418399	0.0454911604334835	01:04:27.866	+02:09:34.
8		87416631	0.0459757290961777	01:04:27.910	+02:09:33.
9		87416173	0.0460838457631922	01:04:27.943	+02:09:33.
10		87595655	0.0505050289109621	01:04:27.816	+02:09:34.
11		87415859	0.0530502911429743	01:04:27.894	+02:09:33.
12		87417121	0.0553675651103514	01:04:27.809	+02:09:37.

AstroView

01:04:29.296 +02:09:51.38
01:04:28.000 +02:09:36.00 RA DEC hhmmss/deg

HSC: Science Use Case, Variables in IC 1613



HSC: Science Use Case, Variables in IC 1613

Select a collection...
Hubble Source Catalog (HSCv2) and enter target:
01:04:28 2:09:36 r=0.5m Search

About Collections... HSC DB: MagAper2 Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231

2416 Total Rows of Objects Equatorial Coord 01:04:28 2:09:36 J2000, radius: 0.00833°





































Filters

Keyword/Text Filter
Filter All Columns

Match ID
87411055 87595960
Zoom to Range Reset/Unzoom

Distance
0.0209 0.5
Zoom to Range Reset/Unzoom

List View
Edit Columns... Table Display: All

	Actions	Match ID	Distance	Match RA	Match Dec	DSigma	AbsCorr	Num Filters	Num Visits	Num Images
<input checked="" type="checkbox"/>	  	87413475	0.442471804533232	01:04:28.391	+02:09:10.11	5.353971479...	Y	2	12	24
<input type="checkbox"/>	  	87416231	0.0209300446210454	01:04:27.958	+02:09:34.91	3.040930984...	Y	2	10	20
<input type="checkbox"/>	  	87418391	0.0227336760824004	01:04:27.916	+02:09:35.46	0	Y	1	1	1
<input type="checkbox"/>	  	87416241	0.0379670283468321	01:04:27.897	+02:09:37.67	9.709568143...	Y	2	10	20
<input type="checkbox"/>	  	87416171	0.0412776078346797	01:04:27.949	+02:09:33.65	8.059347551...	Y	2	11	15
<input type="checkbox"/>	  	87428772	0.042604457732627	01:04:27.861	+02:09:34.51	0	Y	1	1	1
<input type="checkbox"/>	  	87415845	0.0441243272632123	01:04:27.973	+02:09:33.38	2.607678444...	Y	2	12	24
<input type="checkbox"/>	  	87418399	0.0454911604334835	01:04:27.866	+02:09:34.15	0	Y	1	1	1
<input type="checkbox"/>	  	87416631	0.0459757290961777	01:04:27.910	+02:09:33.59	8.218517325...	Y	2	12	15
<input type="checkbox"/>	  	87416173	0.0460838457631922	01:04:27.943	+02:09:33.37	4.558227625...	Y	2	12	24
<input type="checkbox"/>	  	87595655	0.0505050289109621	01:04:27.816	+02:09:34.75	3.949158426...	Y	2	12	24
<input type="checkbox"/>	  	87415859	0.0530502911429743	01:04:27.894	+02:09:33.24	0	Y	1	1	1

HSC: Science Use Case, Variables in IC 1613

Select a collection...
Hubble Source Catalog (HSCv2) and enter target:
01:04:28 2:09:36 r=0.5m Search

About Collections... HSC DB: MagAper2 Show Examples... Random Search

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Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231 HSC Matches: 87413475

24 Total Rows of Measurements

Filters

Clear Filters Edit Filters... Help...

Keyword/Text Filter

Filter All Columns

ImageName

Name	Quantity
<input type="checkbox"/> hst_10505_11_acs_wfc_f814w	(1 of 1)
<input type="checkbox"/> hst_10505_11_acs_wfc_f475w	(1 of 1)
<input type="checkbox"/> hst_10505_13_acs_wfc_f814w	(1 of 1)
<input type="checkbox"/> hst_10505_13_acs_wfc_f475w	(1 of 1)
<input type="checkbox"/> hst_10505_14_acs_wfc_f814w	(1 of 1)

Show 19 More

Filter

Name	Quantity
<input type="checkbox"/> F814W	(12 of 12)
<input type="checkbox"/> F475W	(12 of 12)

Flags

Name	Quantity
------	----------

List View Album View

Edit Columns... Table Display: All

	Actions	CatID	MatchID	MemID	SourceID	ImageID	Det	Match RA	Match Dec	Sc
<input type="checkbox"/>		110543182	87413475	1	4000295011...	69741	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		87413475	2	4000295011...	69741	Y	01:04:28.391	+02:09:10.11		
<input type="checkbox"/>		110745614	87413475	3	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110742910	87413475	4	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		108267999	87413475	5	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		108268021	87413475	6	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		105523015	87413475	7	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		105523061	87413475	8	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		104261638	87413475	9	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		104261619	87413475	10	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110732263	87413475	11	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110733069	87413475	12	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	

AstroView

HSC: Science Use Case, Variables in IC 1613

Select a collection...
Hubble Source Catalog (HSCv2) and enter target:
01:04:28 2:09:36 r=0.5m Search

About Collections... HSC DB: MagAper2 Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231 HSC Matches: 87416231

24 Total Rows of Measurements

Filters List View Album View

















































Clear Filters Edit Filters... Help... Edit Columns... Table Display: All

Keyword/Text Filter
Filter All Columns

ImageName
Name Quantity
hst_10505_11_acs_wfc_f814w (1 of 1)
hst_10505_11_acs_wfc_f475w (1 of 1)
hst_10505_13_acs_wfc_f814w (1 of 1)
hst_10505_13_acs_wfc_f475w (1 of 1)
hst_10505_14_acs_wfc_f814w (1 of 1)
Show 19 More

Filter
Name Quantity
F814W (12 of 12)
F475W (12 of 12)

Flags
Name Quantity

	Actions	CatID	MatchID	MemID	SourceID	ImageID	Det	Match RA	Match Dec	Sc
1	   	110543182	87413475	1	4000295011...	69741	Y	01:04:28.391	+02:09:10.11	
2	    More Actions...	87413475	2	4000295011...	69741	Y	01:04:28.391	+02:09:10.11		
3	   	110745614	87413475	3	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
4	   	110742910	87413475	4	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
5	   	108267999	87413475	5	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
6	   	108268021	87413475	6	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
7	   	105523015	87413475	7	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
8	   	105523061	87413475	8	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
9	   	104261638	87413475	9	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
10	   	104261619	87413475	10	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
11	   	110732263	87413475	11	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	
12	   	110733069	87413475	12	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	

HSC: Science Use Case, Variables in IC 1613

mast.stsci.edu

MAST Portal

Select a collection... and enter target:
Hubble Source Catalog (HSCv2) 01:04:28 2:09:36 r=0.5m Search

About Collections... HSC DB: MagAper2 Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231 HSC Matches: 87413475

24 Total Rows of Measurements

Filters List View Album View

Clear Filters Edit Filters... Help... Edit Columns... Table Display: All Page 1 of 2 Displaying 1 - 20 of 24

Keyword/Text Filter
Filter All Columns

ImageName

Name	Quantity
<input type="checkbox"/> hst_10505_11_acs_wfc_f814w	(1 of 1)
<input type="checkbox"/> hst_10505_11_acs_wfc_f475w	(1 of 1)
<input type="checkbox"/> hst_10505_13_acs_wfc_f814w	(1 of 1)
<input type="checkbox"/> hst_10505_13_acs_wfc_f475w	(1 of 1)
<input type="checkbox"/> hst_10505_14_acs_wfc_f814w	(1 of 1)

Show 19 More

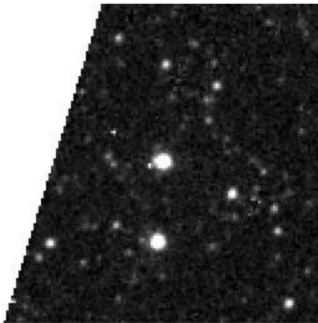
Filter

Name	Quantity
<input type="checkbox"/> F814W	(12 of 12)
<input type="checkbox"/> F475W	(12 of 12)

Flags

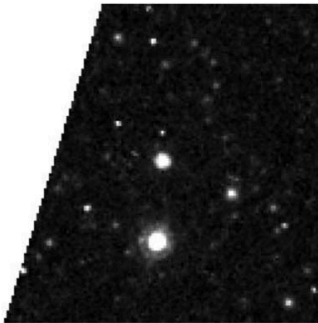
Name	Quantity
------	----------

4000295011782 Selected:



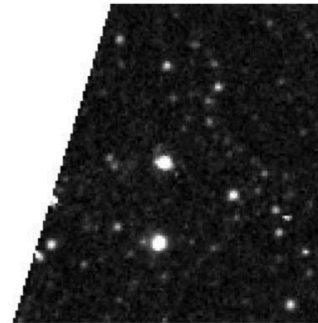
Source ID:4000295011782
Target Name: IC1613
ACS/ACS/WFC/F475W

4000295011782 Selected:



Source ID:4000295011782
Target Name: IC1613
ACS/ACS/WFC/F814W

4000239603209 Selected:



Source ID:4000239603209
Target Name: IC1613
ACS/ACS/WFC/F475W

4000239603209 4000036377404 4000036377404

AstroView

HSC: Science Use Case, Variables in IC 1613

Select a collection...
Hubble Source Catalog (HSCv2) and enter target:
01:04:28 2:09:36 r=0.5m Search

About Collections... HSC DB: MagAper2 Show Examples... Random Search

Upload Target List My Download Basket: 0 files User Manual/Help | Leave Feedback | About This Site

Home Page HSC: 01:04:28 2:09:36 r=0.5m HSC Matches: 87416231 HSC Matches: 87413475

24 Total Rows of Measurements

Filters List View Album View

Clear Filters Edit Filters... Help...

Keyword/Text Filter
Filter All Columns

ImageName
Name Quantity
hst_10505_11_acs_wfc_f814w (1 of 1)
hst_10505_11_acs_wfc_f475w (1 of 1)
hst_10505_13_acs_wfc_f814w (1 of 1)
hst_10505_13_acs_wfc_f475w (1 of 1)
hst_10505_14_acs_wfc_f814w (1 of 1)
Show 19 More

Filter
Name Quantity
F814W (12 of 12)
F475W (12 of 12)

Flags
Name Quantity

	Actions	CatID	MatchID	MemID	SourceID	ImageID	Det	Match RA	Match Dec	Sc
<input type="checkbox"/>		110543182	87413475	1	4000295011...	69741	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>	More Actions...	87413475	2	4000295011...	69741	Y	01:04:28.391	+02:09:10.11		
<input type="checkbox"/>		110745614	87413475	3	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110742910	87413475	4	4000239603...	69735	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		108267999	87413475	5	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		108268021	87413475	6	4000036377...	69810	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		105523015	87413475	7	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		105523061	87413475	8	4000046499...	69789	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		104261638	87413475	9	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		104261619	87413475	10	4000005716...	69796	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110732263	87413475	11	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	
<input type="checkbox"/>		110733069	87413475	12	4000241633...	69755	Y	01:04:28.391	+02:09:10.11	

Footprints: All

AstroView

HSC: Science Use Case, Variables in IC 1613



Select a collection...

Hubble Source Catalog (HSCv2)

and enter target:

01:04:28 2:09:36 r=0.5m

Search

[About Collections...](#)

HSC DB: MagAper2

[Show Examples...](#) [Random Search](#)

Charts - HSC Matches: 87413475

Configuration

Series

X: Start Time Y: FluxAper2

Update Series

Combine Columns

Range

X Use log scale

2006-08-18 05:52 2006-08-20 16:29

Reverse axis

Y Use log scale

8.1127 25.2716

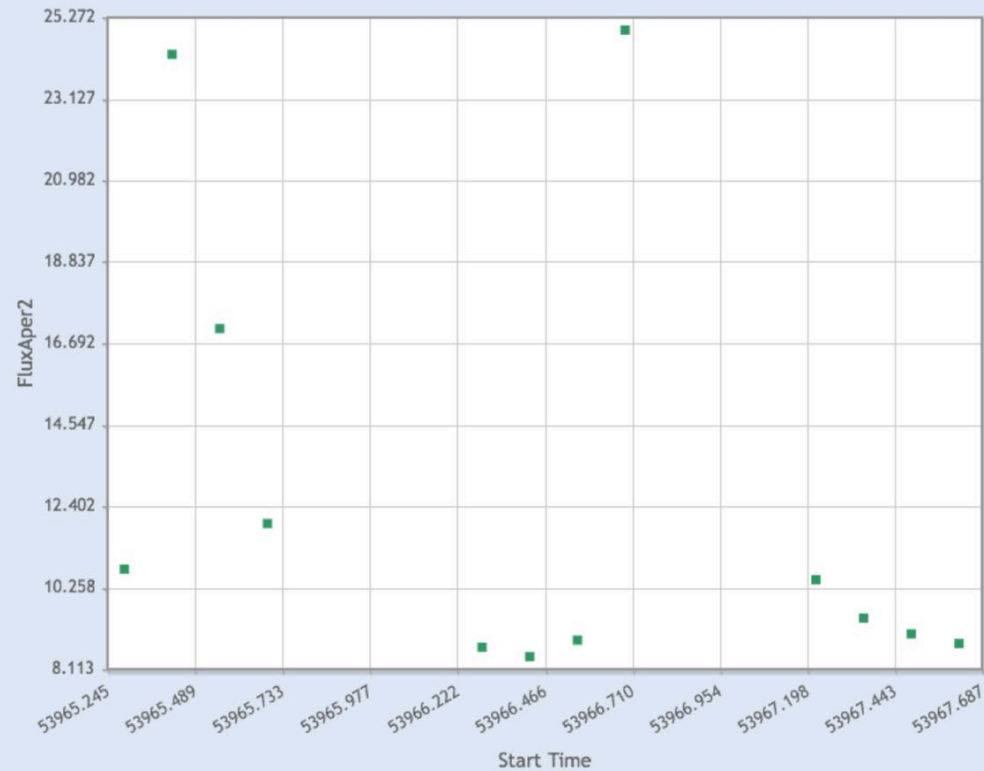
Reverse axis

Apply Range

Reset Range

Show Axis Labels

Click and drag to zoom. Hold shift while clicking and dragging to make a selection. Click without dragging to (un)select nearby points.



All

AstroView

Match Dec Sc

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

02:09:10.11 16

Quantity

Summary

- MAST supports more than 20 missions: cross-mission discoverability is a key driver in our development efforts.
- The MAST Portal allows for searching across MAST missions and catalogs, the Virtual Observatory, and CDS catalogs.
- Beyond archiving mission data, MAST also creates enhanced data products that enable new science. Recent examples are:
 - gPhoton: A time-tagged database of 1.1 trillion GALEX photon events.
 - HSC: A master catalog of unique sources across all HST observations.
- Newly created STScI Data Mission Office, led by Arfon Smith, will begin to expand MAST capabilities into modern technological arenas, including cloud storage, “bring-code-to-the-data” environments, improved access to high performance computing resources, better support for API access to MAST resources.