



MAST
Users
Group
Meeting

December
15-16,
2016

Kepler / K2 / TESS

Scott W. Fleming

STScI

Operations and Engineering Division



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December
15-16,
2016

Kepler Status

- DR25 = Final Release
 - Long and Short Cadence Data Released
 - Documentation Review Completed Oct.
- Things To Come In 2017
 - Final Release of Documentation/Handbooks
 - Release of SOC Pipeline Source Code
 - Final Exoplanet and Completeness Data (NExSci)
 - MAST Redesign, Kepler is the first mission we are using to help design new layout and content



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Meeting

December
15-16,
2016

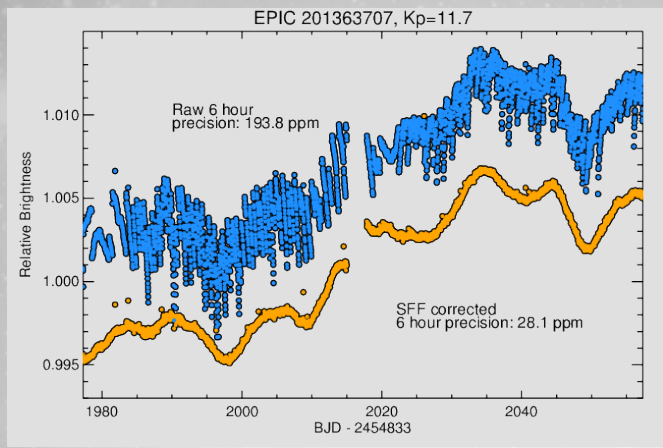
K2 Status

- Existing Data
 - Campaigns 0-9 public, Campaign 10 raw public.
 - High Level Science Products from several groups with custom detrended light curves, some include variable source catalogs
- Near-term Schedule
 - Dec. 19th = C10 ingest at MAST begins
 - C2 reprocessed in Jan., C11 data in Feb., then C0 reprocessed

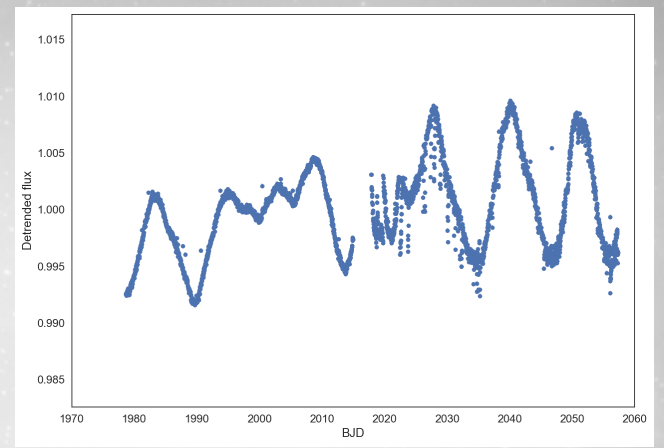


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Users
Group
Meeting
December
15-16,
2016

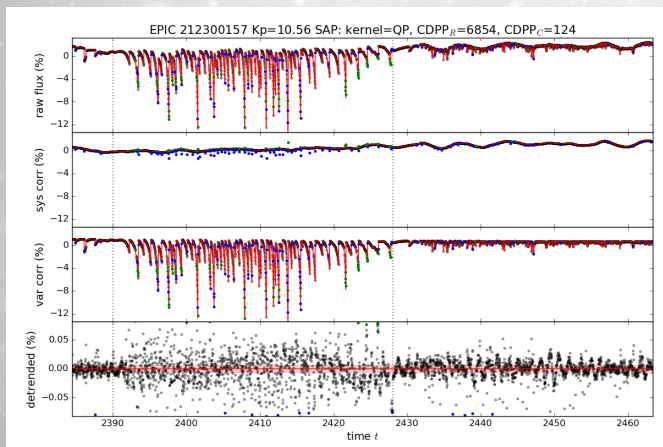
K2 HLSPs



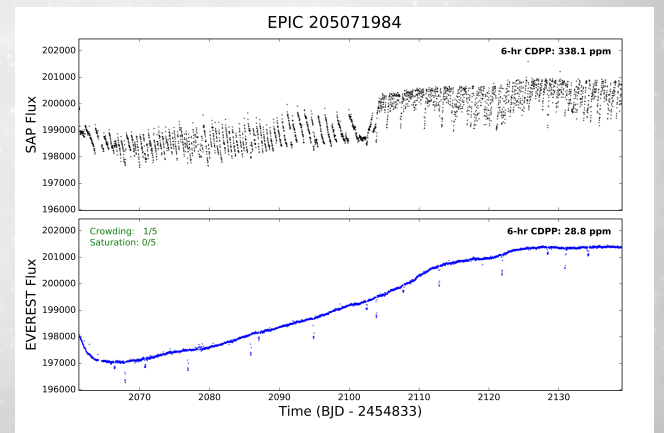
K2SFF – Vanderburg et al.
C0-C9 + ENG



K2VARCAT – Armstrong et al.
C0-C4, and variability cat.



K2SC – Aigrain et al.
C3-C6



EVEREST – Luger et al.
C0-C8, code is open source



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December
15-16,
2016

TESS Input Catalog

- TIC = ~600 million sources of all luminous objects in the sky, down to 2MASS limit, with additional sources added
- Cross-match between 2MASS, Gaia, SDSS, ALLWISE, APASS, Tycho-2, UCAC4, APOGEE-1, RAVE, KIC+EPIC, LAMOST, also includes extended sources from SDSS, 2MASS, and ALLWISE Extended catalogs
- CTL = (currently) 19 million targets that will be considered for 2-minute cadence



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December
15-16,
2016

TESS Input Catalog

- Plan for demos at Jan. AAS
- Public release possibly as soon as late Jan.
- MAST Portal and CasJobs are primary ways of interacting with the TIC



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Meeting

December
15-16,
2016

Primary Interfaces

MAST Access Capabilities, Based On # of Targets

$10^0 - 10^1$ = MAST Portal, standard search

$10^2 - 10^3$ = MAST Portal, target list upload

$10^4 - 10^5$ = MAST Portal, advanced search

10^6+ = MAST CasJobs, SQL interface

Caveats

Screenshots are with v2 of the TIC.

Details subject to change.

10⁰⁻¹: MAST Portal – Standard Search

mast.stsci.edu

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December
15-16,
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Select a collection...

All MAST Observations

[About Collections...](#)

and enter target:

Enter object name or RA and Dec to cone search

Search

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

Upload Target List

My Download Basket: 0 files

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

Fleming

Login...

Account Info...

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:

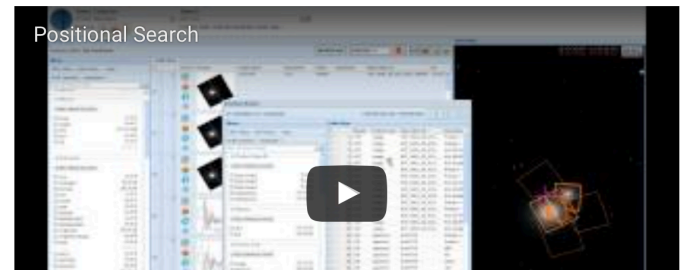
1. Select a collection and enter a new search target OR upload an existing list of targets.
2. Use the filters and analysis tools to find the exact data you're looking for.
3. Add files to the download basket to control your download options.

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- Hubble Source Catalog: A master catalog with a hundred million measurements of objects in Hubble images.

Featured tutorial: Conducting a search



AstroView

10⁰⁻¹: MAST Portal – Standard Search

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December
15-16,
2016



Select a collection...

MAST Catalogs

[About Collections...](#)

Mission: Gaia

and enter target:

Enter object name or RA and Dec to cone search

Search

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

Upload Target List

My Download Basket: 0 files

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MAST
Users
Group
Meeting

December
15-16,
2016



Select a collection...

MAST Catalogs

[About Collections...](#)

Mission: TESS Input

and enter target:

Enter object name or RA and Dec to cone search

Search

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

[Upload Target List](#)

My Download Basket: 0 files

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Quick Start:

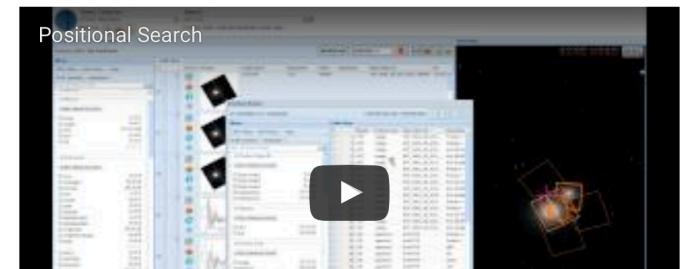
1. Select a collection and enter a new search target OR upload an existing list of targets.
2. Use the filters and analysis tools to find the exact data you're looking for.
3. Add files to the download basket to control your download options.

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Users
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Meeting

December
15-16,
2016

Select a collection...
MAST Catalogs

and enter target:
goods-n r=10m

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 TIC: goods-n r=10m

882 Total Rows NAME GOODS-N FIELD, radius: 0.16667°

Footprints: All

Filters

- Keyword/Text Filter
- Source of Position
 - SDSSGAL (778 of 778)
 - 2mass (103 of 103)
 - 2MASSEXT (1 of 1)
- PM Flag
 - UCAC4 (28 of 28)
- Source of Parallax
 - allen (1 of 1)
- TWOMflag
 - AAA-222-111-000-0-U (42 of 42)
 - AAB-222-111-000-0-U (5 of 5)
 - ABC-222-111-000-0-U (4 of 4)

	Actions	ID	version	HIP	TYC	UCAC	TWOMASS
<input type="checkbox"/>		20208018358	20160411	0			
<input type="checkbox"/>		20208018527	20160411	0			
<input type="checkbox"/>		20208018316	20160411	0			
<input type="checkbox"/>		20208018351	20160411	0			
<input type="checkbox"/>		20208018369	20160411	0			
<input type="checkbox"/>		20208018315	20160411	0			
<input type="checkbox"/>		20208018526	20160411	0			
<input type="checkbox"/>		147681425	20160411	0			12364946+
<input type="checkbox"/>		20208018296	20160411	0			
<input type="checkbox"/>		20208018295	20160411	0			
<input type="checkbox"/>		20208018372	20160411	0			
<input type="checkbox"/>		20208018379	20160411	0			
<input type="checkbox"/>		20208018380	20160411	0			

AstroView

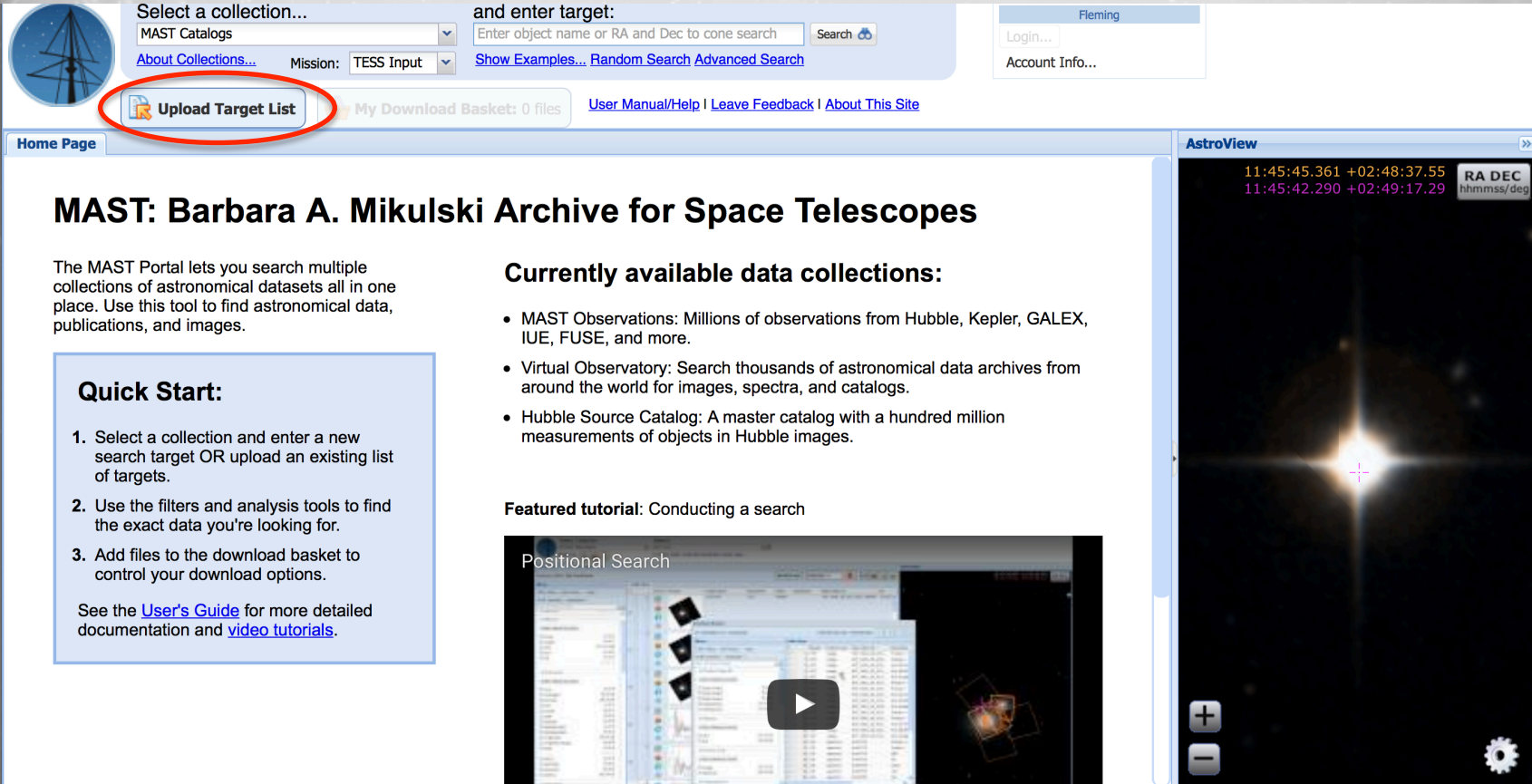
12:36:55.008 +62:14:15.00
12:36:55.008 +62:14:15.00

RA DEC
hhmmss/deg

10²⁻³: MAST Portal – Upload Search

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Users
Group
Meeting

December
15-16,
2016



The screenshot shows the MAST Portal interface. At the top, there is a navigation bar with a search box, a dropdown menu for 'Select a collection...' (currently set to 'MAST Catalogs'), 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, there is a 'Fleming' user profile with 'Login...' and 'Account Info...' options. Below the navigation bar, there is a 'Home Page' tab and a 'My Download Basket: 0 files' indicator. The main content area is titled 'MAST: Barbara A. Mikulski Archive for Space Telescopes'. It contains a 'Quick Start' section with three numbered steps and a 'Featured tutorial: Conducting a search' section with a video player titled 'Positional Search'. On the right side, there is an 'AstroView' panel showing a star with its coordinates (RA DEC) and a zoomed-in view of the star.

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

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- 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
11:45:42.290 +02:49:17.29 RA DEC
hhmmss/deg

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Users
Group
Meeting

December
15-16,
2016

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

Fleming
Login...
Account Info...

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

Home Page kepler_upload_search.txt

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	19:28:52.742	+37:34:04.05

AstroView

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

RA DEC
hhmmss/deg

10²⁻³: MAST Portal – Upload Search

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Group
Meeting

December
15-16,
2016

Select a collection...
MAST Catalogs

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

Flaming
Login...
Account Info...

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	19:28:52.742 +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, et
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, MI
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

TIC will be here as a choice.

10²⁻³: MAST Portal – Upload Search

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Users
Group
Meeting

December
15-16,
2016

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

Footprints: All

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

Filters

Keyword/Text Filter

astrometric_n_obs_ac

astrometric_n_good_obs_ac

AstroView

10⁴⁻⁵: MAST Portal – Advanced Search

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December
15-16,
2016

Select a collection...
MAST Catalogs
About Collections... Mission: TESS Input Show Examples... Random Search **Advanced Search**

and enter target:
Enter object name or RA and Dec to [copy search](#) Search

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

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Featured tutorial: Conducting a search

Positional Search

AstroView
03.098 +37:14:13.17 RA DEC
03.098 +37:14:13.17 hhmss/deg

10⁴⁻⁵: MAST Portal – Advanced Search



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Meeting

December
15-16,
2016

Select a collection... and enter target: Fleming

MAST Catalog Advanced Search

Records Found: 595,540,434
(Load Limit: 50,000)
(Download Limit: 500,000)

Enter object name or RA and Dec to cone search [Show Examples...](#)

Applied Filters

Clear All

Columns

Defaults Hide All

Filter columns:

- ID
- version
- HIP
- TYC
- UCAC
- TWOMASS
- SDSS
- ALLWISE
- GAIA
- APASS
- KIC
- RA

Filters

ID <input type="text" value="Enter text here"/> This column must be searched via the text box at the top of this panel	TWOMASS <input type="text" value="Enter text here"/> This column must be searched via the text box at the top of this panel	RA 0 360
Dec 	Bmag 	Vmag

10⁴⁻⁵: MAST Portal – Advanced Search



MAST
Users
Group
Meeting

December
15-16,
2016

Select a collection... and enter target: Fleming

MAST Catalog Advanced Search

Records Found: 474,723
(Load Limit: 50,000)

Enter object name or RA and Dec to cone search Search 🔍

[Show Examples...](#)

Applied Filters

Clear All Hmag: [8, 9] Effective Temperature: [2000, 4000]

Columns

Defaults Hide All

Filter columns:

- prox
- w1mag
- e_w1mag
- w2mag
- e_w2mag
- w3mag
- e_w3mag
- w4mag
- e_w4mag
- GAIAmag
- e_GAIAmag
- Tmag
- e_Tmag

Filters

	<input type="text" value="0"/> <input type="text" value="360"/>	<input type="text" value="-89.9928"/> <input type="text" value="89.9901"/>
Hmag	Effective Temperature	log Surface Gravity
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="text" value="8"/> <input type="text" value="9"/>	<input type="text" value="2000"/> <input type="text" value="4000"/>	<input type="text" value="0"/> <input type="text" value="5.5"/>
Metallicity		
<input checked="" type="checkbox"/>		

10⁴⁻⁵: MAST Portal – Advanced Search



MAST
Users
Group
Meeting

December
15-16,
2016

Select a collection... and enter target: Fleming

MAST Catalog Advanced Search

Records Found: 52

Enter object name or RA and Dec to cone search Search

[Show Examples...](#)

Applied Filters

Clear All pmRA: [500, 7000] Hmag: [8, 9] Effective Temperature: [2000, 4000]

Columns

Defaults Hide All

Filter columns:

- Dec
- Source of Position
- pmRA
- e_pmRA
- pmDEC
- e_pmDEC
- PM Flag
- Parallax
- Parallax Uncertainty
- Source of Parallax
- Galactic Longitude
- Galactic Latitude
- Ecliptic Longitude

Filters

	<input type="text" value="0"/> <input type="text" value="360"/>	<input type="text" value="-89.9928"/> <input type="text" value="89.9901"/>
pmRA	Hmag	Effective Temperature
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="text" value="500"/> <input type="text" value="7000"/>	<input type="text" value="8"/> <input type="text" value="9"/>	<input type="text" value="2000"/> <input type="text" value="4000"/>
log Surface Gravity	Metallicity	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

10⁴⁻⁵: MAST Portal – Advanced Search



MAST
Users
Group
Meeting

December
15-16,
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Select a collection...
MAST Catalogs

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

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

Home Page | TIC: Advanced Search 1

52 Total Rows | Footprints: All

Filters

- Keyword/Text Filter**
Filter All Columns
- Source of Parallax**
Name: allen (33 of 33)
- TWOMflag**
Name: AAA-111-111-000-0-0 (27 of 27), AAA-212-111-000-0-0 (9 of 9), AAA-222-111-000-0-0 (7 of 7), AAA-112-111-000-0-0 (3 of 3), AAA-212-111-000-0-U (2 of 2)
- TESS Flag**
Name: icmag (49 of 49), tor_jhk (2 of 2), tor_vjhc (1 of 1)

Actions	ID	version
1	344161751	20160411
2	336777483	20160411
3	24923308	20160411
4	398570754	20160411
5	388130306	20160411
6	257526400	20160411
7	326196770	20160411
8	219228930	20160411
9	12421103	20160411
10	322736687	20160411
11	165231801	20160411
12	200729521	20160411
13	197758148	20160411

AstroView

02:20:21.079 +21:34:15.75
23:04:16.651 +10:53:49.78

RA DEC
hhmmss/deg

10⁶⁺: MAST CasJobs – SQL Interface

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December
15-16,
2016



MAST Query / CasJobs

Help Tools Query History MyDB Import Groups Output Profile Admin Logout scfleming

Context **Table (optional)** **Task Name**

Kepler MyTable My Query

Samples Recent Clear Line 5, Col 15 [3 s] Query complete! Syntax Plan Quick Submit

```
select * from kepler_input_catalog
where
kic_hmag < 9
and
kic_pmra > 0.1
```

51 row(s)

kic_ra	kic_dec	kic_pmra	kic_pmdec	kic_umag	kic_gmag	kic_rmag	kic_imag	kic_zmag	kic_gredmag	kic_d51mag	kic_jmag	kic_hmag	kic_kmag	kic_kepmag	kic_kepler_id	kic_t
19.8217041	41.582462	0.104	-0.176	null	7.988	7.531	null	null	null	null	6.544	6.346	6.283	7.501	6225718	28321
19.4405476	49.465282	0.457	0.713	null	8.973	8.047	null	null	null	null	6.161	5.674	5.566	7.903	11506859	31212
19.5609558	39.526875	0.219	-0.423	null	13.128	11.419	null	null	null	null	8.119	7.56	7.339	10.935	4470937	26847
19.7781373	44.34853	0.1338	-0.0022	null	7.292	6.885	6.819	6.837	null	null	5.934	5.698	5.623	6.961	8379927	13053
20.0860509	38.478457	0.2633	0.1115	null	6.81	6.189	null	null	null	null	4.923	4.743	4.621	6.119	3393677	11110
20.1868449	37.963882	0.14	-0.132	null	13.467	12.019	11.402	null	null	null	8.593	7.929	7.735	12.016	2804752	31853
20.0471894	39.668157	0.1533	0.0467	null	13.152	12.449	null	null	null	null	9.518	8.831	8.71	12.359	4605317	11424
18.8569942	38.626571	0.3235	0.044	null	7.686	7.156	null	null	null	null	6.015	5.762	5.685	7.108	3520395	10650

Plot Save As HTML Query Results Both

Contact MAST
CASJobs is made possible by the [Sloan Digital Sky Survey Collaboration](#)
\$Name: v3_5_16 \$, \$Revision: 1.70 \$, Last modified: Wednesday, September 17, 2008 at 4:35:22 PM

Example from Kepler KIC.



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10⁶⁺: MAST CasJobs – SQL Interface

- Output results, and queries, are stored in CasJobs.
- Long jobs allowed, start query and return later.
- Export as CSV, FITS, VOTable.
- Use SQL joins to cross-match in bulk with other large catalogs in MAST CasJobs:

GALEX, PanSTARRS, Kepler/K2, Gaia, SDSS, Hubble Source Catalog, various High Level Science Product catalogs from the community



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Other MAST TESS Spaces

- MAST mission homepage, like Kepler and K2 ones.
<https://archive.stsci.edu/tess/> (not active yet)
- Data Release notes, information from wiki for public.
- Step-by-step examples for various search interfaces.
- MAST forum, includes a category for TESS questions.

<https://forum.stsci.edu>

- CSV files of the entire TIC will be put online for those who want it.
- MAST redesigning website look & feel for 2017.