Status of the Spitzer Space Telescope and of Selected Other IPAC Projects

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IPAC, Head of Science Staff

What is IPAC?

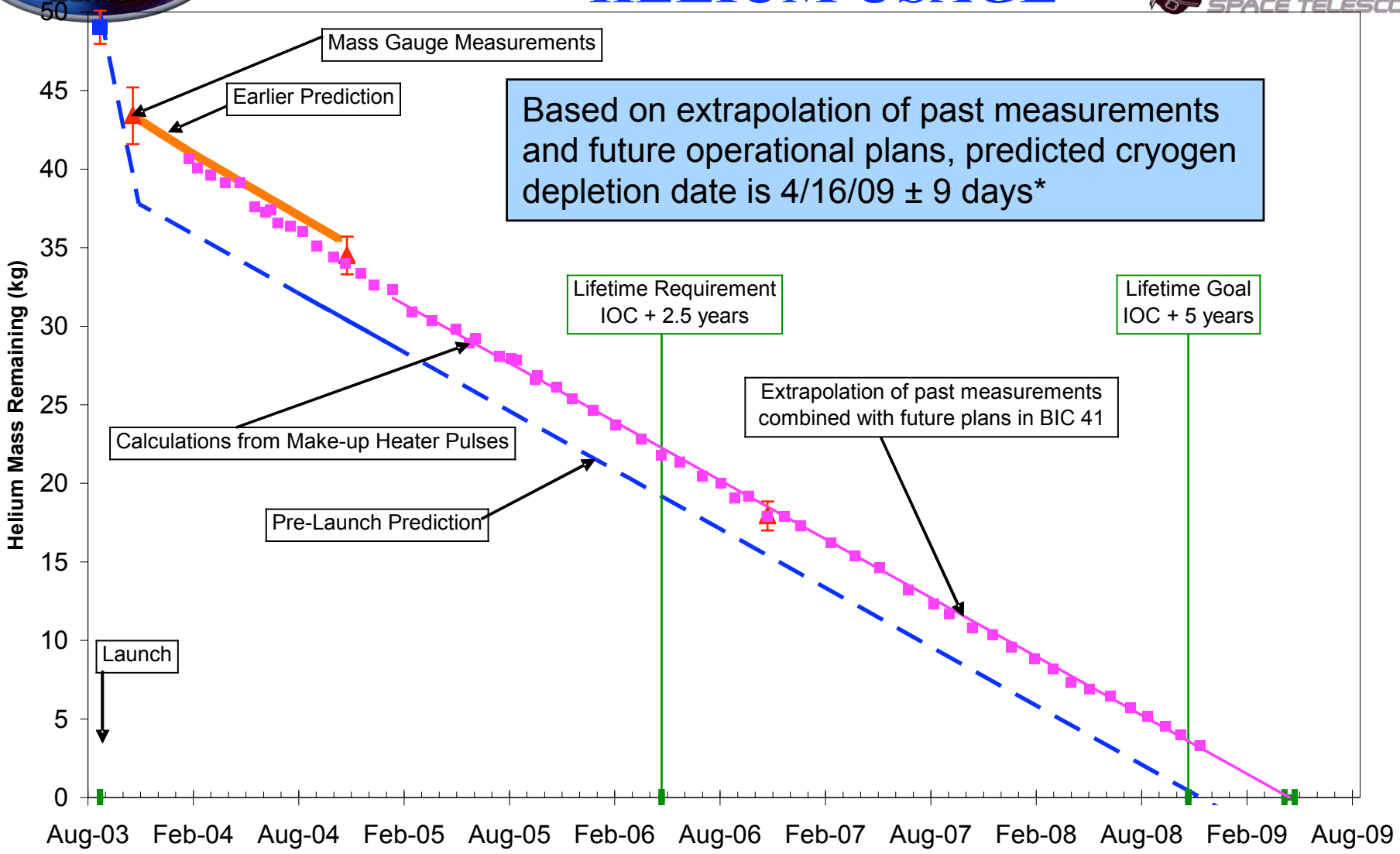
- **IPAC is NASA's Infrared Science center**
- **It includes:**
  - *The Spitzer Science Center*
  - *The NASA Herschel Science Center*
  - *IRSA (Infrared Science Archive - serves IRAS, 2MASS, SWAS, etc.)*
  - *NED (NASA Extragalactic Database)*
  - *NStED (NASA Stellar and Exoplanet Database - New)*
  - *WISE science center*

What will I be talking about?

- The past, present and future of Spitzer
- Status and expectations for WISE
- Status of NStED

Completion of the Cryogenic Mission and Preparation for the Beginning of the Warm Mission

HELIUM USAGE



Depletion date uses a linear extrapolation of mass measurements since January 2005, then adjusts the end date by comparing future operational plans to the past operations.
*Depletion date uncertainty ±9 days based on 2-sigma linearity of data. Historically, this method has errors as large as ±5% (3 months).

Scheduling Summary Through Week 266 (2009 January 1)

Category	Hours Scheduled (Week)	Hours Scheduled to Date	Hours Total	Hours Remaining	Percent Complete
GTO	-	3541.9	3541.9	0.0	100.0
Legacy I	-	3198.9	3198.9	0.0	100.0
GO1	-	3366.0	3366.0	0.0	100.0
GO2	-	6169.4	6169.4	0.0	100.0
GO3 - GTO	-	1117.2	1117.2	0.0	100.0
GO3 - GO/Legacy	-	6006.9	6006.9	0.0	100.0
GO4 - GTO	2.6	954.2	1021.6	67.4	93.4
GO4 - GO/Legacy	5.5	5337.7	5587.1	249.4	95.5
GO5 - GTO/Fazio	0.0	160.7	343.2	182.5	46.8
GO5 - GTO/Houck	0.0	172.5	327.0	154.5	52.8
GO5 - GTO/Rieke	4.0	202.1	340.4	138.3	59.4
GO5 - GTO Total	4.0	535.3	1010.6	475.3	53.0
GO5 - GO/Legacy	123.4	2433.2	4919.9	2486.7	49.5
DDT including Cycle 5	2.0	1132.5	1221.1	88.6	92.7
TOTAL	137.5	33793.2	37160.6	3367.4	90.9

Issues and Comments

- **When Cycle-5 began, unexecuted AORs from previous cycles were elevated one group in scheduling priority**
  - *e.g. Low priority AORs from Cycle-4 become medium priority in Cycle-5*

    WE DON'T GUARANTEE CYCLE-4 PROGRAMS WILL BE COMPLETED
- **Goal remains to ensure that the highest ranked science programs are scheduled before the end of the cryogenic mission while maintaining high efficiency**
  - *All Cycle 3 AORs have been executed*
  - *Expect to complete nearly all Cycle 4 and Cycle 5 priorities 1 and 2*
    - Are working with observers to satisfactorily schedule AORs causing difficulty (e.g. difficult constraints, large data volumes, bright source latents)
  - *Assuming no major anomalies and with cryogen lasting until April 2009, we should accommodate much of the Cycle 5 priority 3*
    - Approximately 1500 hours
    - Began executing priority 3 observations in IRAC 56 (end of October 2008)

Operating Environment Assumptions for IWIC

- **Spitzer will be passively cooled after cryogen runs out**
  - *Telescope ~ 24-25 K*
  - *Multiple Instrument chamber (IRAC) ~ 25-29 K*
  - *IRAC will be ~0.2-0.6 K above the MIC through self-heating*
  - *Plan to operate IRAC at >1K above MIC for thermal control ⇒ 31 K*
  - *Telescope temperature equilibrium occurs within 5 weeks*
- **Observatory operations remain identical to cryogenic mission**
  - *No change in S/C fault protection*
- **OPZ (operational pointing zone) remains the same**
- **Downlink system supports 1.65 Mb/s**
  - *One downlink / 12 hours*
  - *Downlinks are 2 hours in duration*
- **Pointing system exhibits same stability and accuracy**
  - *Will perform pointing calibrations with same cadence as cryogenic mission*
- **Variations in optical properties of Spitzer will be small**
  - *Dramatic changes in focus, boresight-instrument alignment, PSF will be considered anomalies*

Predicted IRAC Performance

- **Observations with 3.6 and 4.5 μm (InSb) arrays only**
  - *5.8 and 8.0 μm arrays will be powered on, but zero biased*
- **Temperature of arrays actively controlled**
  - *Arrays heated to operating temperature of 31 K*
- **Limited testing of similar arrays at 30 K by University of Rochester (McMurty et al. 2008 SPIE 6265, 626508)**
- **No significant increase in dark current (~ 0.2 electrons/s)**
- **Slight increase in read noise**
  - *Possibly 50%*
  - *May be mitigated with higher Fowler sampling*
- **Most observations should still be background / photon dominated**
  - *Anticipate frametimes >30 seconds background limited for all backgrounds*
- **Residual images are more significant but possibly decay faster**
  - *Behavior of channel 1 long term residuals to be determined (estimated to be half current strength from 30 K ground test)*
  - *Redundancy will be important*
  - *Thermal annealing is expected mitigation method*
  - *$\Delta T \sim 8$ K effective in cryogenic mission, plan anneals to 40 K ($\Delta T = 9$ K) for warm mission*

State of IRAC after IWIC

- IRAC is on and arrays are stabilized at operating temperature
- Array biases are set and fowler number/wait tick combinations for frametimes defined
- AOT has been checked-out and ready for science
- If necessary, anneal strategy has been developed, final anneal IER tested and demonstrated effective
- Detectors linearized to better than 1% up to 90% full well
- Bias Uncertainty 1-2%
- Gain Map uncertainties 1.2% and 0.5% at 3.6 and 4.5 μm
- Relative photometric calibration < 5% (probably much better)
- Absolute photometric calibration < 10% (probably better than 5%)
- Data taken for first-frame correction
- Data taken for pixel-phase effect, array location dependent photometric correction
- Data taken for point response function generation

Results of Cycle 6 “Exploration Science” Call for Proposals

Proposals Received

- **35 proposals received -- 38,050 hours requested**
  - *46 letters of intent received*

Proposals	Science Category	Hours
13	Distant Universe	17,596.1
3	Nearby Universe	2,915.3
7	Exoplanets	5,690.0
10	Galactic	10,018.1
2	Solar System	1,829.8

  - *Oversubscription ~ 4*
- **Original Legacy Science Program**
  - *34 letters of intent, 28 proposals received, requested ~16,800 hours*

Cycle-6 Selection

- **10 programs selected - 10,345 hours**
  - *Extragalactic 5377 hrs* *Galactic/Planetary 4968 hrs*

PID	Science Category	PI Institution	Title	Co-Is	Hours
60010	cosmology	Wendy Freedman *Carnegie Observatories*	The Hubble Constant	5	**705**
60022	high-z galaxies	Giovanni Fazio *Smithsonian Astrophysical Obs.*	SEDS: The Spitzer Extended Deep Survey	46	**2108**
60024	high-z galaxies	Mark Lacy *Spitzer Science Center*	SERVS: the Spitzer Extragalactic Representative Volume Survey	46	**1400**
60034	high-z galaxies	Eiichi Egami *University of Arizona*	The IRAC Lensing Survey: Achieving JWST depth with Spitzer	12	**526.4**
60007	nearby galaxies	Kartik Sheth *Spitzer Science Center*	The Spitzer Survey of Stellar Structure in Galaxies (S4G)	29	**637.2**
60021	exoplanets	Heather Knutson *Harvard University*	Dynamic Studies of Exoplanet Atmospheres: From Global Properties to Local Physics	10	**1138**
60028	exoplanets	David Charbonneau *Harvard University*	Confirmation and Characterization of Kepler Mission Exoplanets: The Era of Rock and Ice Exoplanets	9	**800**
60020	galactic structure	Barbara Whitney, SSI *Space Science Institute*	GLIMPSE360: Completing the Spitzer Galactic Plane Survey	51	**1980.3**
60014	young stellar obj.	John Stauffer *Spitzer Science Center*	Young Stellar Object Variability: Mid Infrared Clues to Accretion Disk Physics & Protostar Rotational Evolution	36	**550**
60012	near-earth objects	David Trilling *Northern Arizona University*	The Warm Spitzer NEO Survey: Exploring the history of the inner Solar System and near Earth space	14	**500**

Cycle-6 Selection (2)

- **2 exoplanet programs recommended for DDT**

PID	Science Category	PI Institution	Title	Co-Is	Hours
60003	exoplanets	Joseph Harrington *Univeristy of Central Florida*	The Spitzer Exoplanetary Atmosphere Survey	16	**200 DDT**
60027	exoplanets	Michael Gillon *Geneva University*	Detecting the Transits of Nearby Super-Earths	12	**100 DDT**

- *Harrington - ToO program for new planets*
  - Requested 1400 hours (500 hrs known planets, 900 hrs ToO)
  - Awarded 200 hours DDT
- *Gillon - Detecting a super-Earth transit*
  - Requested 500 hours
  - Awarded 100 hours DDT

Cycle-6 & 7 Small GO program

- **Proposals due 6 February 2009**
  - *1500 hours available (one-year)*
  - *Proposals < 500 hours*
  - *Simplified TAC process*
- **Data Analysis Funding**
  - *Estimate ~ $1.5 million small GO program support*
- **Cycle-7: expect to solicit another 1500 hours of small programs**

After Cycle 7

- **We will propose for a continuation of the Spitzer warm mission in early 2010.**
- **If our proposal is approved, there will be a 2nd call for two more years of Exploration Science proposals, with proposals due in the Fall of 2010.**
- **Orbital geometry requires that the Warm Mission end around January 2014.**

Creation of the Final Spitzer Archive

Why a "Heritage" Archive?

- **Leopard was optimized for identification & retrieval of data from specific observations**
  - *The HA will have additional functionality and an improved interface to facilitate deeper and more complex mining of the archival data*
    - Support for searches based on astronomical criteria
    - Maintain support for Spitzer-specific search criteria
    - Significant capability for interaction with the result set

- **The current archive, served through Leopard is part of the SSC Operations system**
  - *Leopard is a Java Application*
  - *Built to support uplink and pipeline operations as well as data access*
  - *Not built with an emphasis on long term maintenance and ease of migration*

- **The Heritage Archive is to be built by SSC and maintained long-term by IRSA**

Heritage Archive Holdings

- **The Spitzer Heritage Archive will contain ~25 TB (DBMS <1TB) at handover, including:**
  - *Spitzer pipeline data:*
    - Raw data products
    - BCD and post-BCD data and ancillary products
  - *Calibration products*
  - *Data Quality Analysis Information*
  - *Observation design information*
    - Program abstract, title, observational constraints.
  - *Enhanced Spitzer data and other legacy data*
    - Data from the Legacy teams
    - SSC-produced enhanced data
      - *Supermosiacs from IRAC and MIPS-24 (if available and validated)*
      - *Enhanced IRS products (if available and validated)*
      - *Source lists (if available and validated*
- **The HA will also eventually contain the IRAC data from the "warm" mission (Added incrementally)**

Source Lists for the Archive

- **Description:**
  - *list of fluxes/colors of compact sources in Spitzer imaging data*
    - Excluding 16/70/160 microns (which are more labor intensive)
    - Excluding known moving objects
  - *Goal is to have a lights-out pipeline for processing*
    - Except for generating input assignment of namelists to programs
  - *Final product needs to be an easily searchable, highly documented, list for archive users*
- **Post-BCD team is working towards a Source List for the Spitzer Heritage Archive**
  - *Held Internal Review 10/08*
    - The overall approach was deemed sensible
    - But many details remain to be understood
- **Go/No-Go decision Pending external review in 3/09**

WISE Mission Status and Planned Science

Project Overview

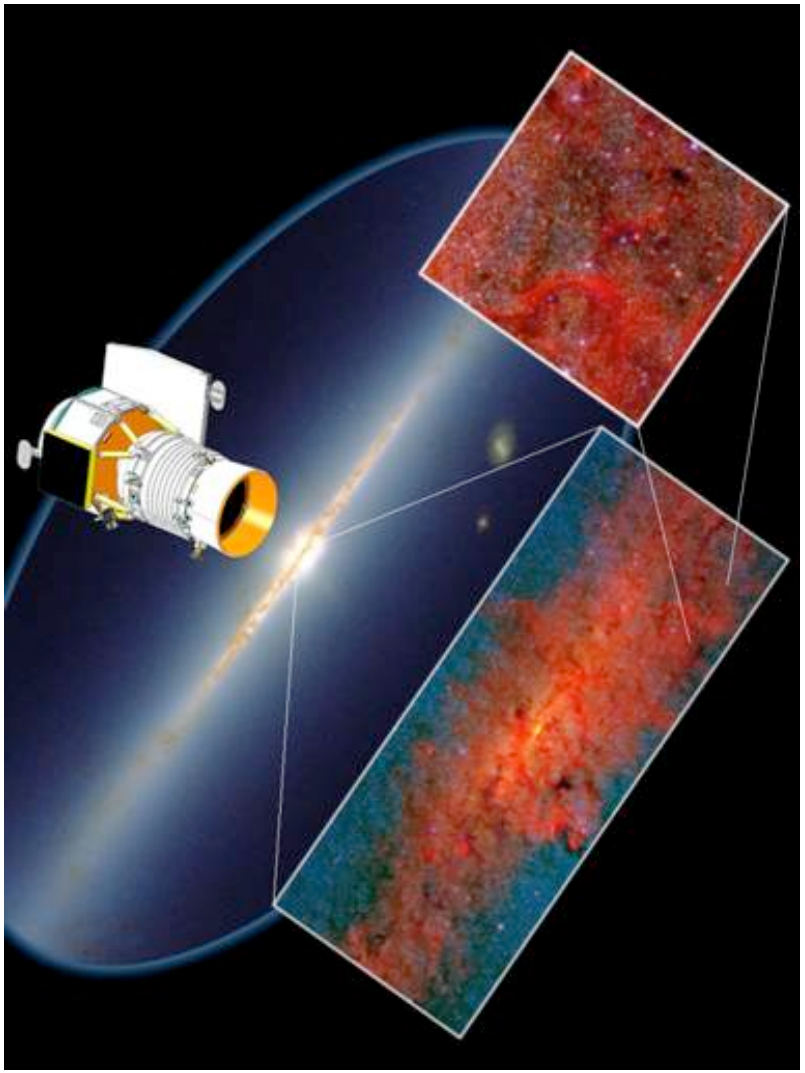
Science

- ***Sensitive all sky survey with 8X redundancy***
  - Find the most luminous galaxies
  - Find the closest stars to the sun
  - Provides input catalog for JWST
  - Provide lasting research legacy

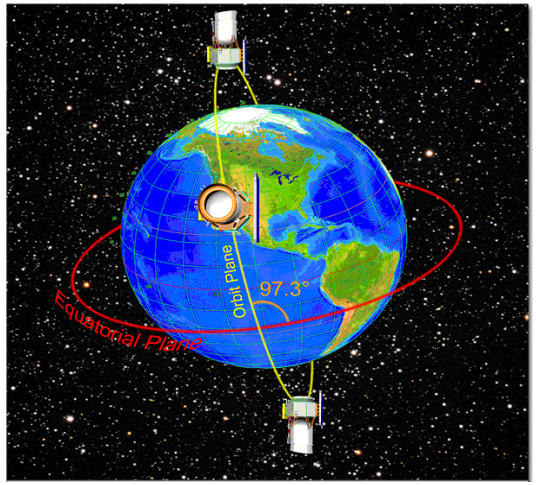
Salient Features

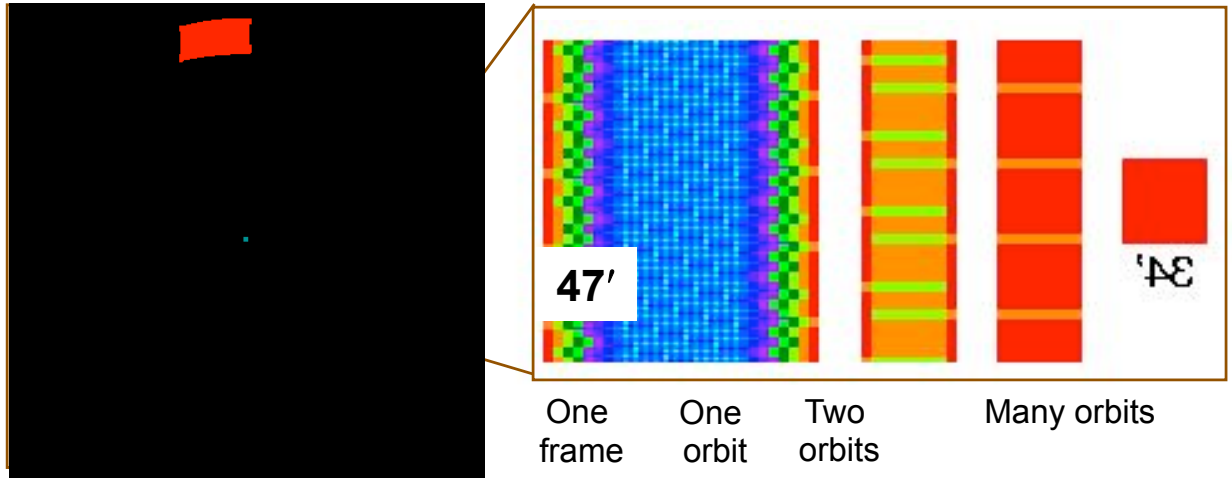
- ***4 imaging channels covering 3 - 25 microns wavelength***
- ***40 cm telescope operating at <17K***
- ***Two stage solid hydrogen cryostat***
- ***Delta launch from WTR in November, 2009***
- ***Sun-synchronous 6am/6pm 500km orbit***
- ***Scan mirror provides efficient mapping***
- ***Operational life: 7 months (124% margin)***
- ***4 TDRSS tracks per day***

Wide Field Infrared Survey Explorer



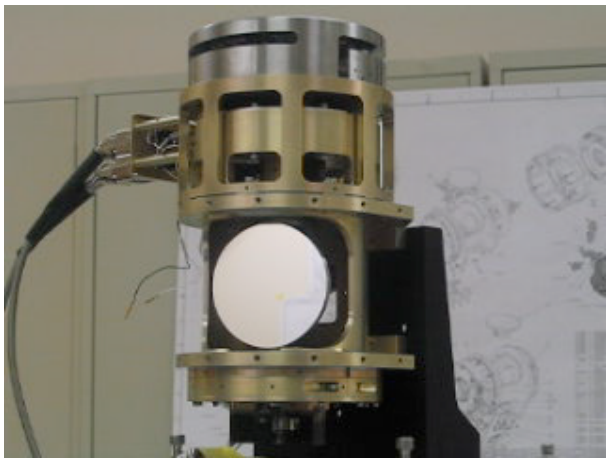
Simple Mission Design





- **Delta 7320 launch – WTR**
- **523 km, circular, polar sun-synchronous orbit**
  - *Nodal crossing time 6:00 PM*
  - *One month of checkout*
  - *6 months of survey operations*
- **One simple observing mode – half orbit scan**

- Scan mirror "freezes" orbital motion - enabling efficient mapping
  - 8.8-s exposure/11-s duty cycle
  - 10% frame to frame overlap
  - 90% orbit to orbit overlap
- Expect to achieve at least 8 exposures/position after losses to Moon and SAA
- Uplink, downlink, calibrations at poles
  - 4 TDRSS tracks per day



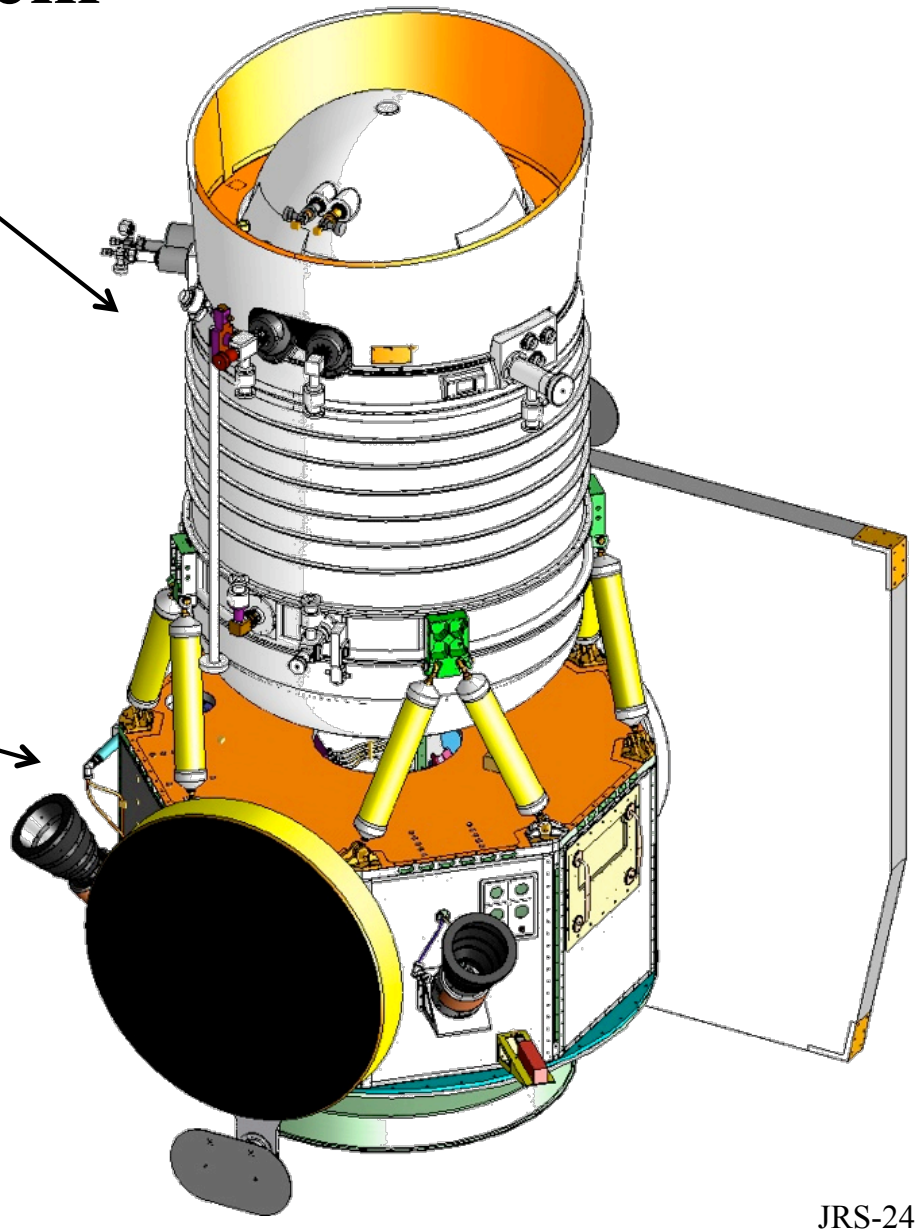
WISE Flight System

Payload (Space Dynamics Lab, USU)

- 2-Stage Solid H_2 cryostat
  - 13.5 months life time (7 required)
- All aluminum reflective optics: <17K
  - 40-cm telescope
- Dichroic beamsplitters separate wavelengths onto four 1024^2 pixel arrays
- 2 HgCdTe detectors: 3.3, 4.7 microns (32K)
- 2 Si:As detectors: 12, 23 microns (7.8K)
- 3 electronics boxes (mounted in spacecraft)

Spacecraft (Ball Aerospace Tech. Corp.)

- Orbital Express architecture
- Augmented single string
- No mechanisms, no deployables, no propulsion
- 3-axis stabilized
- Pointing stability/accuracy: ~ 1”/ ~1’
- Ku band science data link: 100Mbps
- 3.5 days (96 GB) of science data storage



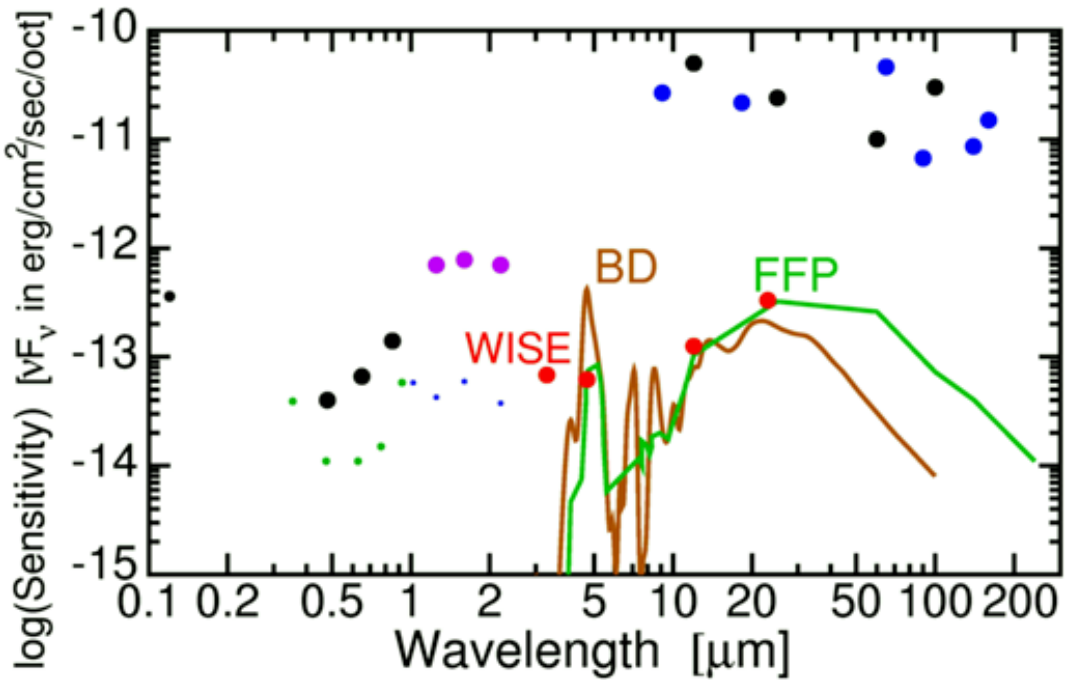
WISE Data Products

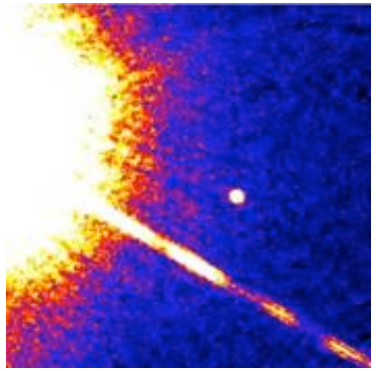
- **WISE Image Atlas**
  - *Formed by combining all image frames covering each point on the sky ($\geq$8x @ $|\beta|$~0; ~1500x @ $|\beta|$~90)*
  - *FITS format, 4 bands registered, approx. 4kx4k pix @ 1.375"/pix.*
  - *Depth-of-coverage and noise maps corresponding to each Atlas Image*
  - *Metadata describing each Atlas Image*
  - *Approx. 140,000 images covering entire sky in four WISE bands (depends on final footprint)*

- **WISE Source Catalog**
  - *Basic attributes of each object detected on combined (*i.e. *Atlas) images*
    - J2000 positions accurate to 500 mas with respect to 2MASS All-Sky PSC
    - Photometry in four WISE bands with SNR$\geq$5 at 120, 160, 650, 2600 μJy at 3.3, 4.7, 12, 23 μm
    - >95% completeness and >99.9% reliability at SNR=20 (in unconfused regions)
  - *~300 million entries (*Working Database *will contain ~10^9 entries)*

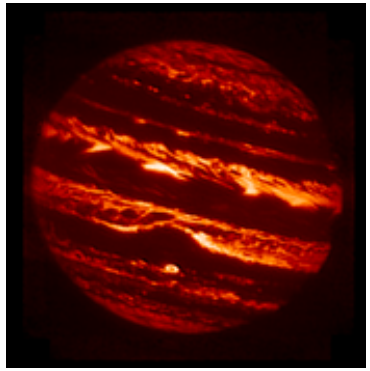
- **WISE Explanatory Supplement**
  - *Mission and data product description and characteristics*
  - *User's guide (*e.g. *data formats, access modes)*
  - *Cautionary notes*

WISE and Brown Dwarfs/Superplanets





GL 229B

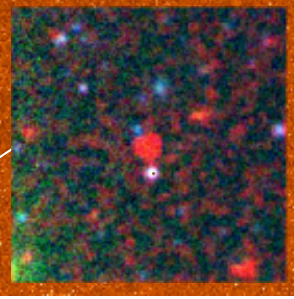


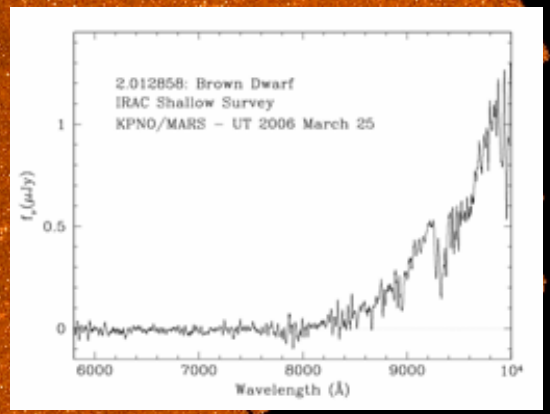
Jupiter at 5 μm

- Brown Dwarfs (BDs): stars with too little mass to fuse H into He.
- WISE 3.3 & 4.7 μm filters tuned to methane dominated BD spectra.
- WISE could identify Gliese 229B (10^{-5} $L_\odot$) to 150 light years, a free floating planet (FFP) like Jupiter (10^{-9} $L_\odot$) to 1 light year, BDs with T > 200 K (10^{-8} $L_\odot$) if closer than α Centauri.

The First Field Brown Dwarf Discovered by Spitzer

- The brown dwarf found in the 8 square degree Spitzer/IRAC Shallow Survey would be a 6σ detection with WISE.
- WISE will survey 5000 times more sky.
- WISE should discover several hundred brown dwarfs cooler than any currently known, and double or triple the density of known star systems in the solar neighborhood.





Field T4.5 BD
Stern et al 2006 ApJ submitted

How many BDs will WISE see?

Mass Function	$T_{eff} < 300$	$T_{eff} < 500$	$T_{eff} < 750$	d < 1.3 pc
Chabrier etal log-normal	7	221	1340	0.88
Reid etal $M^{-0.7}$	5	121	671	0.53
Reid etal $M^{-1.0}$	11	197	921	0.93
Reid etal $M^{-1.3}$	22	330	1310	1.74

Assuming uniform star formation rate over the past 10 billion years and that WISE just meets its 4.6 μm sensitivity requirement.

At present, only 1 Brown Dwarf with T < 750 K has been found, even using Spitzer data.
WISE will find about one thousand such objects, including perhaps the nearest planetary system to our own.

WISE Status and Schedule

- Passed mission Critical Design Review in June 2007
- Passed System Integration Review in November 2008
- Payload is assembled and has completed first round of cryogenic performance testing
- Spacecraft integration is nearing completion
- System integration begins in April 2009
- Launch scheduled for November 2009
- On-orbit operations December 2009 - May 2010
- Preliminary Data Release November 2010
- Final Data Release December 2011

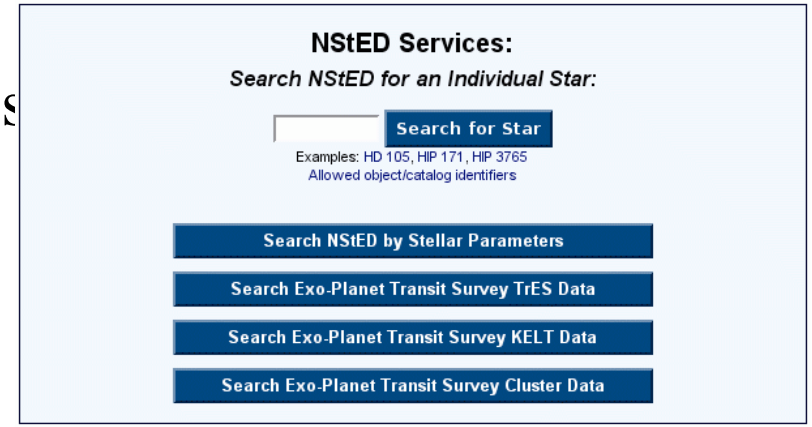
NASA Star and Exoplanet Database (NStED) Status and Plans

The NStED Charter

- Curate scientific data related to exoplanets and potential host stars
- Facilitate scientific exploitation of these data sets
- Support target selection and science planning for future observations

The NStED Services

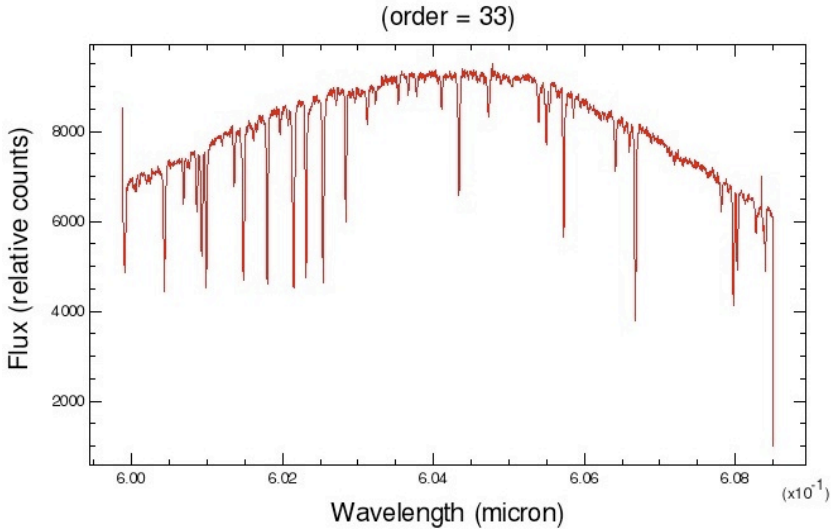
- Stellar Services
  - Data related to relatively bright nearby stars
    - All known planet-hosting stars
  - Query for individual stars or by s planetary parameters
  - Images and spectra



- **Exoplanet Services**
  - *Data related to known exoplanets*
  - *Photometric light curves of transiting exoplanets*
  - *Dedicated interface related to exo-planet transit surveys*

Stellar Content for NStED

- **Approximately 140,000 stars**
- **Associated data include:**
  - *Next 2000 (N2K) Stars template spectra*
  - *Coronographic images from Palomar*
  - *2MASS image mosaics*



Published Parameters		Derived Parameters	Associated Data
Position, Distances	Metallicity	Temperature	Images
Kinematics	Rotation	Luminosity	Spectra
Photometry, Colors	Activity Indicators	Radius	
Spectral type		Mass	
Luminosity Class	Variability	LSR Space Motion	
	Multiplicity		

Stellar Data - Published Parameters

- **Current data types**
  - *Position & Distances*
  - *Kinematics*
  - *Photometry and Colors*
  - *Spectral types*
  - *Luminosity class*
  - *Metallicity*
  - *Rotation*
  - *Activity Indicators*
  - *Variability*
  - *Multiplicity*

Object and Aliases				
HIP 54035	GJ 411	TYC 2521-02279-1	2MASS J11032027+3558203	IRAS 11005+3615
HD 95735	BD+36 2147	SAO 62377		

Multiplicity	
Number of components listed in the WDS catalog	0
Number of known planets	0
Link to Planet Encyclopedia	

Variability		
Type	Amplitude (mags)	Period (days)

Coordinates		
System	Right Ascension / Longitude	Declination / Latitude
Equatorial J2000	11h 3m20.19s	35d58m11.56s
Ecliptic	152.107126	27.393945
Galactic	184.959199	65.423979
Proper Motion (mas/year)	-577.000	-4761.800

Physical Properties			
	Value	Uncertainty	Number of measurements
Distance (pc)	2.55	0.01	1
Parallax (mas)	392.40	0.91	1
Spectral Type ("HD")	Mb		1
Luminosity (L_solar)	0.020	0.008	1
Age (Myr)			
Mass (Solar masses)	0.55		1
[Fe/H] (dex)	-0.200		1
Teff (K)	3726.64		1
Radius (Solar Radii)	0.34	0.06	1
V sini (km/s)	3.0000		1
Radial Velocity (km/sec)	-85.60	0.10	2
S-Index (Mt. Wilson)	0.402	0.052	17
log R'HK			0
X-ray activity (Log (Lx))	26.778		3
Rotation Period (days)	48.00		1
Infrared Excess ("" microns)			

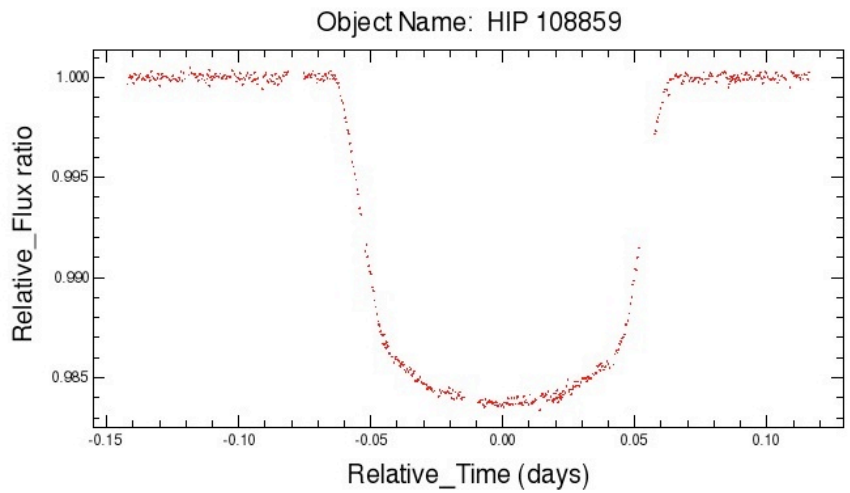
Photometry			
Band	Flux (mag)	Uncertainty (mag)	Number of measurements
U (Johnson)			0
B (Johnson)	8.915	0.019	1
V (Johnson)	7.494	0.011	1
R (Cousins)			0
I (Cousins)			0
J (2MASS)	4.320	0.282	1
H (2MASS)	3.722	0.224	1
K (2MASS)	3.501	0.352	1
IRAC 3.6			0
IRAC 4.5			0
IRAC 5.8			0
IRAC 8.0			0
Band	Flux (Jy)	Uncertainty (Jy)	Number of measurements
MIPS 24			0
MIPS 70			0
MIPS 160			0
IRAS 12	2.504e+00	1.252e-01	1
IRAS 25	6.804e-01	7.484e-02	1
IRAS 60	< 4.000e-01		1
IRAS 100	< 1.000e+00		1

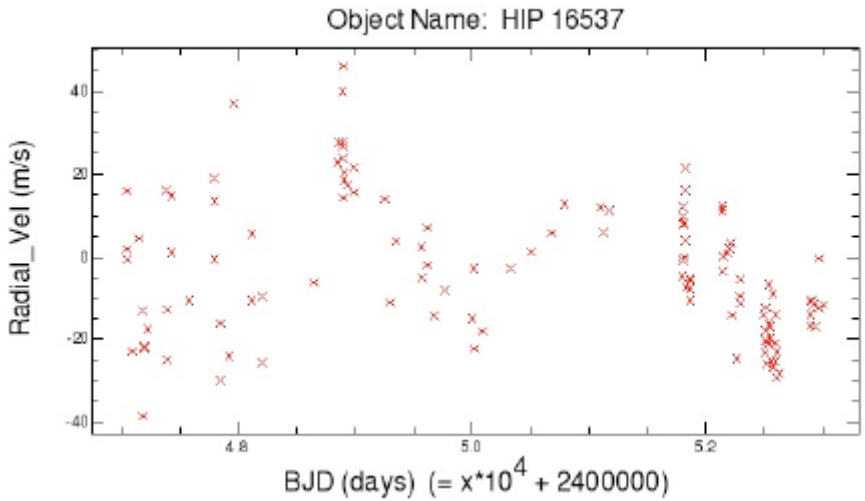
Colors			
Band	Flux (mag)	Uncertainty (mag)	Number of measurements
U-B (Johnson)			0
B-V (Johnson)	1.421	0.022	1
V-I (Cousins)			0
J-H (2MASS)	0.598	0.360	1
H-K (2MASS)	0.221	0.417	1
J-K (2MASS)	0.819	0.451	1
b-y (Stromgren)	0.981	0.002	1
m1 (Stromgren)	0.419	0.003	1
c1 (Stromgren)	0.155	0.008	1

Exoplanet Data - Published Parameters

- **Maintaining up to date list of stars known to host exoplanets**
  - *Updated weekly*
- **Time Series Data**
  - *Photometry*
  - *Radial Velocity*

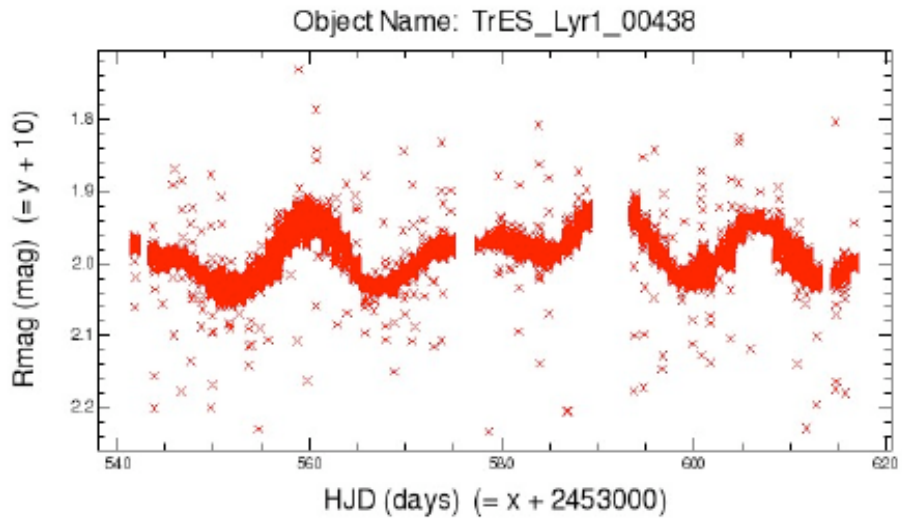
Published Parameters
Number of Planets
Planetary Mass
Orbital Period
Orbital semi-major axis
Orbital Eccentricity
Link to Exoplanet Encyclopedia Entry





Transit Survey Data

- **Dedicated service for transit survey data**
- **Initial service based upon**
  - *TrES Observations of Kepler Field*
  - *KELT survey data*
  - *Donated surveys of four clusters*



Survey Region	Number of Stars	Time-Series Filter	Additional Static Filters	Time Span (days)	Number of Epochs
TrES-Lyr1	25947	r, R	B, V	75	~15000
KELT-Praesepe	66637	R_K		73	~3000
NGC 2301	3961	R	B, R	14	~150
NGC 3201	58666	V, I	V, I	700	~120
M 10	43930	V, I	V, I	500	~50
M 12	32378	V, I	V, I	500	~50

Transit Survey Query Interface

- All of the parameters in the data master files are searchable
- Cross-dataset searches enabled
- Grouped by category
- Selectable output

Region Constraints

Select all Select none

Regions			
☑ NGC2301	☑ NGC3201	☑ M10	☑ M12

Lightcurve Filter Constraints

Select all Select none

Filters		
☑ V Filter	☑ R Filter	☑ I Filter

Positional Constraints

Select all Select none Clear text fields

Column Description	Min Value	Max Value	Equinox	Output
Right Ascension (decimal degrees or sexagesimal)			J2000	☑
Declination (decimal degrees or sexagesimal)			J2000	☑

Photometric Constraints

Select all Select none Clear text fields

Column Description	Min Value	Max Value	Unit	Output
Average B band magnitude			magnitude	☑
Average B band error			magnitude	☑
Average V band magnitude			magnitude	☑
Average V band error			magnitude	☑
Average R band magnitude			magnitude	☑
Average R band error			magnitude	☑
Average I band magnitude			magnitude	☑
Average I band error			magnitude	☑

Time Constraints

Select all Select none Clear text fields

Column Description	Min Value	Max Value	Unit	Output
Start Heliocentric Julian Date Coverage			day	☑
End Heliocentric Julian Date Coverage			day	☑

Lightcurve Constraints

Select all Select none Clear text fields

Column Description	Min Value	Max Value	Unit	Output
Number of Points in Lightcurve				☑
1 Sigma rms dispersion of lightcurve			magnitude	☑
Chi-square about the median light curve value			magnitude	☐
Number of points in lightcurve beyond 5-sigma of median value				☐

Transit Survey Table Output

- **HTML table output**
- **ASCII version of whole table**
  - *Self documenting header for columns*
- **Scripts for bulk downloading light curves resulti from query**
- **Unique ID links to detail page**

```
\ STARID = unique identification for star within dataset
\ RA = Right Ascension of star in decimal degrees (J2000)
\ Dec = Declination of star in decimal degrees (J2000)
\ Bmag = Median value of apparent B magnitude
\ Berr = Observational uncertainty on B magnitude
\ Rmag = Median value of apparent R magnitude
\ Rerr = Observational uncertainty on R magnitude
\ Vmag = Median value of apparent V magnitude
\ Verr = Observational uncertainty on V magnitude
\ Imag = Median value of apparent I magnitude
\ Ierr = Observational uncertainty on I magnitude
\ LCfil = name of filter in which lightcurve was obtained
\ Npts = Number of datapoints in lightcurve
\ StartHJD = minimal value of Heliocentric Julian date in lightcurve
\ EndHJD = maximum value of Heliocentric Julian date in lightcurve
\ LCdisp = 1-sigma rms dispersion of lightcurve around median value of lightcurve
\ LCchisq = chi-squared of lightcurve about median lightcurve value
\ N5sig = number of lightcurves beyond 5-sigma of lightcurve median value
\ Duplicates = Duplicate occurence of star within the same dataset
\ Public = Y/N keyword indicating if lightcurve data available to public
\ Region = identifier for part of sky observed in survey
\ References = refereed publication referring to technical details of survey
|          starid|     region|                ra|               dec|
|            char|       char|            double|            double|
|                |           |           degrees|           degrees|
|            null|       null|              null|              null|
     M10_I_4        M10        254.090405        -4.227928
     M10_I_6        M10        254.091227        -4.192087
    M10_I_22        M10        254.091236        -4.215684
    M10_I_41        M10        254.091307        -4.254944
    M10_I_31        M10        254.091358        -4.229150
    M10_I_20        M10        254.091491        -4.200049
    M10_I_65        M10        254.091808        -4.288031
    M10_I_19        M10        254.091814        -4.183814
     M10_I_1        M10        254.091988        -4.143943
    M10_I_45        M10        254.092277        -4.214966
    M10_I_35        M10        254.092308        -4.200482
    M10_I_54        M10        254.092385        -4.234715
    M10_I_87        M10        254.092651        -4.288904
    M10_I_74        M10        254.092818        -4.251986
```

Result Table

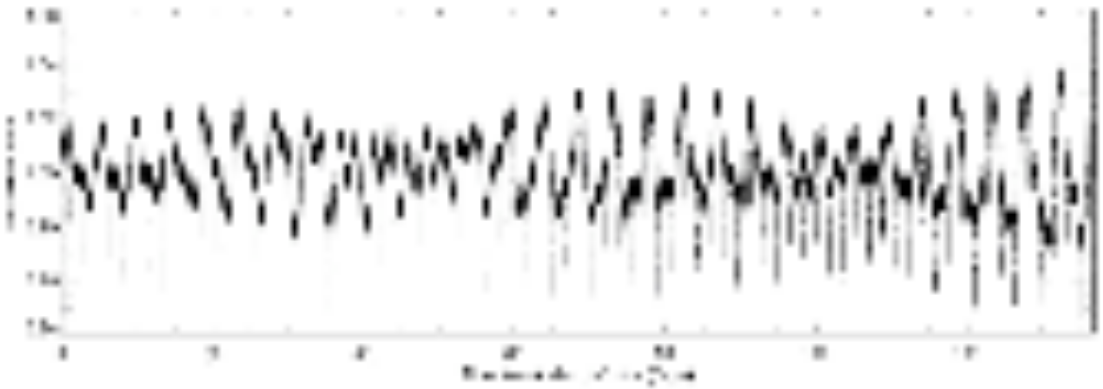
Download all results: IPAC ASCII format table Download all lightcurves: scripts

Row: 1 - 100 of 113508 101 - 200 Display Maximum 100 rows per page.

StarID	Region	RA J2000	Dec J2000	Start HJD	End HJD	Bmag	Berr	Vmag	Verr	Rmag	Rerr	Imag	Ierr	Lightcurve filter	Points in lightcurve	Lightcurve dispersion	Lightcurve chisq	Points in Lightcurve beyond 5 sigma
		h m s	° ' "	*day*	*day*	*mag*	*mag*	*mag*	*mag*	*mag*	*mag*	*mag*	*mag*			*mag*	*mag*	
M10_I_4	M10	16h 56m 21.70s	-04d 13m 40.54s	2450931.98	2451052.74	null	null	19.067	0.018	null	null	18.019	0.015	I	15	0.015	1.000	0
M10_I_6	M10	16h 56m 21.89s	-04d 11m 31.51s	2450569.00	2451052.74	null	null	22.144	0.160	null	null	19.148	0.034	I	21	0.029	0.680	0
M10_I_22	M10	16h 56m 21.90s	-04d 12m 56.46s	2450566.97	2451052.74	null	null	21.888	0.142	null	null	20.905	0.144	I	28	0.120	0.770	0
M10_I_41	M10	16h 56m 21.91s	-04d 15m 17.80s	2450566.97	2450939.98	null	null	19.990	0.034	null	null	18.416	0.023	I	22	0.017	0.740	0
M10_I_31	M10	16h 56m 21.93s	-04d 13m 44.94s	2450567.03	2451052.74	null	null	21.794	0.129	null	null	20.377	0.095	I	21	0.160	2.750	1
M10_I_20	M10	16h 56m 21.96s	-04d 12m 00.18s	2450566.97	2451052.74	null	null	22.364	0.190	null	null	20.793	0.124	I	28	0.123	0.900	0
M10_I_65	M10	16h 56m 22.03s	-04d 17m 16.91s	2450566.97	2450938.05	null	null	19.103	0.028	null	null	18.235	0.022	I	23	0.030	1.880	0
M10_I_19	M10	16h 56m 22.04s	-04d 11m 01.73s	2450566.97	2451052.74	null	null	18.474	0.015	null	null	17.507	0.016	I	28	0.014	1.050	2
M10_I_1	M10	16h 56m 22.08s	-04d 08m 38.19s	2450569.00	2451052.74	null	null	17.543	0.013	null	null	16.525	0.010	I	22	0.012	0.670	0

NStED-CoRoT Collaboration

- **NStED is the U.S. portal to CoRoT mission data**
- **CoRoT: COnvection, ROtation & planetary Transits**
  - *NASA/CNES/ESA Collaboration*
- **NStED will serve CoRoT mission and ground-based data**
- **NStED and CoRoT is collaborating with CoRoT to build light curve characterization and manipulation tools**
- **First CoRoT public data expected early 2009**



Website and Contacts

- **NStED Version 2.0 is now publicly available**

  http://nsted.ipac.caltech.edu

- **To contribute data, contact**

  Stephen Kane (skane@ipac.caltech.edu)

  Kaspar von Braun (kaspar@ipac.caltech.edu)