The NASA Exoplanet Archive and Support for the Kepler Community

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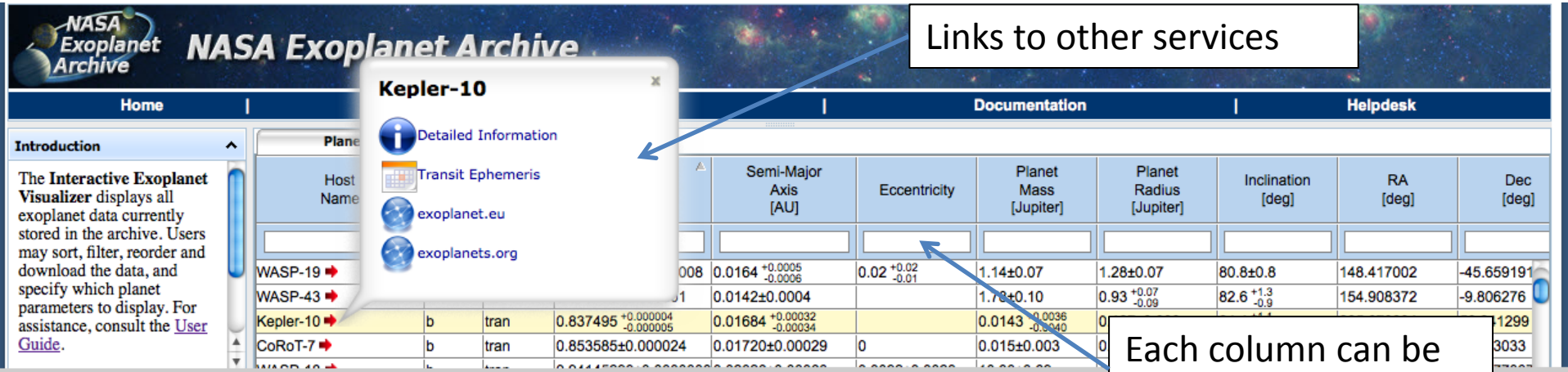
The NASA Exoplanet Archive

- At the request of NASA HQ, NExScI has transitioned NStED (NASA Stellar and Exoplanet Database) to a new service, the "NASA Exoplanet Archive"
  - Focus on support for broad Kepler community
  - Capitalize on NExScI development work on KSAS (Kepler Science Analysis System)
  - Apply tools to multiple datasets
- Data content
  - Kepler planets and candidates
    - Integrated list of public confirmed planets, candidates, eclipsing binaries, and false positives
    - Interactive table display
    - Includes in/out of transit centroiding information
  - Kepler light curves
    - Tabulated, searchable statistics
    - Multi-quarter, interactive display with optional normalization and interface with periodogram and phasing tools
  - Exoplanet table
    - Interactive table display
  - Interface to CoRoT and other time series data sets

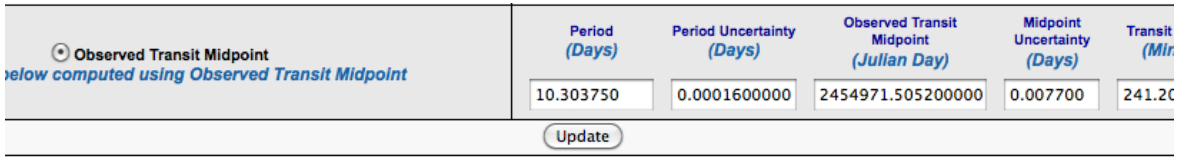
http://exoplanetarchive.ipac.caltech.edu

New Interactive Table Interface



Tools: Ephemeris prediction

- Archive values used by default
- User can provide different orbital values
- Will calculate transit times or user-specified orbital phase times



Observed Transit Midpoint
below computed using Observed Transit Midpoint

Period (Days)	Period Uncertainty (Days)	Observed Transit Midpoint (Julian Day)	Midpoint Uncertainty (Days)	Transit (Mi
10.303750	0.0001600000	2454971.505200000	0.007700	241.20

Update

Transit Ephemeris

Download or Convert Table

All times UTC · Observed Transit Duration: 241.2 Minutes

2455929.64762	01/03/2012 03:32	2455929.75395	01/03/2012 06:05	2455929.86028	01/03/2012 0
2455939.95121	01/13/2012 10:49	2455940.05770	01/13/2012 13:23	2455940.16419	01/13/2012 1
2455950.25480	01/23/2012 18:06	2455950.36145	01/23/2012 20:40	2455950.46810	01/23/2012 2
2455960.55839	02/03/2012 01:24	2455960.66520	02/03/2012 03:57	2455960.77201	02/03/2012 0
2455970.86198	02/13/2012 08:41	2455970.96895	02/13/2012 11:15	2455971.07592	02/13/2012 1
2455981.16557	02/23/2012 15:58	2455981.27270	02/23/2012 18:32	2455981.37983	02/23/2012 2
2455991.46916	03/04/2012 23:15	2455991.57645	03/05/2012 01:50	2455991.68374	03/05/2012 0
2456001.77275	03/15/2012 06:32	2456001.88020	03/15/2012 09:07	2456001.98765	03/15/2012 1
2456012.07634	03/25/2012 13:49	2456012.18395	03/25/2012 16:24	2456012.29156	03/25/2012 1
2456022.37993	04/04/2012 21:07	2456022.48770	04/04/2012 23:42	2456022.59547	04/05/2012 0
2456032.68352	04/15/2012 04:24	2456032.79145	04/15/2012 06:59	2456032.89938	04/15/2012 0
2456042.98711	04/25/2012 11:41	2456043.09520	04/25/2012 14:17	2456043.20329	04/25/2012 1
2456053.29070	05/05/2012 18:58	2456053.39895	05/05/2012 21:34	2456053.50720	05/06/2012 0

Additional data

- US portal for CoRoT data: exoplanet and asteroseismology
- Additional Transit surveys: XO, HATNet, TrES, KELT, NGC 2301, NGC 3201, M10, M12
- Time series: Amateur, Hipparcos, radial velocity, photometric
- Additional data sets: N2K spectra, GJ stars positions and photometry

Survey Region	Number of Objects	Time-Series Filter	Additional Static Filters	Time Span (days)	Number of Epochs	Number of Light Curves
XO	2047	W (XO)	JHK (2MASS)	486	< ~3500	2047
HATNet	2656	I/R Cousins	JHK (2MASS), BV Johnson, I Cousins	1996	~1100 - ~12000	6047
Kepler Field	177799	CCD White light	g, r, i, z, J, H, & Ks	508	~500 - ~50000	548841
CoRoT-Exoplanet	96568	CCD White light and 3 color Prism	B, V, R, & I	~900	3400 – 396000	97971
CoRoT-Seismology	84	CCD White light	V	~900	68000 – 420000	85
TrES-Lyr1	25947	r, R	B, V	75	~15000	25947
KELT-Praesepe	66637	R_K		73	~3000	66637
NGC 2301	3961	R	B, R	14	~150	3961
NGC 3201	58666	V, I	V, I	700	~120	58666
M 10	43930	V, I	V, I	500	~50	43930
M 12	32378	V, I	V, I	500	~50	32378

Kepler community follow-up observing

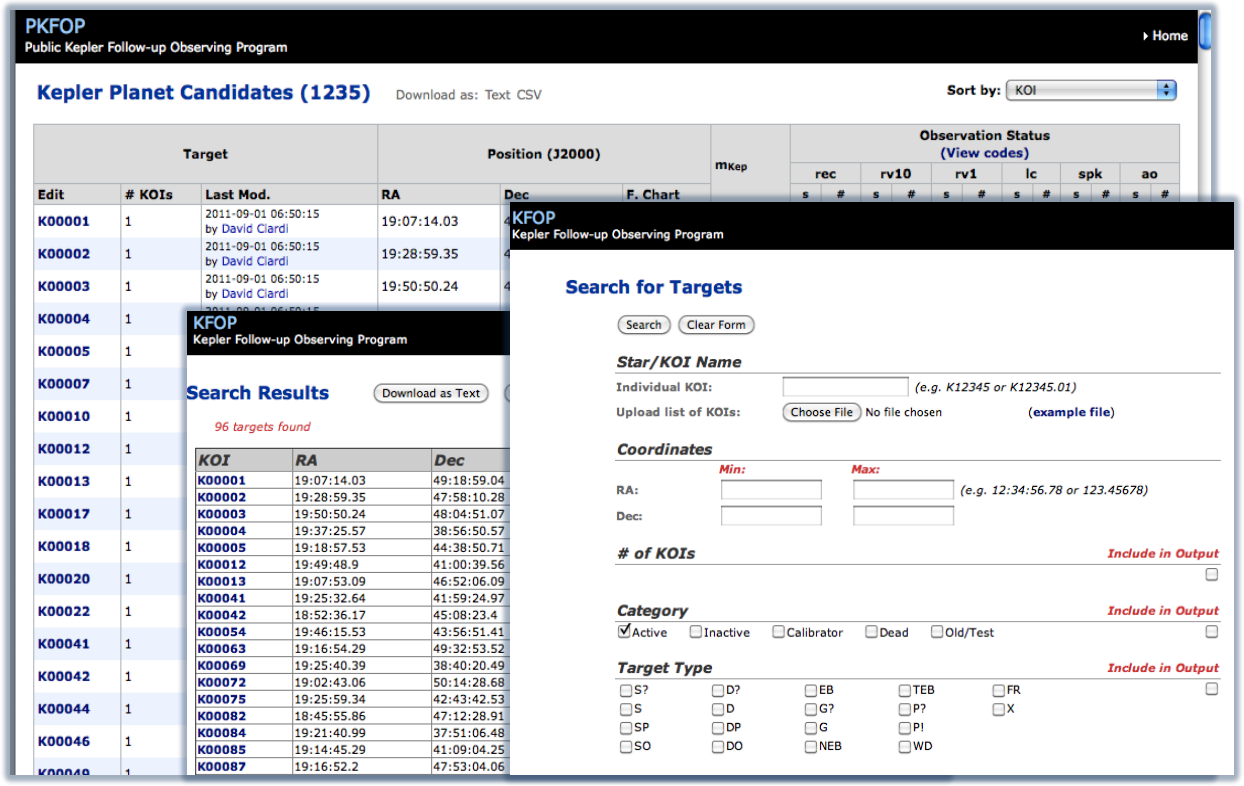
- Follow-up observing is crucial in confirming planetary nature of candidates identified in light curves
- During the prime mission, the Kepler Science Team has a coordinated group for the follow-up observing program (FOP)
  - NExScI has developed and is operating a project-only website (KFOP) to support this team
  - During the 2012 Cygnus observing season, NExScI will operate a public version of the KFOP website for the wider community to follow-up candidates made public by the project
- During the extended mission, Kepler will involve the wider community in follow-up observing
  - All planet candidates, light curves and contributed data will be available to the community at the Exoplanet Archive and MAST

Community FOP site

- Goal is to facilitate collaborations to make the best use of the available resources
- In 2012, the site will include Kepler candidates from the published lists
  - Transit predictors, associated KIC data
  - Public contributed data
  - Method for users to identify candidates
- Users will need to register to access and/or upload user-supplied data
- All data will be tagged with user name, date and description
- Long-term archiving of the stellar and planetary parameters will be in the NASA Exoplanet Archive

FOP website features

- Complete list of KOI targets
- Visible to all without logging into service
- Positions, magnitude, number of observations, finding charts (sortable)
- Links to detail pages
- Other features include:
  - Bulk upload of notes and parameters
  - Change log
  - Search capability



Input from the community

- The Kepler Project and NExScI will help coordinate the community effort
- How can we encourage users to contribute their data to public FOP site?
  - Goal is to make efficient use of resources and reduce redundancies
  - Possibilities include:
    - Ability to provide log of observations - Allows new observers to see which candidates are already being tracked
    - Ability to upload parameters without underlying data
  - Users will need to register to access and/or upload user-supplied data and parameters
- How should groups be organized?
  - By science topic
  - By observational technique
- We are seeking input so the website can be modified to support the wider community (email CFOP@ipac.caltech.edu)
  - Plan is to release community-wide website in Feb/Mar for the start of the next observing season
  - Populated with public Kepler candidates

Forward plans

- During 2012 we will expand the archive capabilities
  - New tools: transit fitting, plotting table data
    - Other suggestions welcome
  - Additional integration of data sets and existing tools
- During the Kepler extended mission, the NASA Exoplanet Archive will include the candidate list with pipeline information and the list of identified potential transits (TCE: threshold crossing events)

Summary

- The Exoplanet Archive is now available
- If interested in Kepler follow-up observing, register at http://pkfop.ipac.caltech.edu/home (additional capabilities still under development)
- For a demo or if you have questions/comments/suggestions, stop by the NExScI table at the ExEP booth
  - Exoplanet Archive team members at the AAS: Rachel Akeson, David Ciardi, Stephen Kane, Peter Plavchan, Solange Ramirez, Kaspar von Braun

http://exoplanetarchive.ipac.caltech.edu