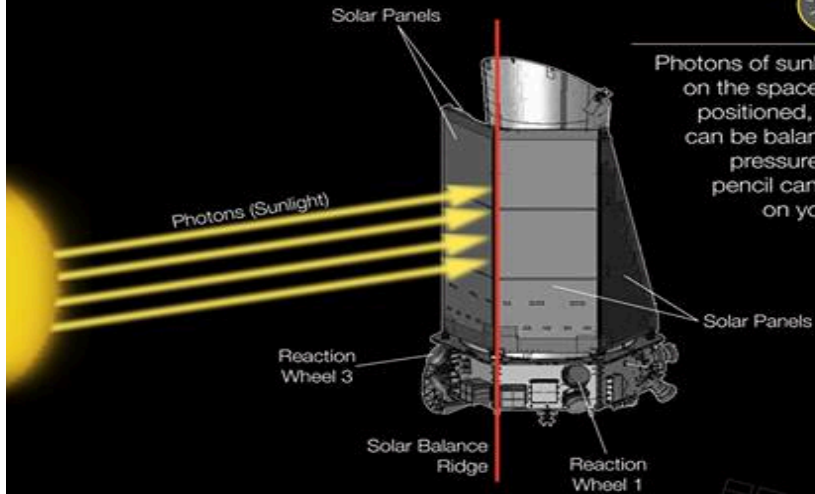




# Kepler's Second Light: How K2 Will Work

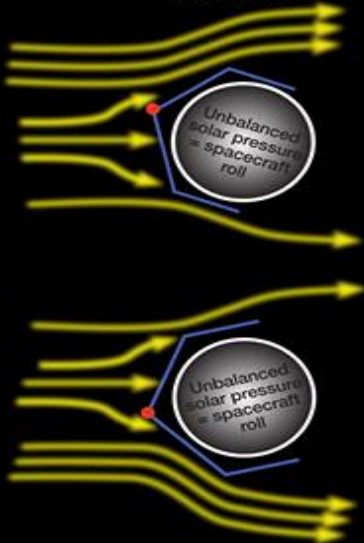


Photons of sunlight exert pressure on the spacecraft. If properly positioned, the spacecraft can be balanced against the pressure much as a pencil can be balanced on your finger.

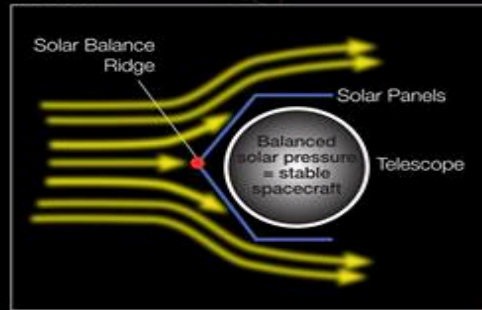


## TOP-DOWN VIEWS OF SPACECRAFT

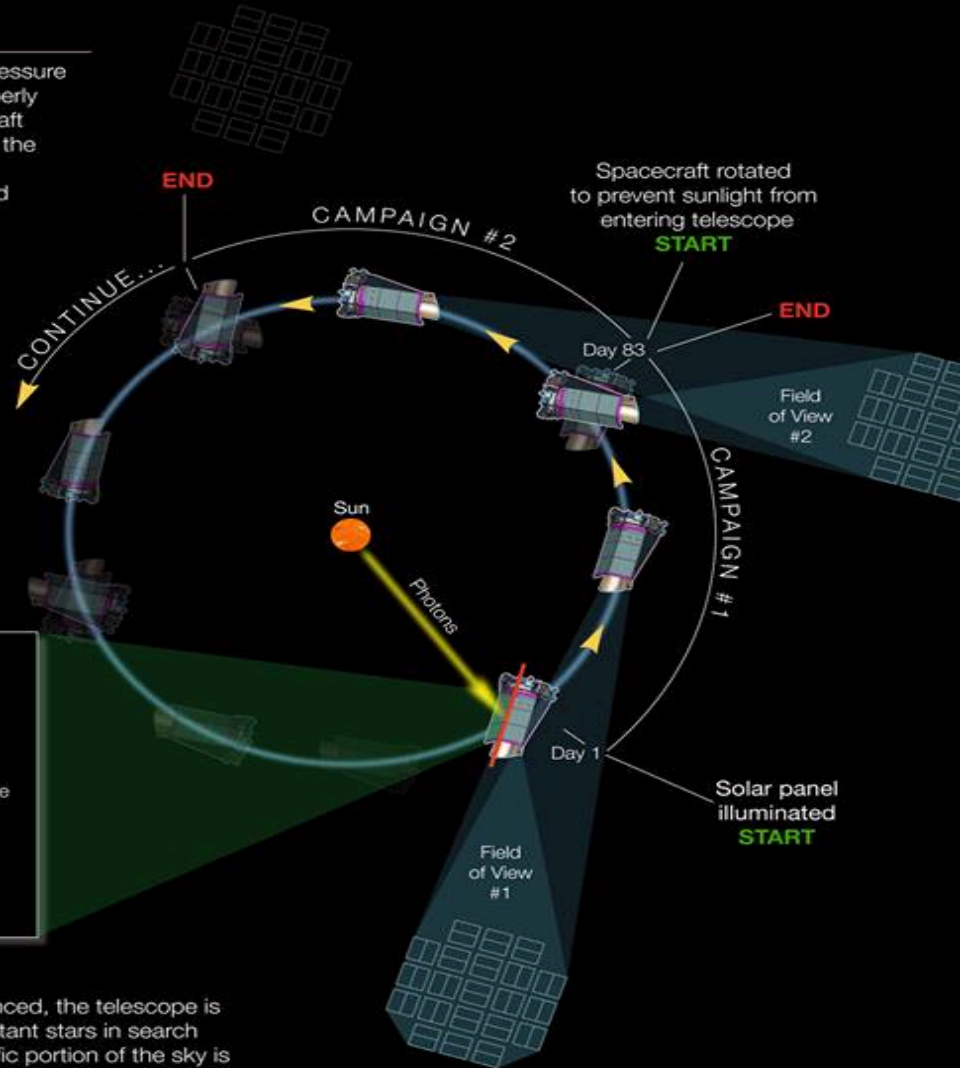
### UNSTABLE



### STABLE



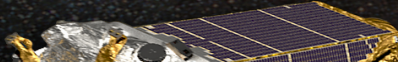
When the spacecraft is balanced, the telescope is stable enough to monitor distant stars in search of transiting planets. A specific portion of the sky is studied for approximately 83 days, until it is necessary to rotate the spacecraft to prevent sunlight from entering the telescope. There are approximately 4.5 viewing periods or campaigns per orbit or year.



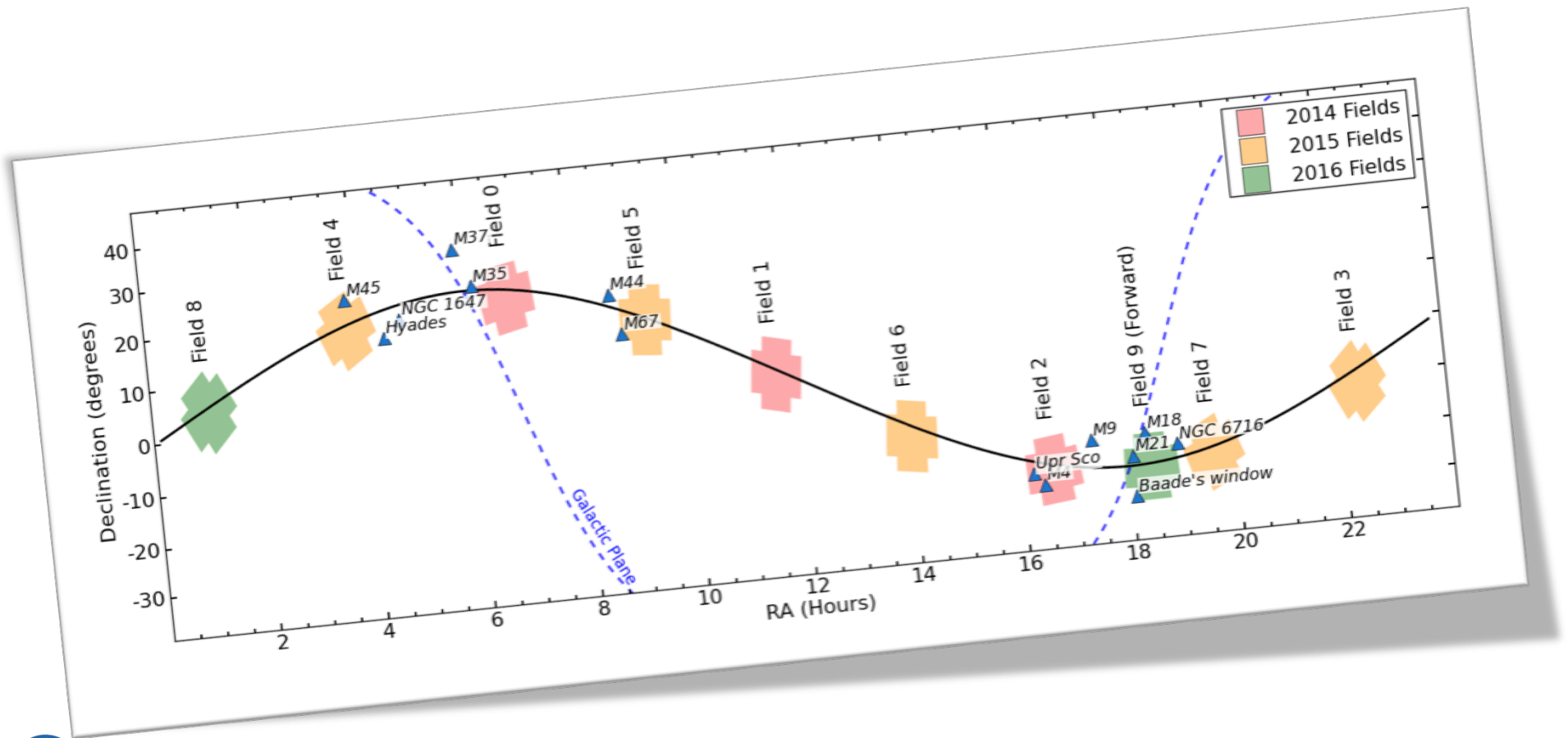
CONCEPTUAL ILLUSTRATION OF SPACECRAFT SOLAR DISTURBANCE. THE ACTUAL DISTURBANCE IS DUE TO PHOTON PRESSURE, NOT SOLAR WIND.

K2

Extending Kepler's Power to the Ecliptic

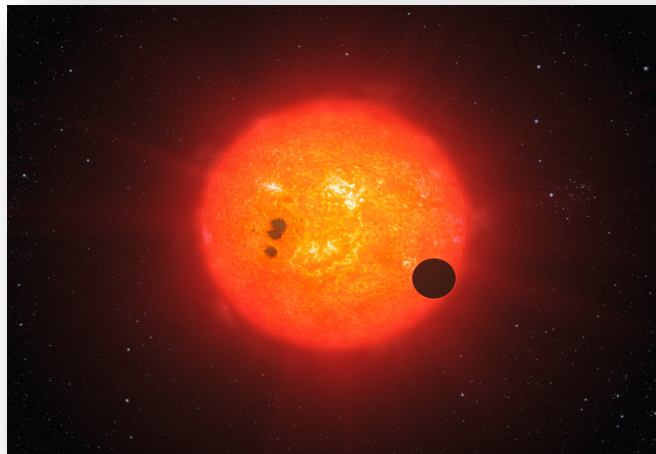
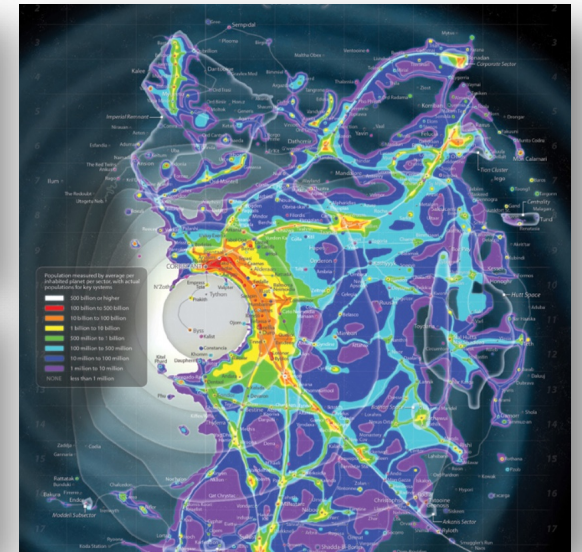
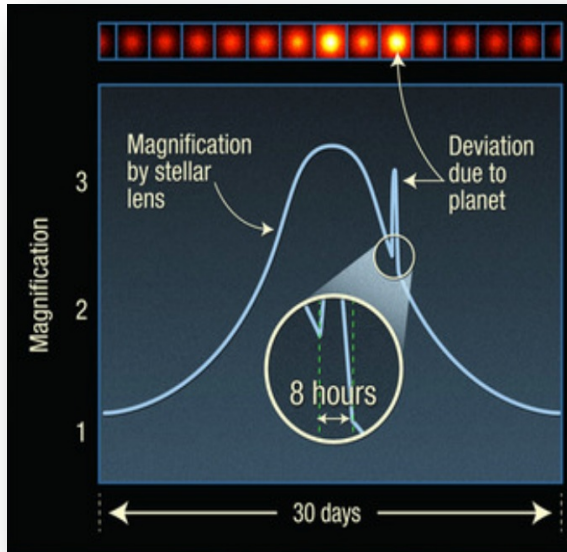


Baseline observing windows of ~80 days lend themselves to an ecliptic plane survey



# K2

Extending Kepler's Power to the Ecliptic



A banner image for the K2 mission. On the left, the text 'K2' is displayed in a large, bold, white font, with the tagline 'Extending Kepler's Power to the Ecliptic' underneath it. The background shows a satellite in space with solar panels. On the right, the letters 'K2' are rendered in a large, stylized, metallic font, with a blue orbital path and white stars around them.

K2

Extending Kepler's Power to the Ecliptic

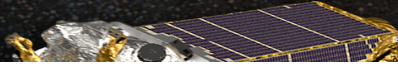
## A Community Facility

- Community advocacy allows the K2 Project to define final field locations for each campaign
- All science targets are proposed competitively by the community
- The science program for each campaign is set by peer review of target proposals
- All data collected is archived immediately after calibration with no exclusive use period
- K2 encourages open source data analysis software solutions and fosters a community of data problem solvers



K2

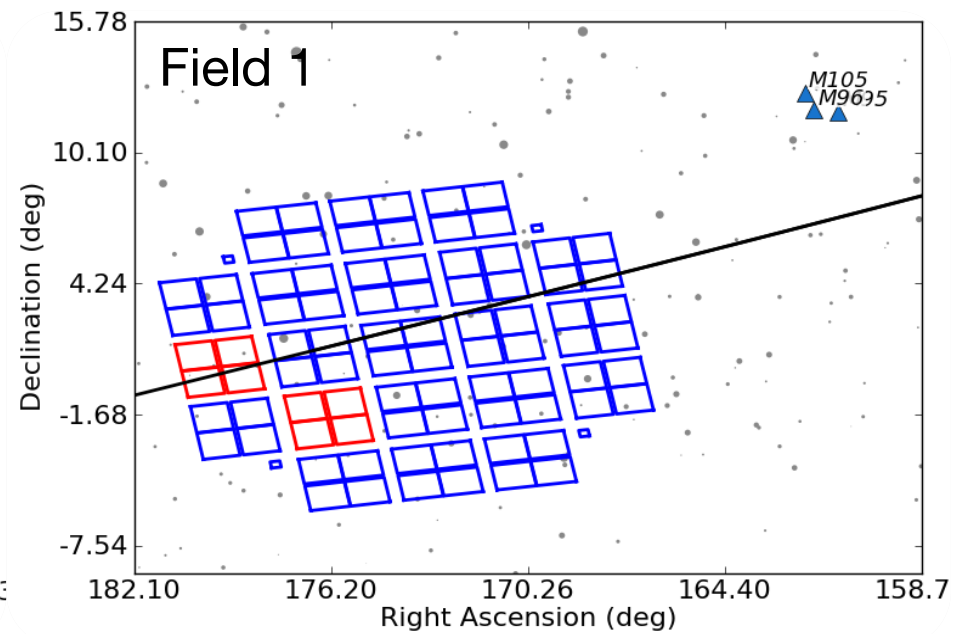
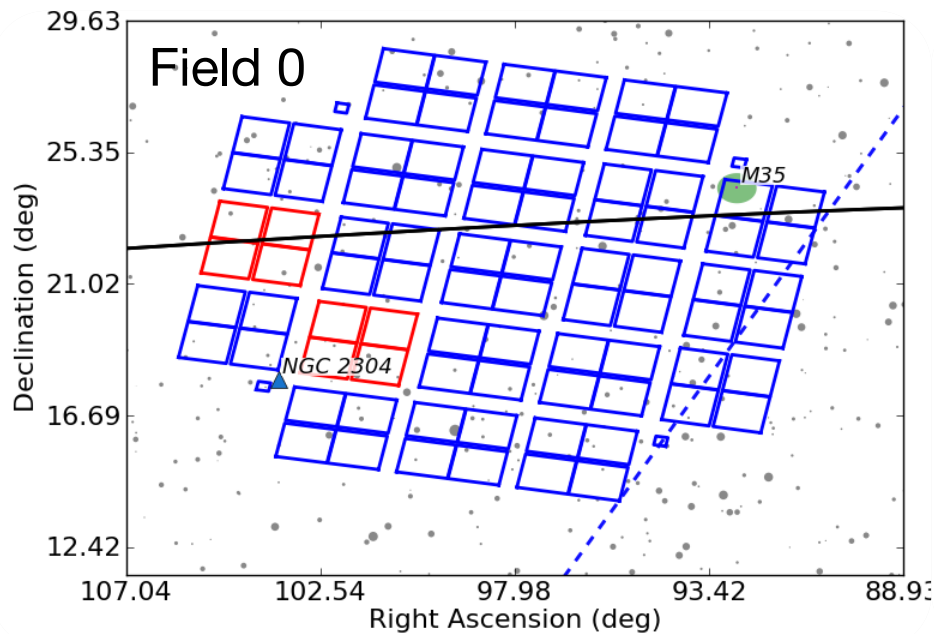
Extending Kepler's Power to the Ecliptic



# K2 Field Advocacy

[keplerscience.arc.nasa.gov/K2/Fields.shtml](http://keplerscience.arc.nasa.gov/K2/Fields.shtml)

[keplergo@mail.arc.nasa.gov](mailto:keplergo@mail.arc.nasa.gov)



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

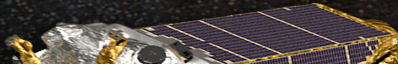
PEER REVIEW

DATA DISTRIBUTION AND ARCHIVE

SOFTWARE

# K2

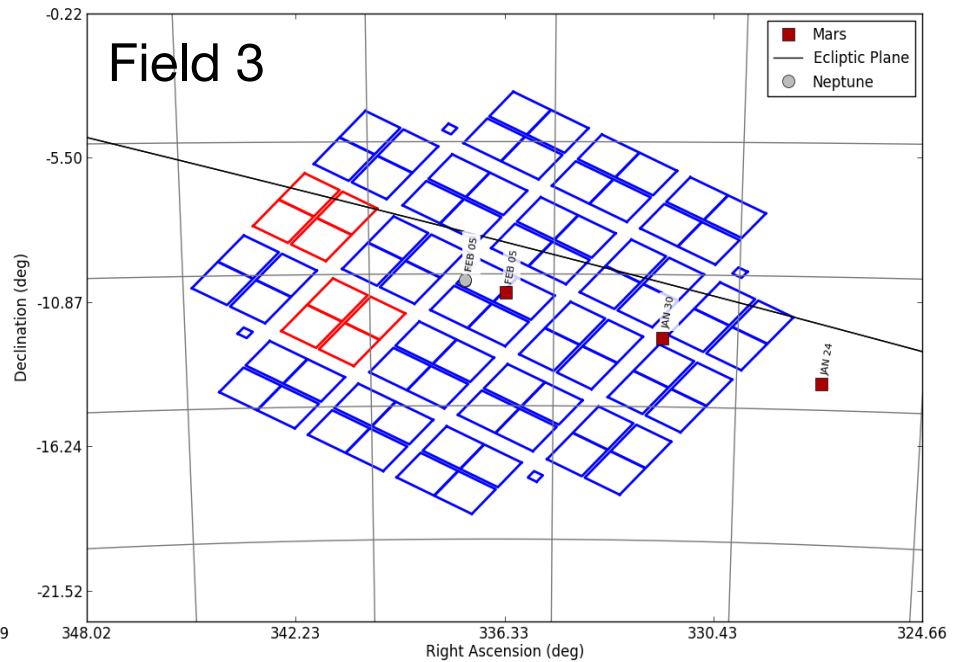
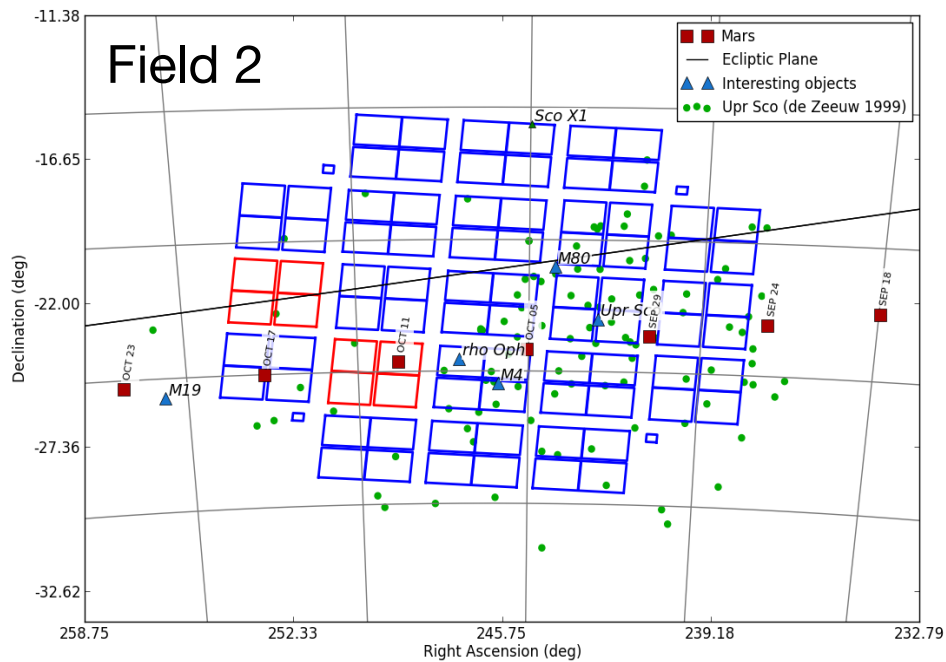
Extending Kepler's Power to the Ecliptic



# K2 Field Advocacy

[keplerscience.arc.nasa.gov/K2/Fields.shtml](http://keplerscience.arc.nasa.gov/K2/Fields.shtml)

[keplergo@mail.arc.nasa.gov](mailto:keplergo@mail.arc.nasa.gov)



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

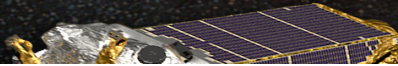
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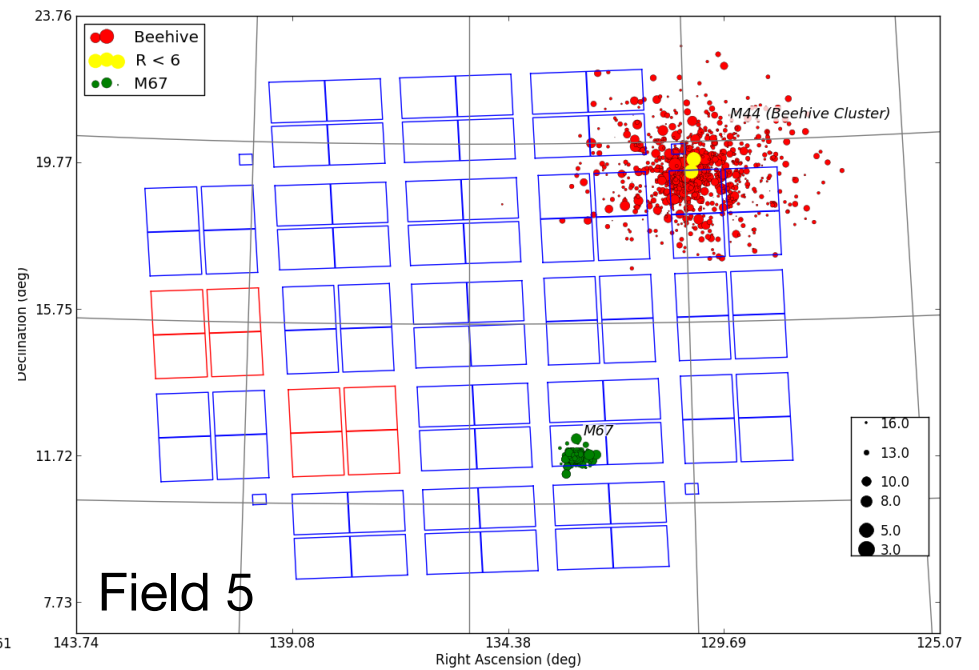
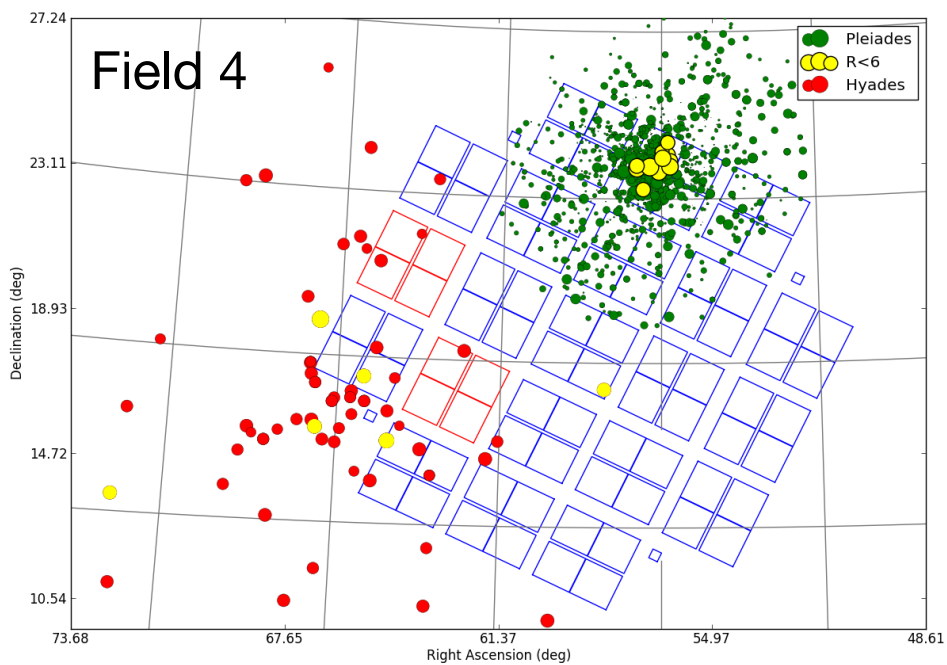
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# K2 Field Advocacy

[keplerscience.arc.nasa.gov/K2/Fields.shtml](http://keplerscience.arc.nasa.gov/K2/Fields.shtml)

[keplergo@mail.arc.nasa.gov](mailto:keplergo@mail.arc.nasa.gov)



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

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SOFTWARE

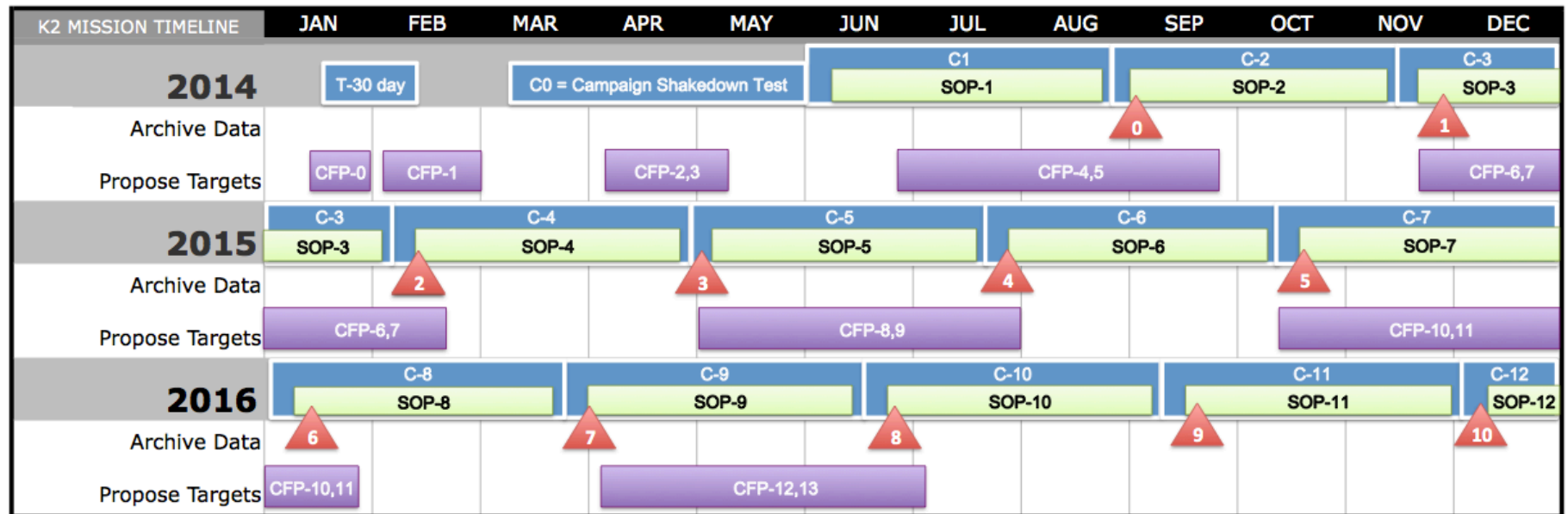
# K2

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## K2 Milestones

[keplerscience.arc.nasa.gov/K2/MissionConcept.shtml](http://keplerscience.arc.nasa.gov/K2/MissionConcept.shtml)



T = test

C = Campaign

SOP = Science Observation Period

CFP = Call For Proposals (community target selection)



Campaign Data to Archive



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

PEER REVIEW

DATA DISTRIBUTION AND ARCHIVE

SOFTWARE



K2

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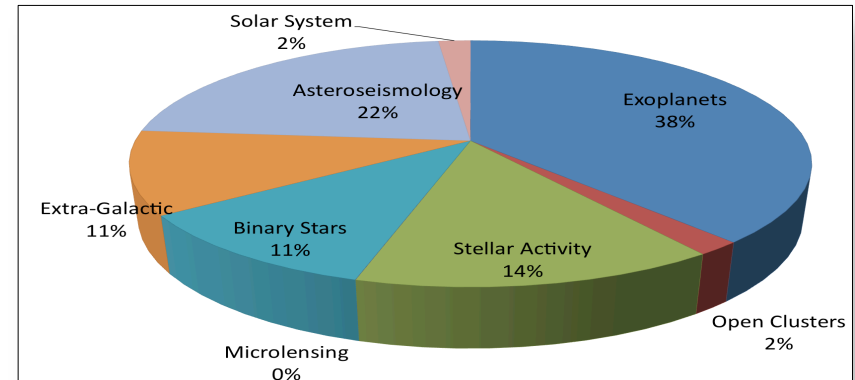
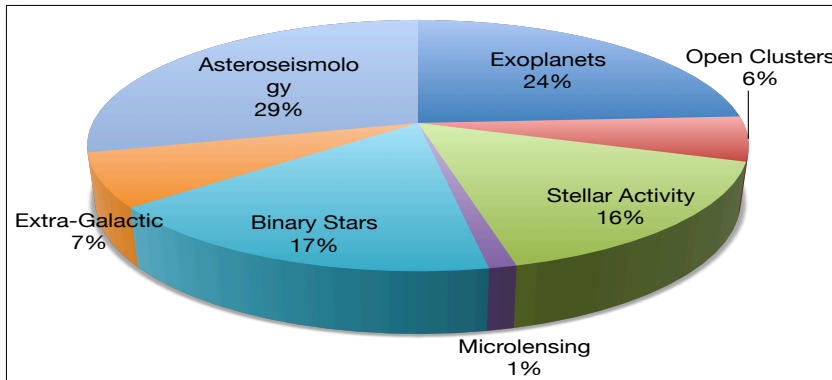
# Science and Target Proposals

[keplerscience.arc.nasa.gov/K2/GuestInvestigations.shtml](http://keplerscience.arc.nasa.gov/K2/GuestInvestigations.shtml)

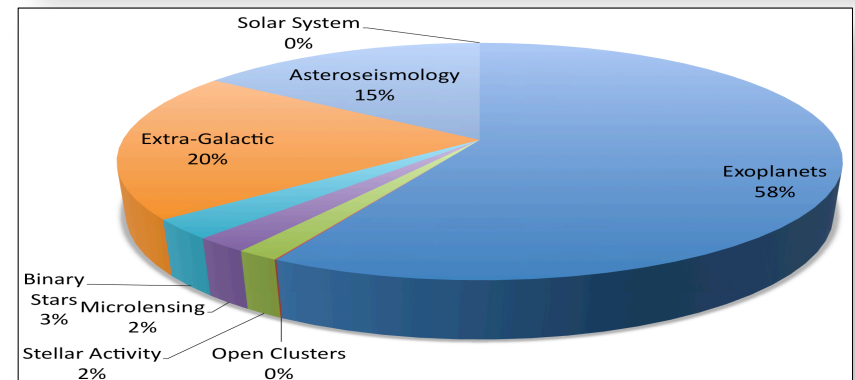
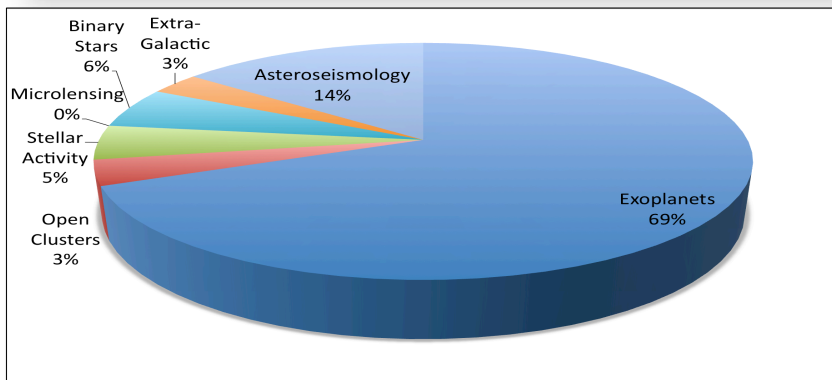
### Campaign 0

### Campaign 1

Proposal Topics



Target Types



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

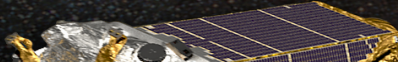
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SOFTWARE

K2

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# Future Science and Target Proposals

[keplerscience.arc.nasa.gov/K2/ProposeTargets4-5.shtml](http://keplerscience.arc.nasa.gov/K2/ProposeTargets4-5.shtml)

[nspires.nasaprs.com](http://nspires.nasaprs.com)

- Future campaign proposals will occur through the NSPIRES system
- Peer review will be administered by NASA HQ
- Next opportunity is campaigns 4-5, NASA Research Announcement on NSPIRES is imminent
  - Stage 1 deadline: Aug 8 2014
  - Stage 2 deadline: Sep 23 2014

Approx. \$4M of  
GO funding is  
available over  
the next 2 years



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

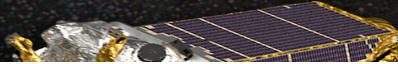
PEER REVIEW

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# K2

## Extending Kepler's Power to the Ecliptic



Barbara A. MIKULSKI ARCHIVE OF SPACE TELESCOPES

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K2 Home About K2 K2 EPIC Search CasJobs

Search & Retrieval Documentation Related Sites MAST Services

On Saturday May 31, 2014 between 9AM and noon there will be interruptions to STScI network connectivity for network maintenance activities.

### K2 Latest News

- 4/30/14 - 28 targets which were proposed for observation for Campaign 1 were added to EPIC.
- 4/25/14 - Field 0 targets have been added to the [Ecliptic Plane Input Catalog](#). The updated [EPIC Document](#) and the downloadable catalog file are also available.
- 4/11/14 - The K2 EPIC Document has been updated.
- 4/09/14 - The Ecliptic Plane Input Catalog has been updated to include Campaigns 2 and 3. The new entries can also be downloaded as a pipe-delimited gzipped ASCII file. See the [K2 Search & Retrieval](#) page for more information.
- 3/25/14 - Sample Two-Wheel Concept Engineering test target pixel files are now available online. The files can be downloaded individually or as 2 .tgz files (the 4 GB short cadence file contains 17 files, the 16 GB long cadence file contains 2,079 files). The .csv files provide a brief description of why each target was observed during the test.

To download, ftp to archive.stsci.edu and cd to /pub/k2/tpf\_eng. The individual files can be found in subdirectories "short\_cadence" and "long\_cadence". To access from the web, click [here](#). For more information, see the [Kepler Blog](#) dated March 25, 2014.

- 2/26/14 - Important Note: Yesterday an incorrect version of the Ecliptic Plane Input Catalog was made available for download. This was an incomplete test version containing possibly incorrect values. Users should delete this file (k2\_Field1\_012914.dat.gz) and replace it with the correct version (d1435\_02\_epic\_field1\_dmc.mgz) which is now available for download. The README file was up-to-date. The MAST staff apologize for this mistake.
- 2/25/14 - The Ecliptic Plane Input Catalog can now be downloaded as a pipe-delimited gzipped ASCII file. It is also now available for searching using casjobs. See the [K2 Search & Retrieval](#) page for more information on both.
- 2/07/14 - The search interface for the Ecliptic Plane Input Catalog ([EPIC](#)) is now available.
- 1/16/14 - Deadline for suggesting targets for Campaign 1 of the proposed K2 mission is 7 March 2014. See the [K2 mission page](#) for more information.

### Quick Links

- [K2 EPIC Document](#) - description of K2 Ecliptic Plane Input Catalog.
- [General Search Information](#) - Information on search syntax.

News

January 03, 2014:  
New Instructional Videos for the MAST Discovery Portal

November 25, 2013:  
A New Way To Search, A New Way To Discover: MAST Discovery Portal Goes Live

July 01, 2013:  
MAST post on AstroBetter Blog Site

June 04, 2013:  
Updated Guidelines for submission of High Level Science Products

May 20, 2013:  
Faster Display of Large HTML Tables

Missions

- Hubble
- Hubble Legacy Archive
- HSTonline
- DSS
- JWST
- K2
- KEPLER
- SwiftUVOT
- XMM-OM
- BEFS (ORFEUS)
- Copernicus
- EPOCH
- FUSE
- GALEX
- GSC
- HPOL
- HUT
- IMAPS (ORFEUS)
- IUE
- TUES (ORFEUS)
- UIT
- VLA-FIRST
- WUPPE

# Archives and Data

archive.stsci.edu/K2

exoplanetarchive.ipac.caltech.edu

NASA EXOPLANET ARCHIVE  
A SERVICE OF NASA EXOPLANET SCIENCE INSTITUTE

Home About the Archive Data Tools User Guides & Helpdesk

1,713 Confirmed Planets 05/14/2014

443 Multi-Planet Systems 05/14/2014

3,845 Kepler Candidates 02/13/2014

Explore the Archive

Name or Coordinates Search

Radius Arcsecs: 30 Advanced Search

Transit Surveys 21,267,575 Light Curves

Kepler The first space mission to search for Earth-sized and smaller planets in the habitable zone of other stars in our neighborhood of the galaxy.

Light Curves Objects of Interest (KOI) Search Stellar Data Documentation

Threshold-Crossing Events Kepler, KOI Numbers and KIC Identifiers

Kepler CoRoT SuperWASP More Datasets

Tools & Services

Periodogram and Light Curve Viewer Bulk Download Service Build a Query (API) Transit and Ephemeris Service

FAQ Documentation

Kepler Candidate Equilibrium Temperature

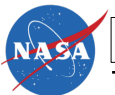
Radius (Earth Radii) Planetary Equilibrium Temperature (K)

Work with Data

Confirmed Planets Plotting Tool Confirmed Planets Table Kepler CFOP Search Interactive Tables

News Plots

Video Tutorials Contact Us



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

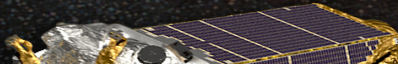
PEER REVIEW

DATA DISTRIBUTION AND ARCHIVE

SOFTWARE

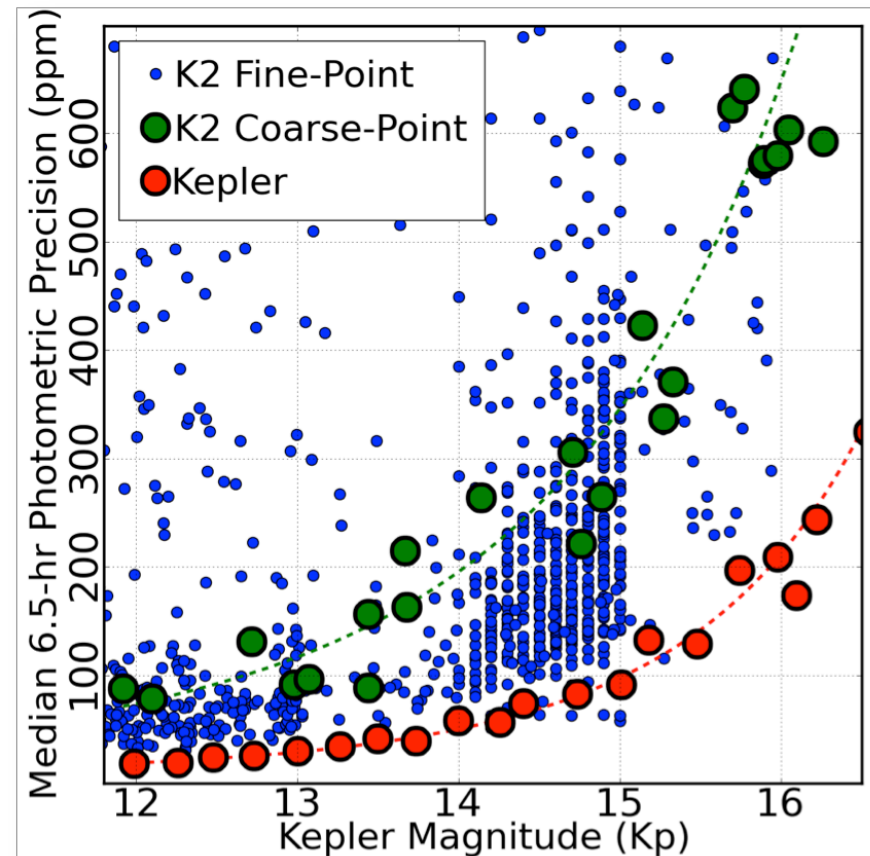
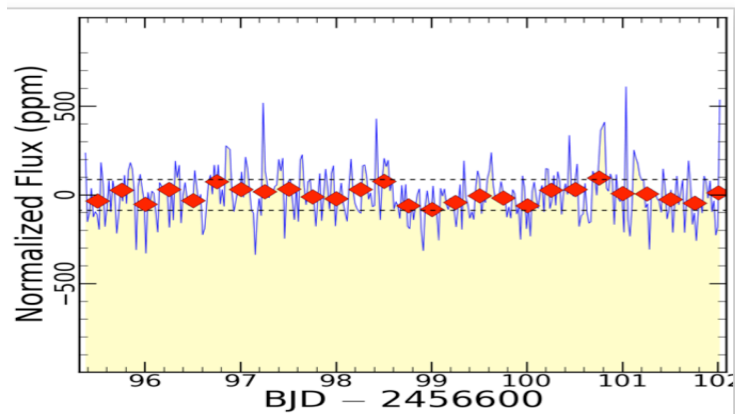
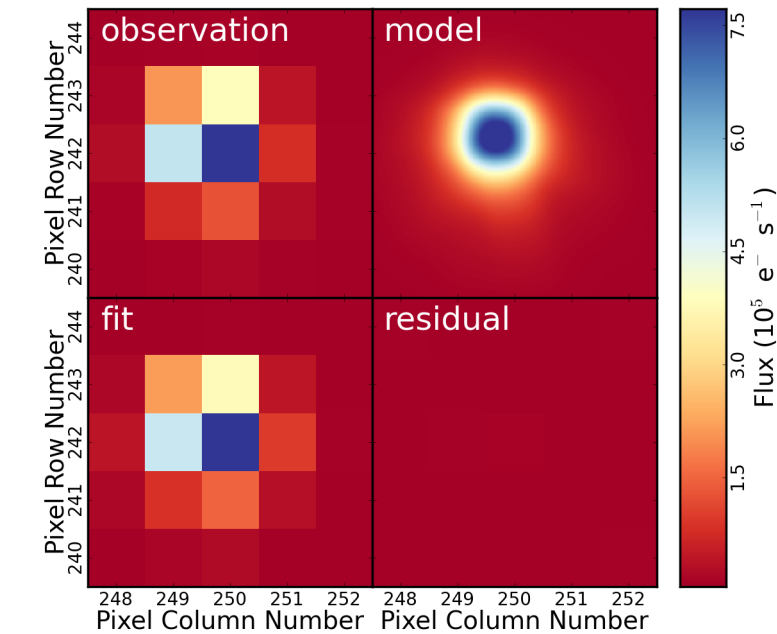
# K2

Extending Kepler's Power to the Ecliptic



# Data Analysis

[keplerscience.arc.nasa.gov/PyKE.shtml](http://keplerscience.arc.nasa.gov/PyKE.shtml)



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

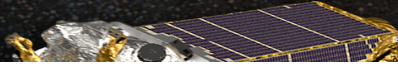
PEER REVIEW

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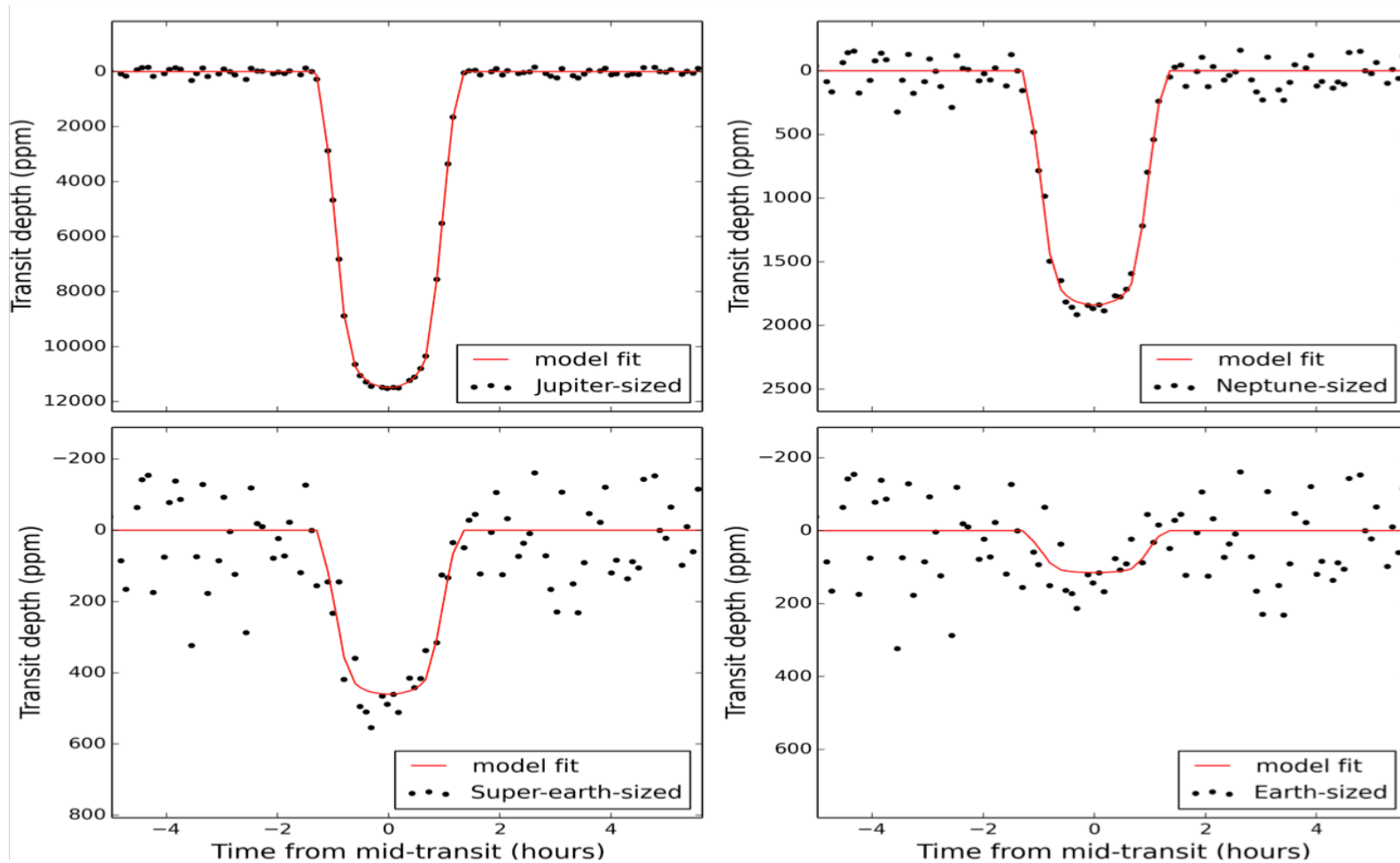
SOFTWARE

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# Transit Injection



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

PEER REVIEW

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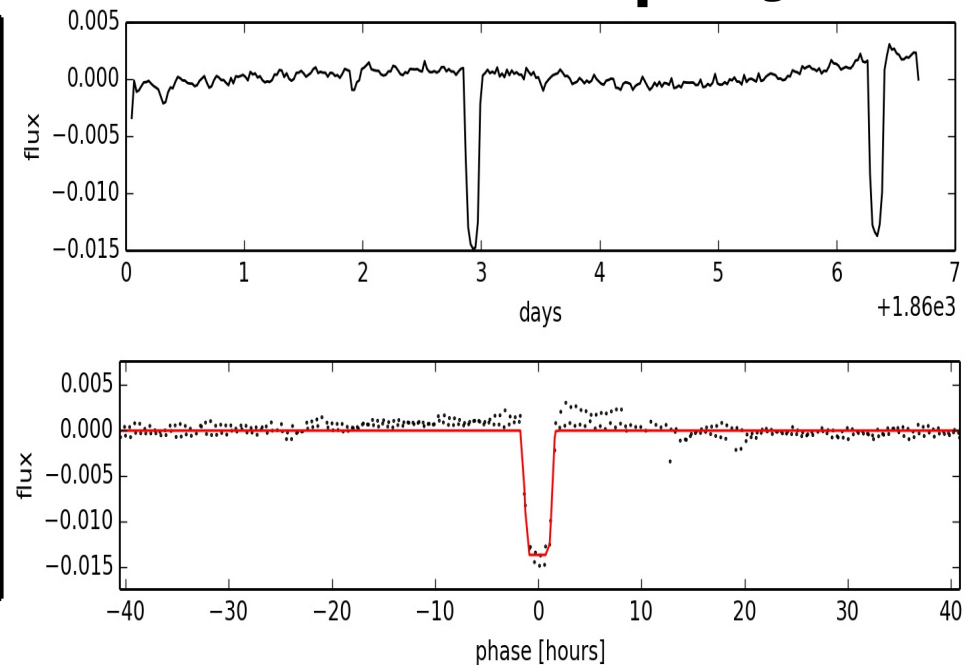
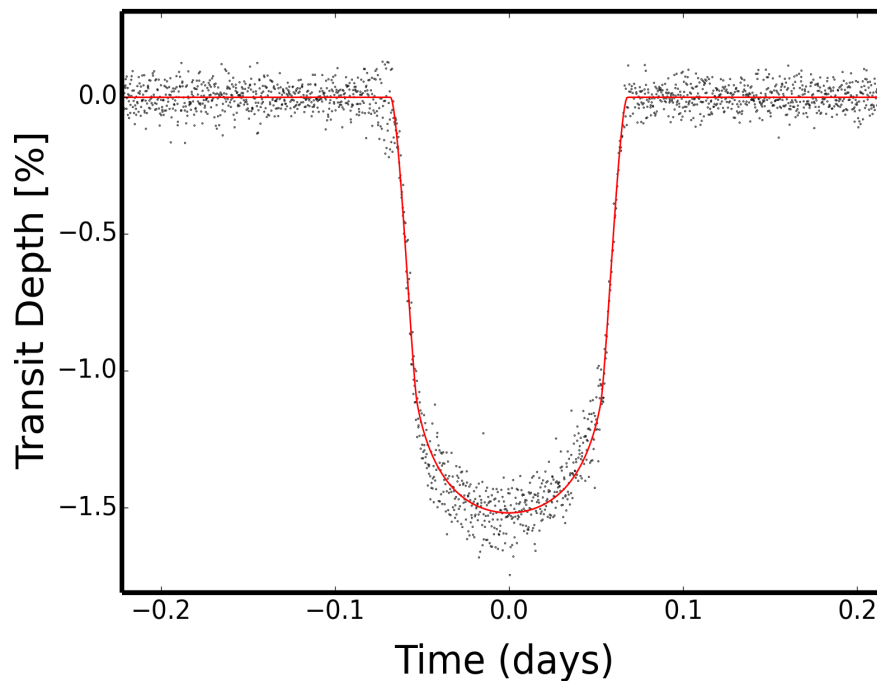
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# Data Analysis - Transit Candidates

## WASP-28b

## serendipity



FIELD ADVOCACY

SCIENCE AND TARGET PROPOSALS

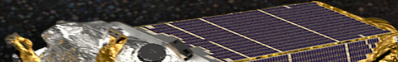
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Kepler Science Center

keplergo@mail.arc.nasa.gov

<http://keplerscience.arc.nasa.gov/K2>

NAVIGATION AERONAUTICS AND SPACE ADMINISTRATION  
MISSION CONCEPT PERFORMANCE SCIENCE FIELDS PROPOSE TARGETS PROGRAMS FAQ KEPLER

### Extending Kepler's Power to the Ecliptic

ARCHIVE TOOLS HELPDESK

The K2 mission is a concept being proposed to NASA through the 2014 Senior Review Process. K2 is currently not a NASA-funded mission and the operational plan described within these web pages is contingent upon NASA approval and funding. K2 provides an opportunity to continue exoplanet discoveries in the field of its role into new and exciting astrophysical observations by repurposing Kepler as a new mission.

Kepler's loss of a second spacecraft reaction wheel in May 2013 effectively ended data collection in the original Kepler field after 4 years of continuous monitoring. However, all other Kepler assets remain intact and can be used for the K2 mission. Both missions are founded on the proven value of long-baseline, high-cadence, high-precision photometry and exploit a large field of view to simultaneously monitor many targets. On two observing fields, sequential reaction wheels, K2 orbits the sun, sequentially pointing near the ecliptic plane, sequentially observing fields of scientifically important objects across a wide range of galactic latitudes in both the northern and southern skies. K2 will perform a series of long, ecliptic-pointed campaigns to collect data for the mission, a series of young stars, and a series of extragalactic science.

Kepler's limited pointing near the ecliptic plane, sequentially observing fields of scientifically important objects across a wide range of galactic latitudes in both the northern and southern skies. K2 will perform a series of long, ecliptic-pointed campaigns to collect data for the mission, a series of young stars, and a series of extragalactic science.

On the ground, the proposed approximately 80-day observing campaigns enable a unique exoplanet survey which fills the gaps in duration and sensitivity between the Kepler and TESS missions, and offers pre-launch exoplanet target identification for JWST transmission spectroscopy.

#### SCIENCE MOTIVATION

#### CALL FOR WHITE PAPERS: Soliciting Community input for Alternative Science Investigations with Kepler

An open solicitation from the Kepler Project Office at NASA Ames Research Center  
Closed on Sep 3, 2013  
Click here for the abstracts from white papers received

#### ENGINEERING DATA QUALITY (FEB 2014)

#### K2 PHOTOMETRIC PERFORMANCE +more

#### LATEST K2 NEWS

- Community-nominated target lists solicited for Campaigns 2 and 3 (Apr 8, 2014)
- Campaign 0 science programs and targets selected (Feb 28, 2014)
- The K2 Mission: paper providing a mission characterization and early photometric performance (Feb 28, 2014)
- Community-nominated target lists solicited for Campaign 1 (Feb 7, 2014)
- Ecliptic Plane Input Catalog (EPIC), for K2 target selection, is live at the MAST (Feb 7, 2014)
- Tool for determining whether a potential K2 target is on silicon (Feb 7, 2014)

#### TARGET PROPOSAL TIMELINE

Submission of Alternative Science Proposals: Feb 20, 2014



# Summary

- K2 achieves similar photometric precision to Kepler within target fields along the ecliptic plane
- Fuel reserves suggest a 2-3 yr operational facility
- K2 is a community facility. The community:
  - advocates all fields
  - proposes and nominates all science programs
  - selects all targets
  - performs all science
- The community will need to be more hands-on with data reduction



**WE'RE  
HIRING!**