United Nations
Educational, Scientific and
Cultural Organization

International
Year of Light
2015

A FÉNY
NEMZETKÖZI ÉVE
2015

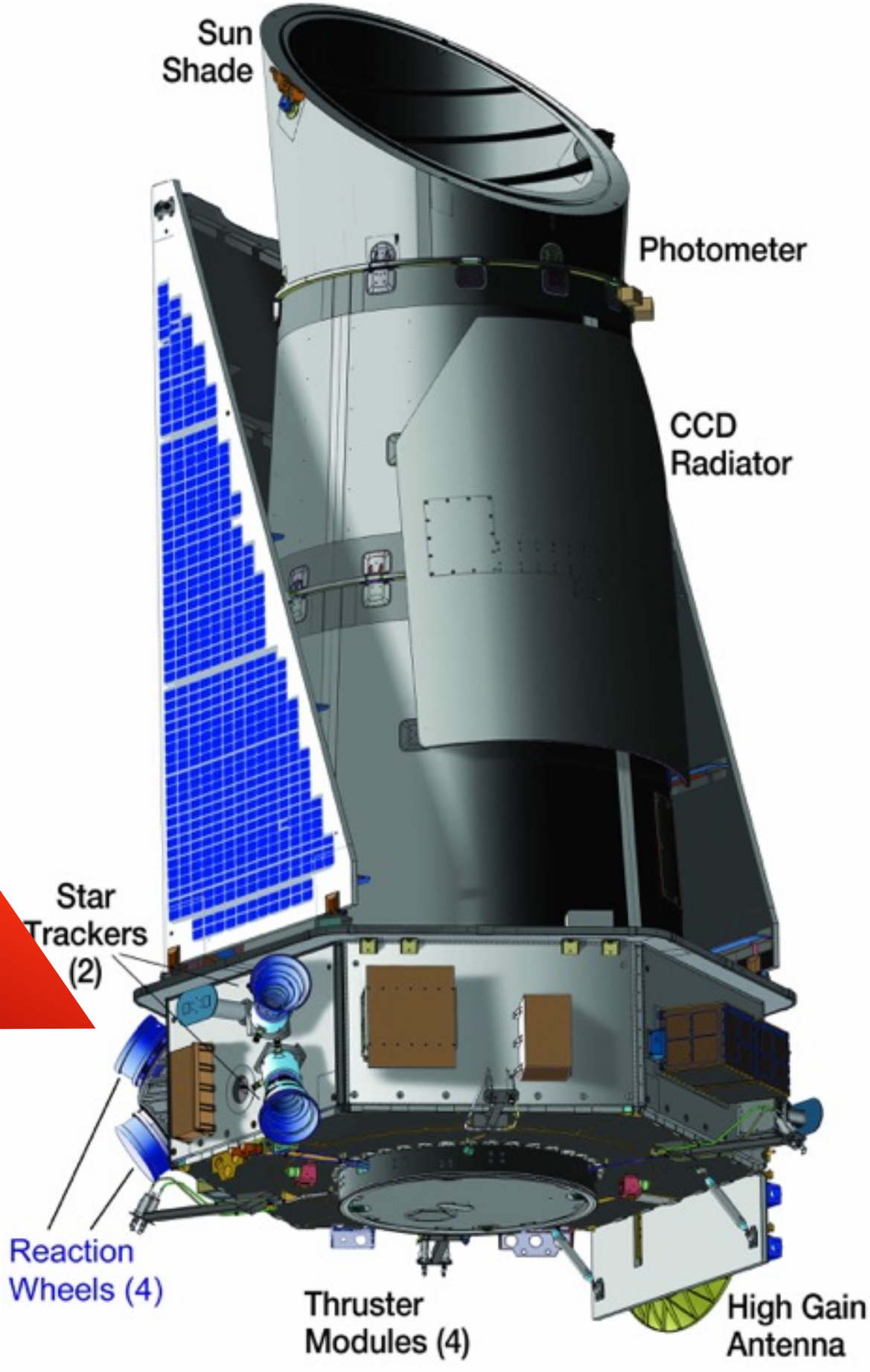
KOZMIKUS
FÉNY

Mire jó a K2? Új célpontok a Kepler-űrtávcsővel

Kiss L. László

MTA Csillagászati és Földtudományi Kutatóközpont
www.csillagaszat.hu


Miles
50
PAKISTAN
KARAKORAM MOUNTAINS
CHINA
K2
BROAD PEAK
BALTORO GLACIER
SWAT
SWAT VALLEY
Karakoram Highway
NANGA PARBAT
Skardu
NORTH-WEST FRONTIER PROVINCE
Besham
Controlled by Pakistan
JAMMU AND KASHMIR
Indus River
Peshawar
Start of journey
Islamabad
Controlled by India
Area of detail
CHINA
PAKISTAN
INDIA


Sun
Shade
Photometer
CCD
Radiator
Star
Trackers
(2)
Reaction
Wheels (4)
Thruster
Modules (4)
High Gain
Antenna

(Optikai) csillagászat mért mennyiségei

- **Égi irányok** - koordináták
- **Fényesség** - pontszerű és kiterjedt objektumok
- **Színkép** - folytonos és vonalas spektrumok
- **Sokaságok vizsgálata** - égboltfelmérések

A pontosság növelése, “régi” technikák újszerű alkalmazásai új fizikai jelenségek felfedezéséhez vezethet!

FOTOMETRIAI FEJLŐDÉS

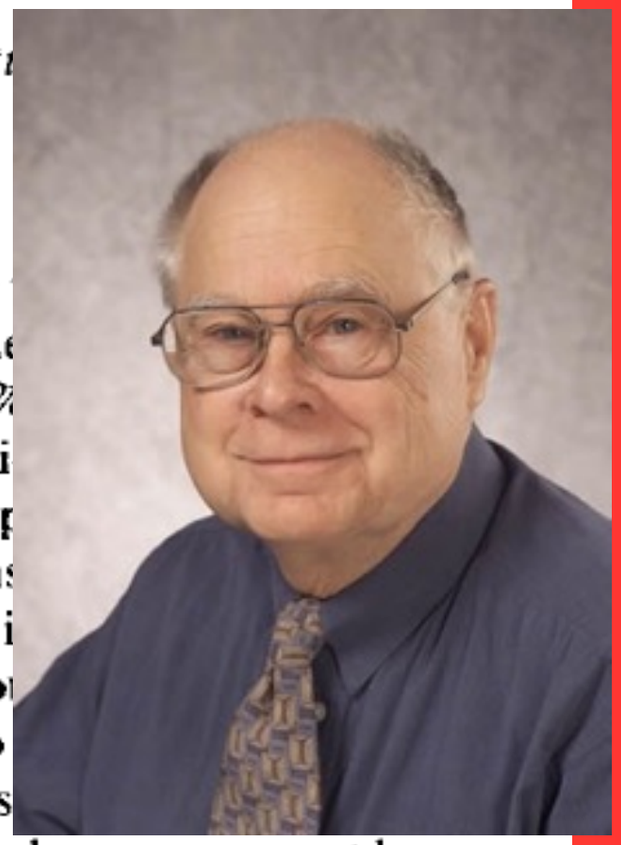
- Nagyságrendi ugrások:
  - 1 magnitúdó: Mirák, (szuper)nóvák
  - 0,1-0,01 magnitúdó: geometriai és fizikai (pulzáló, eruptív és kataklizmikus) változócsillagok
  - 0,001 magnitúdó (1 mmag): fedési exobolygók - forró jupiterek
  - 0,1-0,001 mmag: Nap típusú csillagrezgések, exoholdak, exoföldek, ??????

ICARUS 58, 121–134 (1984)

The Photometric Method of Detecting Other Planetary Systems

WILLIAM J. BORUCKI AND AUDREY L. SUMMERS

Theoretical and Planetary Studies Branch, NASA–Ames Research Center, Moffett



Received August 10, 1983; revised January 18, 1984

The photometric method detects planets orbiting other stars by searching for
light flux or the change in the color of the stellar flux that occurs when a plane
transit by Jupiter or Saturn would reduce the stellar flux by approximately 1%
Uranus or Neptune would reduce the stellar flux by 0.1%. A highly characteristi
an amplitude approximately 0.1 of that for the flux reduction would also accomp
could be used to verify that the source of the flux reduction was a planetary trans
other phenomenon. Although the precision required to detect major planets i
with state-of-the-art photometers, the detection of terrestrial-sized planets wo
sion substantially greater than the state-of-the-art and a spaceborne platform to
variations in sky transparency and scintillation. Because the probability is so s
planetary transit during a single observation of a randomly chosen star, the search program must be designed to continuously monitor hundreds or thousands of stars. The most promising approach is to search for large planets with a photometric system that has a single-measurement precision of 0.1%. If it is assumed that large planets will have long-period orbits, and that each star has an average of one large planet, then approximately 10^4 stars must be monitored continuously. To monitor such a large groups of stars simultaneously while maintaining the required photometric precision, a detector array coupled by a fiber-optic bundle to the focal plane of a moderate aperture (≈1 m), wide field of view (≈50°) telescope is required. Based on the stated assumptions, a detection rate of one planet per year of observation appears possible.

Kepler-űrtávcső

A Kepler célja Föld típusú, lakható bolygók felfedezése a fedési módszerrel

Szimultán észlelt több mint 150 ezer csillagot

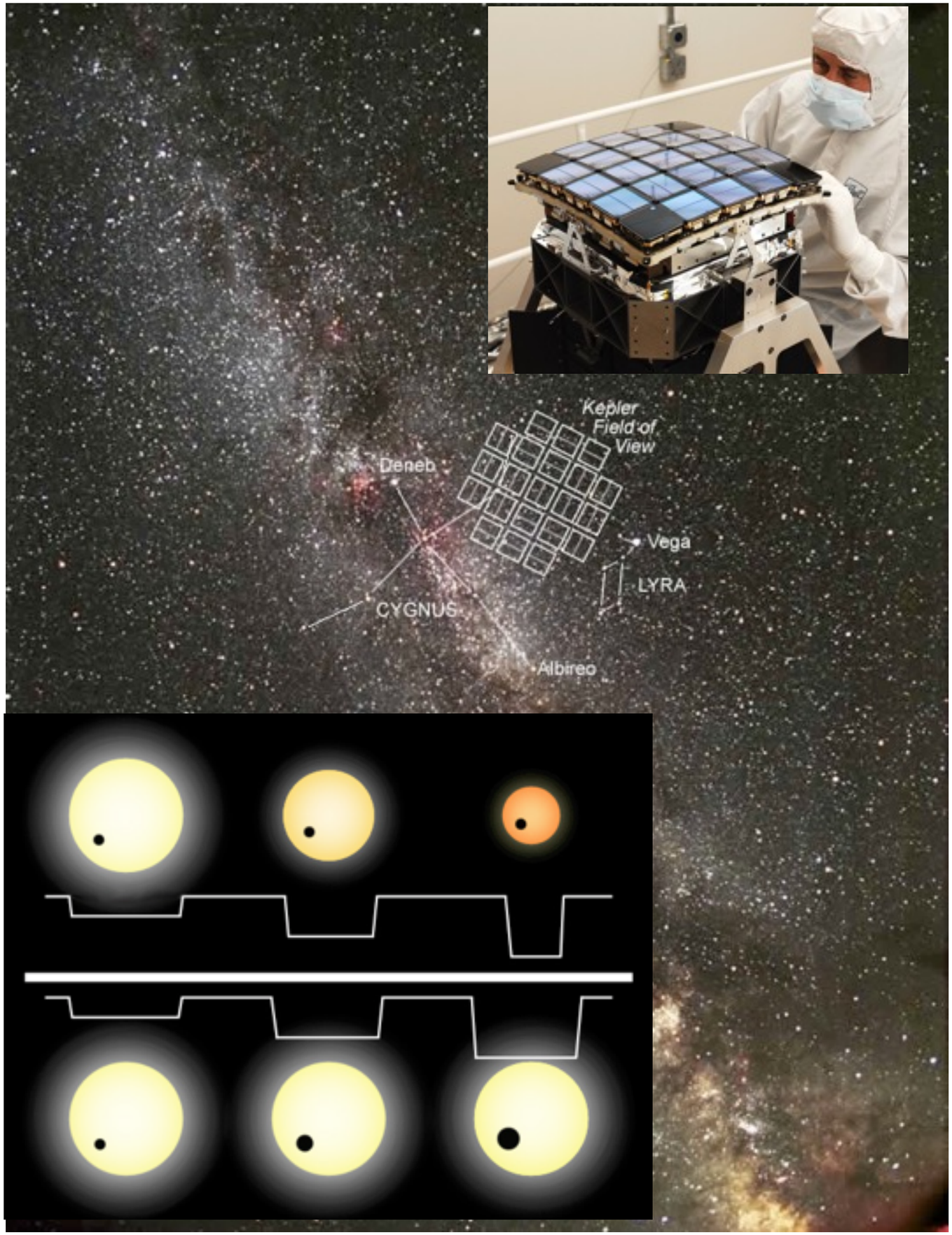
95 cm-es belépő nyílású Schmidt-távcső, látómezeje mintegy 100 négyzetfok, 42 CCD-ből álló mozaikkal

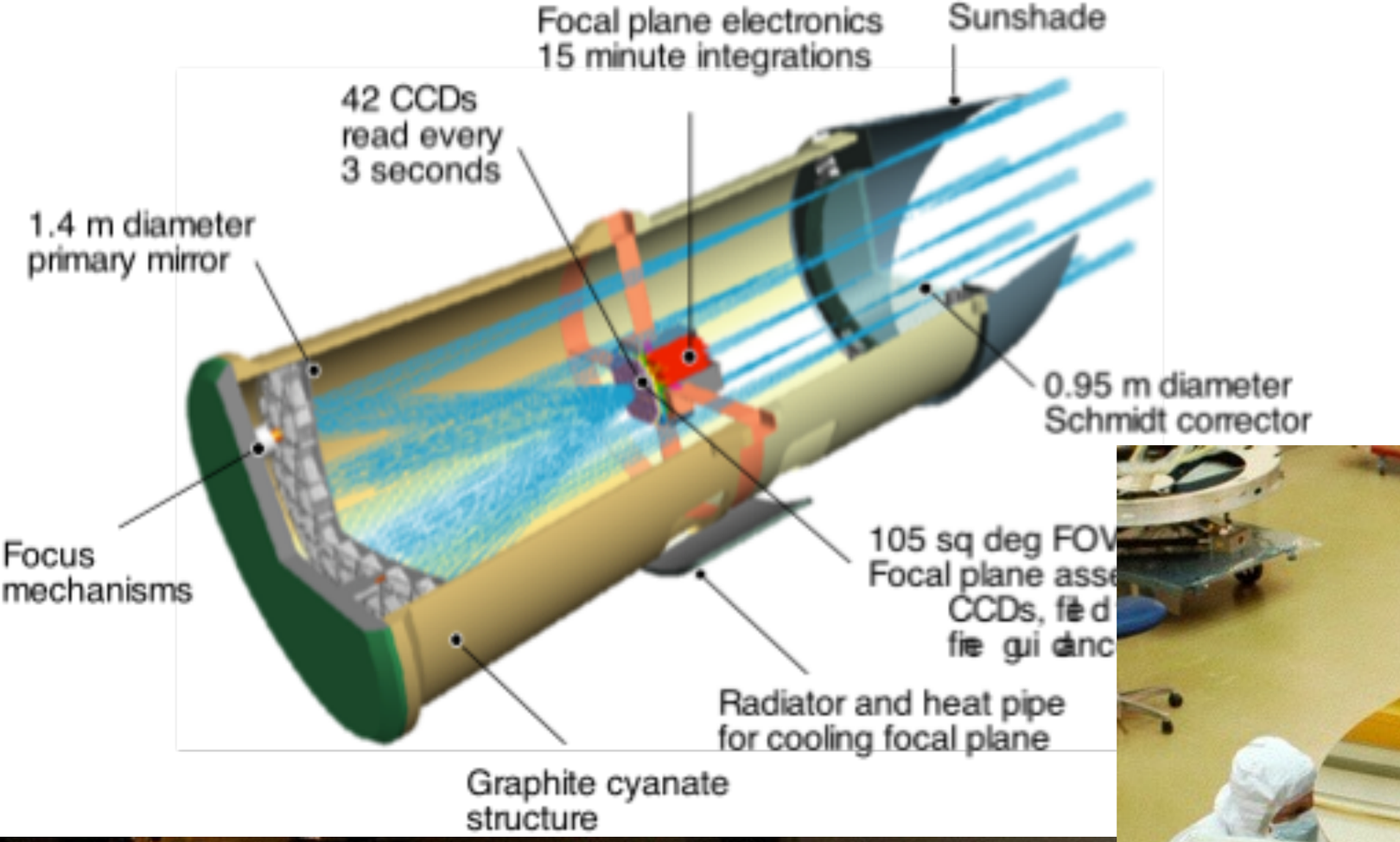
Fotometriai pontosság:

A zaj < 20 ppm 6,5 órányi mérés után egy 12 magn. Nap típusú csillagra

=> 4-szigma detektálás egy exoföld tranzitja esetén.

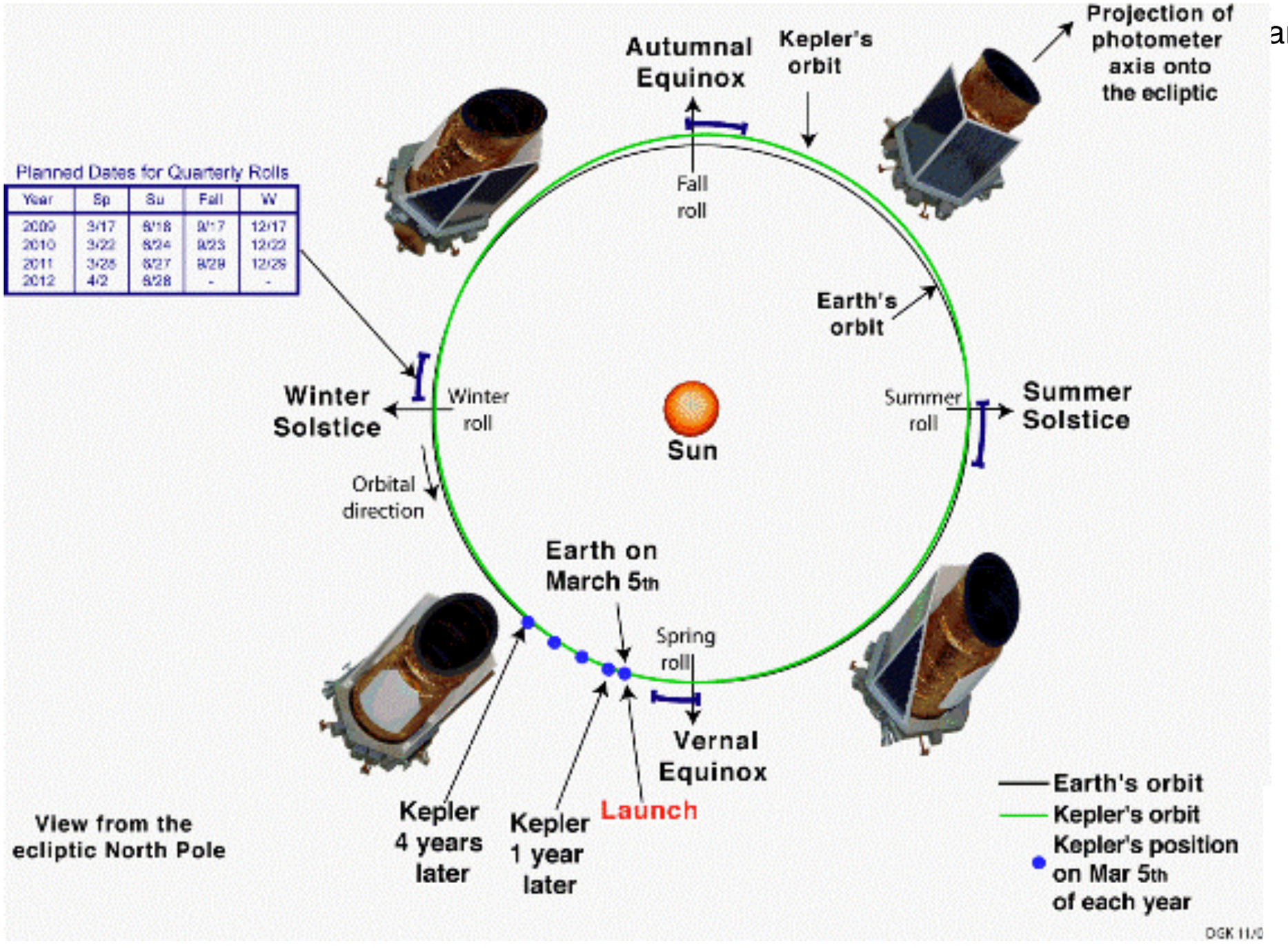
Heliocentrikus pálya, 2009-2013

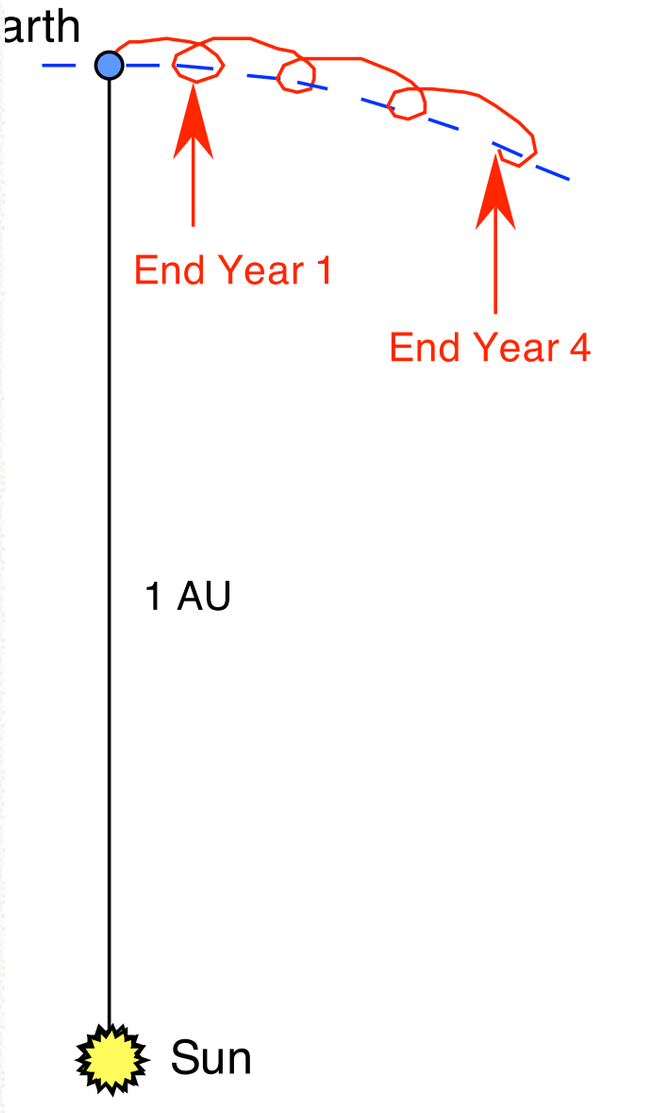



Focal plane electronics
15 minute integrations
Sunshade
42 CCDs
read every
3 seconds
1.4 m diameter
primary mirror
0.95 m diameter
Schmidt corrector
Focus
mechanisms
105 sq deg FOV
Focal plane asse
CCDs, fe d
fie gui anc
Radiator and heat pipe
for cooling focal plane
Graphite cyanate
structure

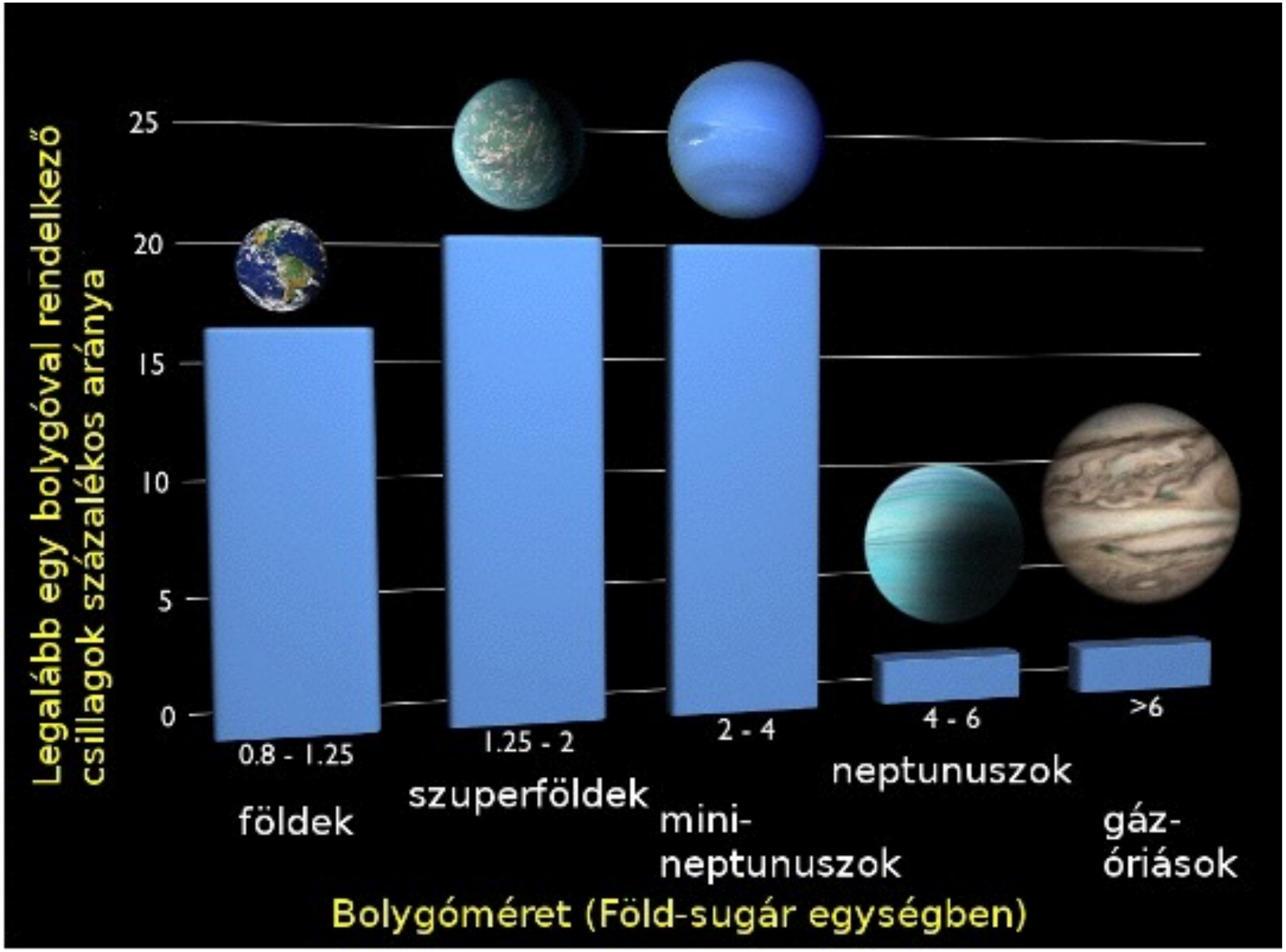

Ball

Heliocentric orbit, 1 week/yr lag behind Earth

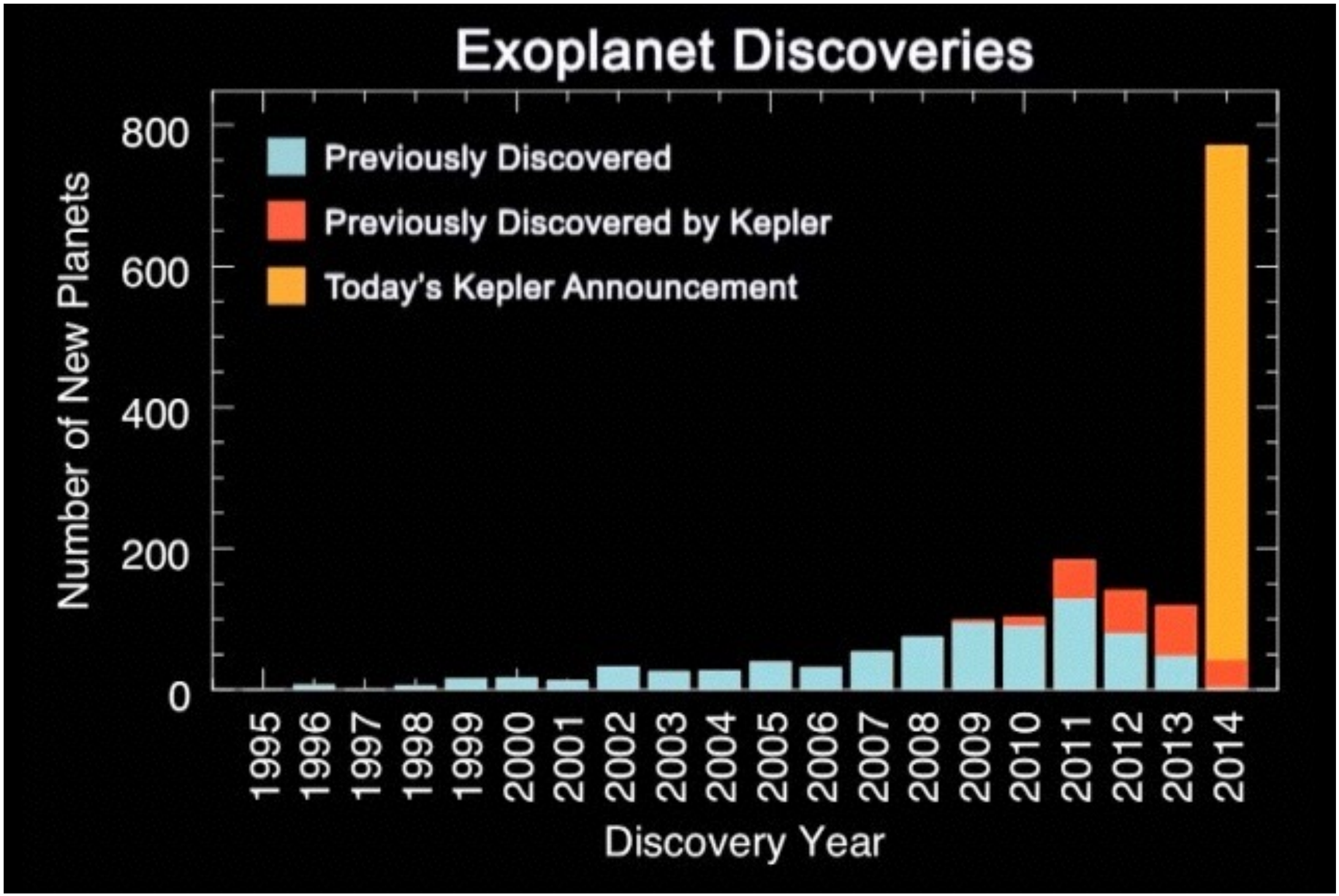




Rövidperiódusú bolygók gyakorisága



2014. február 26.: 715 új bolygó többes rendszerben

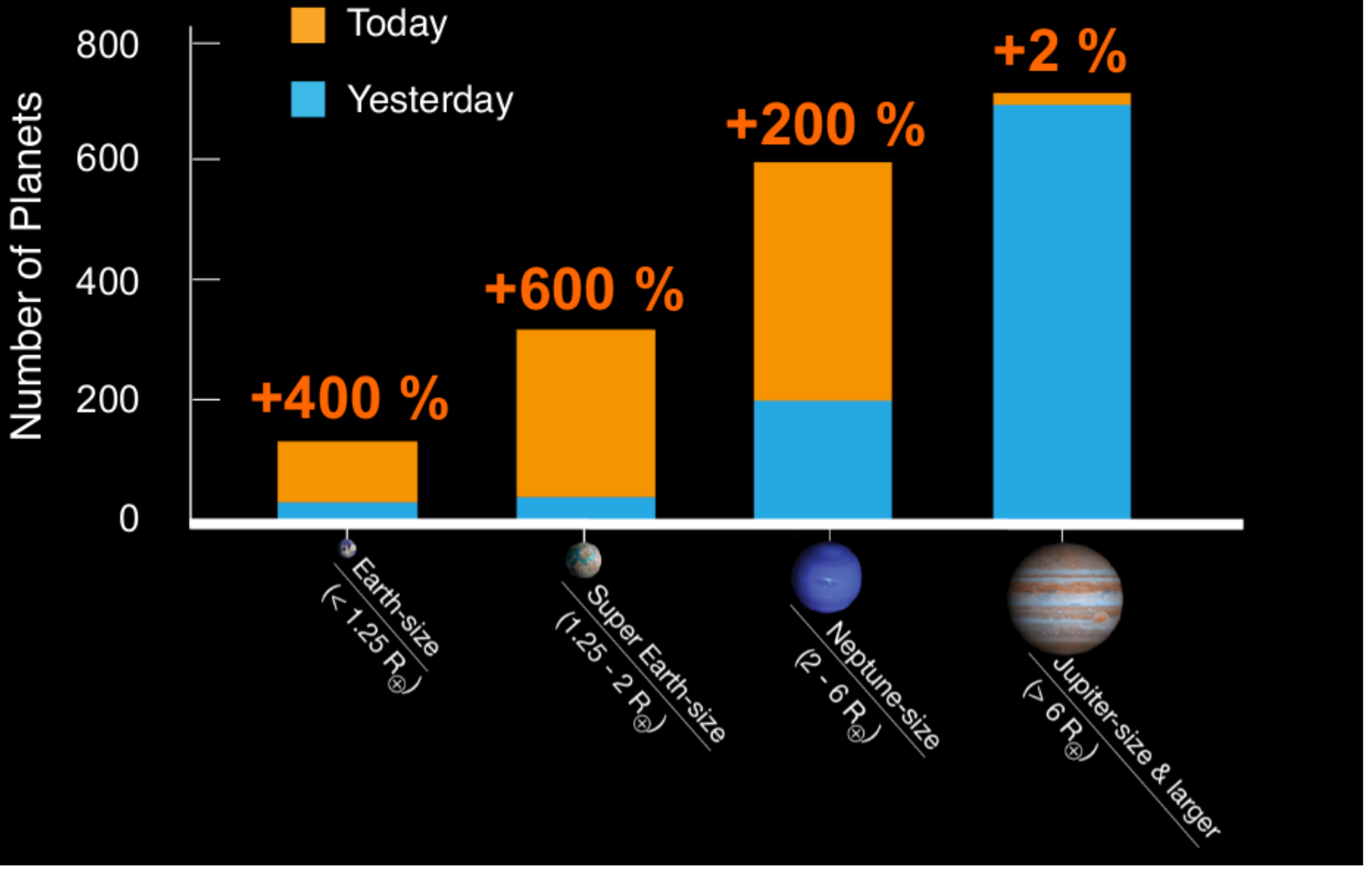


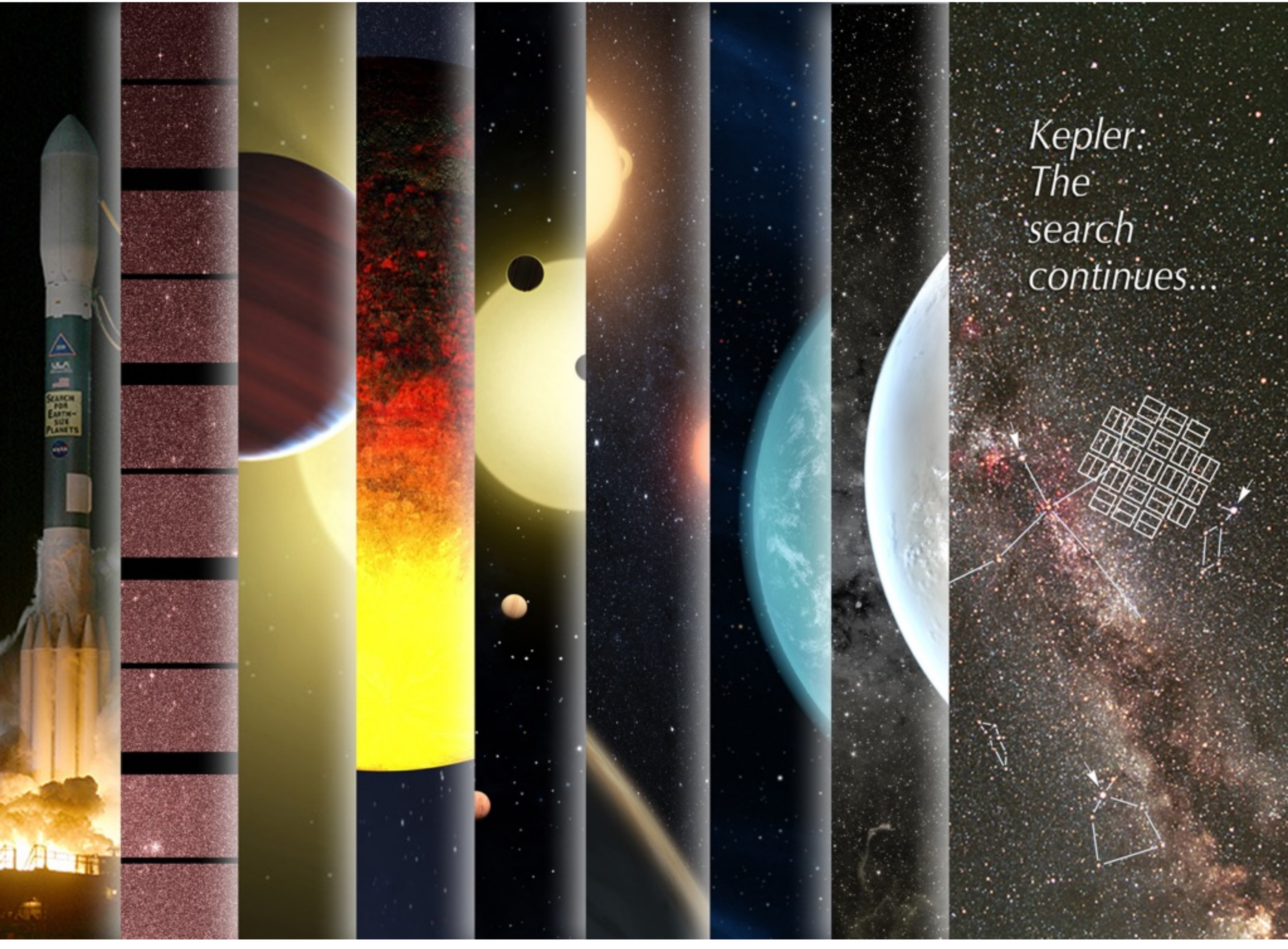
Kepler

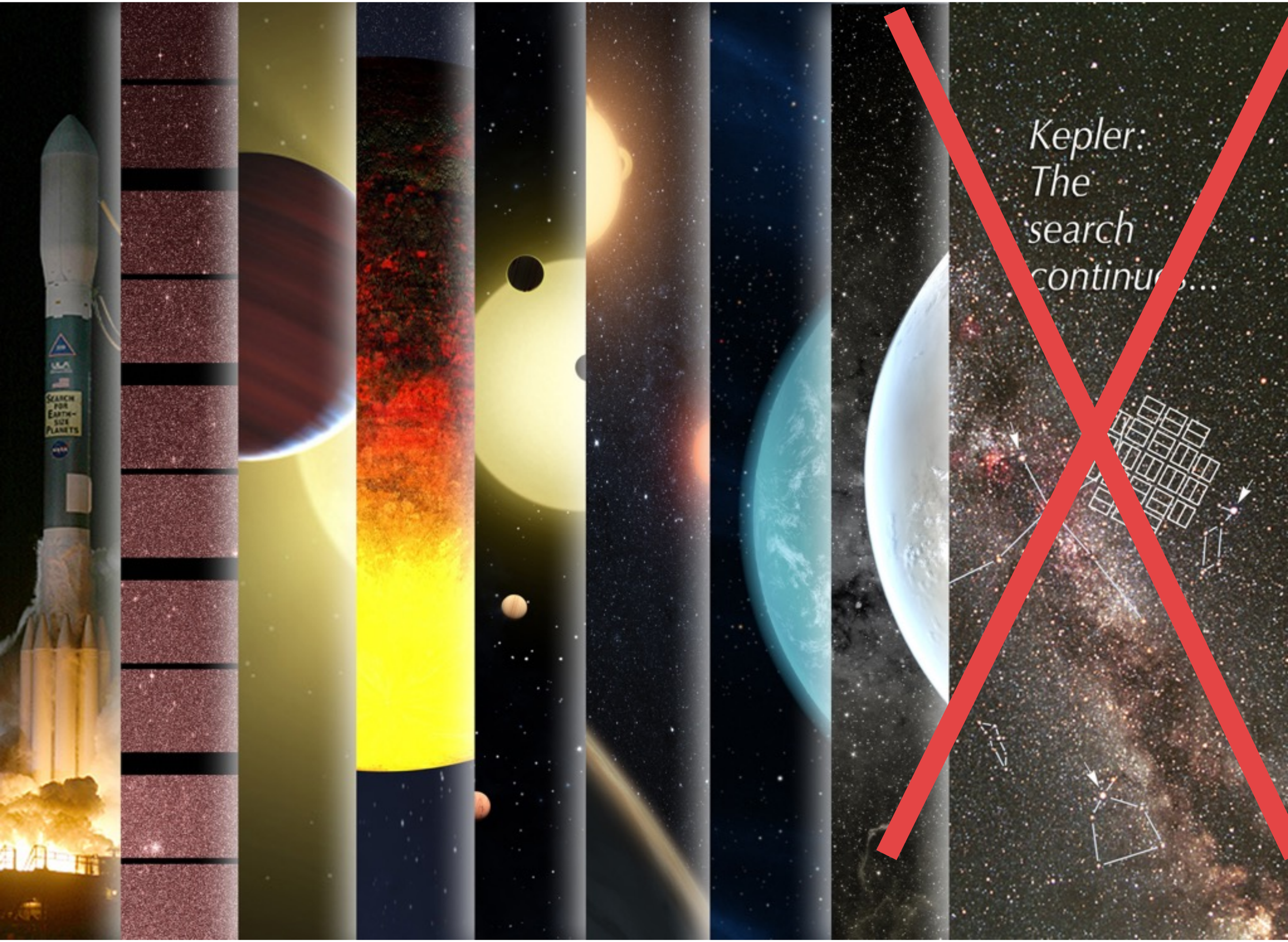
Sizes of Verified Planets

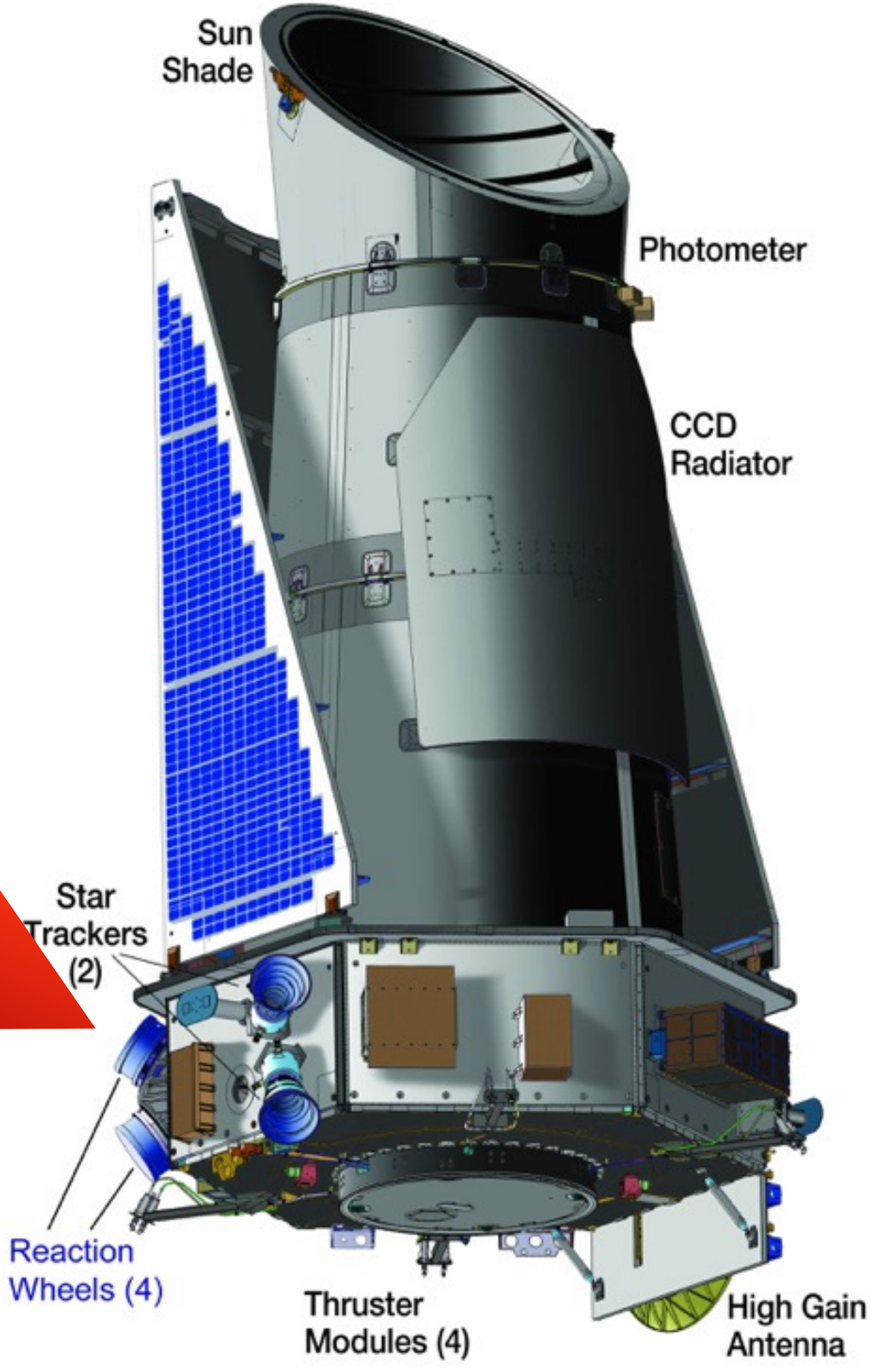
As of February 26, 2014

NASA



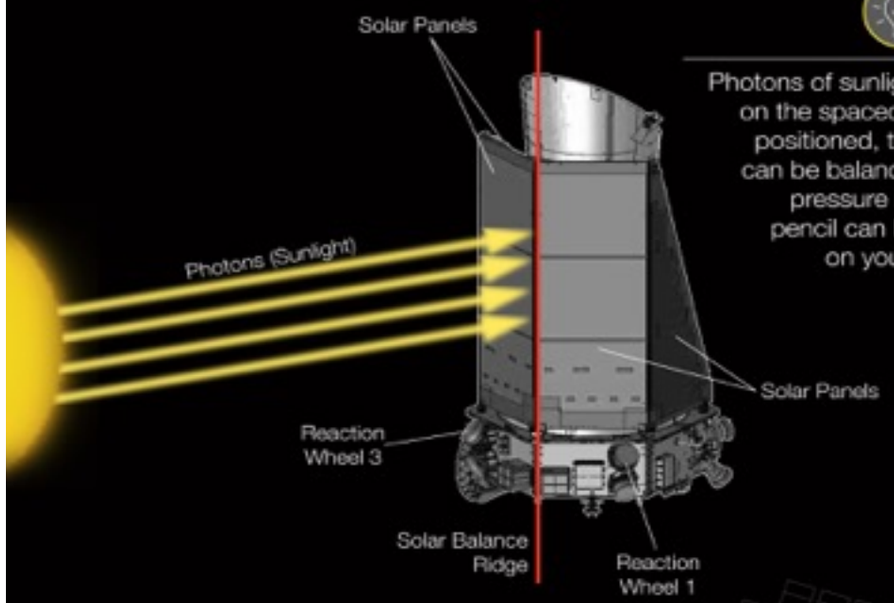

SEARCH FOR EARTH-SIZE PLANETS
Kepler:
The
search
continues...

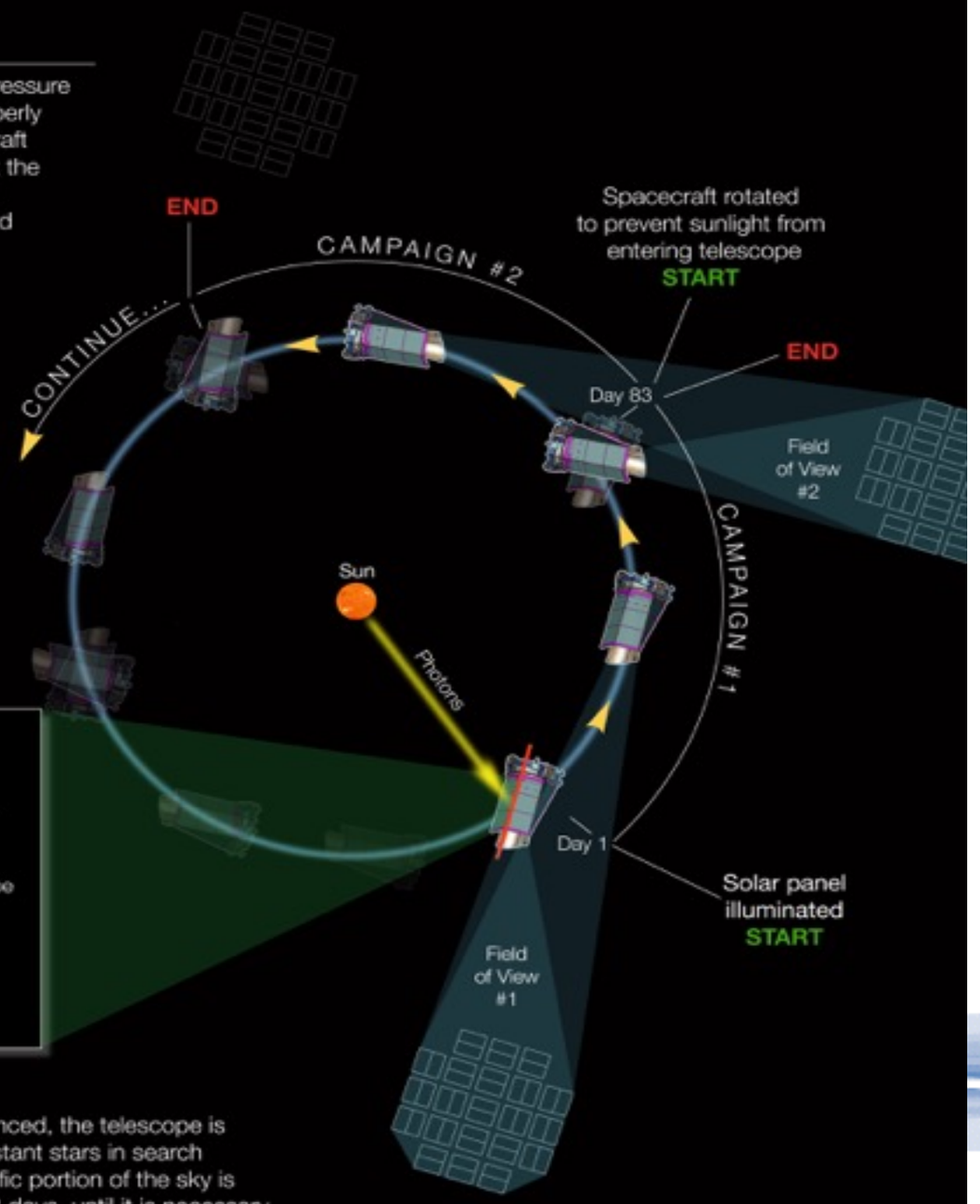

SEARCH FOR EARTH-SIZE PLANETS
Kepler:
The
search
continues...


Sun
Shade
Photometer
CCD
Radiator
Star
Trackers
(2)
Reaction
Wheels (4)
Thruster
Modules (4)
High Gain
Antenna

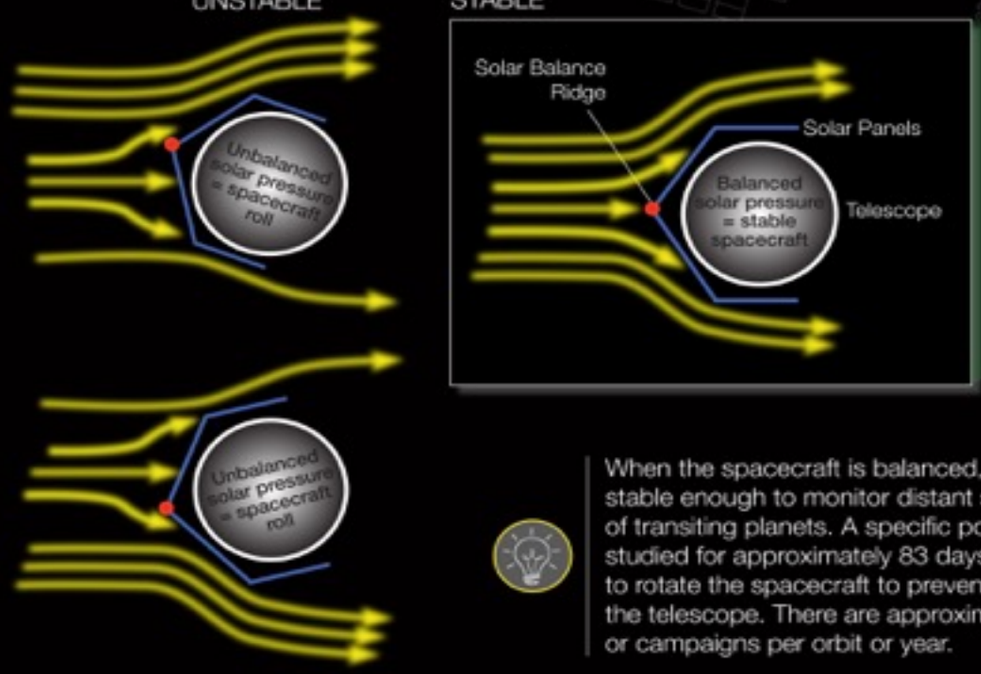
Kepler's Second Light: How K2 Will Work

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



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.

pencil can be balanced
on your finger.

Solar Panels

Reaction
Wheel 1

RAFT
E

CONTINUE...

CAMPAIGN #2

to prevent sunlight from
entering telescope

START

END

Day 83

Field
of View
#2

CAMPAIGN #1

Sun

Photons

Day 1

Solar panel
illuminated

START

Field
of View
#1

Balance
Ridge

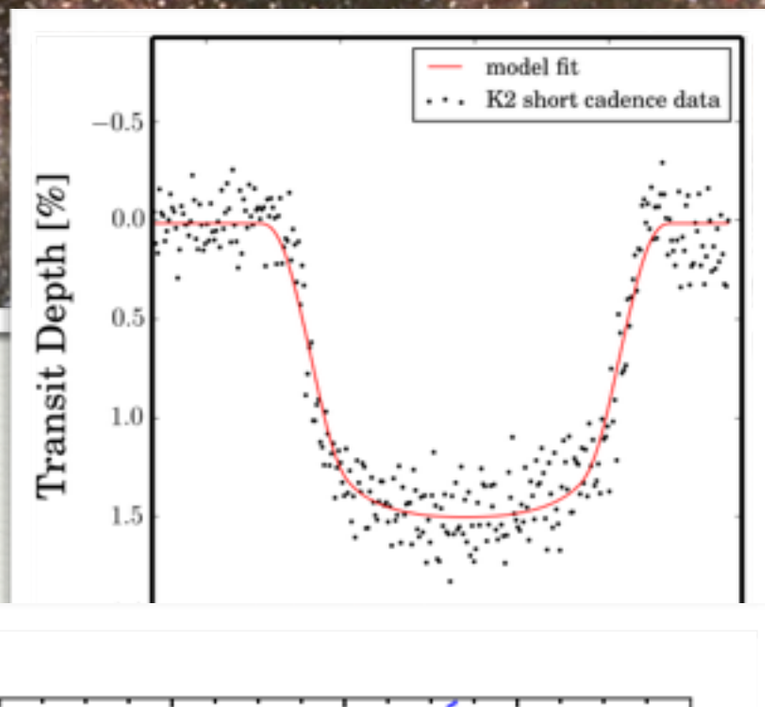
Solar Panels

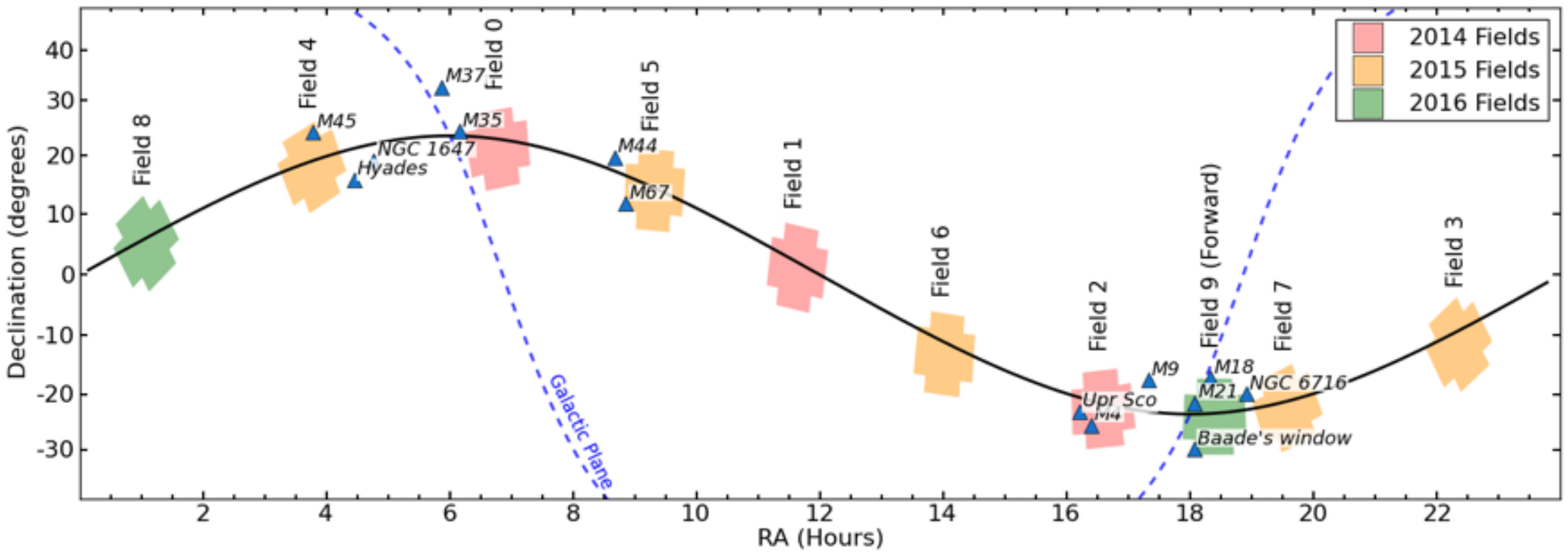
Balanced
solar pressure
= stable
spacecraft

Telescope

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


K2
Extending Kepler's Power to the Ecliptic


model fit
K2 short cadence data
Transit Depth [%]
−0.5
0.0
0.5
1.0
1.5


2014 Fields
2015 Fields
2016 Fields
Field 8
Field 4
Field 0
Field 5
Field 1
Field 6
Field 2
Field 9 (Forward)
Field 7
Field 3
M37
M45
M35
NGC 1647
Hyades
M44
M67
M9
M18
NGC 6716
M21
Upr Sco
M4
Baade's window
Galactic Plane
Declination (degrees)
RA (Hours)
40
30
20
10
0
-10
-20
-30
2
4
6
8
10
12
14
16
18
20
22

Trans-Neptunian objects with K2: targeting our own Solar System white paper

Cs. P. Kiss[1], Gy. M. Szabó[1,2], R. Szabó[1], K. Sárneczky[1], L. L. Kiss[1]

[1]Konkoly Observatory, Research Center for Astronomy and Earth Sciences of the Hungarian Academy of Sciences, H-1121 Konkoly Thege Miklós út 15-17, Budapest, Hungary, email: rszabo@konkoly.hu
[2]ELTE Gothard Astrophysical Observatory, H-9700 Szombathely, Szent Imre herceg út 112, Hungary

Abstract

We propose to observe trans-Neptunian objects (TNOs) with the Kepler space telescope along the ecliptic fields (K2 Mission). The aim of the proposed program is to follow the brightest TNOs in K2 fields for a time interval of about 40 days each. This will provide us a completely new view of TNOs, uncovering the shape distributions, albedo variations, and moons - even small ones - around the targets, based on a data set which is unprecedented in all senses. These data would help us to learn more about the formation, structure and evolution of our own Solar System. K2 pointings offer an unprecedented opportunity, since the 60-130 deg planned elongation coincides with the lowest apparent speed (stationary point) of the TNOs orbiting at 30-50 AU. By capitalizing on this unique and fortunate fact we elaborate and suggest an observing mode that would require one pixel block to cover each slowly moving object's path. This approach fits nicely to the observing strategy of the K2 Mission and the project would compete for pixel sets like any other proposal. We recommend to adopt this observing mode that open up new vistas in studying our own Solar System.

The Astronomical Journal, 149:112 (5pp), 2015 March doi:10.1088/0004-6256/149/3/112

MAIN-BELT ASTEROIDS IN THE K2 ENGINEERING FIELD OF VIEW

R. Szabó[1], K. Sárneczky[1,2], Gy. M. Szabó[1,2,3], A. Pál[1,4], Cs. P. Kiss[1], B. Csák[2,3], L. Illés[4], G. Rácz[4], and L. L. Kiss[1,2]
[1] Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, H-1121 Budapest, Konkoly Thege Miklós út 15-17, Hungary; rszabo@konkoly.hu
[2] Gothard-Lendület Research Team, H-9704 Szombathely, Szent Imre herceg út 112, Hungary
[3] ELTE Gothard Astrophysical Observatory, H-9704 Szombathely, Szent Imre herceg út 112, Hungary
[4] Eötvös Loránd Tudományegyetem, H-1117 Pázmány Péter sétány 1/A, Budapest, Hungary
Received 2014 October 9; accepted 2015 January 22; published 2015 February 26

ABSTRACT

Unlike NASA's original *Kepler* Discovery Mission, the renewed K2 Mission will target the plane of the Ecliptic, observing each field for approximately 75 days. This will bring new opportunities and challenges, in particular the presence of a large number of main-belt asteroids that will contaminate the photometry. The large pixel size makes K2 data susceptible to the effects of apparent minor planet encounters. Here, we investigate the effects of asteroid encounters on photometric precision using a subsample of the K2 engineering data taken in 2014 February. We show examples of asteroid contamination to facilitate their recognition and distinguish these events from other error sources. We conclude that main-belt asteroids will have considerable effects on K2 photometry of a large number of photometric targets during the Mission that will have to be taken into account. These results will be readily applicable for future space photometric missions applying large-format CCDs, such as *TESS* and *PLATO*.

Key words: astrometry – methods: observational – minor planets, asteroids: general – minor planets, asteroids: individual ((732) Tjilaki, (120934) 1998 SE149, 2013 OE) – techniques: photometric

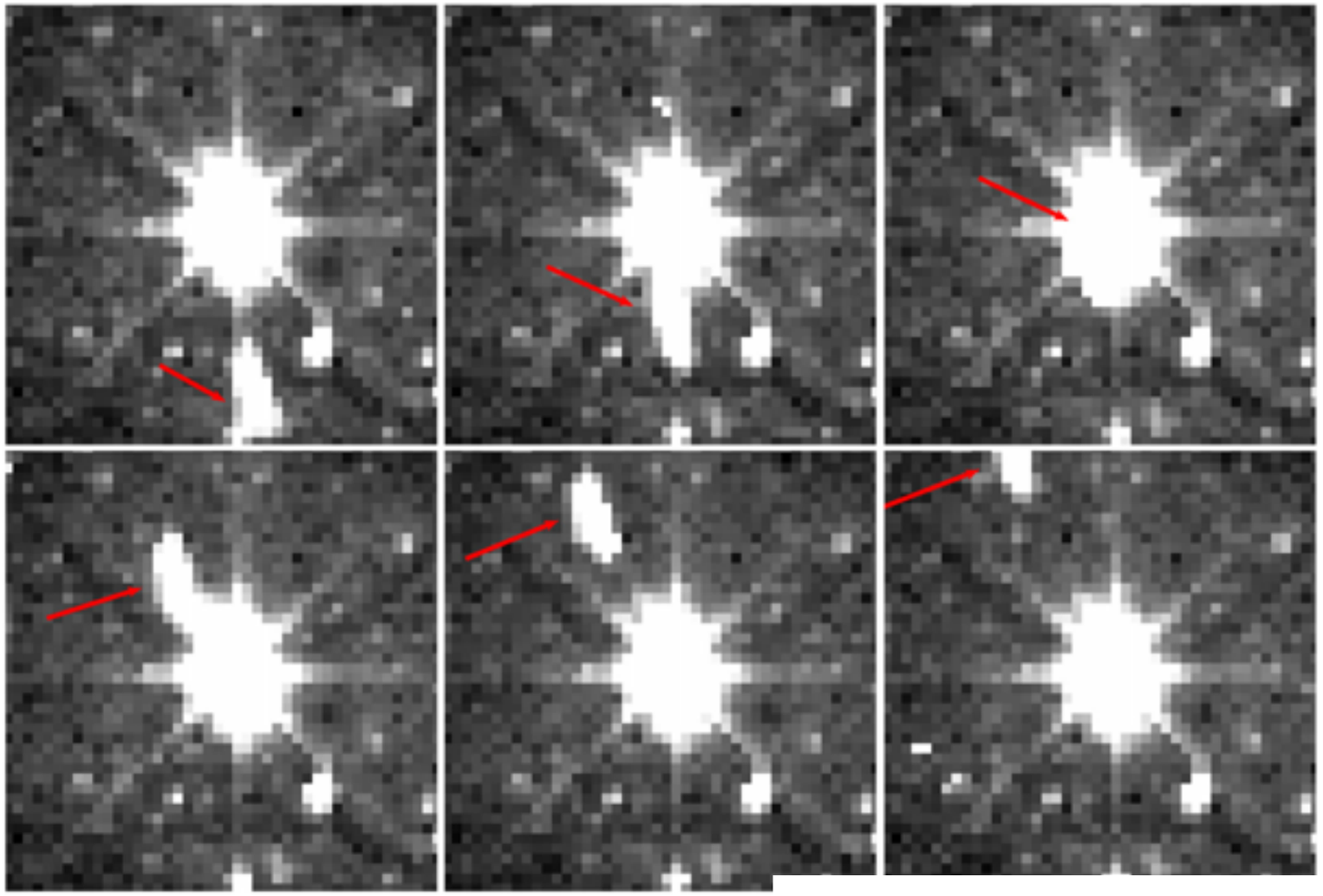
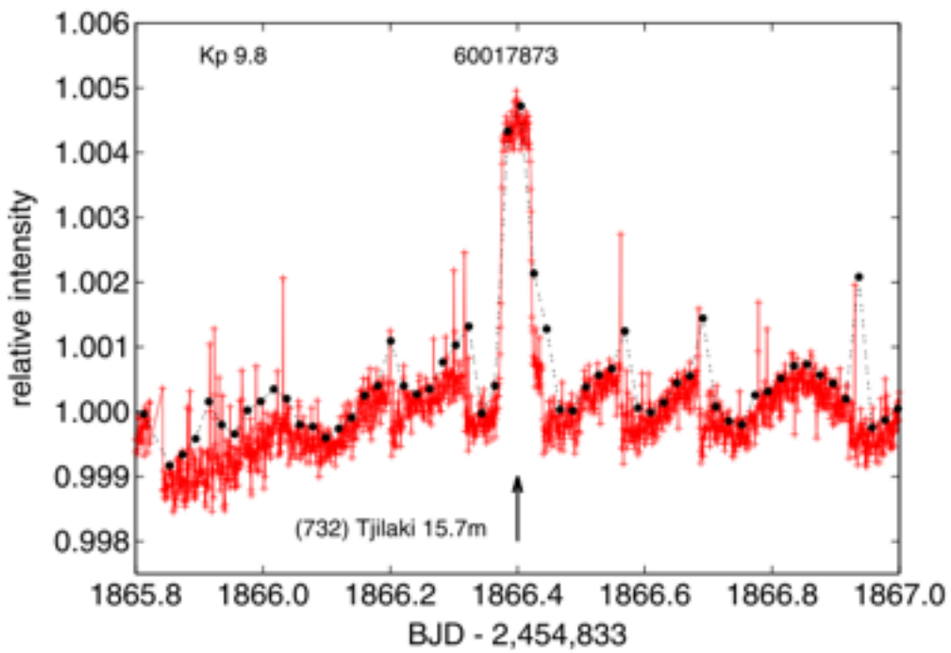


Figure 4. Close encounter of the 15.7 magnitude asteroid (732) Tjilaki with the K2 target 60017
the ecliptic. The frames are taken in long-cadence mode and span three hours. The asteroid—
bottom of the image, and left the pixel mask on the top of the image. Time increases from left t
the same event.

Szabó et al.



Draft version March 26, 2015
Preprint typeset using LaTeX style emulateapj v. 08/22/09

PUSHING THE LIMITS: K2 OBSERVATIONS OF THE TRANS-NEPTUNIAN OBJECTS 2002 GV_{31} AND 2007 JJ_{43}

A. Pál[1,2], R. Szabó[1], Gy. M. Szabó[1,3,4], L. L. Kiss[1,4], L. Molnár[1], K. Sárneczky[1], and Cs. P. Kiss[1]

Draft version March 26, 2015

ABSTRACT

We present the first photometric observations of trans-Neptunian objects (TNOs) taken with the *Kepler* space telescope, obtained in the course of the K2 ecliptic survey. Two faint objects have been monitored in specifically designed pixel masks that were centered on the stationary points of the objects, when their daily motion was the slowest. The design of the experiment was such that the observational costs in terms of Kepler pixels were minimized. Because of the faintness of the targets... We measure rotational periods and amplitudes in the unfiltered Kepler band as follows: Besides demonstrating the feasibility of this pioneering observing mode, the results indicate that...

Future space missions, like TESS and PLATO are not well suited to this kind of observations, therefore we encourage to include the brightest TNOs around their stationary points in each K2 observing campaigns to exploit this unique capability of the Mission.

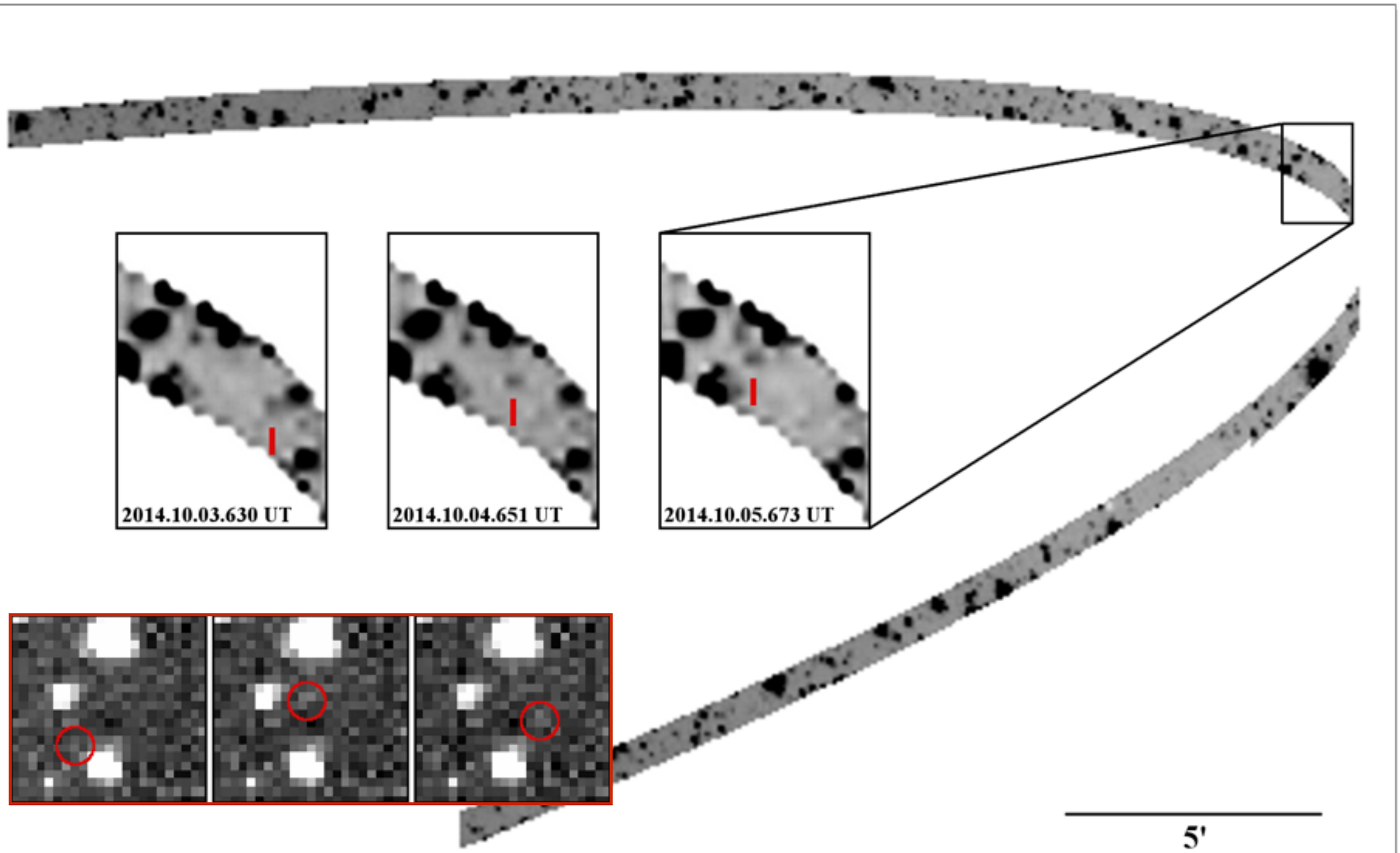
Subject headings: methods: observational — techniques: photometric — astrometry — minor planets, asteroids: general — Kuiper belt objects: individual (2002 GV_{31}, 2007 JJ_{43})

1. INTRODUCTION

Kepler has provided incredible results on extrasolar planets and planetary systems, as well as on stellar astrophysics. After analysing main-belt asteroids (Szabó et al. 2015), here we continue the exploration of our ouwn Solar System by pushing the limits of the spacecraft and observing faint, trans-Neptunian objects.

The *Kepler* spacecraft is equipped with a 0.95 m at the detection limit of the telescope (V = 20–22 mag), with an expected precision of a few tenths of a magnitude for a single long-cadence (30-min) observation. Moreover, TNOs exhibit quadratically increasing proper motions away from the stationary points. Since the pixel mask allocation is fixed for an entire campaign, the whole length of the orbital arc has to be observed continuously. Despite these challenges, the K2 mission is in a unique


Theodora


2014.10.03.630 UT
2014.10.04.651 UT
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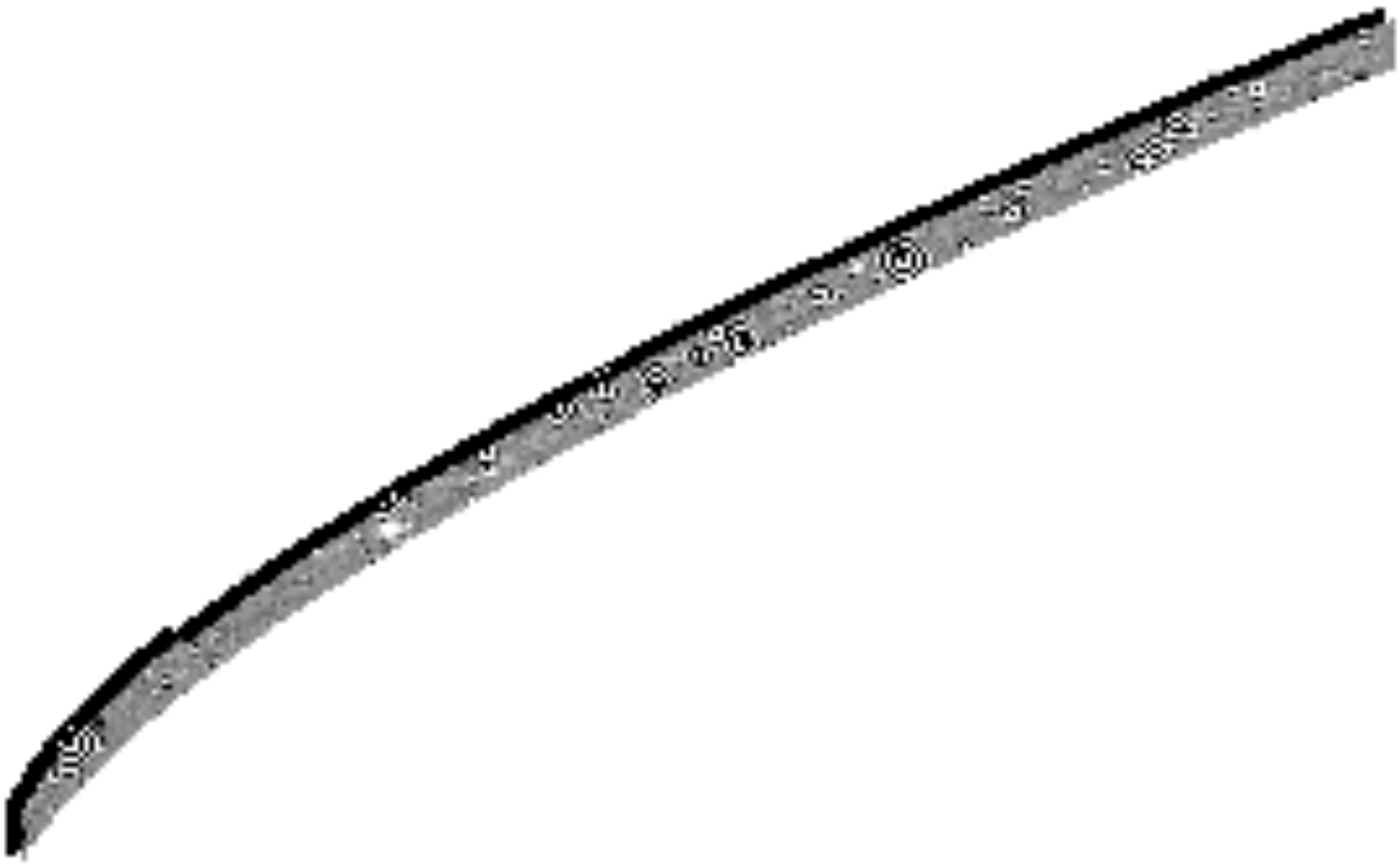


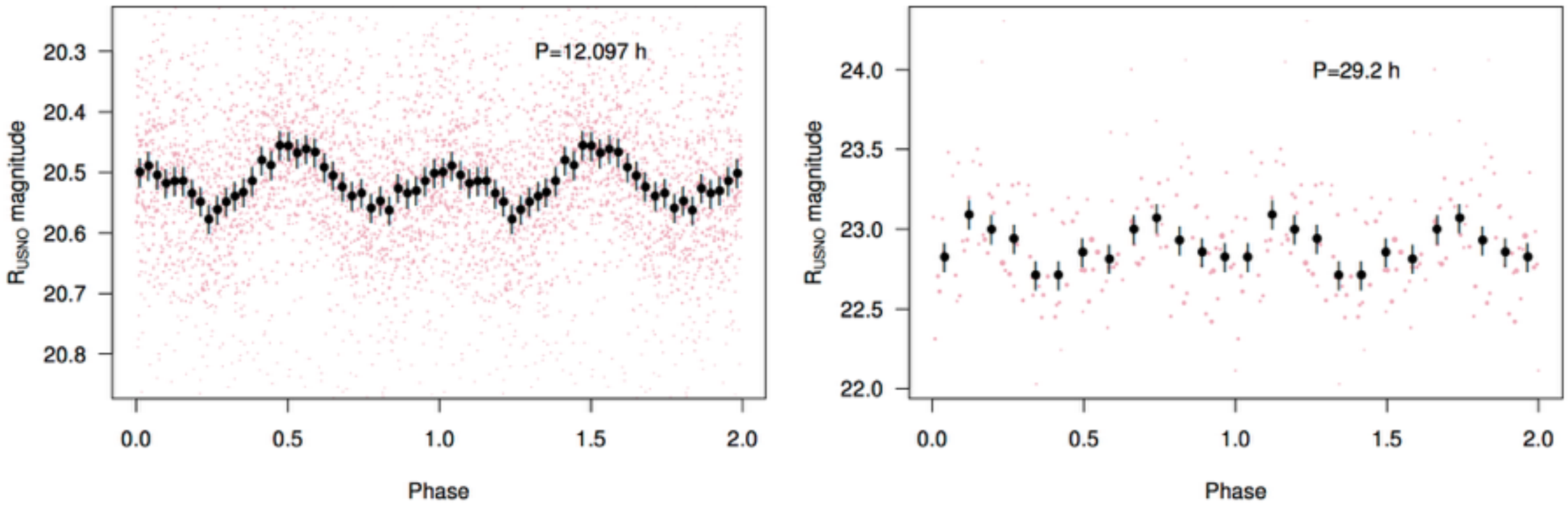
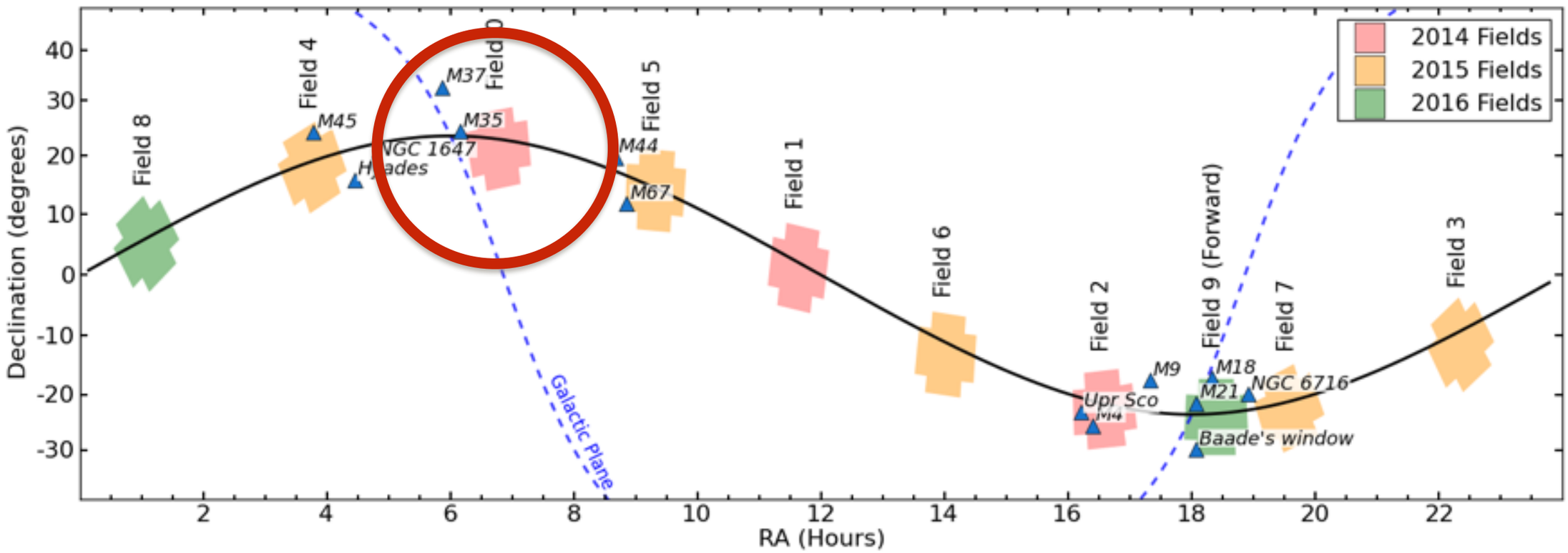


FIG. 3.— Left: phased light curve of 2007 JJ_{43} (red points). The bold symbols with the error bars are binned values. Right: K2 light curve of 2002 GV_{31}


K2
Extending Kepler's Power to the Ecliptic

model fit
K2 short cadence data
Transit Depth [%]
−0.5
0.0
0.5
1.0
1.5


2014 Fields
2015 Fields
2016 Fields
Field 8
Field 4
Field 0
Field 5
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Field 9 (Forward)
Field 7
Field 3
M37
M45
M35
NGC 1647
Hyades
M44
M67
M9
M18
NGC 6716
M21
Upr Sco
M4
Baade's window
Galactic Plane
Declination (degrees)
RA (Hours)
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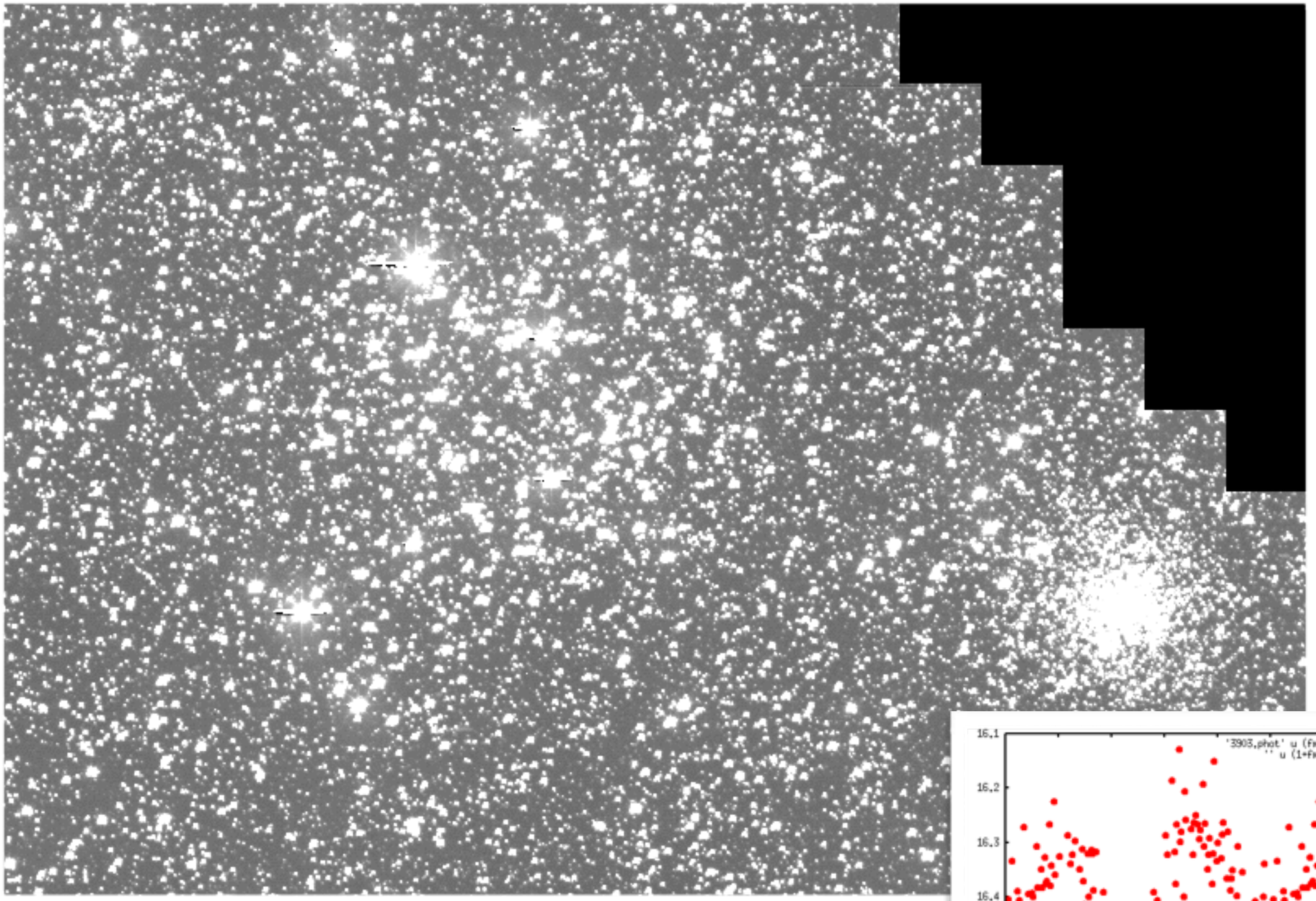
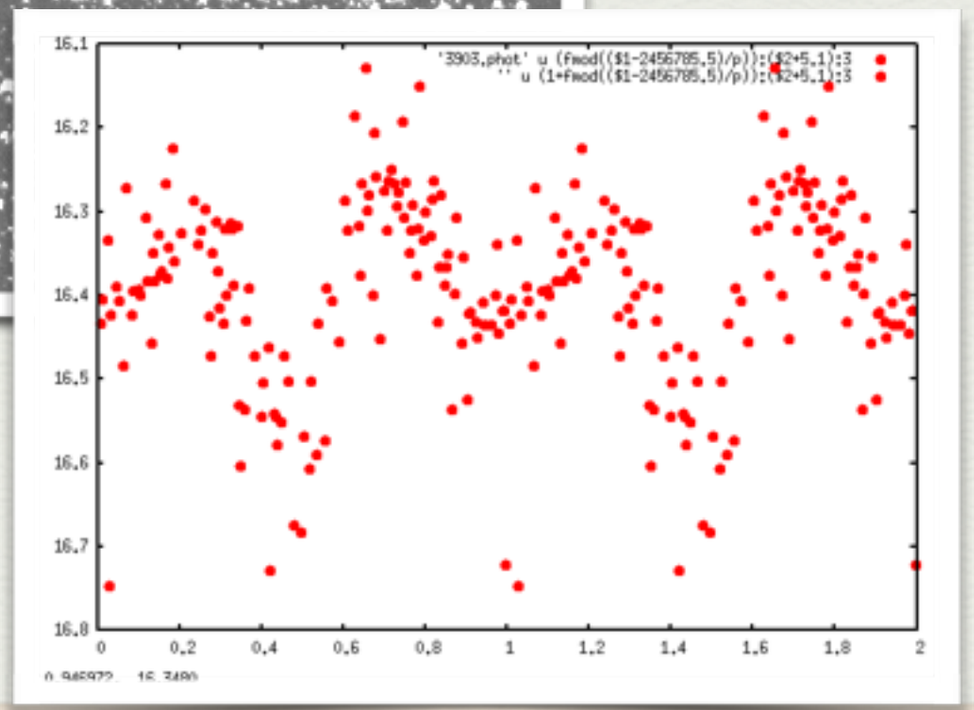
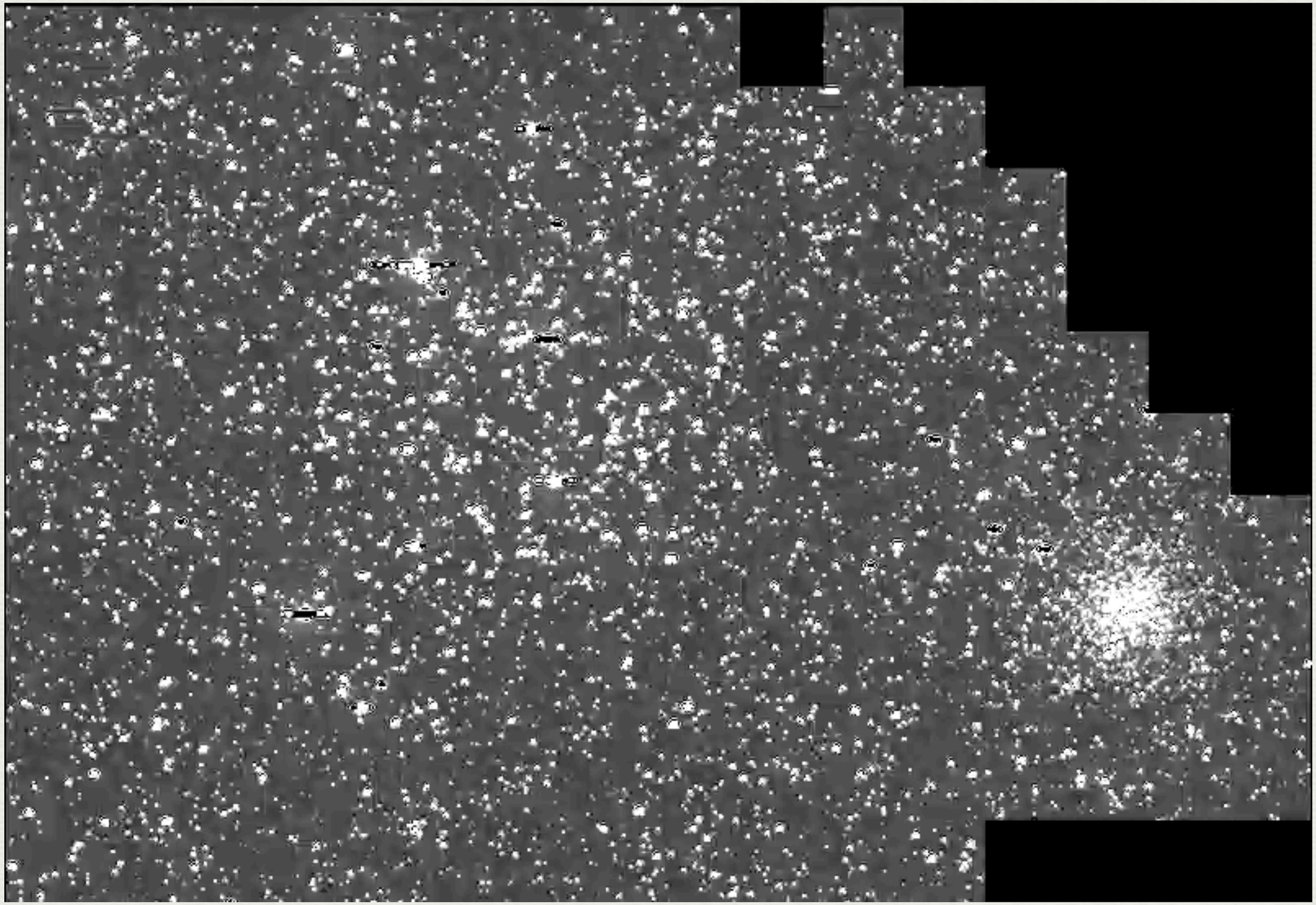



'3903.phot' u (fmod(($1-2456785.5)/p)):($2+5.1):3
'' u (1+fmod(($1-2456785.5)/p)):($2+5.1):3
16.1
16.2
16.3
16.4
16.5
16.6
16.7
16.8
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2



Draft version August 11, 2015
Preprint typeset using LaTeX style emulateapj v. 08/22/09

PUSHING THE LIMITS, EPISODE 2: K2 OBSERVATIONS OF EXTRAGALACTIC RR LYRAE STARS IN THE DWARF GALAXY LEO IV

L. Molnár[1], A. Pál[1,2], E. Plachy[1], V. Ripepi[3], M. I. Moretti[4,5], R. Szabó[1], and L. L. Kiss[1,6,7]

Draft version August 11, 2015

ABSTRACT

We present the first observations of extragalactic pulsating stars in the K2 ecliptic survey of the *Kepler* space telescope. Variability of all three RR Lyrae stars in the dwarf spheroidal galaxy Leo IV were successfully detected, at a brightness of $Kp \approx 21.5$ mag, from data collected during Campaign 1. Two stars turned out to be modulated with Blazhko periods of 29.8 ± 0.9 d and more than 80 d, respectively. EPIC 210282473 represents the first star beyond the Magellanic Clouds for which the Blazhko period and cycle-to-cycle variations in the modulation were unambiguously measured.The photometric [Fe/H] indices of the stars agree with earlier results that Leo IV is a very metal-poor galaxy. Two out of three stars blend with brighter background galaxies in the K2 frames. We demonstrate that image subtraction can be reliably used to extract photometry from faint confused sources that will be crucial not only for the K2 mission but for future space photometric missions as well.

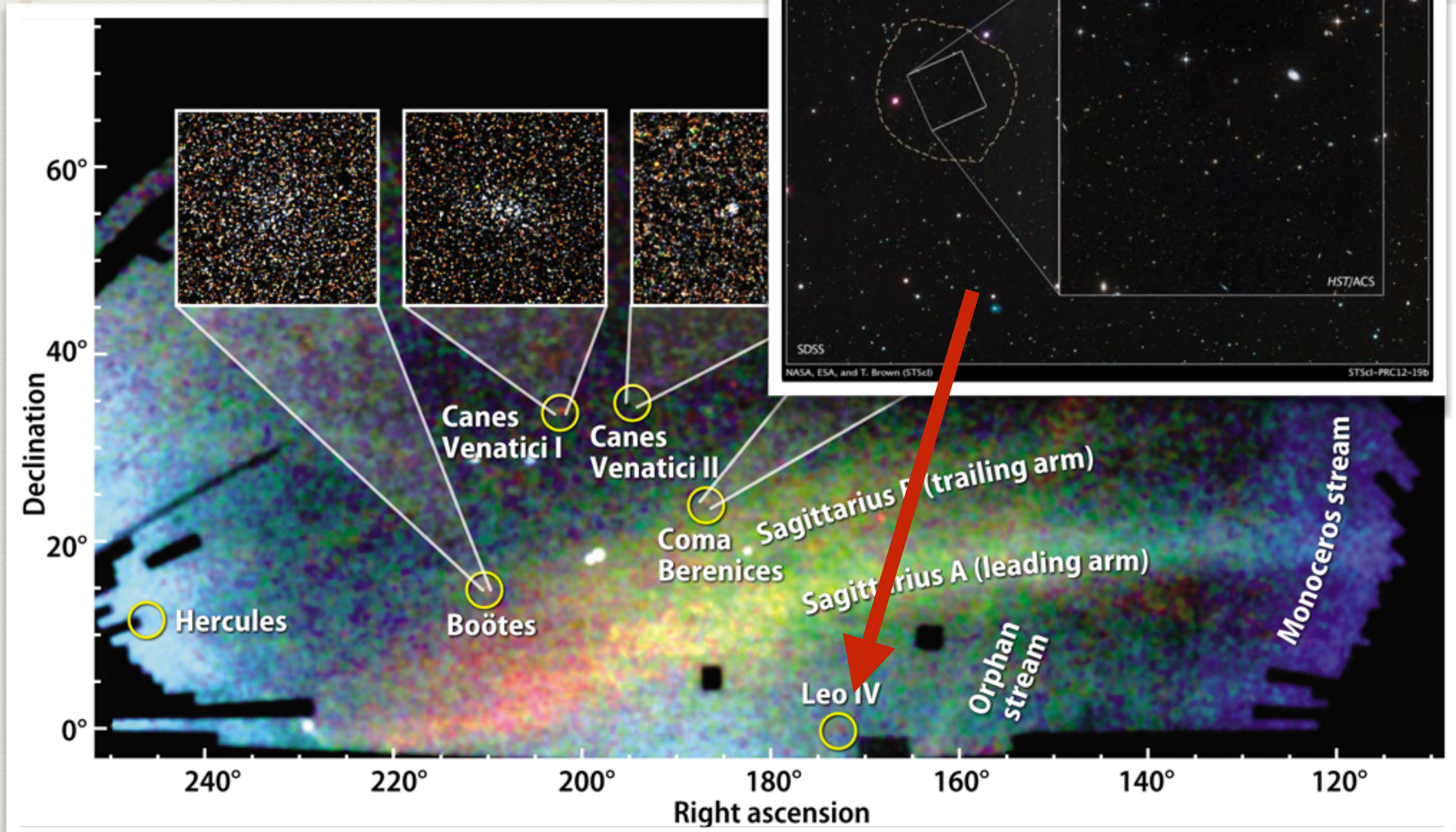
Subject headings: stars: variables: RR Lyrae — methods: observational — techniques: photometric

1. INTRODUCTION

Kepler has provided incredible results on extrasolar planets and planetary systems, as well as on stellar astrophysics. The space telescope was designed to be the most precise photometer ever built in order to detect the transits of numerous small planets (Borucki et al. 2010). To achieve this goal, the original mission of *Kepler* focused almost exclusively on the Galactic stellar

panding the reach of *Kepler* towards extragalactic pulsating stars. The three RR Lyrae stars in the galaxy Leo IV are the first non-cataclysmic stellar targets *Kepler* ever detected outside the Galaxy. We note in passing that the space telescope has already observed four supernovae during the original mission (Olling et al. 2015).

Leo IV is one of the small and faint dwarf spheroidal galaxies around the Milky Way that were recently discovered with the help of the Sloan Digital Sky Survey


Ultra Faint Dwarf Galaxy Leo IV
Hubble Space Telescope • ACS
HST/ACS
SDSS
NASA, ESA, and T. Brown (STScI)
STScI-PRC12-19b
60°
40°
20°
0°
Declination
240°
220°
200°
180°
160°
140°
120°
Right ascension
Canes Venatici I
Canes Venatici II
Coma Berenices
Sagittarius B (trailing arm)
Sagittarius A (leading arm)
Monoceros stream
Hercules
Boötes
Leo IV
Orphan stream

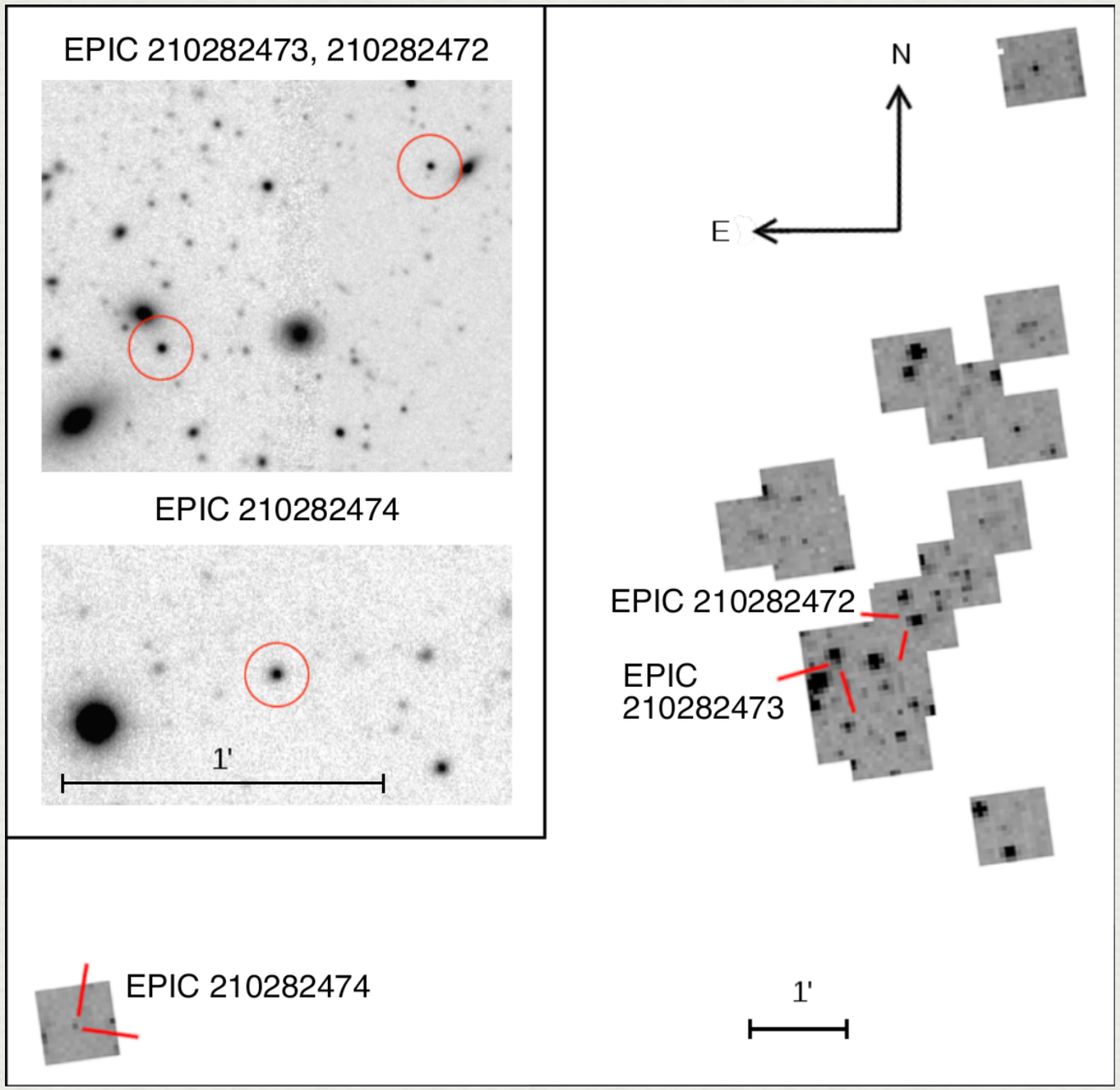


FIG. 1.— The K2 target pixel masks covering parts of Leo IV. The three RR Lyrae stars are indicated. The insert shows high-resolution deep imagery obtained by combining data from the William Herschel Telescope, the Isaac Newton Telescope, and the Southern Astrophysical Research telescope, collected by Moretti et al. (2009). Red circles represent the apertures used in the reduction of the K2 data (see Figure 2).

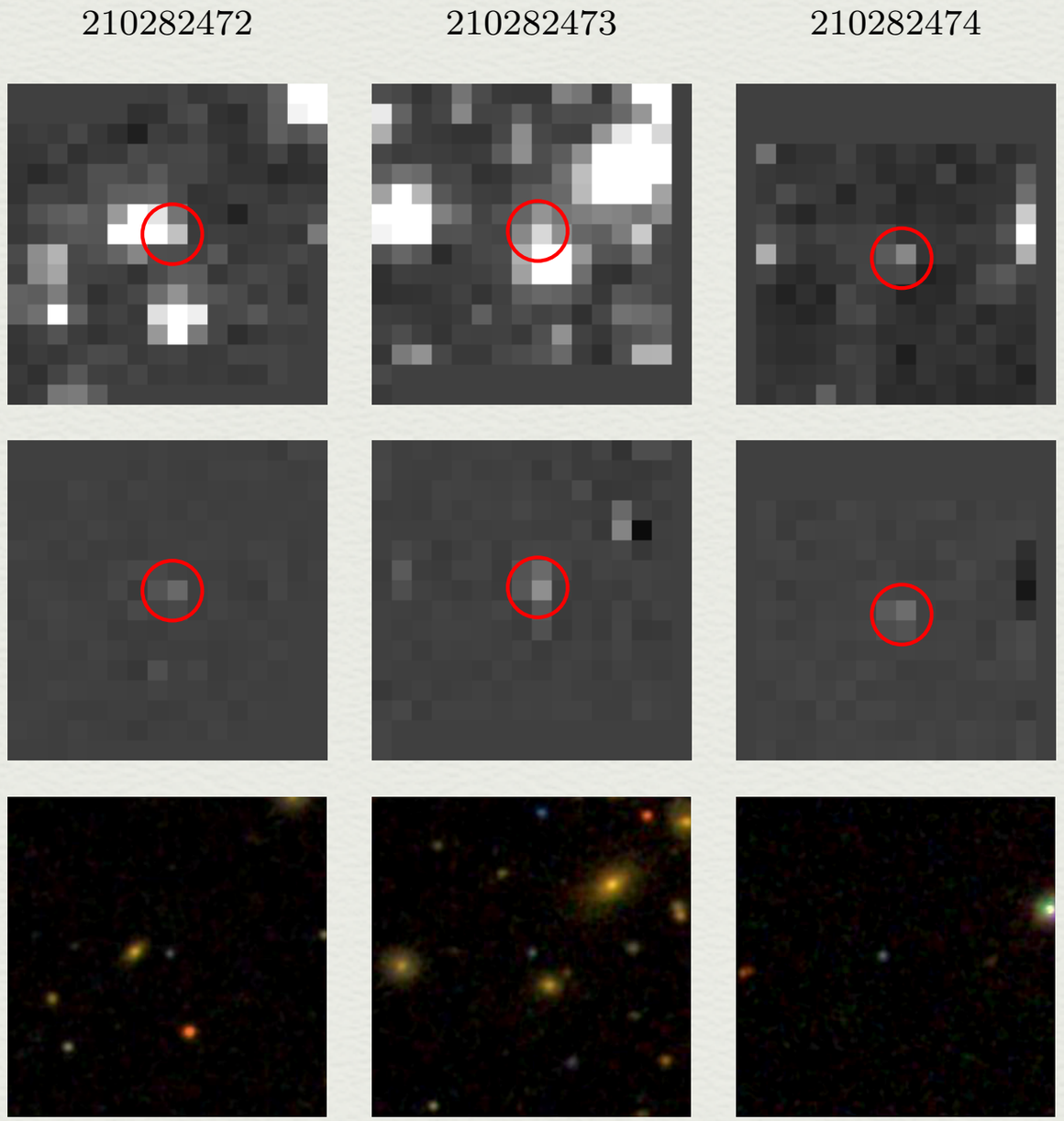


FIG. 2.— Image stamps showing the vicinity of the K2 extragalactic RR Lyrae targets 210282472, 210282473 and 210282474. The first row shows the stamps on the master median-combined image used in the process of differential photometry. The second row shows stamps created as the average of a roughly dozen differential images taken at the brightest phase of the RR Lyr oscillations. The photometric aperture with an $r = 1.5$ px radius used in the procedure is shown as a red circle. Stamps in the third row show the respective SDSS DR9 images. All of these stamps cover an area of $64'' \times 64''$ on the sky, equivalent to 16×16 *Kepler* pixels.

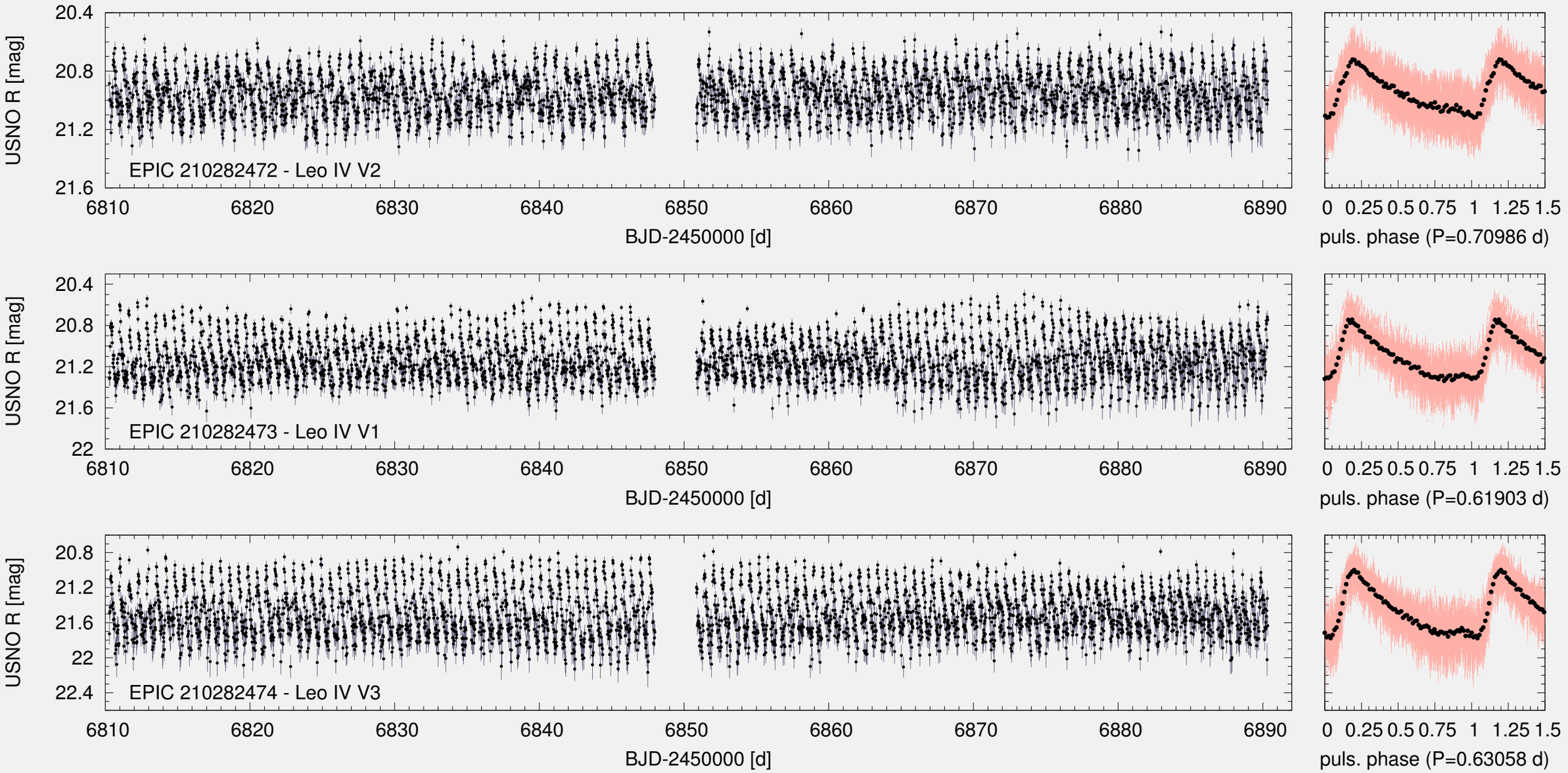
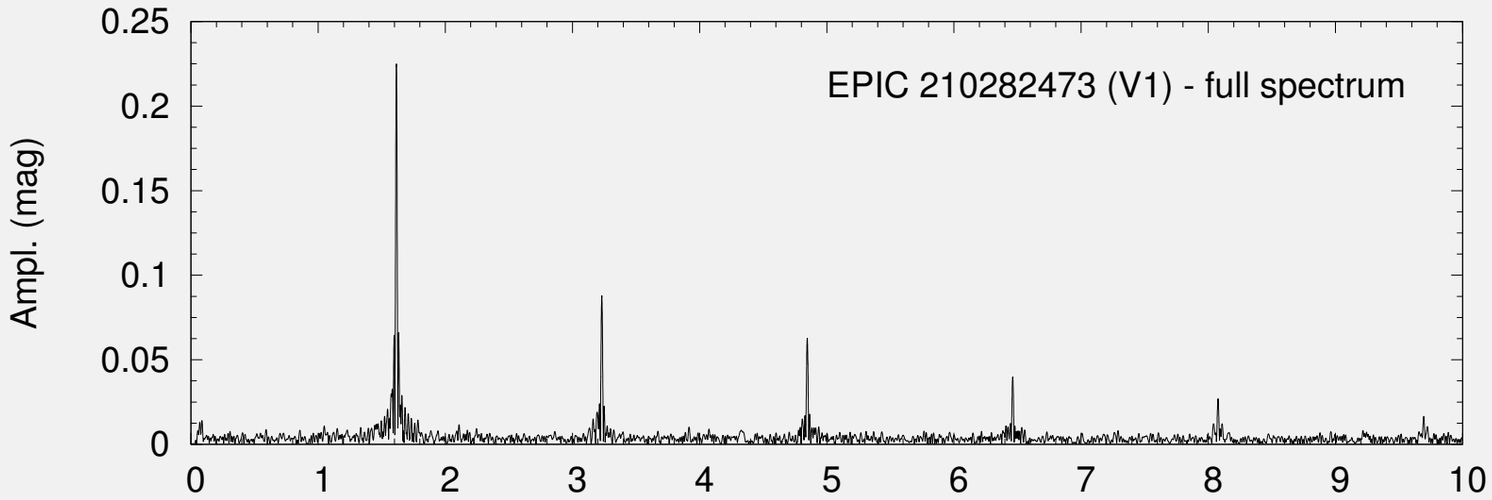
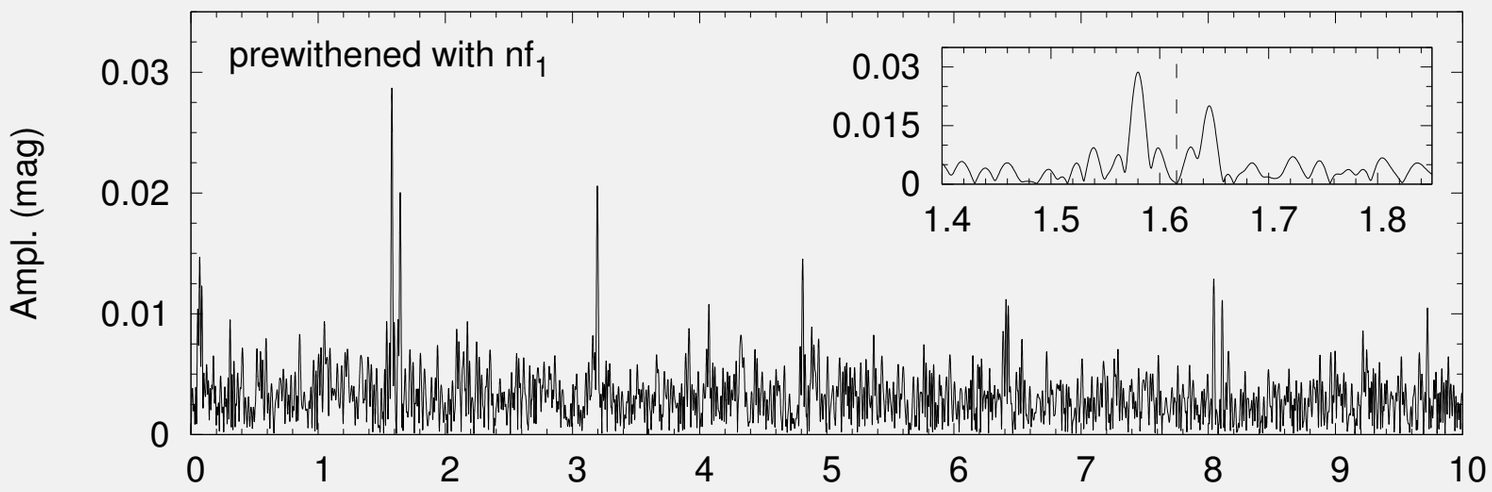
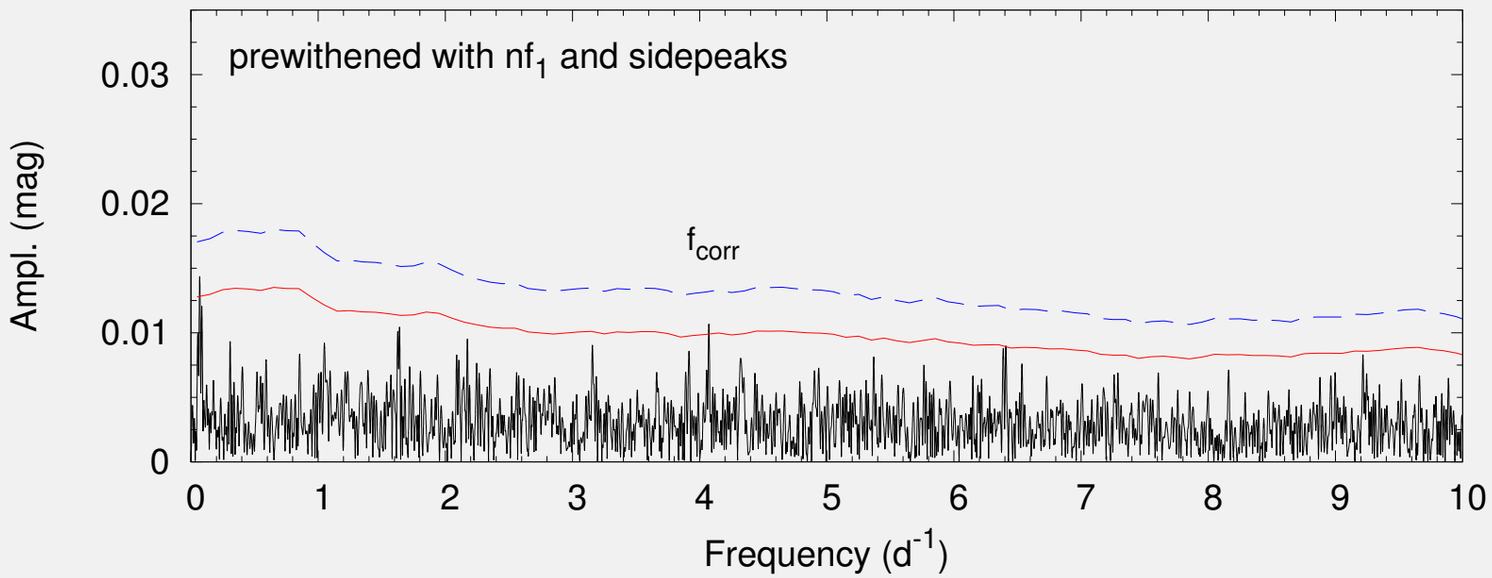


FIG. 3.— Light curves of the three RR Lyrae stars. Left panels: light curves after outlier removal and Fourier filtering. Note the variable amplitude of EPIC 210282473 in the middle panel. Designations from Moretti et al. (2009) are also indicated. The right panels show the folded light curves (pink dots and lines) and the binned phase curves (black points). We used 75 bins per pulsation period for each star.


EPIC 210282473 (V1) - full spectrum
Ampl. (mag)
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
10


prewithened with nf1
0.03
0.015
0
1.4
1.5
1.6
1.7
1.8
Ampl. (mag)
0.03
0.02
0.01
0
0
1
2
3
4
5
6
7
8
9
10


prewithened with nf1 and sidepeaks
fcorr
Ampl. (mag)
0.03
0.02
0.01
0
0
1
2
3
4
5
6
7
8
9
10
Frequency (d-1)

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WASP-47: A HOT JUPITER SYSTEM WITH TWO ADDITIONAL PLANETS DISCOVERED BY K2

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ABSTRACT

Using new data from the K2 mission, we show that WASP-47, a previously known hot Jupiter host, also hosts two additional transiting planets: a Neptune-sized outer planet and a super-Earth inner companion. We measure planetary properties from the K2 light curve and detect transit timing variations, confirming the planetary nature of the outer planet. We performed a large number of numerical simulations to study the dynamical stability of the system and to find the theoretically expected transit timing variations (TTVs). The theoretically predicted TTVs are in good agreement with those observed, and we use the TTVs to determine the masses of two planets, and place a limit on the third. The WASP-47 planetary system is important because companion planets can both be inferred by TTVs and are also detected directly through transit observations. The depth of the hot Jupiter's transits make ground-based TTV measurements possible, and the brightness of the host star makes it amenable for precise radial velocity measurements. The system serves as a Rosetta Stone for understanding TTVs as a planet detection technique.

Subject headings: planets and satellites: detection — planets and satellites: dynamical evolution and stability — techniques: photometric

1. INTRODUCTION

Due to their large sizes and short orbital periods, implies a dearth of nearby planets in these systems. While systems exist with a known hot Jupiter and

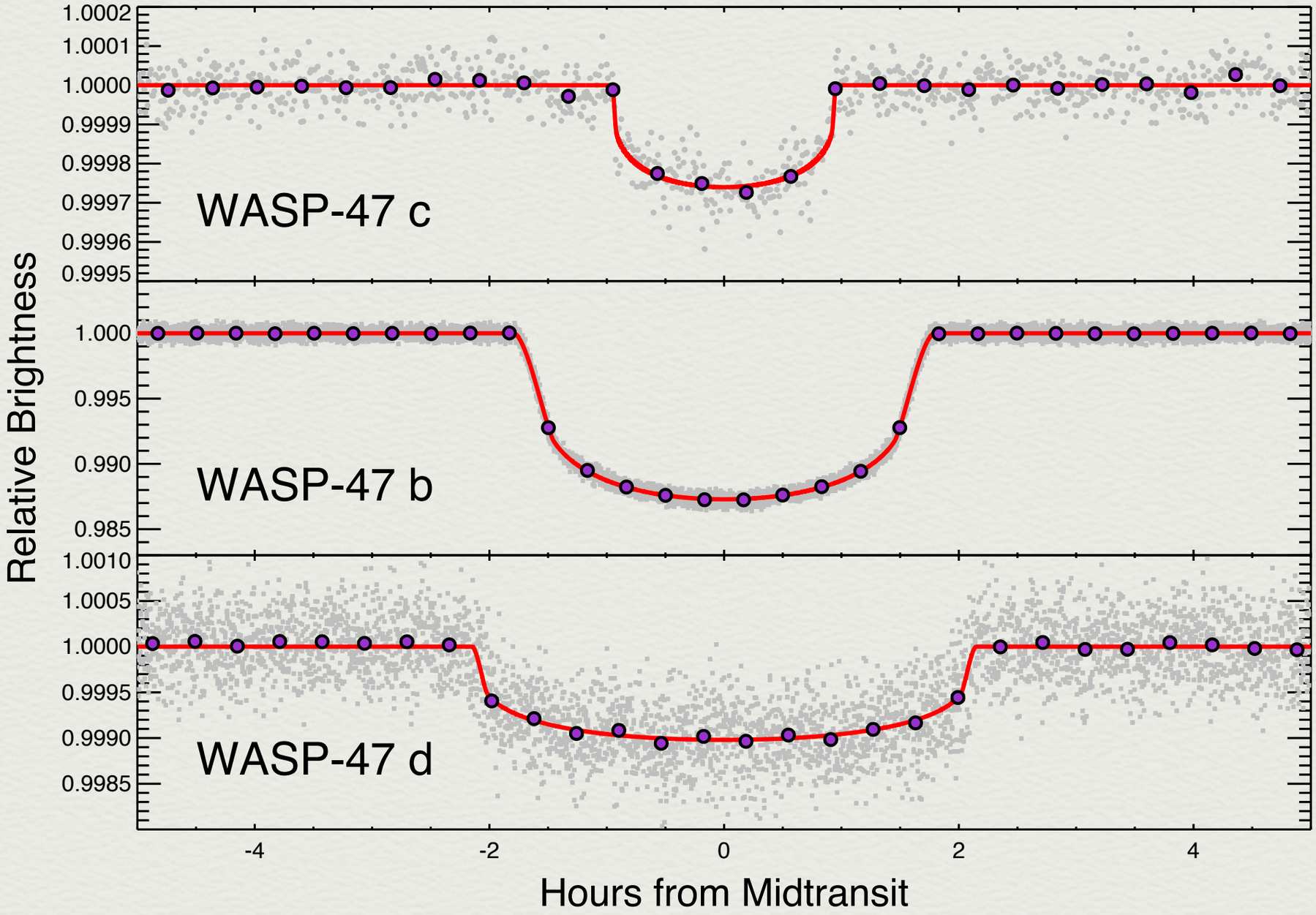

Figure 1. Phase-folded short cadence K2 light curve overlaid with our best-fit transit model (red curves), and binned points (purple circles). In the top panel (WASP-47 c), the grey circles are bins of roughly 30 seconds. In the middle and bottom panels (WASP-47 b and WASP-47 d), the grey squares are the individual K2 short cadence datapoints.

1. arXiv:1508.02411 [pdf, ps, other]
   Title: WASP-47: A Hot Jupiter System with Two Additional Planets Discovered by K2
   Authors: Juliette C. Becker, Andrew Vanderburg, Fred C. Adams, Saul A. Rappaport, Hans Martin Schwengeler
   Comments: 7 pages, 4 figures; submitted to ApJL
   Subjects: Earth and Planetary Astrophysics (astro-ph.EP)
2. arXiv:1507.07578 [pdf, ps, other]
   Title: High Precision Photometry for K2 Campaign 1
   Authors: Chelsea X. Huang, K. Penev, J. D. Hartman, G.Á. Bakos, W. Bhatti, I. Domsa, M. de Val-Borro
   Comments: submitted to MNRAS
   Subjects: Earth and Planetary Astrophysics (astro-ph.EP)
3. arXiv:1507.06311 [pdf, ps, other]
   Title: SDSS J1152+0248: An eclipsing double white dwarf from the Kepler K2 campaign
   Authors: N. Hallakoun, D. Maoz, M. Kilic, T. Mazeh, E. Agol, K. J. Bell, S. Bloemen, W. R. Brown, J. Debes, S. Faigler, A. Gianninas, I. Kull, T. Kupfer, A. Loeb, B. M. Morris, F. Mullally
   Subjects: Solar and Stellar Astrophysics (astro-ph.SR)
4. arXiv:1507.04714 [pdf, ps, other]
   Title: An RR Lyrae family portrait: 33 stars observed in Pisces with K2-E2
   Authors: L. Molnár, R. Szabó, P. A. Moskalik, J. M. Nemec, E. Guggenberger, R. Smolec, R. Poleski, E. Plachy, K. Kolenberg, Z. Kolláth
   Comments: 15 pages, 14 figures, accepted for publication in MNRAS. Data files can be accessed at this http URL
   Subjects: Solar and Stellar Astrophysics (astro-ph.SR)
5. arXiv:1507.03091 [pdf, ps, other]
   Title: Kepler's first view of O-star variability: K2 data of five O stars in Campaign 0 as a proof-of-concept for O-star asteroseismology

6. arXiv:1507.01827 [pdf, ps, other]
   Title: Asteroseismology of solar-type stars with K2
   Authors: W. J. Chaplin, M. N. Lund, R. Handberg, S. Basu, L. A. Buchhave, T. L. Campante, G. R. Davies, D. Huber, D. W. Latham, C. A. Latham, A. Serenelli, H. M. Antia, T. Appourchaux, W. H. Ball, O. Benomar, L. Casagrande, J. Christensen-Dalsgaard, H. R. Coelho, O. L. Creevey, Y. Elsworth, R. A. Garc, P. Gaulme, S. Hekker, T. Kallinger, C. Karoff, S. D. Kawaler, H. Kjeldsen, M. S. Lundkvist, F. Marcadon, S. Mathur, A. Miglio, B. Mosser, C. R, I. W. Roxburgh, V. Silva Aguirre, D. Stello, K. Verma, T. R. White, T. R. Bedding, T. Barclay, D. L. Buzasi, S. Deheuvels, L. Gizon, G. Houdek, S. B. Howell, D. Salabert, D. R. Soderblom
   Comments: Accepted for publication in PASP; 16 pages, 2 figures
   Subjects: Solar and Stellar Astrophysics (astro-ph.SR)
7. arXiv:1507.00149 [pdf, ps, other]
   Title: K2 and MAXI observations of Sco X-1 - Evidence for disc precession?
   Authors: Pasi Hakala, Gavin Ramsay, Thomas Barclay, Phil Charles
   Comments: 6 pages, 6 figures, Accepted for publication in MNRAS letters 2015 June 30. Received in original form 2015 May 19
   Subjects: High Energy Astrophysical Phenomena (astro-ph.HE); Solar and Stellar Astrophysics (astro-ph.SR)
8. arXiv:1506.08931 [pdf, ps, other]
   Title: Oscillating red giants observed during Campaign 1 of the Kepler K2 mission: New prospects for galactic archaeology
   Authors: D. Stello, D. Huber, S. Sharma, J. Johnson, M. N. Lund, R. Handberg, D. L. Buzasi, V. Silva Aguirre, W. J. Chaplin, A. Miglio, M. Pinsonneault, S. Basu, T. R. Bedding, J. Bland-Hawthorn, L. Casagrande, G. Davies, Y. Elsworth, R. A. Garcia, S. Mathur, M. Pia Di Mauro, B. Mosser, D. P. Schneider, A. Serenelli, M. Valentini
   Comments: 6 pages, 4 figures, submitted to ApJL
   Subjects: Astrophysics of Galaxies (astro-ph.GA); Solar and Stellar Astrophysics (astro-ph.SR)
9. arXiv:1506.06771 [pdf, other]
   Title: Rotation Periods of Young Brown Dwarfs: K2 Survey in Upper Scorpius
   Authors: Aleks Scholz (University of St Andrews), Veselin Kostov (University of Toronto), Ray Jayawardhana (York University), Koraljka Muzic (Universidad Diego Portales, ESO)
   Comments: 9 pages, 4 figures, accepted for publication in ApJL
   Subjects: Solar and Stellar Astrophysics (astro-ph.SR); Earth and Planetary Astrophysics (astro-ph.EP)
10. arXiv:1506.01776 [pdf, ps, other]
    Title: HAT-P-56b: An inflated massive Hot Jupiter transiting a bright F star followed up with K2 Campaign 0 observations
    Authors: C. X. Huang, J. D. Hartman, G. Á. Bakos, K. Penev, W. Bhatti, A. Bieryla, M. de Val-Borro, D. W. Latham, L. A. Buchhave, Z. Csubry, G. Kovács, B. Béky, E. Falco, P. Berlind, M. L. Calkins, G. A. Esquerdo, J. Lázár, I. Papp, P. Sári
    Comments: 13 pages, 11 figures, accepted by AJ
    Subjects: Earth and Planetary Astrophysics (astro-ph.EP)

FIZ	K	115709	Szabó Róbert: Dinamikai folyamatok vizsgálata űrtávcsövekkel pulzáló változócsillagokban (MTA Csillagászati és Földtudományi Kutatóközpont)	48	39 396
FT1	K	115836	Bór József: Globális, regionális és lokális elektromágneses környezetünk tanulmányozása ELF tranziensek felhasználásával (MTA Csillagászati és Földtudományi Kutatóközpont)	48	19 864
K7K	K	116604	SZARKA László Csaba: Konzorcium, társ p.: REvPAMS: A Kárpát-Pannon térség legfiatalabb, potenciálisan aktív magmatározóval rendelkező vulkánjának (Csomád, K-Kárpátok) komplex kutatása (MTA Csillagászati és Földtudományi Kutatóközpont)	48	3 944
FIZ	PD	116175	Molnár László: Űrfotometriai alkalmazások a K2 misszióban (MTA Csillagászati és Földtudományi Kutatóközpont)	36	21 733
K7K	NN	116446	Kis Árpád: Konzorcium, társ p.: A sugárzási öv energikus elektronsűrűségének származtatása whistler-módusú kórusok frekvenciaváltozási sebességéből (MTA Csillagászati és Földtudományi Kutatóközpont)	36	14 501
COOP	NN	116927	Újvári Gábor: Marsi üledékes képződmények vizsgálata földi analógiák alapján és kapcsolódás európai űrprogramhoz (MTA Csillagászati és Földtudományi Kutatóközpont)	36	17 991


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K2