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ver más allá

Multi-band characterization of Hot Jupiters

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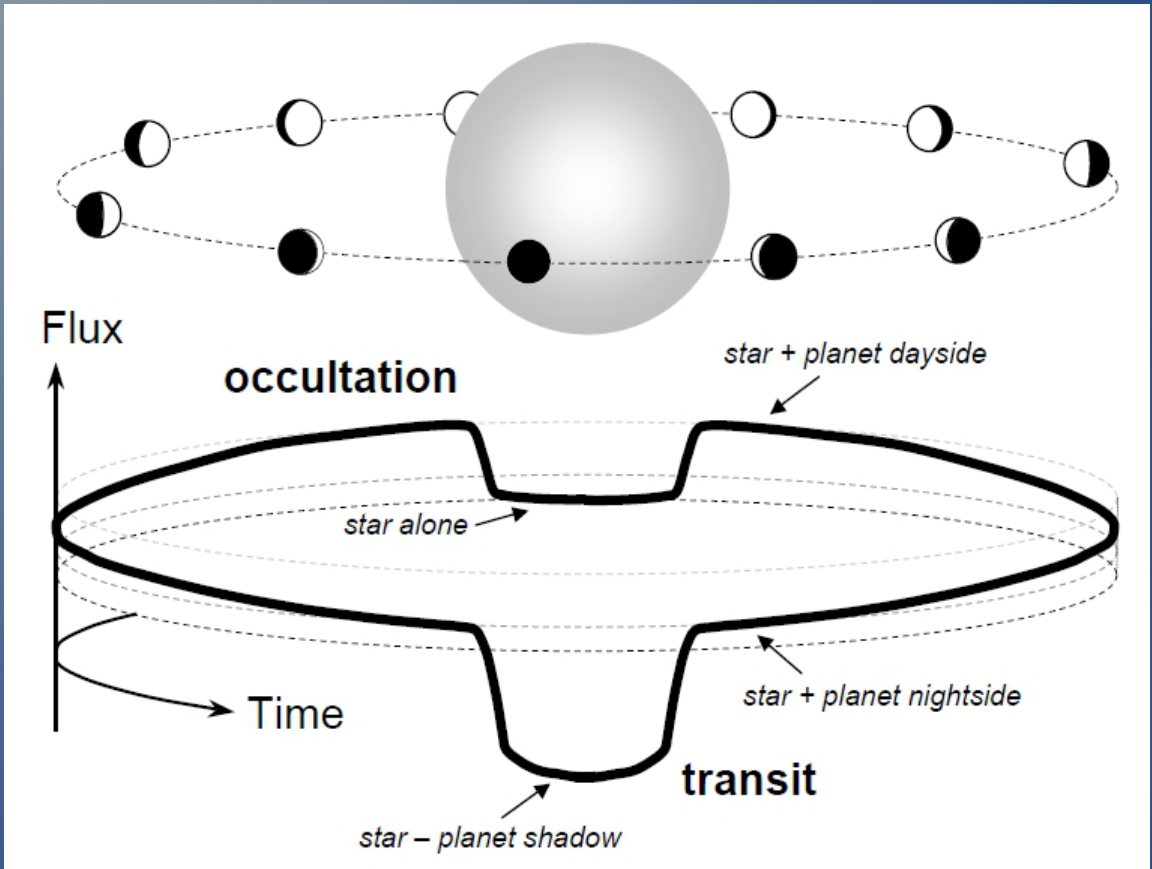
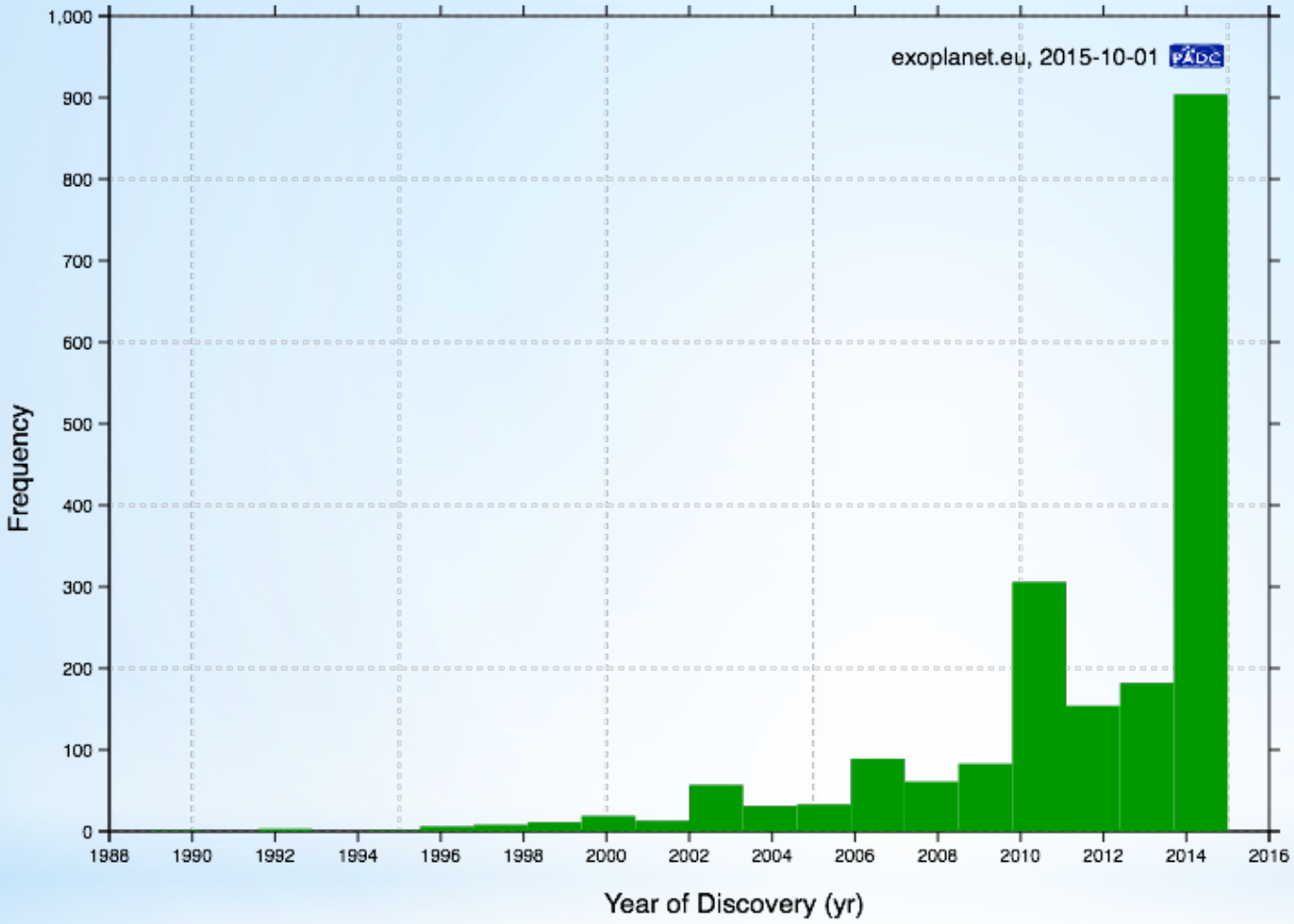


Schematic transiting system (Winn 2010).

- Characterization
- Transmission Spectroscopy
- Thermal Emission
- Transit Timing Variations
- Alignment Spin-Orbit
- Phase curves
- Much more ...

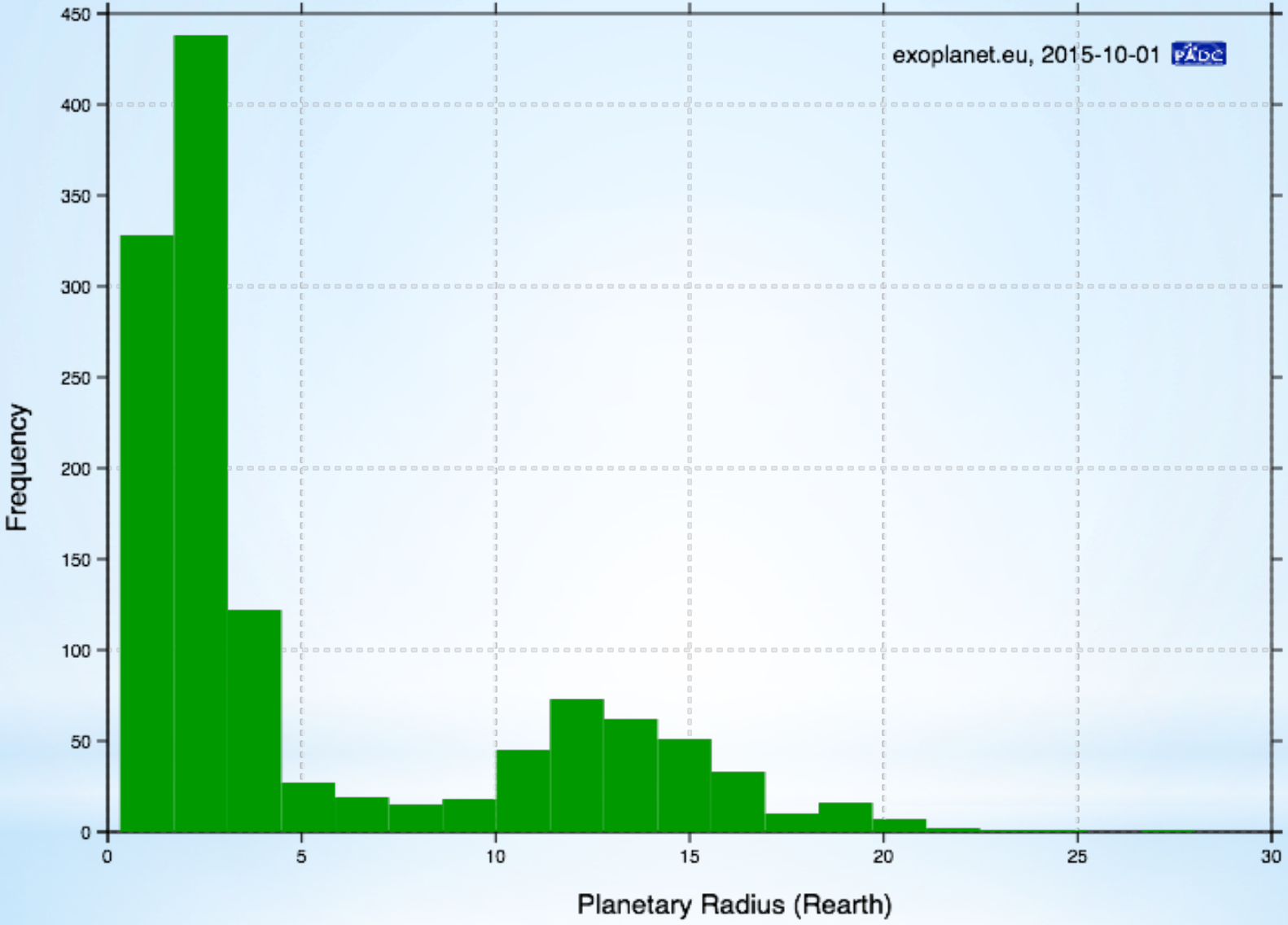
Gold Mine of Planetary Information



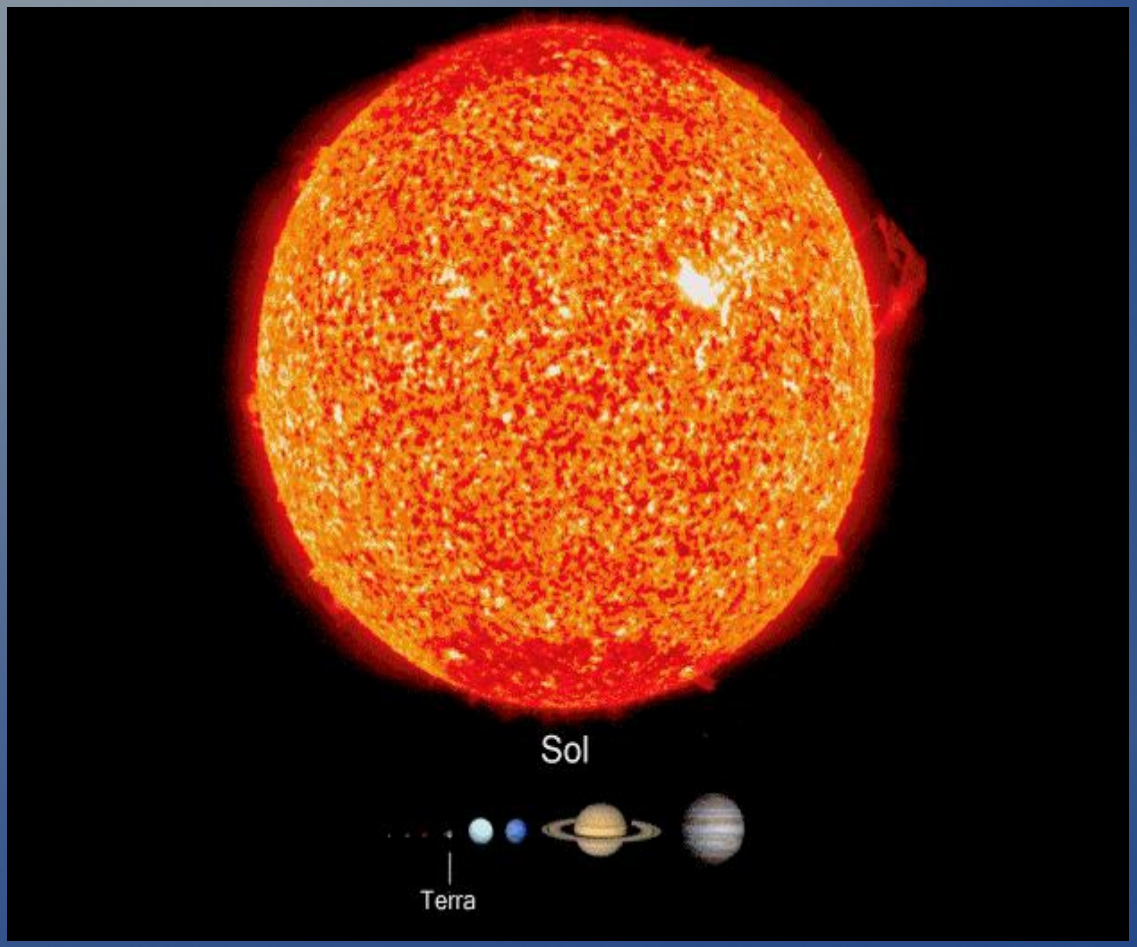
Exoplanetary discoveries

As of Today (exoplanet.eu)

- There are 1962 confirmed planets in 1242 planetary systems.
- 3704 Kepler unconfirmed planet candidates.


exoplanet.eu, 2015-10-01
Frequency
Planetary Radius (Rearth)
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20
25
30

Transit – Brightness decreases



Sun-Jupiter ~ 1%

Sun-Earth ~ 0.01%

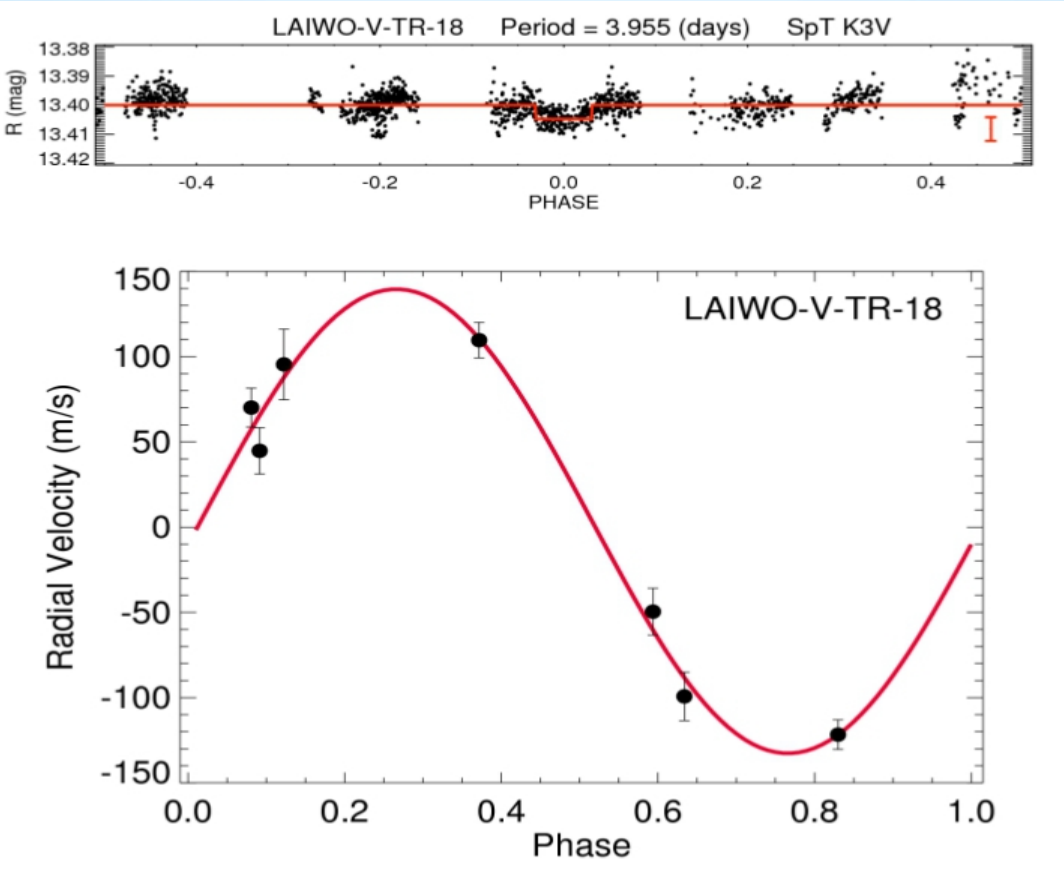
Depth ~ $(R_p/R_{STAR})^2$

“Hot Jupiters”

Jupiter-mass planets

- Periods few days
- Tidally locked to their stars
- Day-side temperature ~ few thousand degrees.

Artist's conception of HATP-7b (credits to NASA/KEPLER)



Discovery (Nikolov, Moyano et al.)

Characterization Hot Jupiters (0.6m and 1.6m telescopes)

WASP-5b

Mp=1.6M_J, Rp=1.2R_J , P=1.6day (Anderson et al. 2008)

WASP-44b

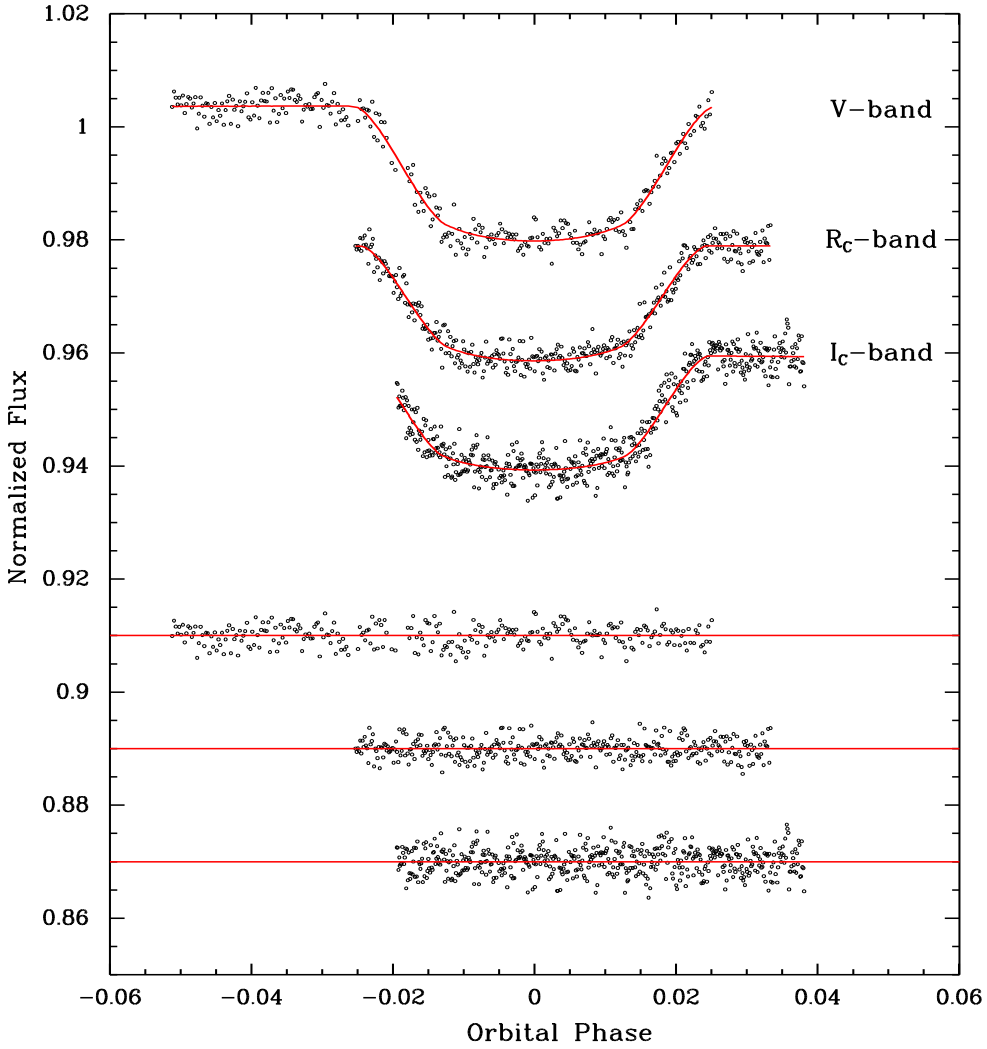
Mp=0.9M_J, Rp=1.0R_J , P=2.4day (Anderson et al. 2012)

WASP-46b

Mp=2.1M_J, Rp=1.3R_J ,P=1.4day (Anderson et al. 2012)

(http://www.lna.br/opd/opd.html)

Most of hot Jupiters hosts are bright, cheap in terms of telescope time.



Multi-band light curves of WASP-46b (Moyano et al. 2015 in prep.)

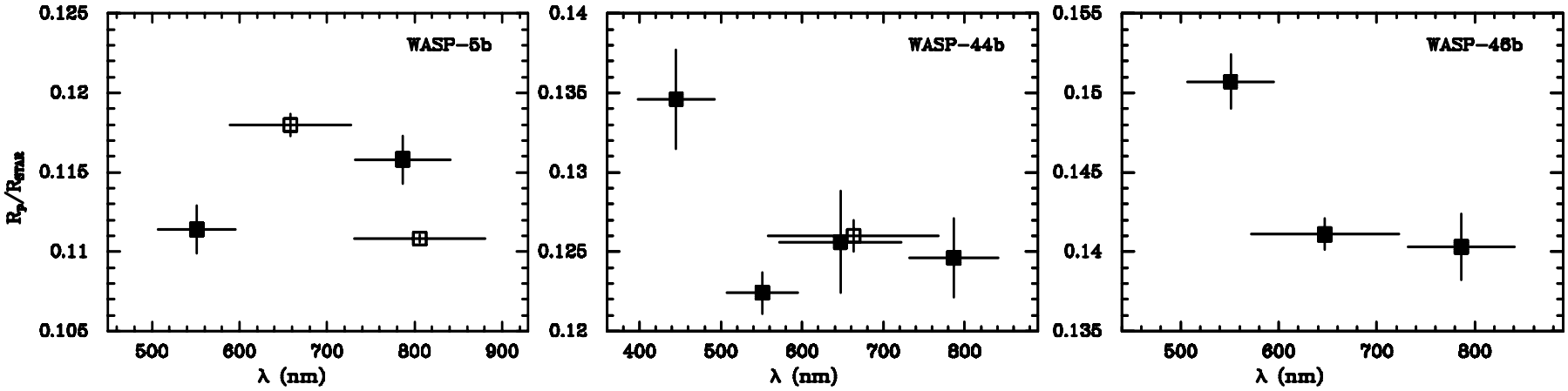
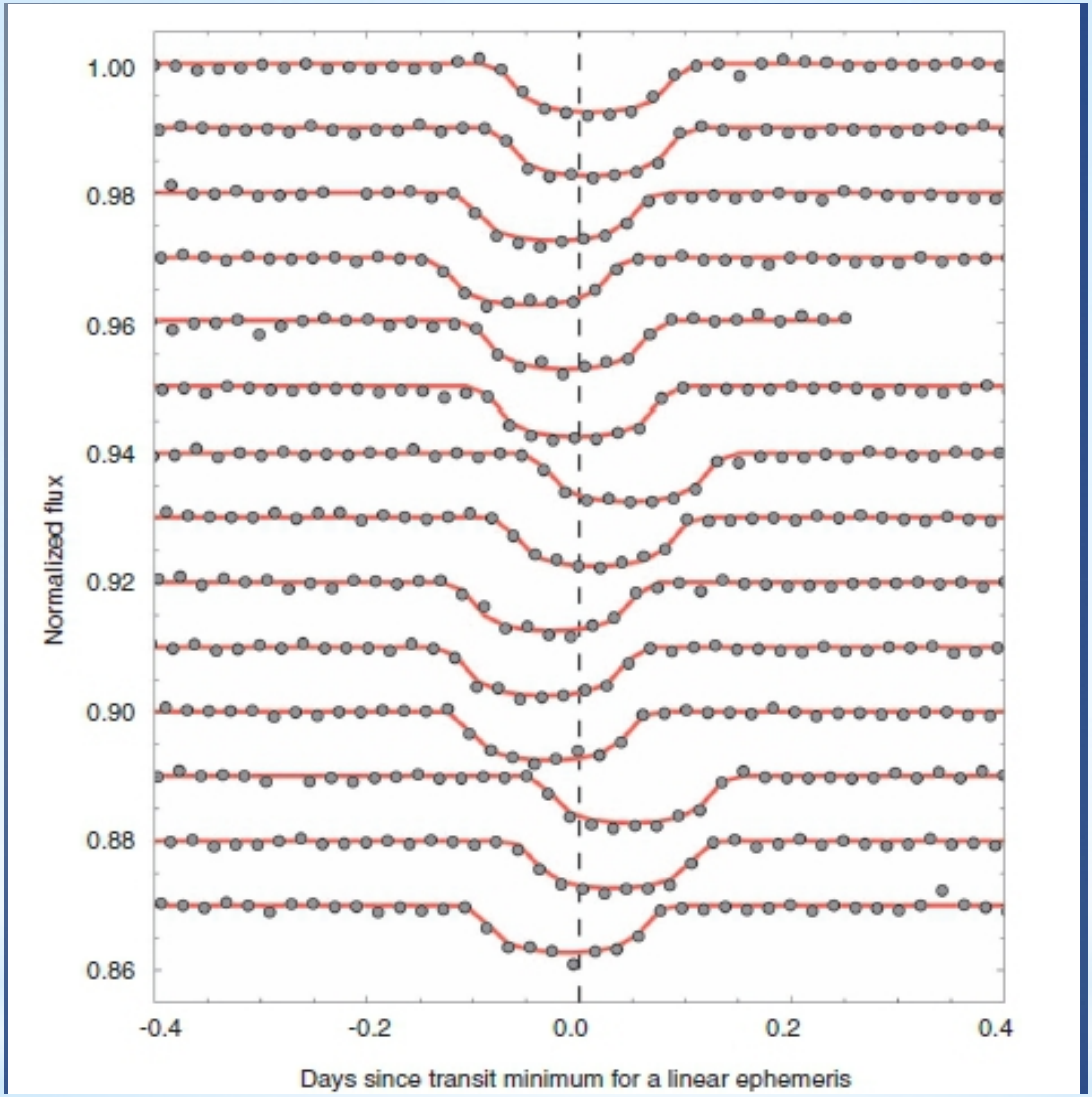
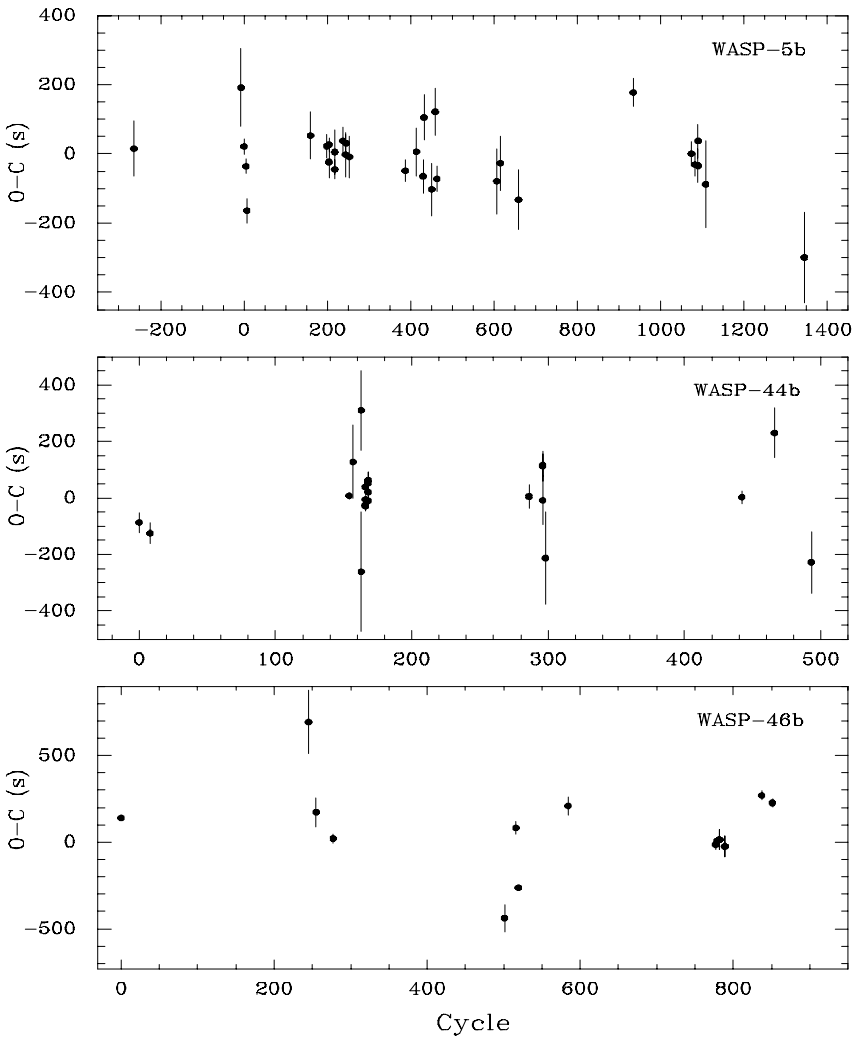


Figure 5: From the left to the right panels, the planet/star radius ratio of WASP-5b, WASP-44b, and WASP-46b are shown as a function of the observed band. Filled and open squares are our results and the measurements collected from (Dragomir et al. 2011, Anderson et al., 2012, Fukui et al. 2011). The points were placed at the effective band wavelength and the horizontal error bars show where the band transmission falls to half of the peak value.

This study is a pilot program to start an homogenoeus characterization of HJ.



Kepler light curves of KOI-872b showing Transit Timing Variations (TTVs, Nesvorny et al. 2012).



$$T_{\rm min} = {\rm TDB}\ 2454375.6251(2) + 1.62843051(50) \times E, \quad (1)$$

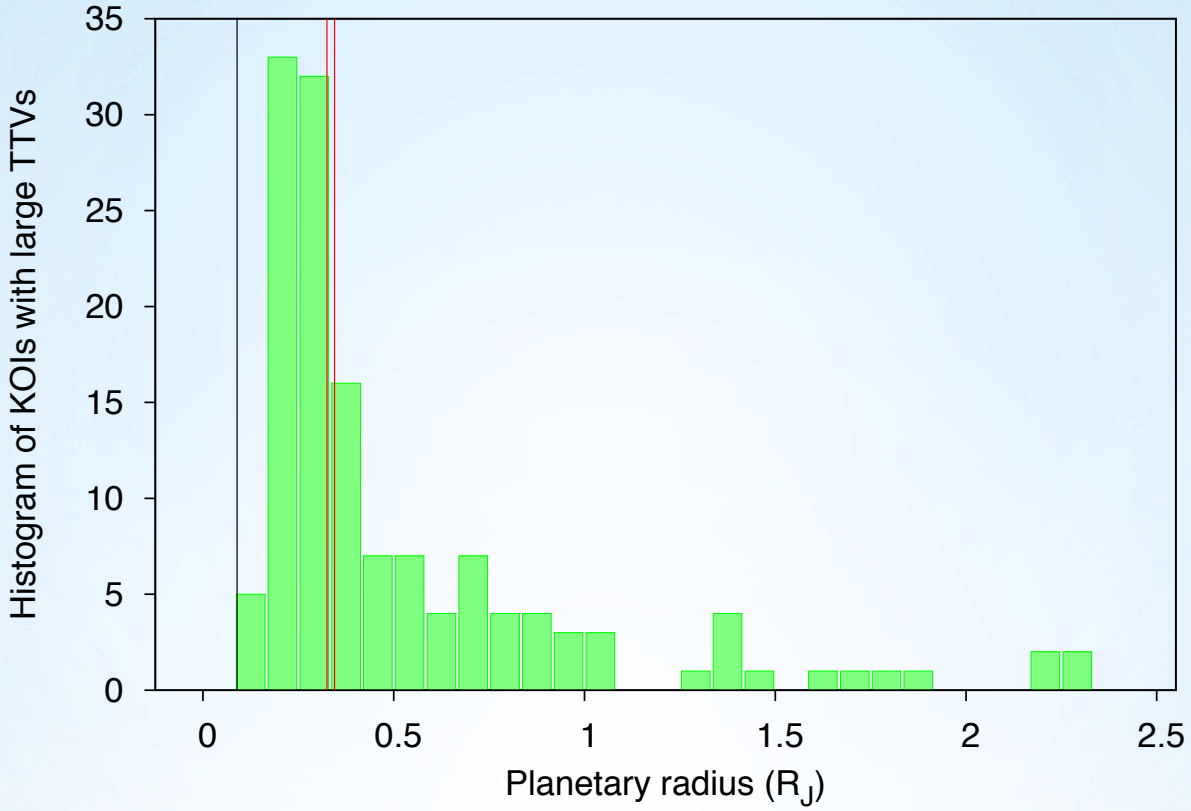
$$T_{\rm min} = {\rm TDB}\ 2455434.3774(7) + 2.423807(2) \times E, \quad (2)$$

and

$$T_{\rm min} = {\rm TDB}\ 2455392.3139(10) + 1.430375(2) \times E, \quad (3)$$

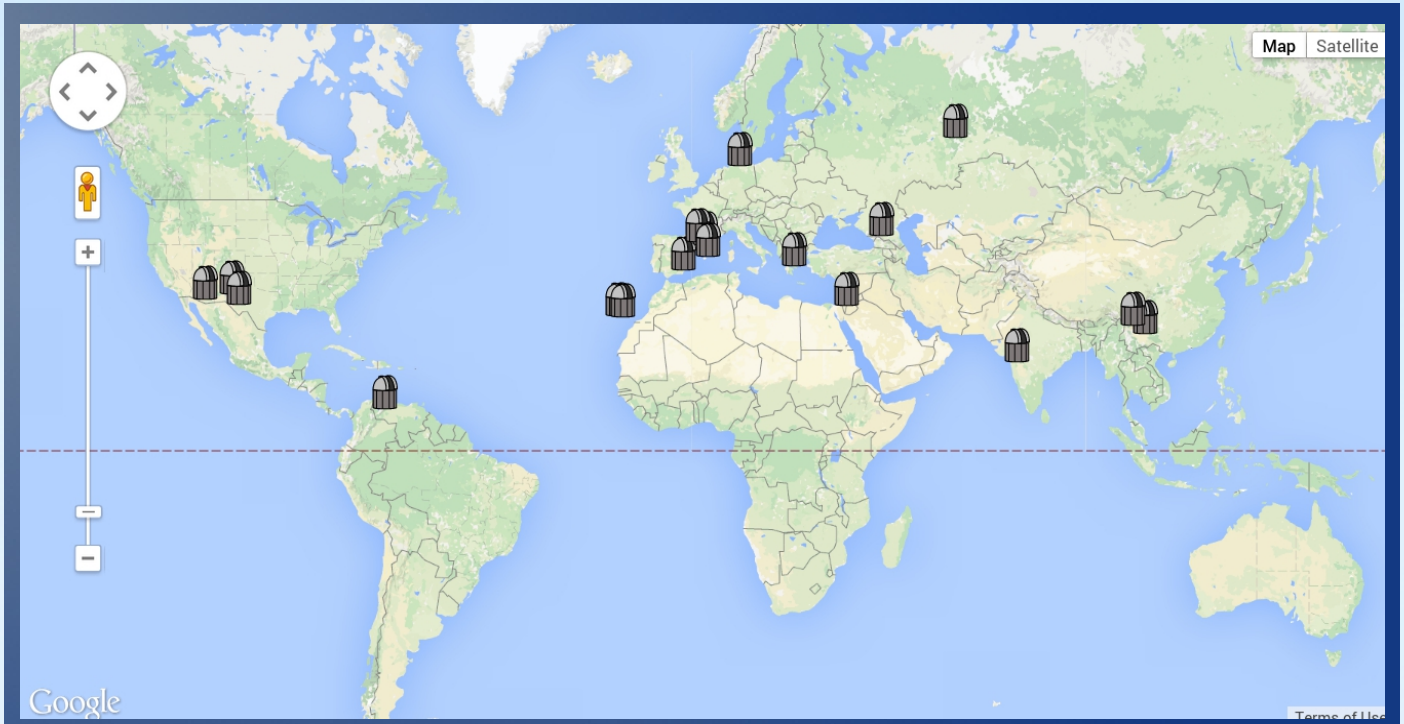
for WASP-5b, WASP-44b, and WASP-46b, respectively.

Hot Jupiters are lonely?



TTVs on Kepler Object of Interest (KOIs, Mazeh et al. 2013).

TTVs on Hot Neptunes



KOI-Net around the world for continuous monitoring of KOIs (PI Carolina Von Essen).

KOI-Net

Similar effort is being started at the Southern Hemisphere (HAT-P-26, GJ-3470, and CoRoT-8, and hopefully many more).

Thank you very much!

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