The KELT Network: Small Telescope Photometric Follow Up for Kepler EBs and KOIs
Joshua Pepper1,2, Bill Welsh3, Jerry Orosz3, & The KELT Followup Network
1 Lehigh University, 2 Vanderbilt University, 3 San Diego State University

Abstract

With the end of regular Kepler observing, a rich array of targets discovered by the mission are in need of photometric time-series follow-up observations. These include a select set of targets that can be observed by small ground-based telescopes for which additional light curves will be valuable. Such targets include eclipsing binaries with third stellar companions, host EBs of circumbinary planets, and KOIs with transits deep enough to be measured from the ground. The KELT transit survey has assembled a collaborative network of small (<1-m) telescopes for follow-up observations of KELT transit candidates. We have begun using the network to photometrically follow up selected Kepler EBs to better characterize the physical parameters of the systems, and their long-term dynamics. Our collaborators have been able to regularly obtain high-quality light curves in multiple filters employing multi-site observatories spanning a range of longitudes, with typical photometric precision of ~2 mmag RMS.

KELT Network Partners

A LCOGT Faulkes Telescope North – Rachel Street
B LCOGT Byrne Observatory at Sedgewick – B. J. Fulton
C CIA, KeplerCam – David Latham and Allyson Bierlya
D Brigham Young University West Mountain Observatory
– Denise Stephens and Mike Joner
E University of Wyoming Red Buttes Observatory and WIRO
– Hannah Jong-Condell and Chip Kobulnicky
F Spot Observatory and MBA Observatory – Mark Manner
G University of Louisville, Moore Observatory
– Karen Collins and John Kieckopf
H Westminster College Observatory – Thomas Oberst
I Kutztown University – Phill Reed
J Swarthmore College, Peter Van de Kamp Observatory – Eric Jensen
K Wellesley College Whitin Observatory – Kim McLeod
L Crow Observatory – Joao Gregorio
M Roberto Zambelli

TAPIR – An interactive online tool for scheduling of transit and EB observing

TAPIR is a free software package for scheduling observations of transiting or eclipsing objects. Developed by KELT collaborator Eric Jensen at Swarthmore College, it allows a coordinator to upload a list of eclipsing objects to an online portal, and observers can log in, select their observatory (with accompanying location and time zone), set a variety of observing constraints, and see all object that fulfill those constraints.

AstroImageJ – Application for managing and reducing time-series photometry

AstroImageJ is an application for managing and reducing time-series photometry.

Targets for Follow up Campaign

1) Long-period EBs and KOIs with incomplete long-term dynamical solutions
Continue to monitor eclipse and transit times, and search for transit and eclipse timing and duration variations (TTVs, TDVs, ETVs, and EDVs)

2) EBs of interest, including systems with circumbinary planets, and those of interest for stellar astrophysics
Monitor eclipses, obtaining multiband measurements of eclipse depths for better characterization of stellar components.

Model fit for two separate observations of a Kepler EB on the same night from Westminster College (WCC) and Kutztown observatories. Both lightcurves fit the dynamical models for the system and each other to within 0.5% timing precision.

Simultaneous V and I observations of a Kepler EB from U. of Louisville Moore Observatory. Eclipse took place on time and differential eclipse depths measured for the different filters.