20

Transit Photometry with the LCOGT network

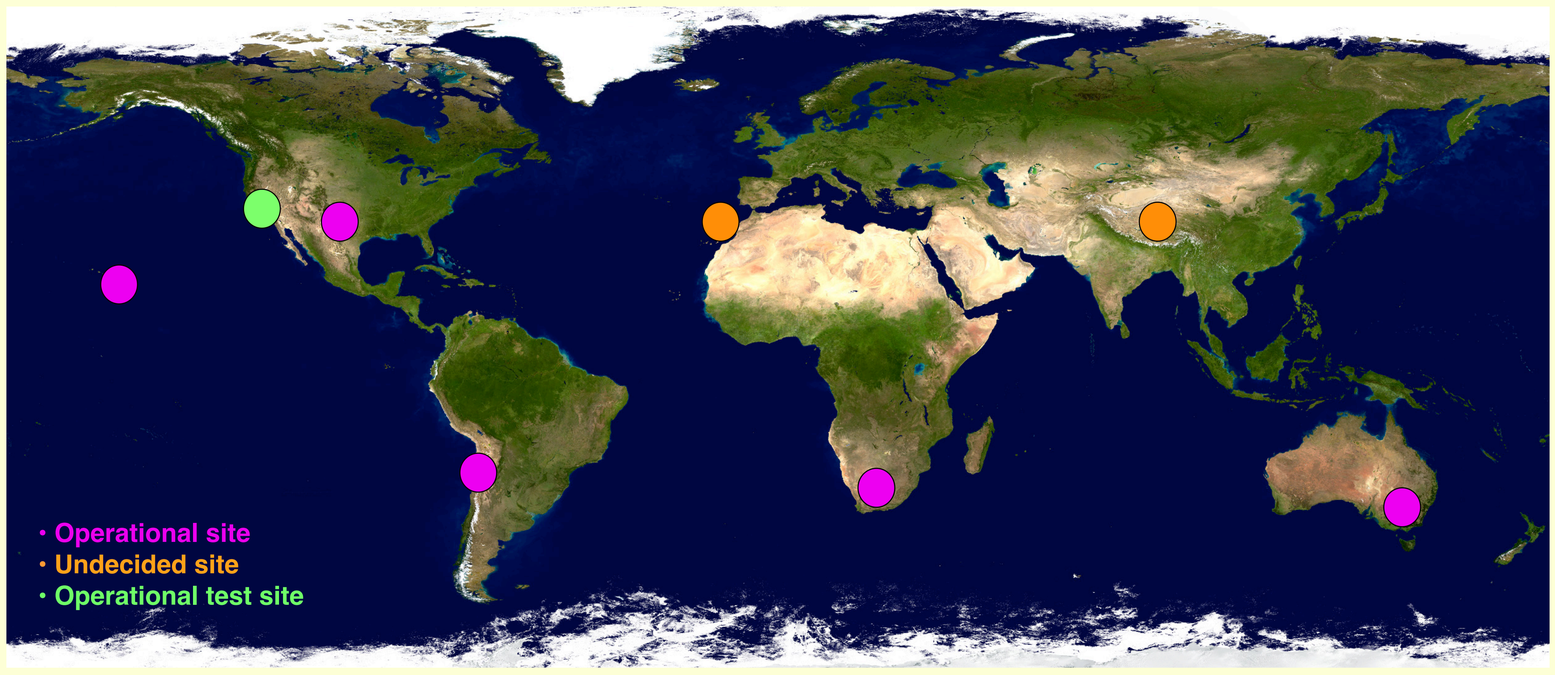
Diana Dragomir, J. Eastman, T. Brown, R. Street,
T. Lister, Y. Tsapras, R. Ross, B. Fulton

The current network (Brown et al. 2013)

- Haleakala: one 2.0m telescope
- Siding Spring: one 2.0m and two 1.0m telescopes
- Cerro Tololo: three 1.0m telescopes
- Sutherland: three 1.0m telescopes
- Fort Davis (McDonald Observatory): one 1.0m telescope
- Santa Barbara: one 0.8m (hosting the NRES spectrograph prototype) and one 1.0m telescopes (for instrument testing).

The 1.0m's

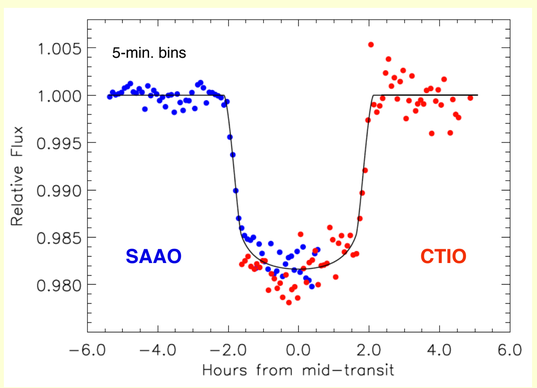
- 16 x 16 arcmin FOV (27 x 27 arcmin in 2014)
- *Filters:* Johnson/Cousins UBVRI, Sloan primed ugri, PanStarrs (short) zs, ys.



Unique potential

- Transit searches for RV-detected exoplanets such as the *MOST* transit search (Dragomir et al., in prep.), *TERMS (*Kane et al. 2009), etc.
- Observations of long transits (i.e. HD 80606b)
- Simultaneous multi-filter observations.

Multi-site transits with 1.0m's



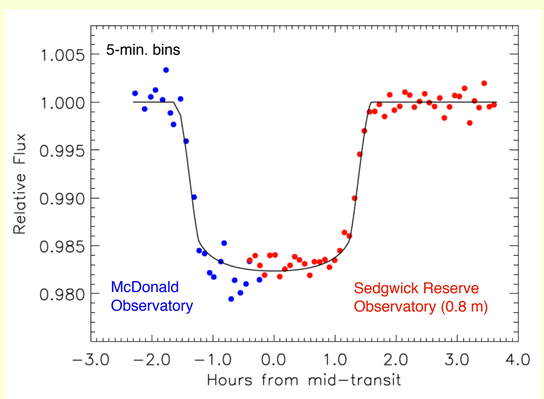
WASP-17b

Period = 3.7354380 ± 0.0000068 days
M_P = 0.486 ± 0.032 M_{Jup}
R_P = 1.991 ± 0.081 R_{Jup}

F4
$M_\star$ = 1.306 ± 0.026 M_{Sun}
$R_\star$ = 1.572 ± 0.056 R_{Sun}

Parameter	Anderson et al. (2011)	This work (Sloan i)
Mid-transit time - T_c (BJD_{TDB})	2456460.5188 ± 0.0037	2456460.53786 ± 0.00038
Scaled semi-major axis - $a/R_\star$	$7.251^{+0.10}_{-0.052}$	$7.566^{+0.075}_{-0.13}$
Impact parameter - *b*	$0.401^{+0.059}_{-0.077}$	$0.118^{+0.11}_{-0.081}$
Planet/star area ratio - $(R_p/R_\star)^2$	0.01696 ± 0.00026	0.01622 ± 0.00025

Transit parameters agree within 2σ.



WASP-35b

Period = 3.161575 ± 0.000002 days
M_P = 0.72 ± 0.06 M_{Jup}
R_P = 1.32 ± 0.03 R_{Jup}

-
$M_\star$ = 1.10 ± 0.08 M_{Sun}
$R_\star$ = 1.09 ± 0.14 R_{Sun}

Parameter	Enoch et al. (2011)	This work (Sloan i)
Mid-transit time - T_c (BJD_{TDB})	2456242.83144 ± 0.0006	$2456242.83017^{+0.00040}_{-0.00042}$
Scaled semi-major axis - $a/R_\star$	8.53 ± 0.19	$8.49^{+0.16}_{-0.35}$
Impact parameter - *b*	0.30 ± 0.04	0.18 ± 0.14
Planet/star area ratio - $(R_p/R_\star)^2$	0.0154 ± 0.0001	0.01584 ± 0.00033

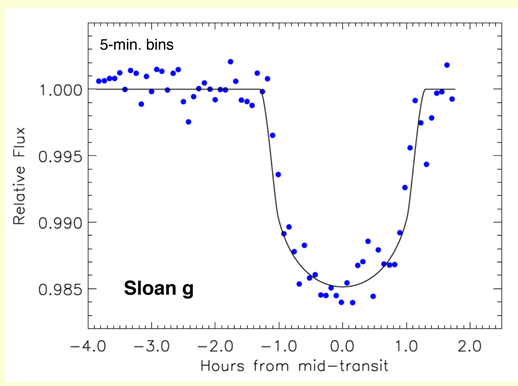
Transit parameters agree within 1 or 2σ.

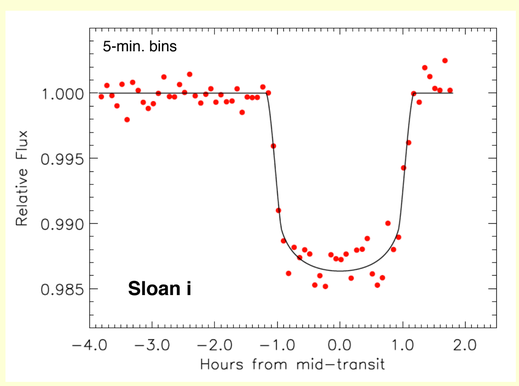
References

Anderson et al., 2011, MNRAS, 416, 2108
Brown et al., 2013, PASP submitted
Demory et al., 2013, ApJ, 768, 154
Enoch et al., 2011, AJ, 142, 86
Fukui et al., 2011, PASJ, 63, 287
Kane et al., 2009, PASP, 121, 1386

Multi-filter transits with 1.0m's

WASP-5b





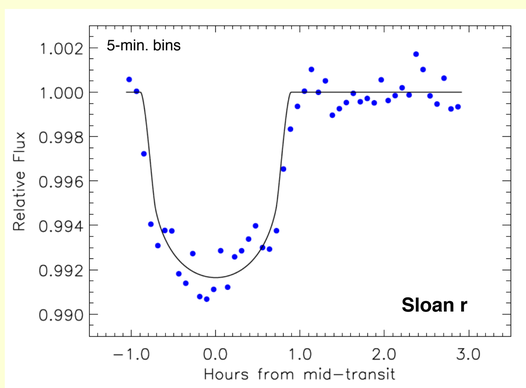
Period = 1.62843142 ± 0.00000064 days
M_P = 1.568 ± 0.071 M_{Jup}
R_P = 1.167 ± 0.043 R_{Jup}

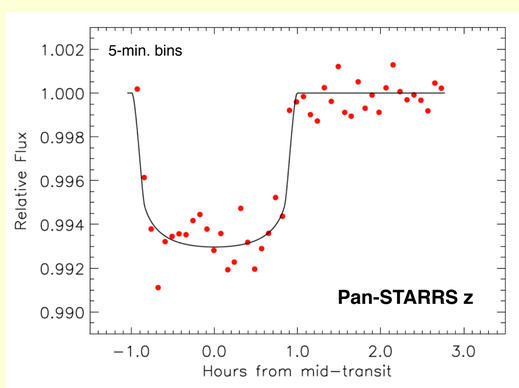
G4V
$M_\star$ = 1.000 ± 0.065 M_{Sun}
$R_\star$ = 1.082 ± 0.038 R_{Sun}

Parameter	Fukui et al. (2011)	This work (Sloan g)	This work (Sloan i)
Mid-transit time - T_c (BJD_{TDB})	2456215.75261 ± 0.00091	$2456215.75138^{+0.00043}_{-0.00042}$	$2456215.75100^{+0.00037}_{-0.00039}$
Scaled semi-major axis - $a/R_\star$	5.37 ± 0.15	$5.21^{+0.15}_{-0.32}$	$5.78^{+0.13}_{-0.27}$
Impact parameter - *b*	0.4575 ± 0.12	$0.26^{+0.20}_{-0.18}$	$0.21^{+0.16}_{-0.14}$
Planet/star area ratio - $(R_p/R_\star)^2$	0.01228 ± 0.00049	$0.01190^{+0.00052}_{-0.00041}$	$0.01193^{+0.00096}_{-0.00094}$

Transit parameters agree within 1 or 2σ.

GJ 3470b





Period = 3.33665 ± 0.00005 days
M_P = 13.9 ± 0.071 M_{Earth}
R_P = 4.83 ± 0.043 R_{Earth}

M1.5V
$M_\star$ = 0.539 ± 0.045 M_{Sun}
$R_\star$ = 0.568 ± 0.034 R_{Sun}

Parameter	Demory et al. (2013)	This work (Sloan r)	This work (Pan-Starrs z)
Mid-transit time - T_c (BJD_{TDB})	2456300.68602 ± 0.0032	2456300.68625 ± 0.00049	$2456300.68585^{+0.00050}_{-0.00047}$
Scaled semi-major axis - $a/R_\star$	$13.42^{+0.25}_{-0.23}$	$13.97^{+0.85}_{-0.77}$	$13.71^{+0.27}_{-0.40}$
Impact parameter - *b*	$0.40^{+0.06}_{-0.08}$	$0.472^{+0.061}_{-0.083}$	$0.16^{+0.14}_{-0.11}$
Planet/star area ratio - $(R_p/R_\star)^2$	0.005929 ± 0.00014	0.00654 ± 0.00034	$0.00617^{+0.00029}_{-0.00028}$

Transit parameters agree within 1 or 2σ.