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Yekaterinburg, Russia

MASTER Robotic Net

Search for new transiting exoplanets in the frame of the «Kourovka Planet Search»

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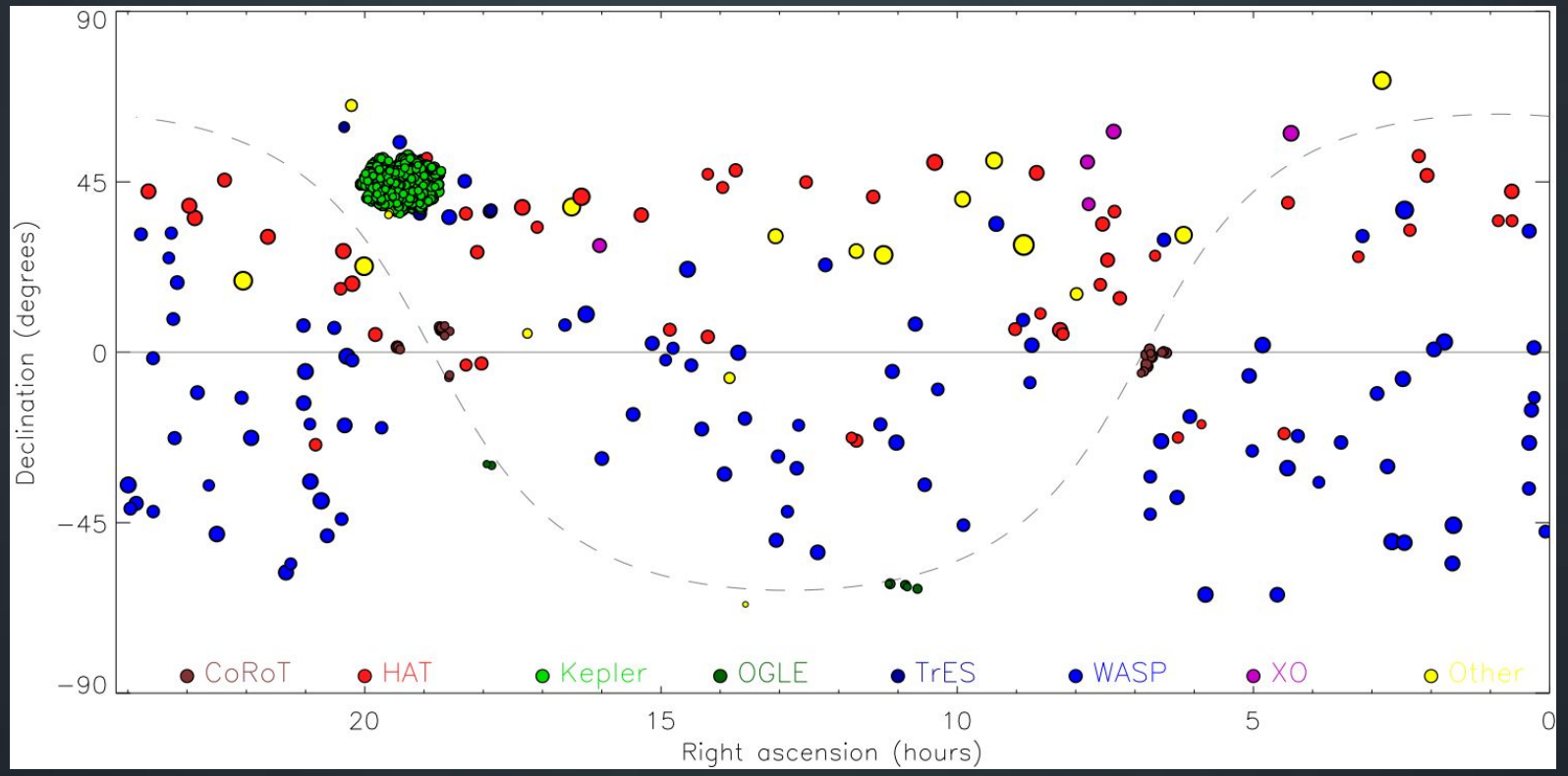
SAO RAS – 2015

Scientific rationale



Southworth J. Observational studies of transiting extrasolar planets // arXiv:1411.5517

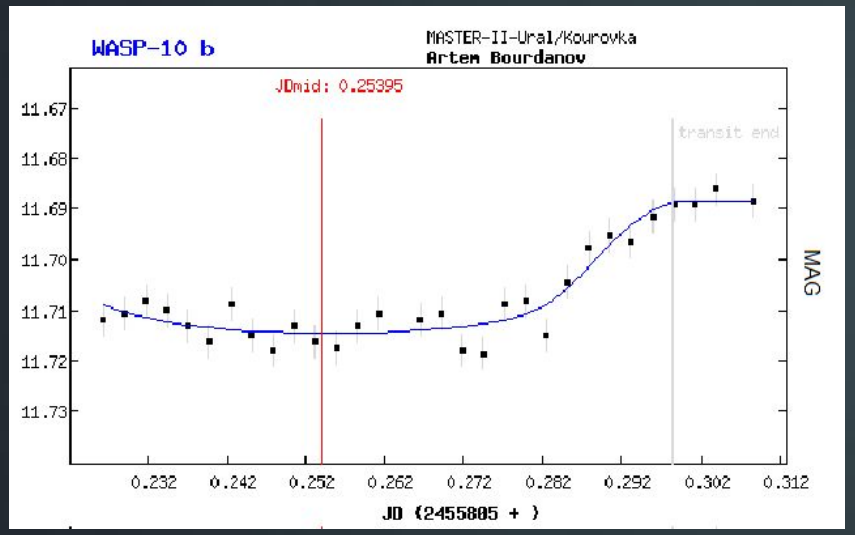
- not the whole sky is covered with recent exoplanet surveys;
- population of about 1600 known exoplanets, but affected by the selection effects — tip of the iceberg;
- every new exoplanet with defined properties will contribute to the planet population synthesis;

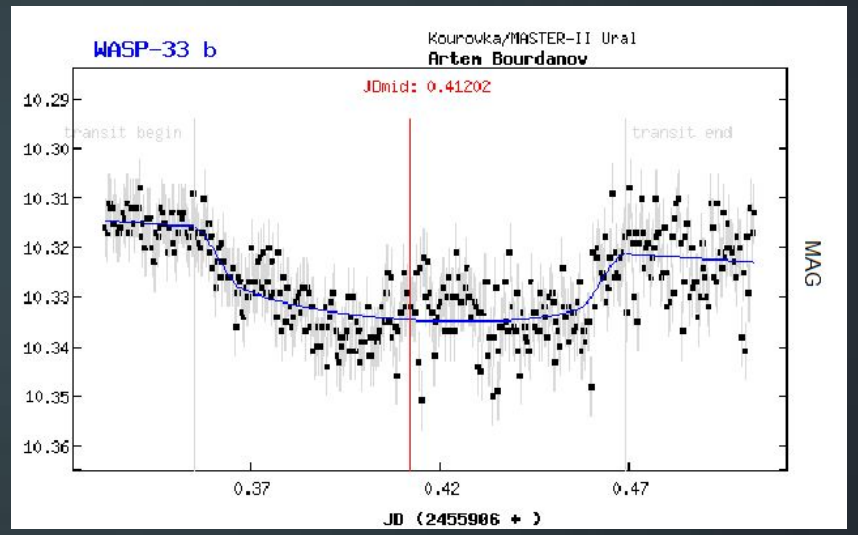
MASTER-II-Ural telescope

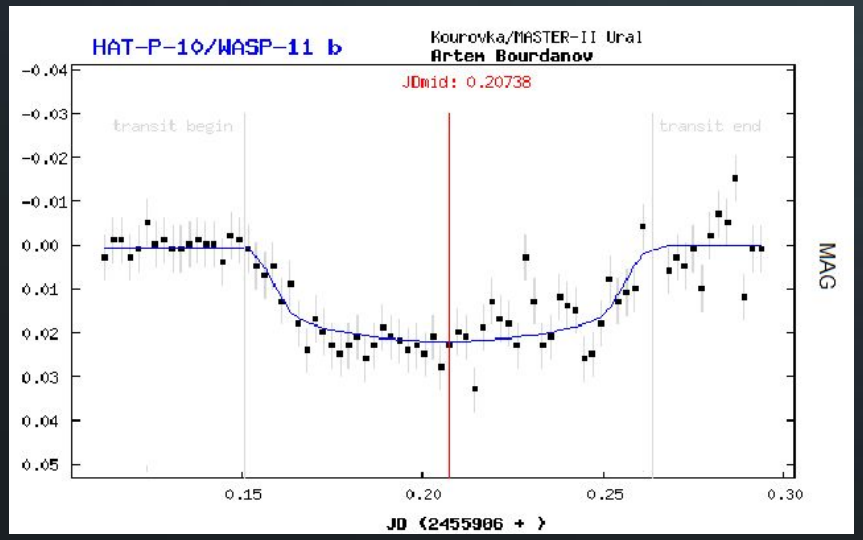
- Located at the Kourovka observatory (φ = 57° N, λ = 59° E, h = 290 m);
- 2 parallel catadioptric tubes (D = 400 mm, F = 1000 mm);
- 4K x 4K ALTA U16M ;
- FOV = 2°×2°; scale – 1.8 " / px;
- BVRI filters, 2 polariods, H-alpha;

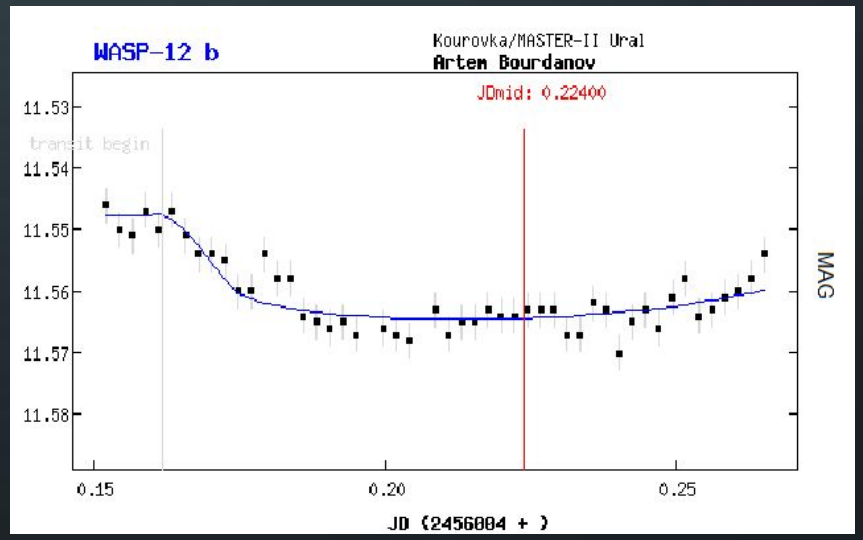
Lipunov V. et al Master Robotic Net // Advances in Astronomy, vol. 2010, Article ID 349171

Observations of known transiting exoplanets





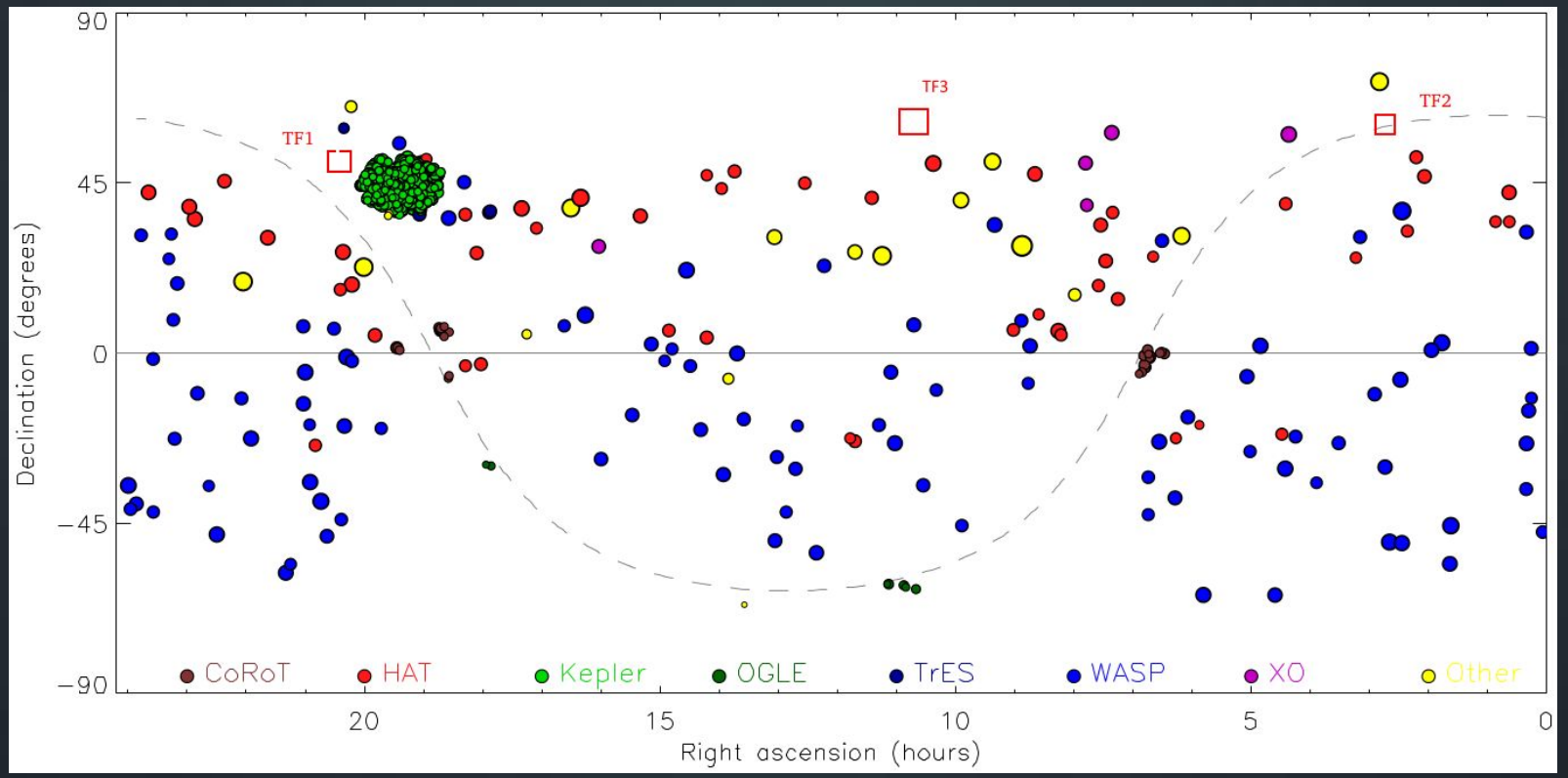




Rowe-Ackermann Schmidt Astrograph

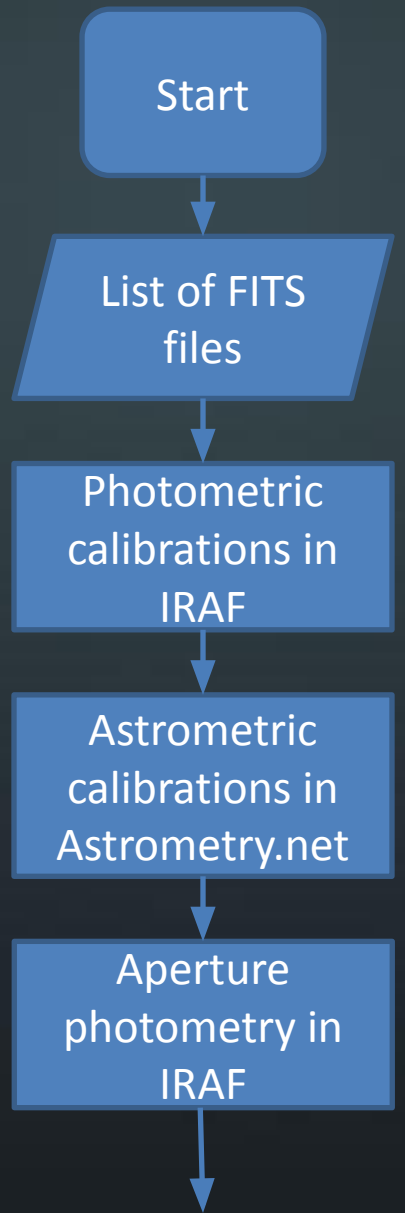
- Located at Acton (USA) (φ = 43° N, λ = 71° W, h = 80 m);
- one catadioptric tube (D = 279 mm, F = 620 mm);
- SBIG ST-8300M;
- FOV = 1.2°×1.6°; scale – 1.8 " / px
- R and CBB filters;

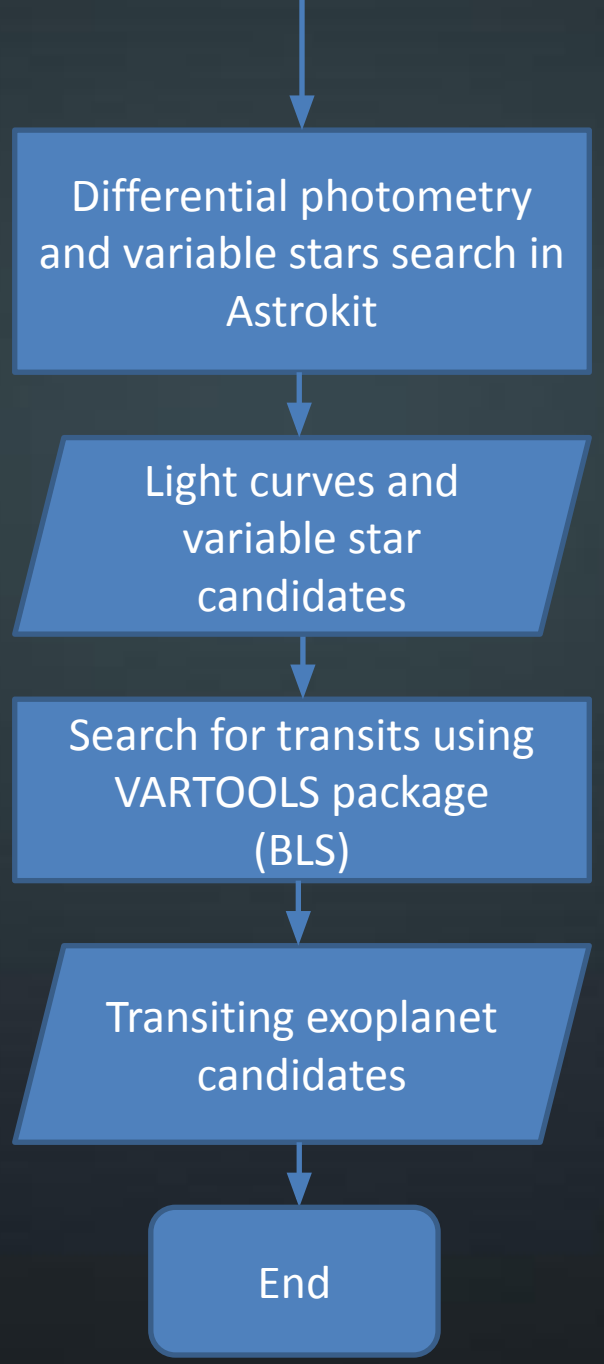
Search for new transiting Hot Jupiters



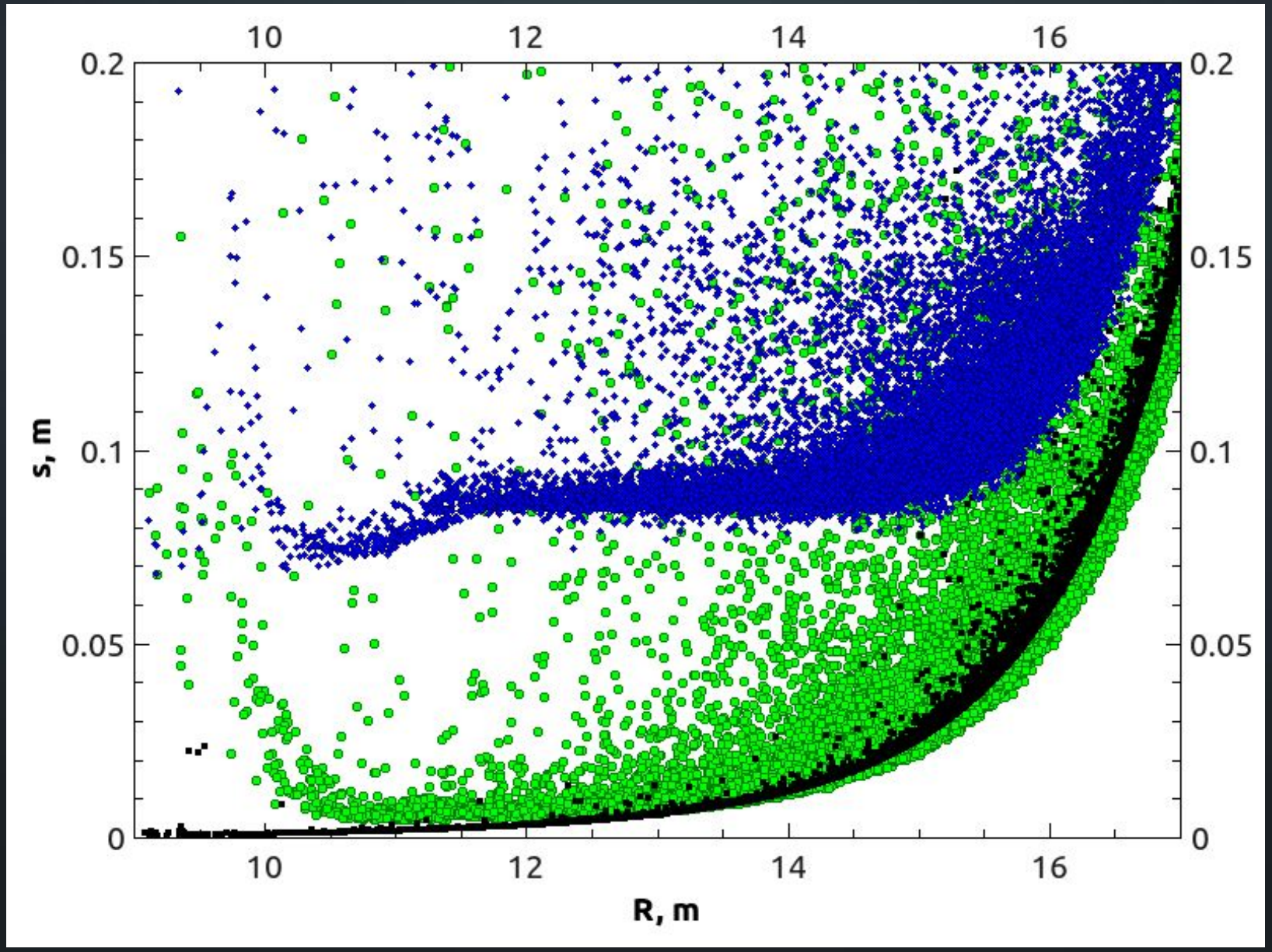
- 2012/2013 – Target Field 1 observations (MASTER-II-Ural);
- 2013/2014 – Target Field 2 observations (MASTER-II-Ural + RASA);
- 2014 – Target Field 3 observations (RASA);

Data reduction




Differential photometry and variable stars search in Astrokit
Light curves and variable star candidates
Search for transits using VARTOOLS package (BLS)
Transiting exoplanet candidates
End

Photometric precision



Photometric precision

Standard deviation<20mmag

Area	Telescope	Total number of stars	Low-noise stars
TF1	MASTER-II-Ural	23 500	25.5%
TF2	MASTER-II-Ural	15 000	18.0%
sub-TF2	RASA	8 500	18.2%
TF3	RASA	1 000	20.9%

Discovered exoplanet candidates

Internal ID	R mag	V mag	Period d	Depth mag	Duration h
KPS-TF1-3154	12.4	12.7	0.847	0.02	1.6
KPS-TF1-19251	13.9	14.3	0.983	0.025	1.7
KPS-TF2-11789	14.2	14.4	1.35	0.02	2
KPS-TF3-663	12.6	13.1	1.706	0.01	1.5

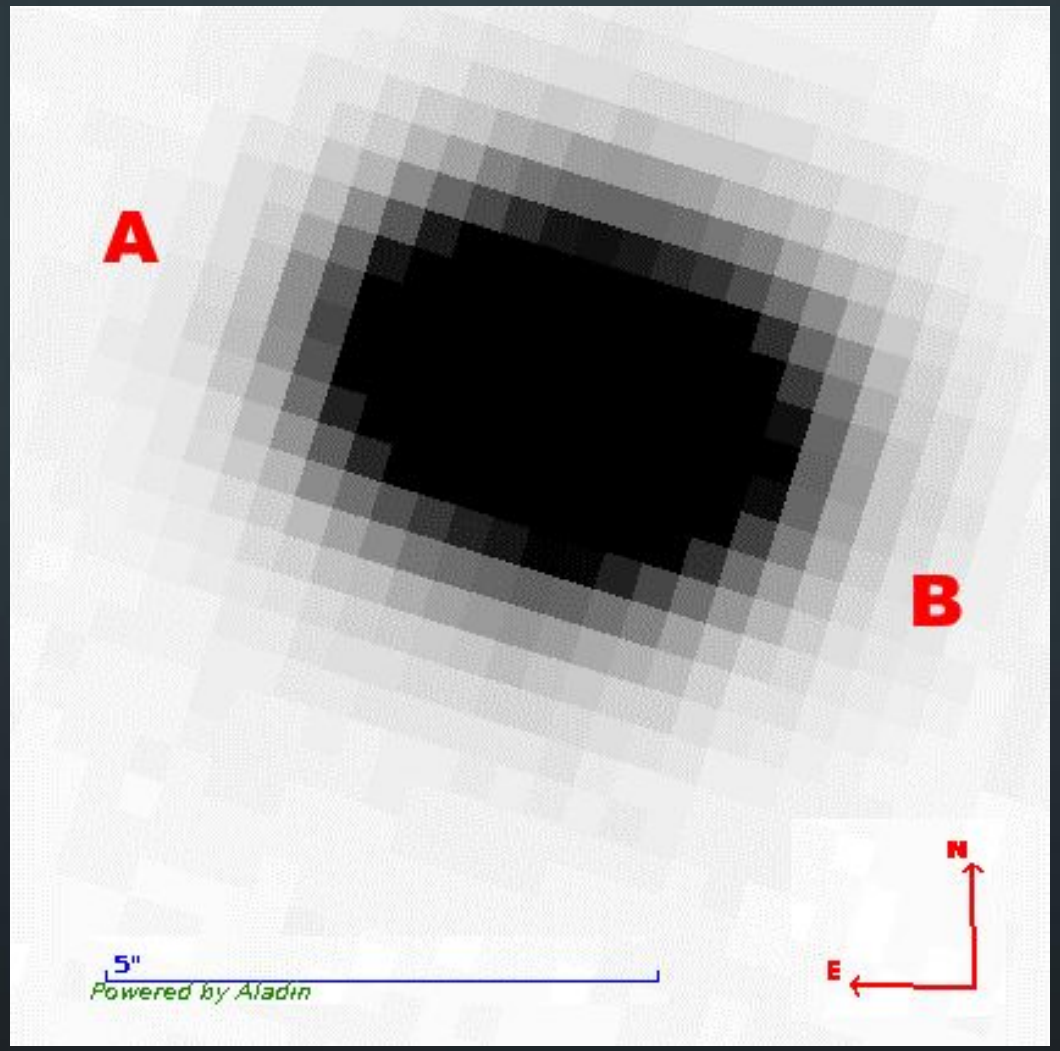
Follow-up observations

Telescope	Observatory
Celestron EdgeHD 11 SCT	Acton Sky Portal
MTM-500	Kislovodsk Mountain Astronomical Station
MASTER-II-Tunka	Irkutsk State University Astrophysical Center
ZA-320M	Pulkovo Observatory
Kreiken	Ankara University Kreiken Observatory
T100	TUBITAK National Observatory
0.6-m Cassegrain	Torun Centre for Astronomy Observatory
BTA	Special Astrophysical Observatory
KAO-1.2-m	Kourovka Observatory

Discovered exoplanet candidates

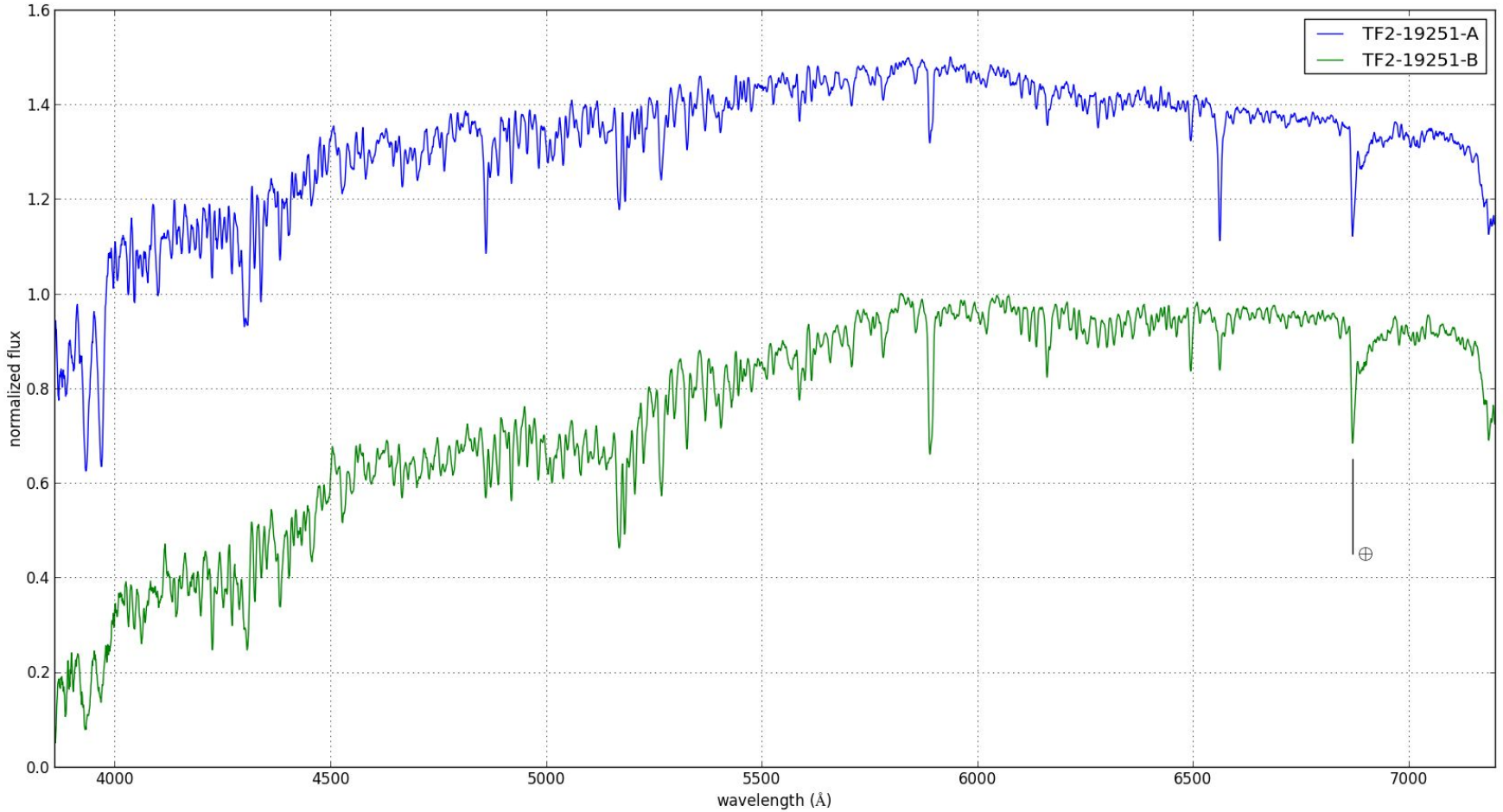
Internal ID	R mag	V mag	Period d	Depth mag	Duration h
~~KPS-TF1-3154~~	12.4	12.7	0.847	0.02	1.6
KPS-TF1-19251	13.9	14.3	0.983	0.025	1.7
~~KPS-TF2-11789~~	14.2	14.4	1.35	0.02	2
KPS-TF3-663	12.6	13.1	1.706	0.01	1.5

KPS-TF1-19251



D = 1.3’’

KPS-TF1-19251

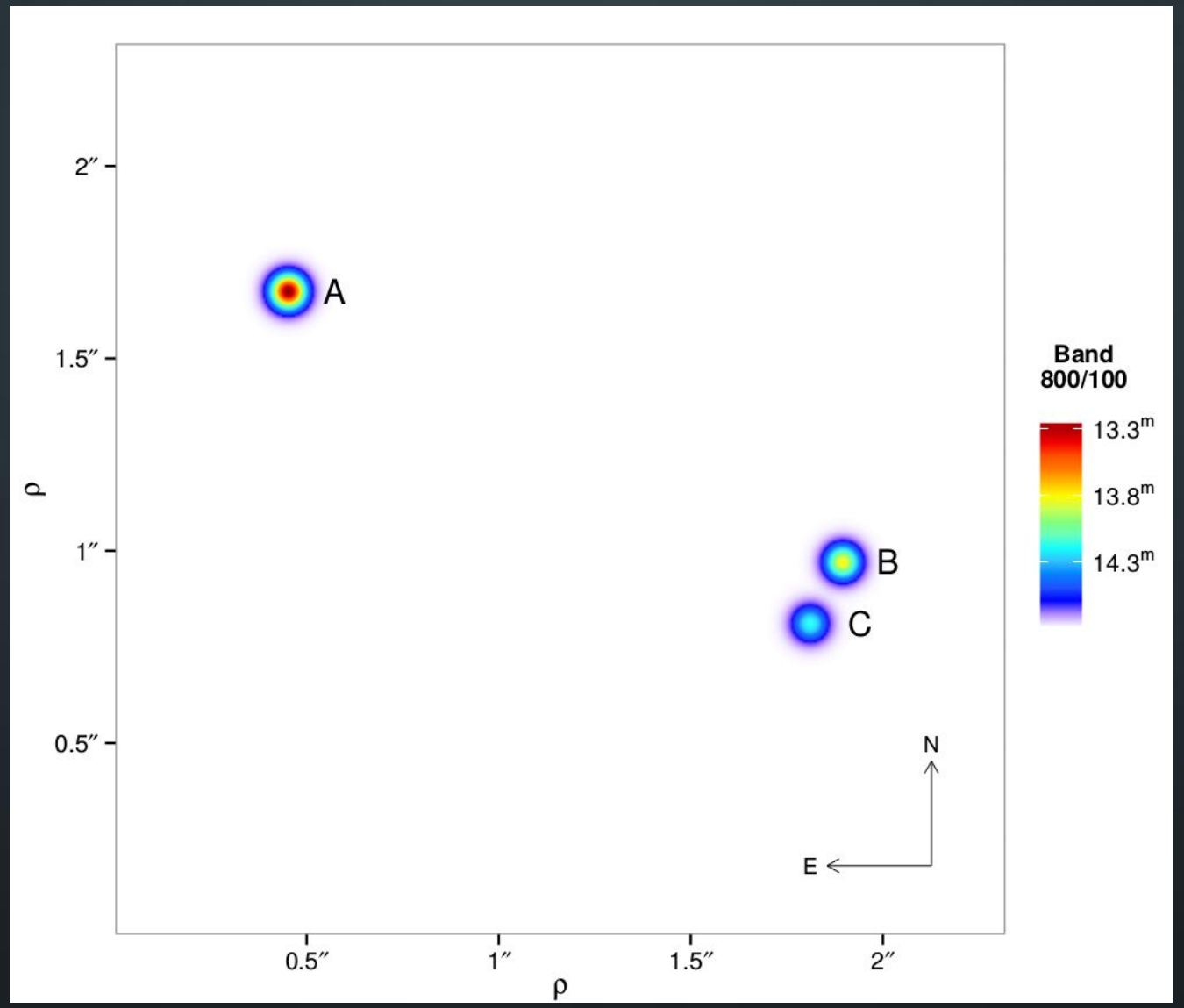


G2&K0

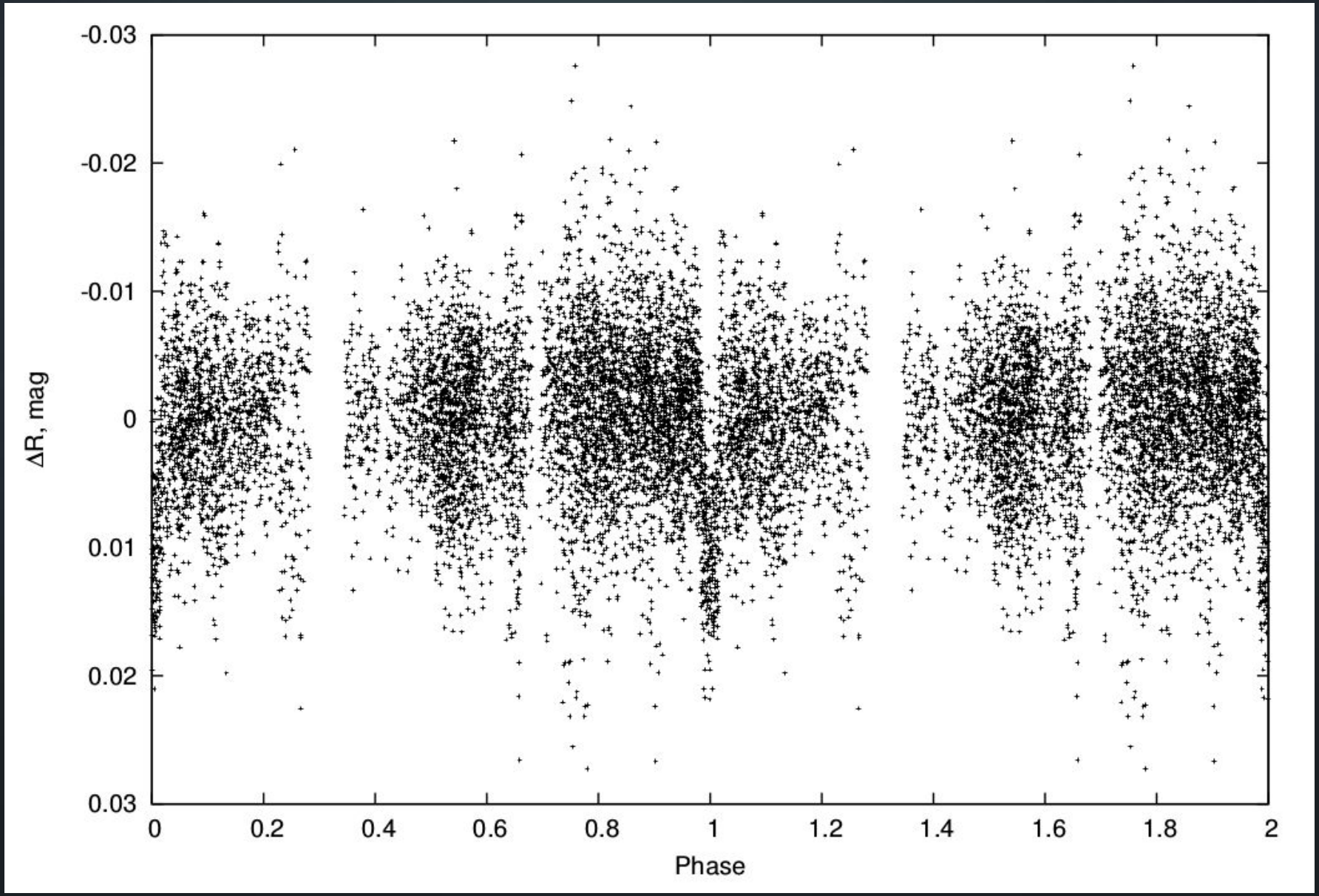
KPS-TF1-19251

True depth
ΔA = 0.05^{m}
ΔB = 0.08^{m}
ΔC = 0.14^{m}

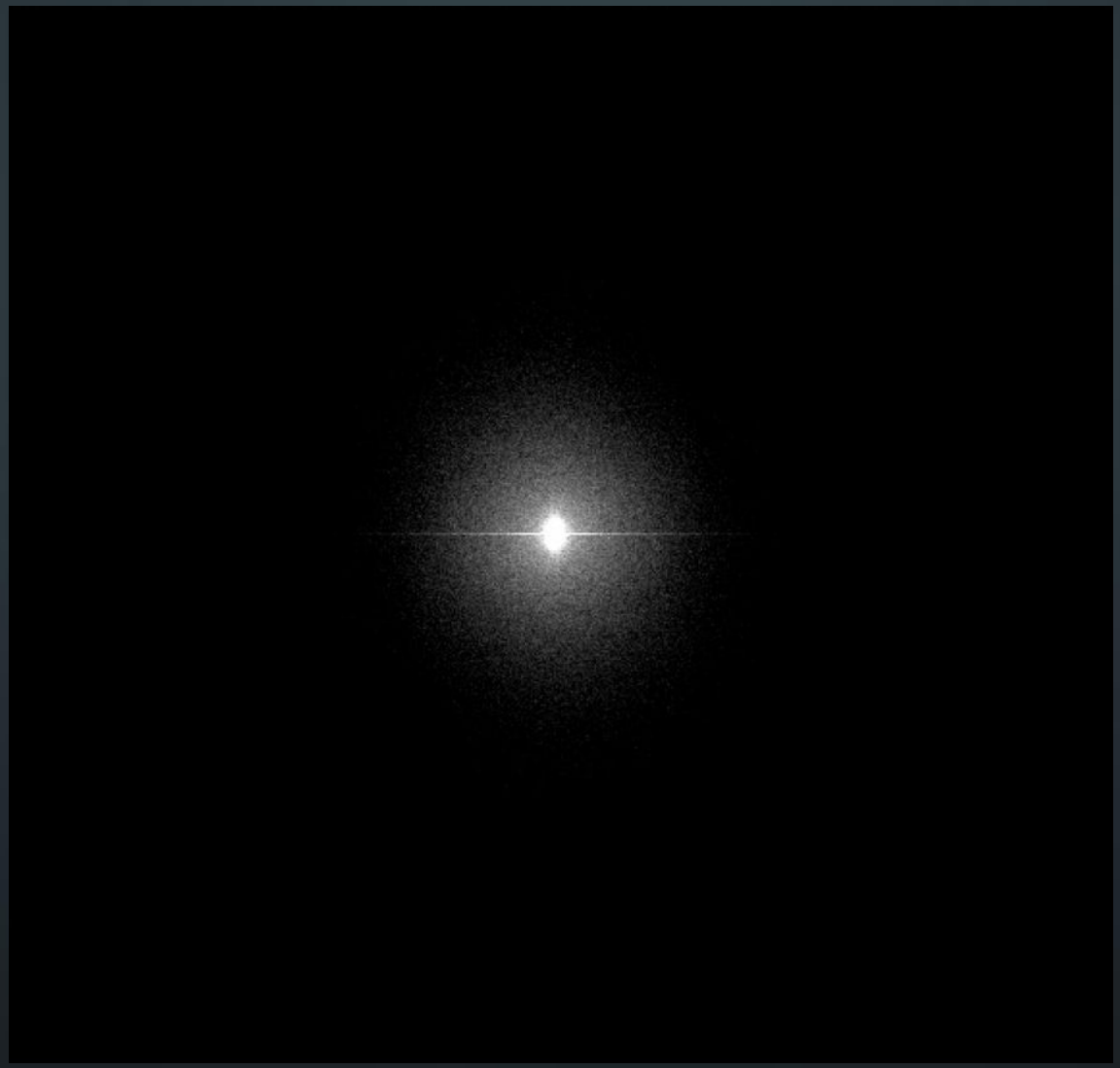
A(G2V) -> 2.2 R Jup?



KPS-TF3-663



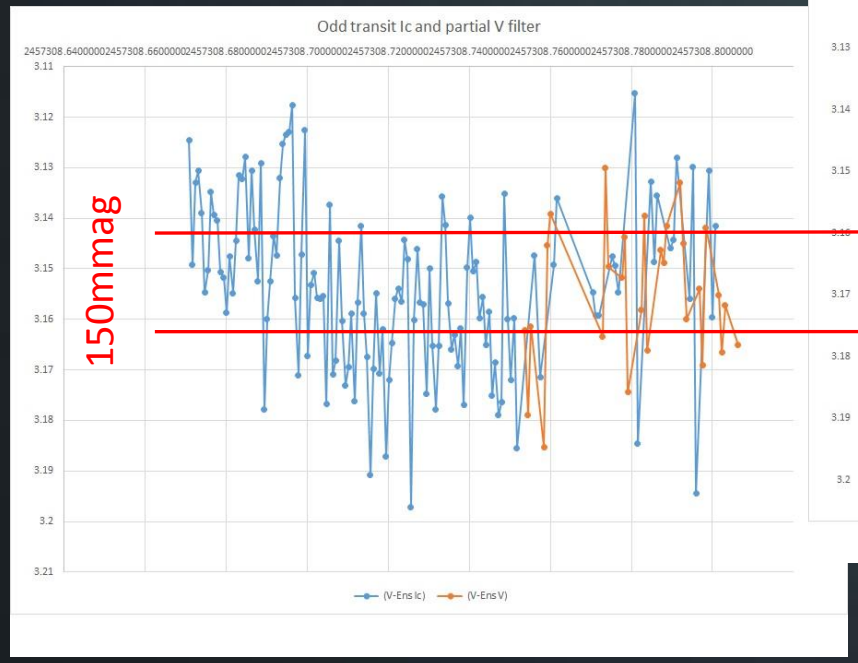
KPS-TF3-663



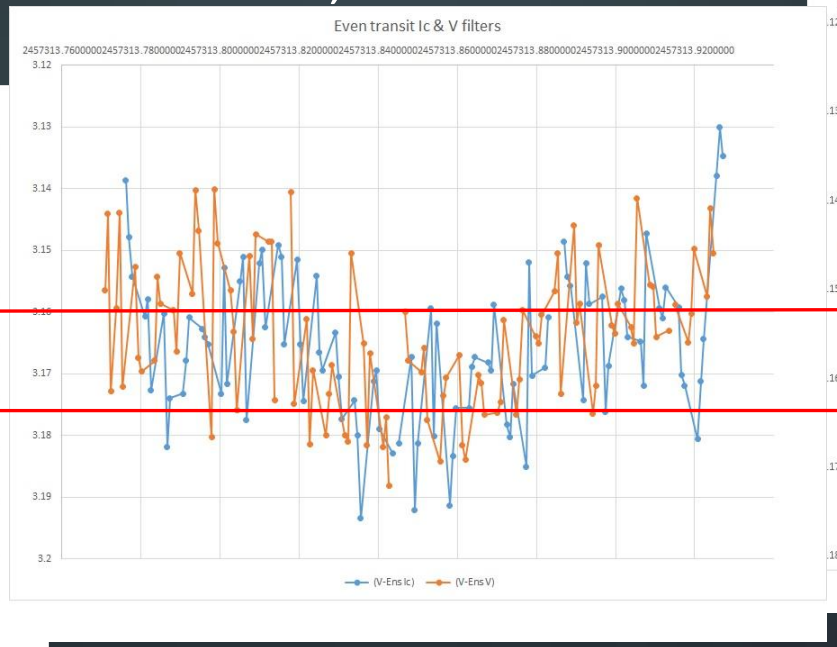
speckle interferometry of the SAO RAS 6-meter BTA telescope

KPS-TF3-663

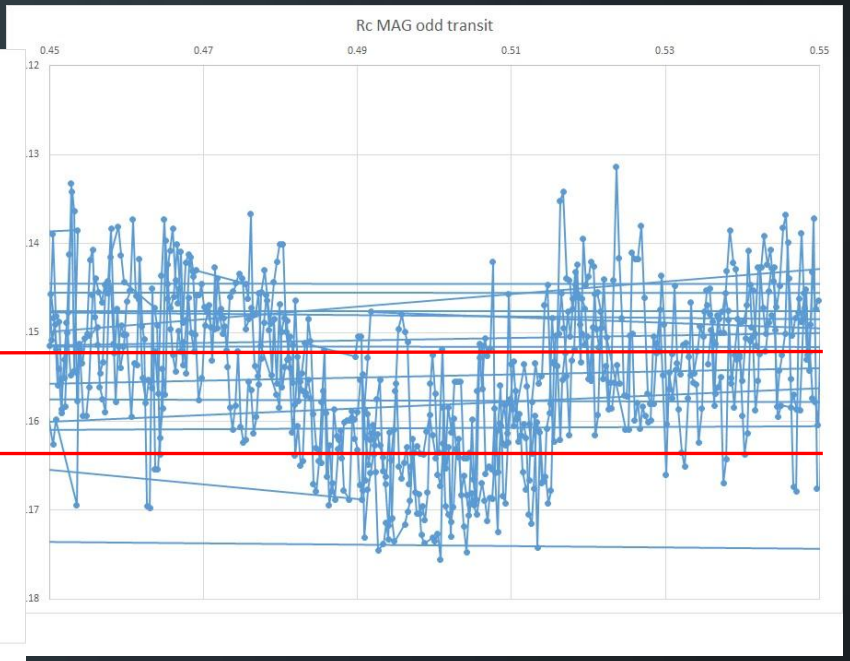
Ic&V, odd transit



Ic&V, even transit



Rc, odd transit, phase folded



Benni P. (Acton Sky Portal)

KPS-TF3-663

- no visual companion (speckle interferometer of the SAO RAS 6-meter BTA telescope);
- no secondary minimum;
- late spectral type G2-K1 (MASTER-U photometry+2MASS);
- application for observations using SOPHIE echelle spectrograph;

New observing mode