YETI

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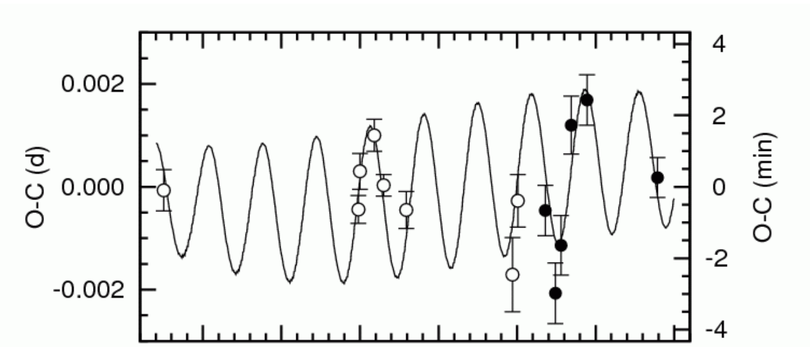
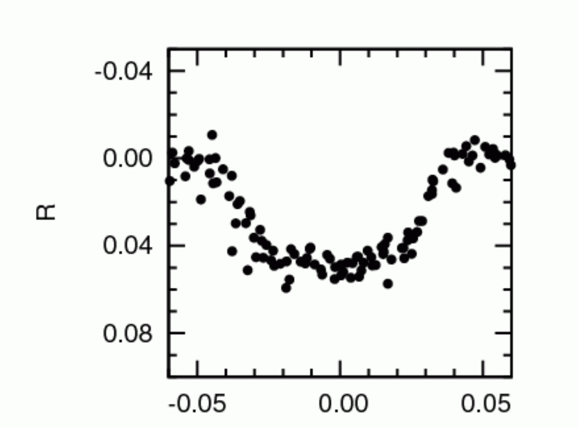
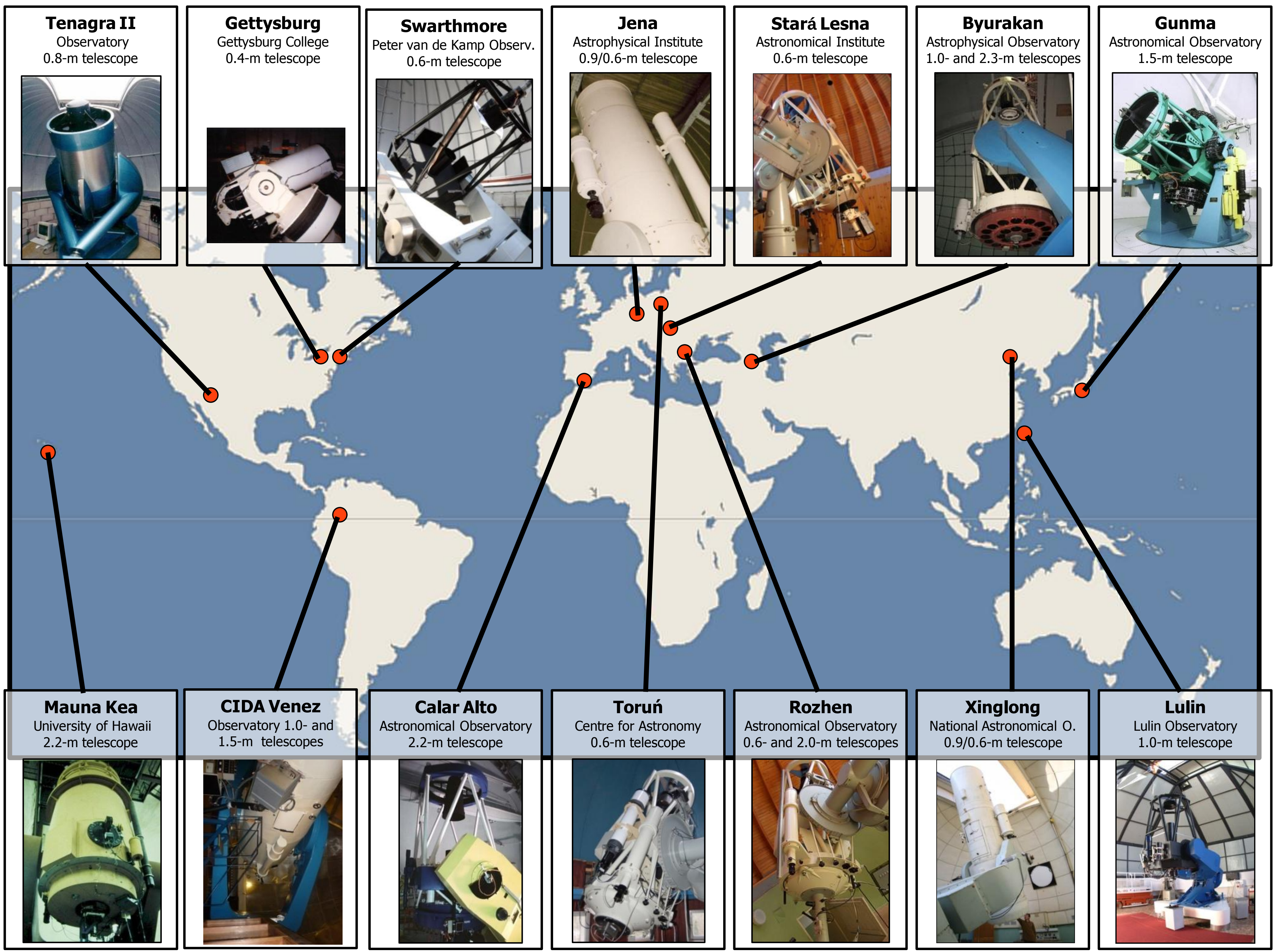
FSU Jena

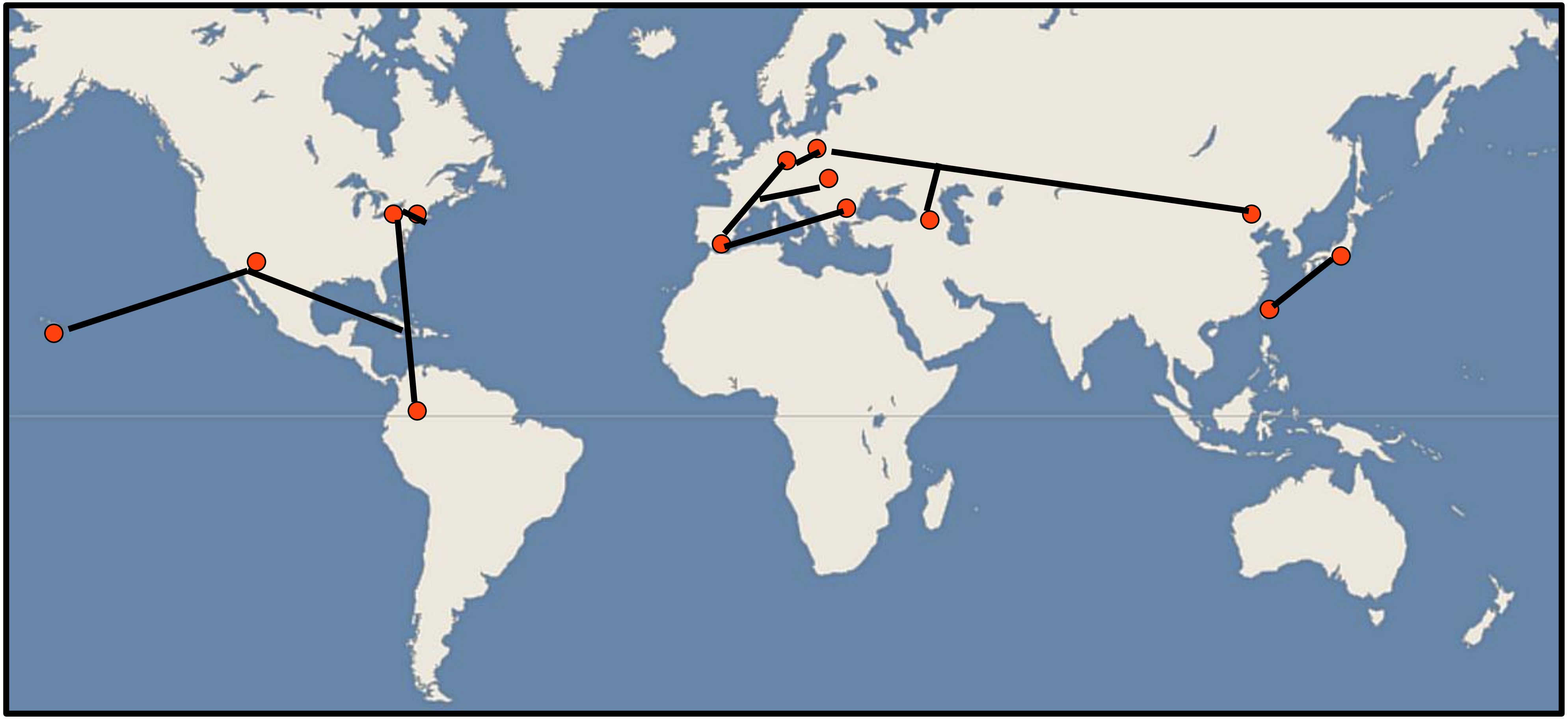






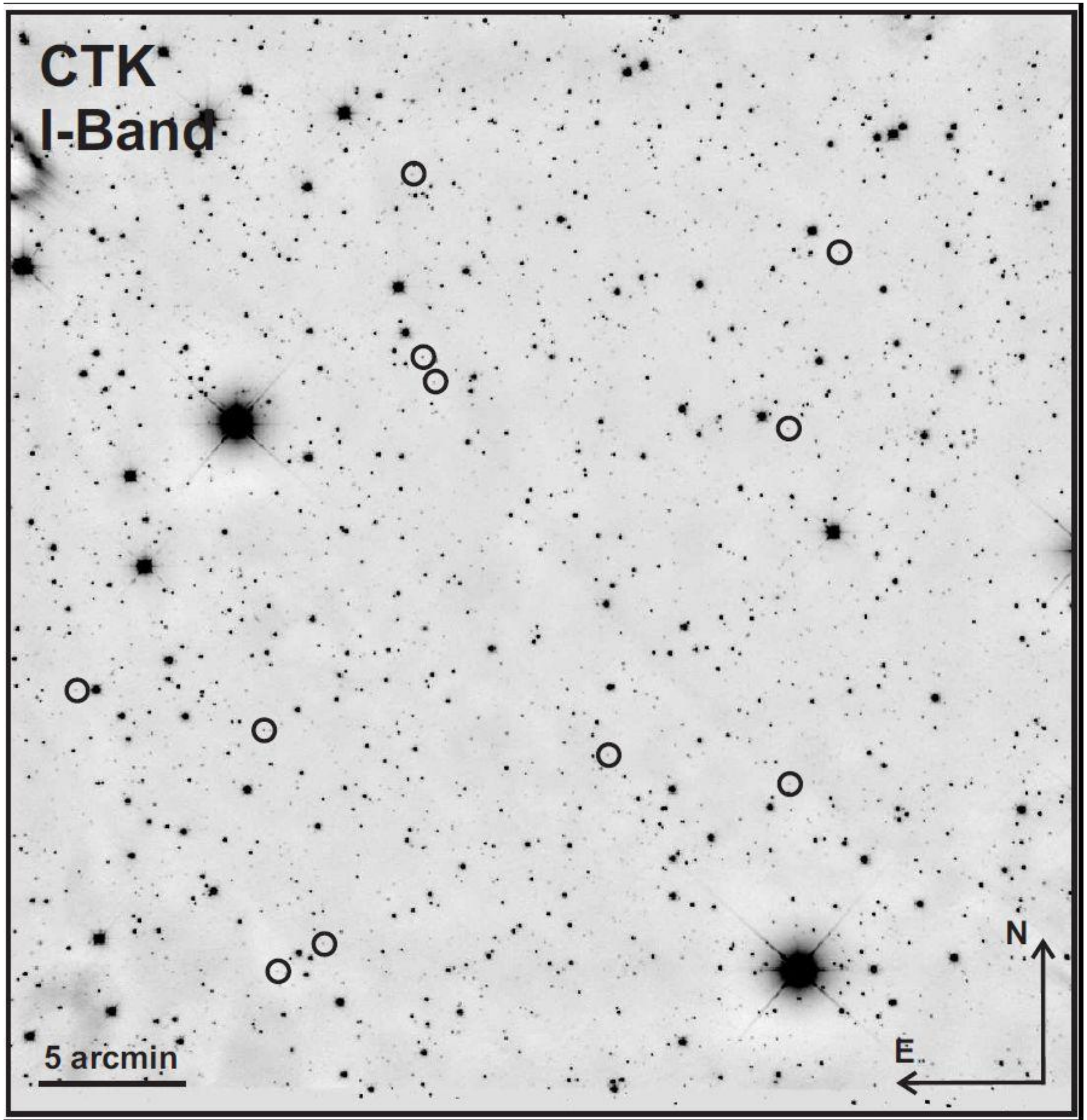
Tenagra II
Observatory
0.8-m telescope
Gettysburg
Gettysburg College
0.4-m telescope
Swarthmore
Peter van de Kamp Observ.
0.6-m telescope
Jena
Astrophysical Institute
0.9/0.6-m telescope
Stará Lesna
Astronomical Institute
0.6-m telescope
Byurakan
Astrophysical Observatory
1.0- and 2.3-m telescopes
Gunma
Astronomical Observatory
1.5-m telescope
Mauna Kea
University of Hawaii
2.2-m telescope
CIDA Venez
Observatory 1.0- and
1.5-m telescopes
Calar Alto
Astronomical Observatory
2.2-m telescope
Toruń
Centre for Astronomy
0.6-m telescope
Rozhen
Astronomical Observatory
0.6- and 2.0-m telescopes
Xinglong
National Astronomical O.
0.9/0.6-m telescope
Lulin
Lulin Observatory
1.0-m telescope

Y E T I = Young Exoplanet Transit Initiative



network of telescopes at all longitudes
to observe 24 / 7
in order not to miss a transit

Cassegrain Teleskop Kamera (CTK) at 25 cm view finder with CCD camera for deep imaging, here Pleiades:



13 hours of I-band
(+ 10h R-band)
imaging at the edge
of the Pleiades.

Variability studied by
Mohammad Moualla (Jena)
PhD thesis

Al images added up:
7-11 brown dwarf candidates
found (RIJHK)
(Eisenbeiss et al. 2009 AN)

32+5.5 hours of follow-up with
VLT/ISAAC & FORS done

(PI Eisenbeiss)

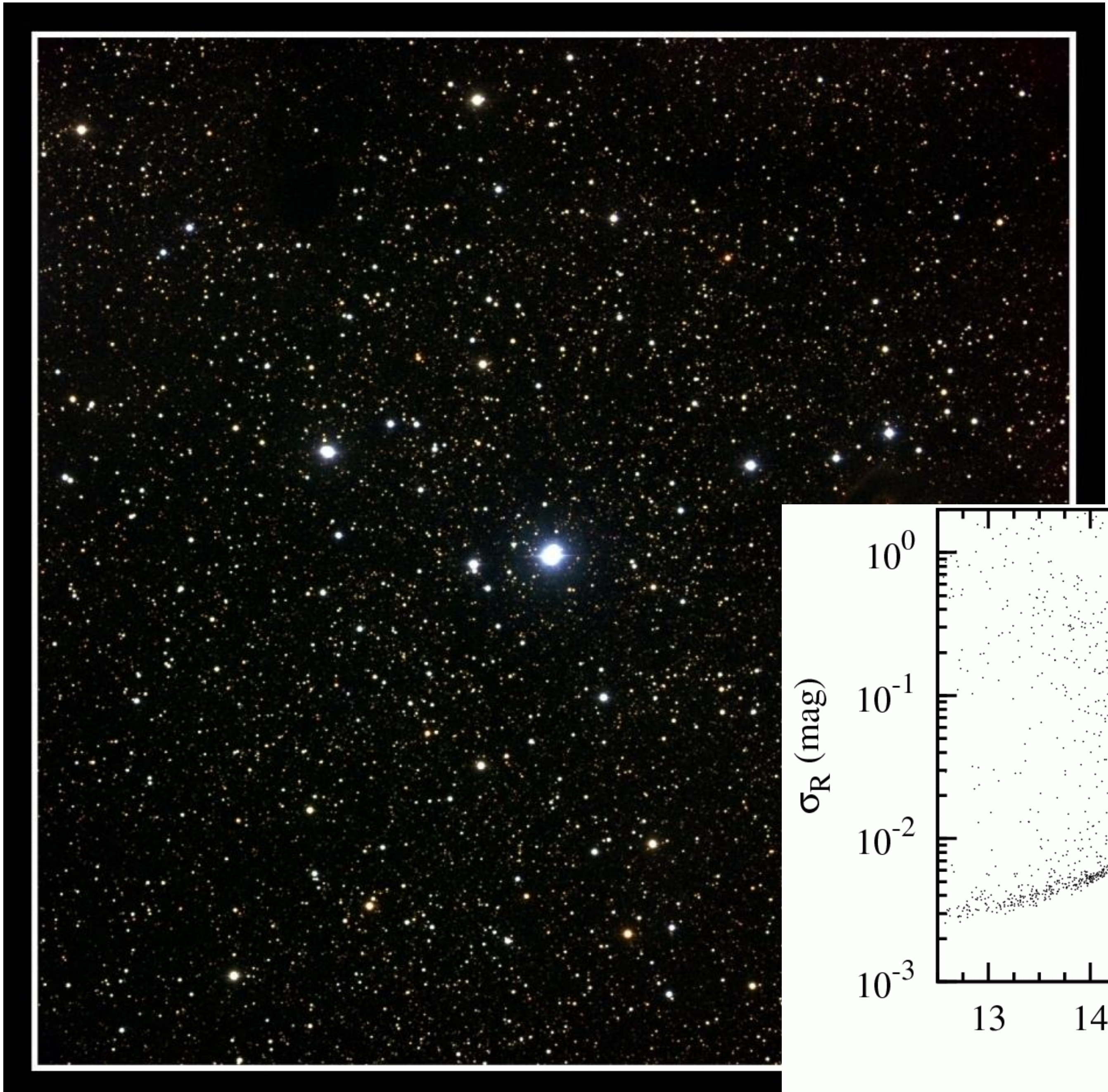
and being reduced (Seeliger)

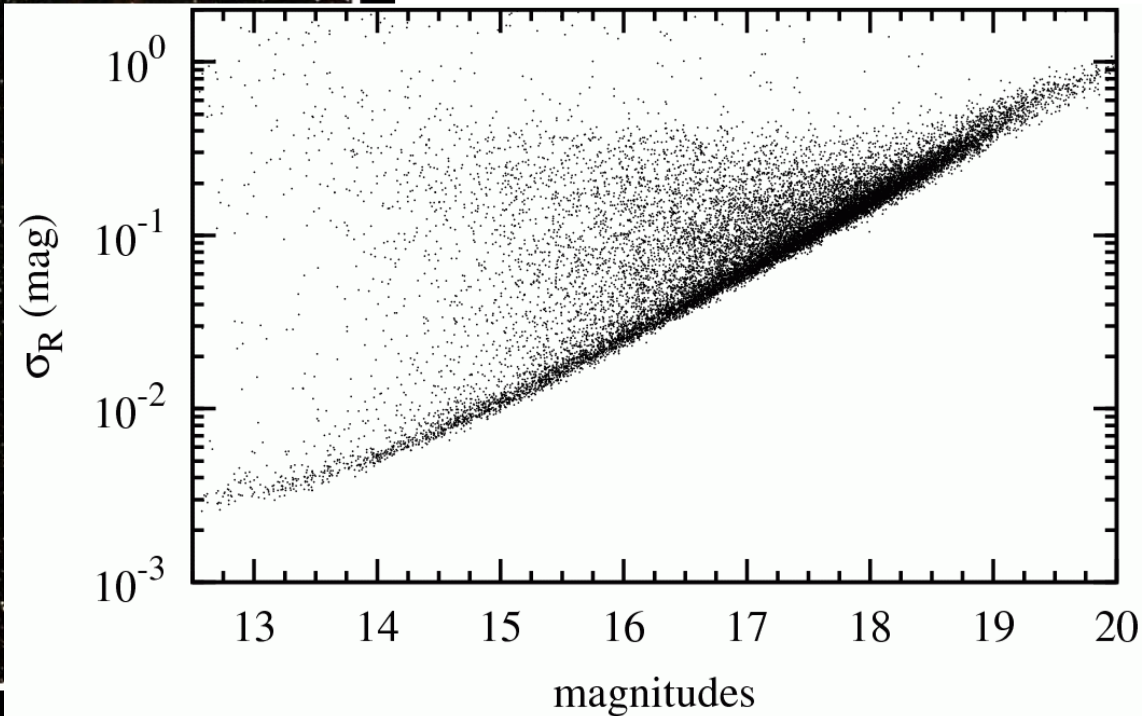

Trumpler-37
GSH / STK B,V, R-band composite
Mugrauer et al. 2009

Transit search in young clusters started with Schmidt Teleskop Kamera (STK) at 90 cm:

Few Myrs cluster Trumpler-37 with 18000 stars.

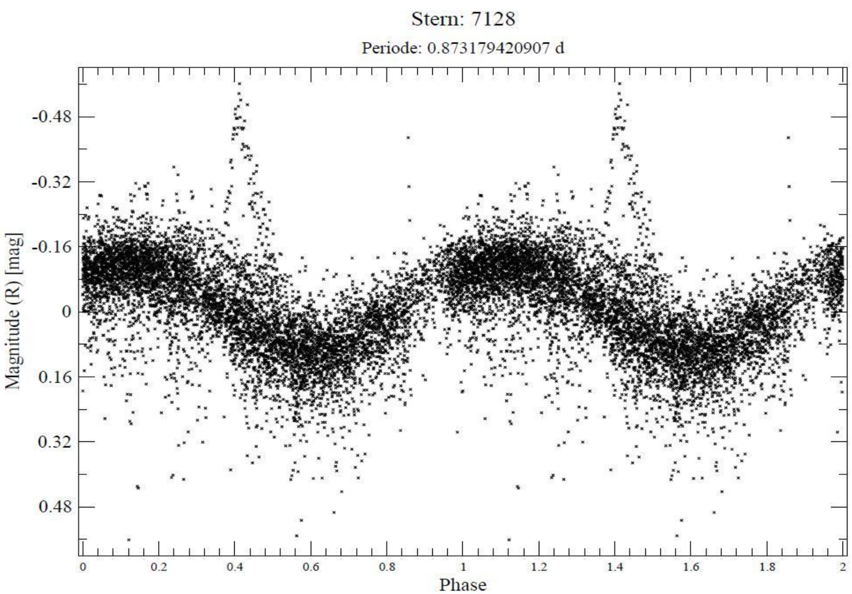
Other clusters later – 25 Ori also started



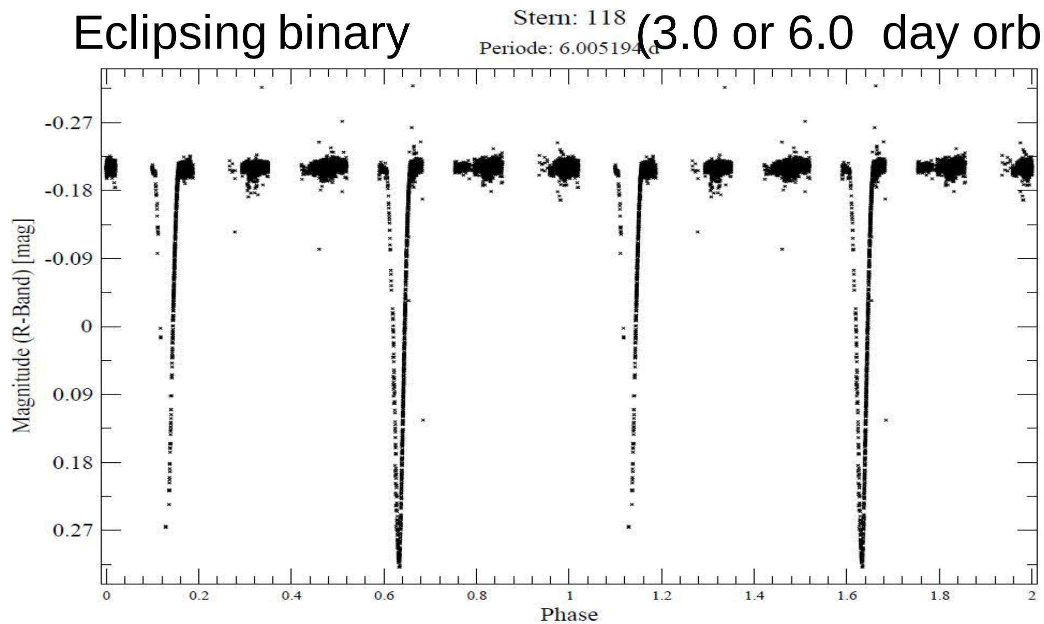


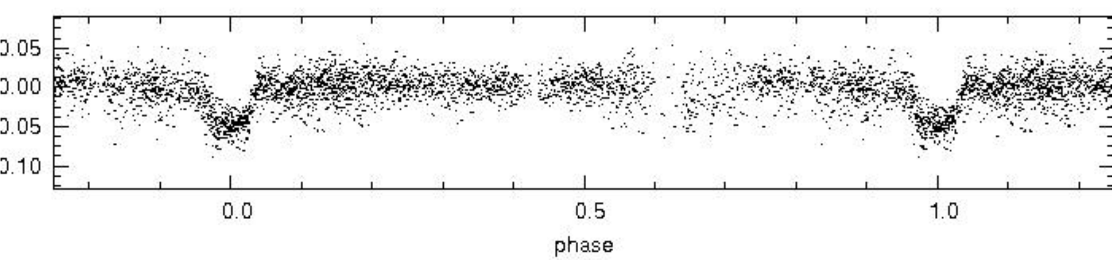
Preliminary Results

Rotating and flaring T Tauri star



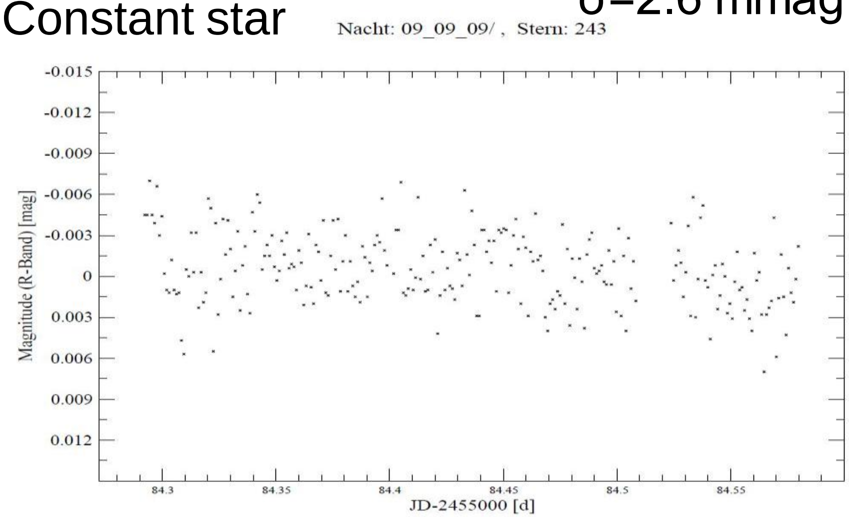
Eclipsing binary (3.0 or 6.0 day orbit?)





A first (planetary ?) transit candidate (?)
Follow-up ongoing …

Constant star σ=2.6 mmag



Target selection criteria for clusters:

- ➔ Age from ~1 Myrs to pre-MS time-scale of lowest mass stars
- ➔ distance, so that cluster stars fill roughly 1 square degree (mosaicing ok)
- ➔ many stars in best magnitude range (neither too bright to avoid daturation nor too faint to loose sensitivity)
- ➔ brighter than 16 mag, so that RV planet follow-up is possible
- ➔ not being studied better before, e.g. with Corot
- ➔ location on sky, so that many/most of our telescopes can observe
- ➔ else … ?

YETI: monitoring of young clusters to find ***young*** transit planets

But with a lot of additional science projects
e.g. eclipsing stars, flares, rotation periods, new members,
deep imaging by adding up all images, field stars, etc

See big table on one of the poster boards.

All groups should help in data reduction etc.

Please put in your science interest into that table.

Please also add more science projects and more clusters as you like

All (and more) to be discussed today

YETI: monitoring of young clusters to find young transit planets

→ Which clusters

→ which other targets (e.g. TTV)

→ which additional science projects

→ observing strategy: fields, filters, mosaicing, run length, repetitions, exposure times, etc etc

→ who will lead which projects in which clusters

→ distribution of work and responsibilities

→ Monthly (?) telecon ?

→ anything else …

→ MoU ?

Transit – Timing – Variation (TTV)

Can detect additional planets in systems
Due to gravitational interaction between planets,
Hence change in one or more orbital parameters, e.g. orbital period.

Few seconds of timing precision can detect few Earth mass planets,
e.g. in MMR

Our target selection criteria:

➔ Bright (to get sufficient S/N)

➔ Northern (to observe from Jena)

➔ not in Kepler or Corot fields (they do better)

➔ transits deeper than few milli-mag (to get timing better than +/- 30 sec)

➔ RV shows eccentricity **non-zero** (possibly indicating a perturber)

Transit timing variation in exoplanet WASP-3b*

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Accepted . Received ; in original form

ABSTRACT
Photometric follow-ups of transiting exoplanets may lead to discoveries of additional, less massive bodies in extrasolar systems. This is possible by detecting and then analysing variations in transit timing of transiting exoplanets. We present photometric observations gathered in 2009 and 2010 for exoplanet WASP-3b during the dedicated transit-timing-variation campaign. The observed transit timing cannot be explained by a constant period but by a periodic variation in the observations minus calculations diagram. Simplified models assuming the existence of a perturbing planet in the system and reproducing the observed variations of timing residuals were identified by three-body simulations. We found that the configuration with the hypothetical second planet of the mass of $\sim$15 $M_{\oplus}$, located close to the outer 2:1 mean motion resonance is the most likely scenario reproducing observed transit timing. We emphasize, however, that more observations are required to constrain better the parameters of the hypothetical second planet in WASP-3 system. For final interpretation not only transit timing but also photometric observations of the transit of the predicted second planet and the high precision radial-velocity data are needed.

Key words: planetary systems – stars: individual: WASP-3.

(TTV signal with much shorter periodicity could not be probed and cannot be excluded)

Summary:

➔ Planetary transit observations with 1-2m telescopes give +/- few milli-mag photometric and +/- 18 sec timing precision
➔ TTV signals ➔ perturbing planets

➔ Continous monitoring of young clusters with 1-2m telescopes can find young planets (+ rotation periods, flares, eSB binaries, etc)

➔ Advantage of „small“ telescopes: „risky“ projects and large amounts of time