

University-Observatory Jena



Technical und Scientific Projects 2006 – 2010

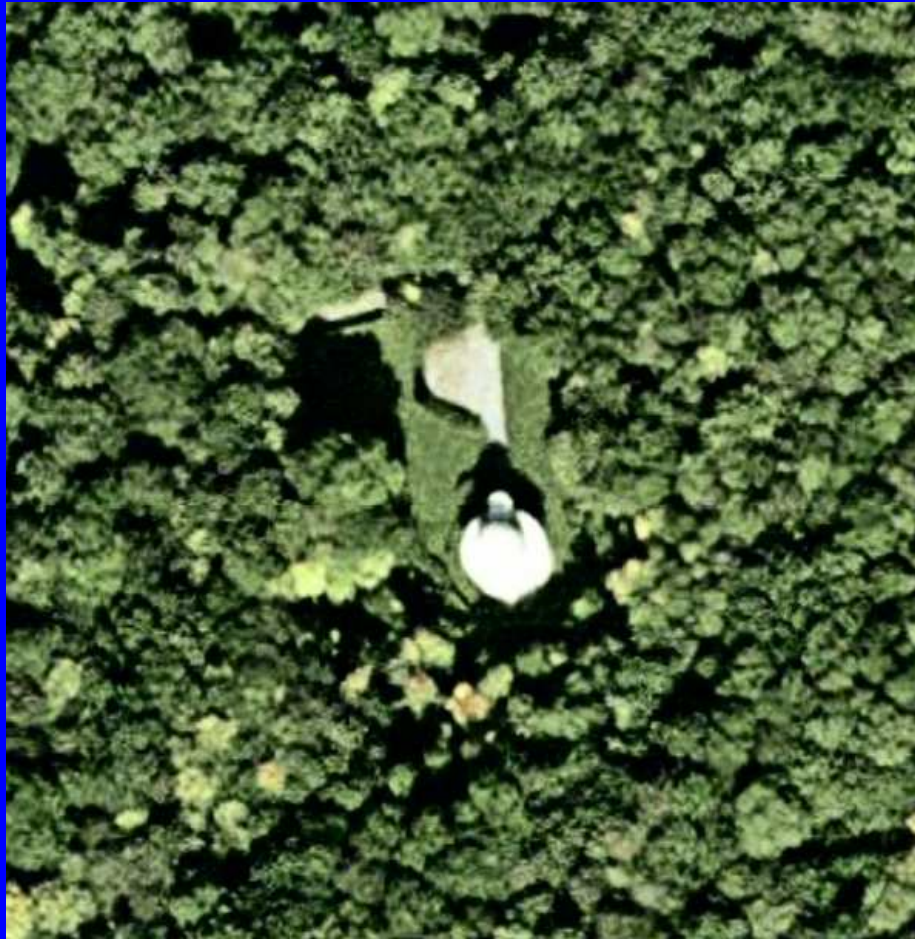
Markus Mugrauer (AIU Jena)



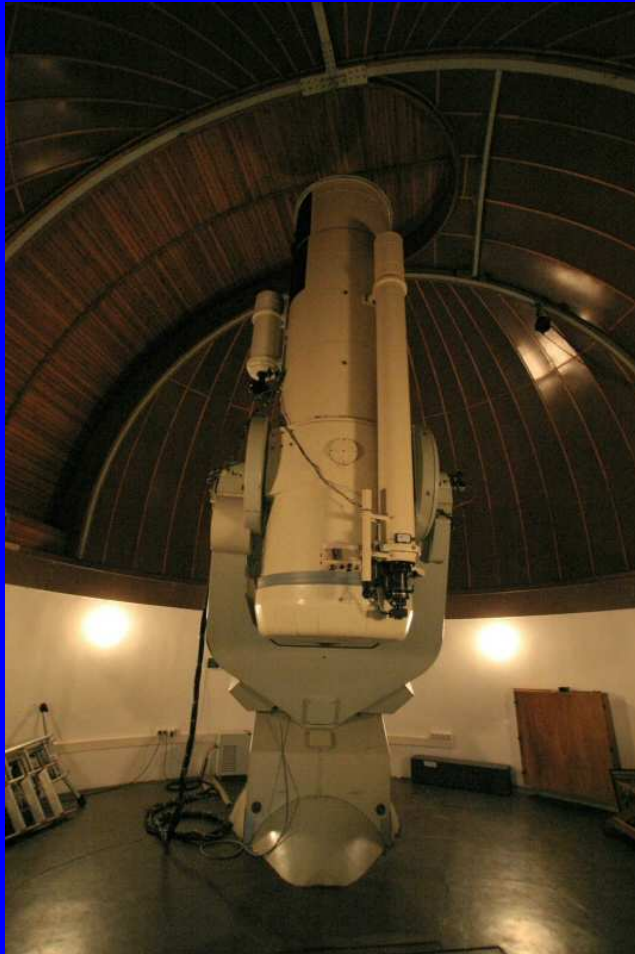
The University-Observatory Jena



The University-Observatory Jena



The Telescopes of the Observatory



90/60/180cm Schmidt-Telescope

- Schmidt-Mode: $D=60\text{cm}$, $f/D=3$
- Nasmyth-Mode: $D=90\text{cm}$, $f/D=15$
- Length = 4.72m , $m_{M1}=315\text{kg}$,
 $m_{\text{total}}=13\text{t}$ (6.4t movable)

20cm - Refractor

$f/D=15$, $m_{\text{total}}=120\text{kg}$

25cm - Cassegrain

$f/D=9$, $m_{\text{total}}=45\text{kg}$

Hardware for Telescope Control



RA-Axis without protection cover with its servomotors and the Hall-Referencesensor



Telescope Control Unit

Software for Telescope Control

GUITeC

(Großschwabhausen User Interface for Telescope Control)

```
GUITeC V1.2

** Telescopecontrol **

F1 - Tracking ON
F2 - Target-Coordinates
F3 - Pixel-Coordinates
F4 - Target-List

F5 - Return to Parkposition
F6 - Cover-Position
F7 - Manual Operation-Mode
F8 - Stop

F9 - Reference
F10 - Reset Pixel Offset
F11 - Error receipt
F12 - Exit

Current Coordinates:
LMST: 15h 31' 3''
RA : 5h 20' 30''
Dec : 52d 0' 0''

Az : 0.000
El : 89.929
AM : 1.000

Tracking OFF Reference ON
RA -Error : 0
Dec-Error : 0

Control-Field

Please press a Function-Key
to choose a function.
```

Task: Development of software for telescope control via PC

- First tests of hardware drivers begin of 2006
- Implementation mid of 2006
- continuous software improvements

Software for Telescope Control

GUITeC

(Großschwabhausen User Interface for Telescope Control)

Welcome to GUITeC

Reference Parkposition Coverposition Tracking

Manual mode Pixel correction Reset pixel_offset Stop

Clear error Autoguiding About Quit

Status

UT: 09:39:34
LMST: 03:40:04
TLO: 07:19:33
Pixel offset X: 0
Pixel offset Y: 0

Target

Right ascension: 0h 43m 18.0s
Declination: 41° 19' 26.0"
Target list Go

Current equatorial

Right ascension: 00h 43m 33.9s
Declination: +41° 19' 26.0"
Hour angle: 02h 56m 30.3s

Current horizontal

Azimuth: 269° 44' 43.0"
Elevation: +58° 28' 28.9"
Air mass: 1.173

Important GUITeC Properties:

- Model for precise telescope pointing on objects
- Pixel precise positioning of objects on the individual CCD-detectors of all three telescopes
- Output of actual object information (elevation, azimuth, airmass, ...)

Software for Telescope Control

GUITeC

(Großschwabhausen User Interface for Telescope Control)

Welcome to GUITeC

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Elevation: +58° 28' 28.9"

Air mass: 1.173

Important GUITeC Properties:

- Motion on certain fixed positions
 - Zenit (park position)
 - Horizon-North (cover position)
- Telescope control via manual control hand unit possible from the dome
- Logging of telescope motion

Software for Telescope Control

GUITeC

(Großschwabhausen User Interface for Telescope Control)



Important GUITeC Properties:

- Reference motion for automatical calibration of the pointing model
- Observations with target lists and much more ...
- continuous upgrades and optimization of GUITeC

Instruments of the University-Observatory

Cassegrain Teleskop Kamera (CTK)



CTK Timetable:

- Installation and first light begin of 2006
 - Characterization of CTK-detector properties (on sky) during 2006
 - Start of scientific projects mid of 2006
 - Decommissioning mid of 2010
- moved to 60cm telescope of the Stara Lesna Observatory, Slovakia

Instruments of the University-Observatory

Cassegrain Teleskop Kamera (CTK)



CTK Properties:

- Optics: Cassegrain $D=25\text{cm}$ ($f/D=9$)
- Detector
 - TK1024 (1024x1024 24 μm Pixel)
 - Pixelscale: $2.2065\pm 0.0008''/\text{Pixel}$
 - FoV: $37.7' \times 37.7'$
- External filter wheel
 - Bessell B, V, R, I, und Gunn-z Filter
- Limit: $V=17.2\text{mag}$ @ 1min

Instruments of the University-Observatory

Cassegrain Teleskop Kamera (CTK-II)



CTK-II Timetable:

- Installation July 2010 (test operations)
- Characterization of CTK-II detector properties mid of 2010
- Test of on sky performance, still ongoing
- Implementation of electronic focuser planned for begin of 2011

Instruments of the University-Observatory

Cassegrain Teleskop Kamera (CTK-II)



CTK-II Properties:

- Optics: Cassegrain $D=25\text{cm}$ ($f/D=9$)
- Detector
 - E2V PI47-10 (1056x1027 $13\mu\text{m}$ Pixel)
 - Pixelscale: $1.1956\pm 0.0001''/\text{Pixel}$
 - FoV: $21.0' \times 20.4'$
- External filter wheel
 - Bessell B, V, R, I, und Gunn-z Filter
- Limit: $V=18.2\text{mag}$ @ 1min

CTK-II FirstLight

Der offene Sternhaufen Trumpler 37
CTK-II V-Band (2340s) → V~20mag
Mugrauer et al. 03.08.2010



Instruments of the University-Observatory

Spectrograph FIASCO

(Fiber Amateur Spectrograph Casually Organized)



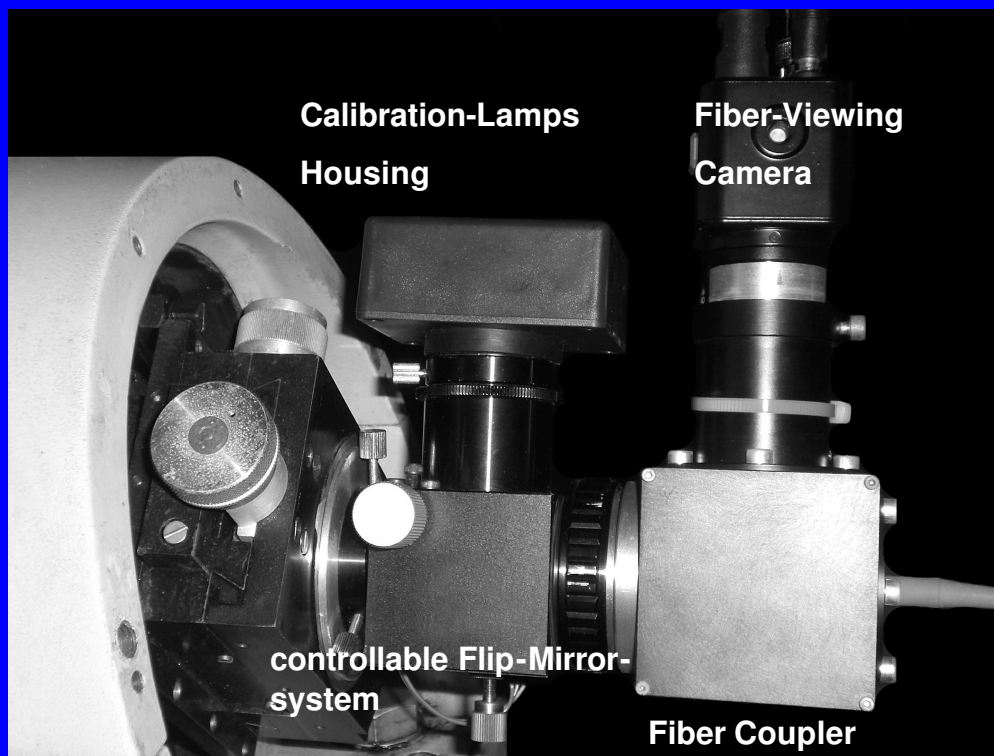
FIASCO timetable

- Begin of implementation end of 2007
- Characterization of FIASCO
- First Light on 31.5.2008
- Begin of scientific projects mid of 2008

Instruments of the University-Observatory

Spectrograph FIASCO

(Fiber Amateur Spectrograph Casually Organized)

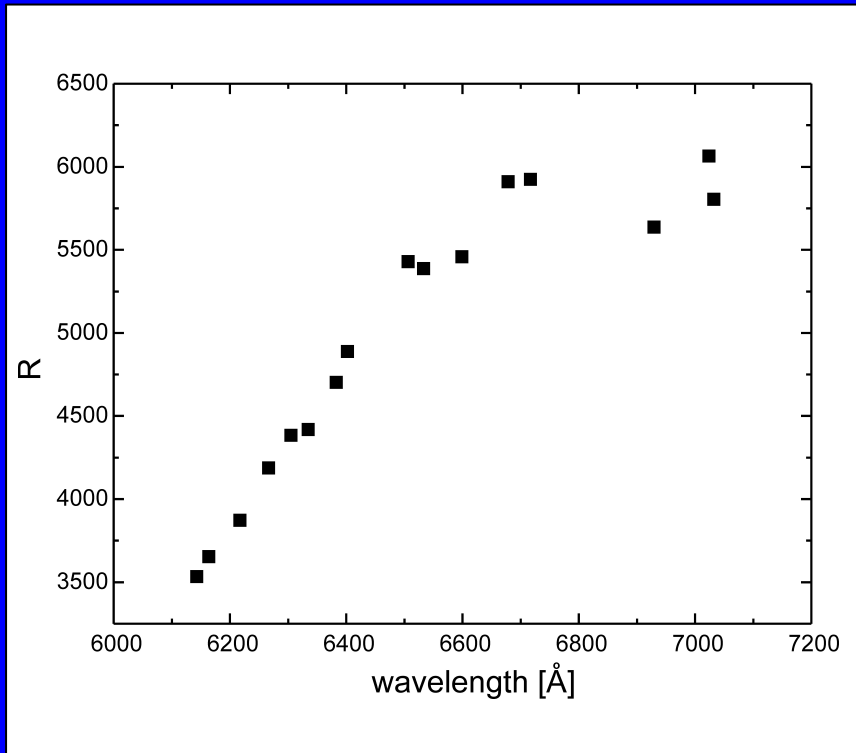


FIASCO Calibration Unit:

- Calibration unit operated from control room
- Bulb-lamp for internal Flats
- Ne Arc-lamp for wavelength calibration

Instruments of the University-Observatory

Spectrograph FIASCO

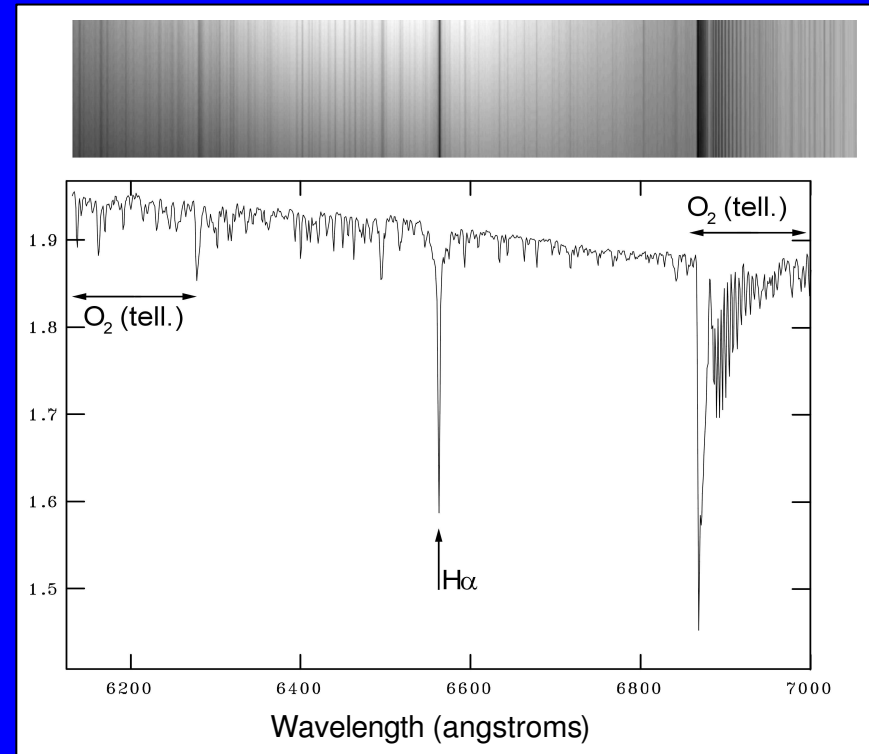
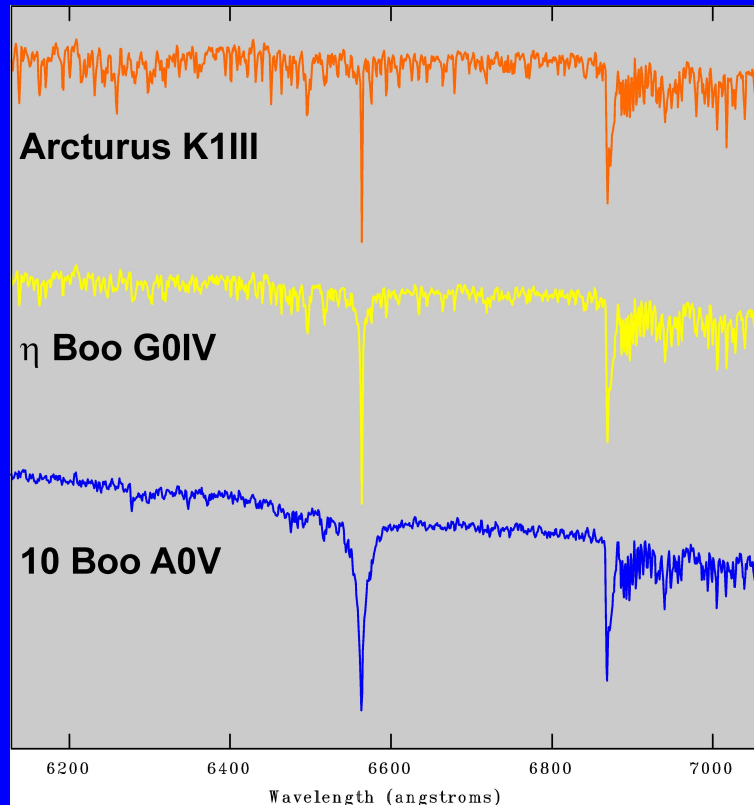


FIASCO Properties:

- Optics: Nasmyth D=90cm, f/D=15
- spectral range adjustable
- act. spectral range 6126 – 7059 Å
- $\Delta\lambda/\text{Pixel} = 0.912 \text{ Å}$
- $R = \lambda/\Delta\lambda = 5500 \text{ @ H}\alpha (6562 \text{ Å})$
- Limit: V=12mag @ 10min

Instruments of the University-Observatory

FIASCO - Firstlight



Instruments of the University-Observatory

Refraktor Teleskop Kamera (RTK)



RTK Properties:

- Optics: Achromat $D=20\text{cm}$, $f/D=15$
- CCD-Detector
 - KAF-402ME (765x510 $9\mu\text{m}$ Pixel)
 - Pixelscale: $\sim 0.62''/\text{Pixel}$
 - FoV: $7.9' \times 5.3'$
- Internal filter wheel
 - Bessell B, V, I, clear

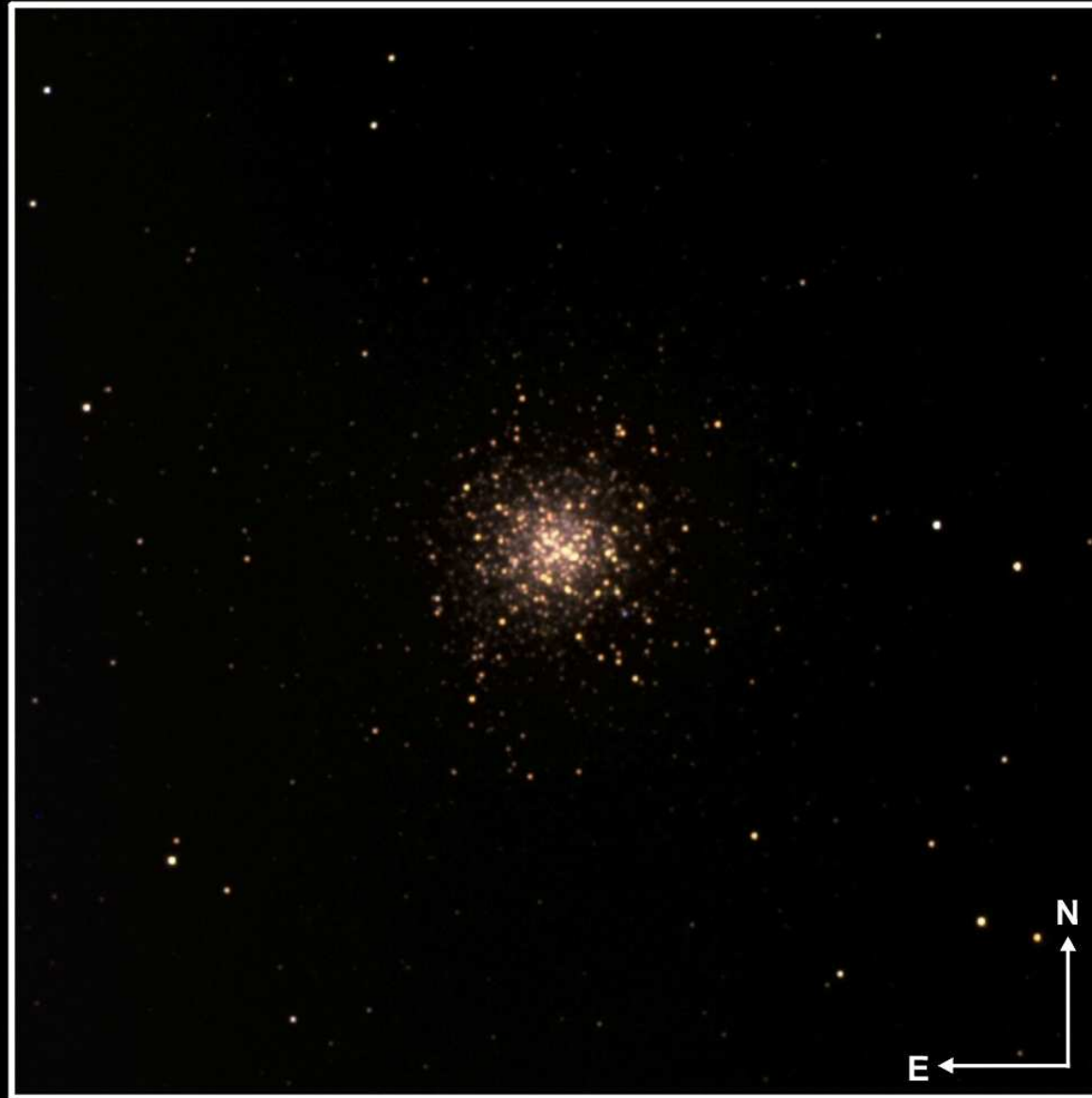
Instruments of the University-Observatory

Refraktor Teleskop Kamera (RTK)



RTK Properties:

- fast download speed <1s (full frame)
- integration times down to 0.05s
→ Lucky Imaging, Seeing-Sensing
- RTK First Light on 22.10.2008



CTK B+V+R
Der Kugelsternhaufen M13

Mugrauer, Rätz, Schmidt, 17.10.2006



RTK First Light

M13

RTK 60s
Mugrauer, Rätz, Költzsch, Rammo



Instruments of the University-Observatory

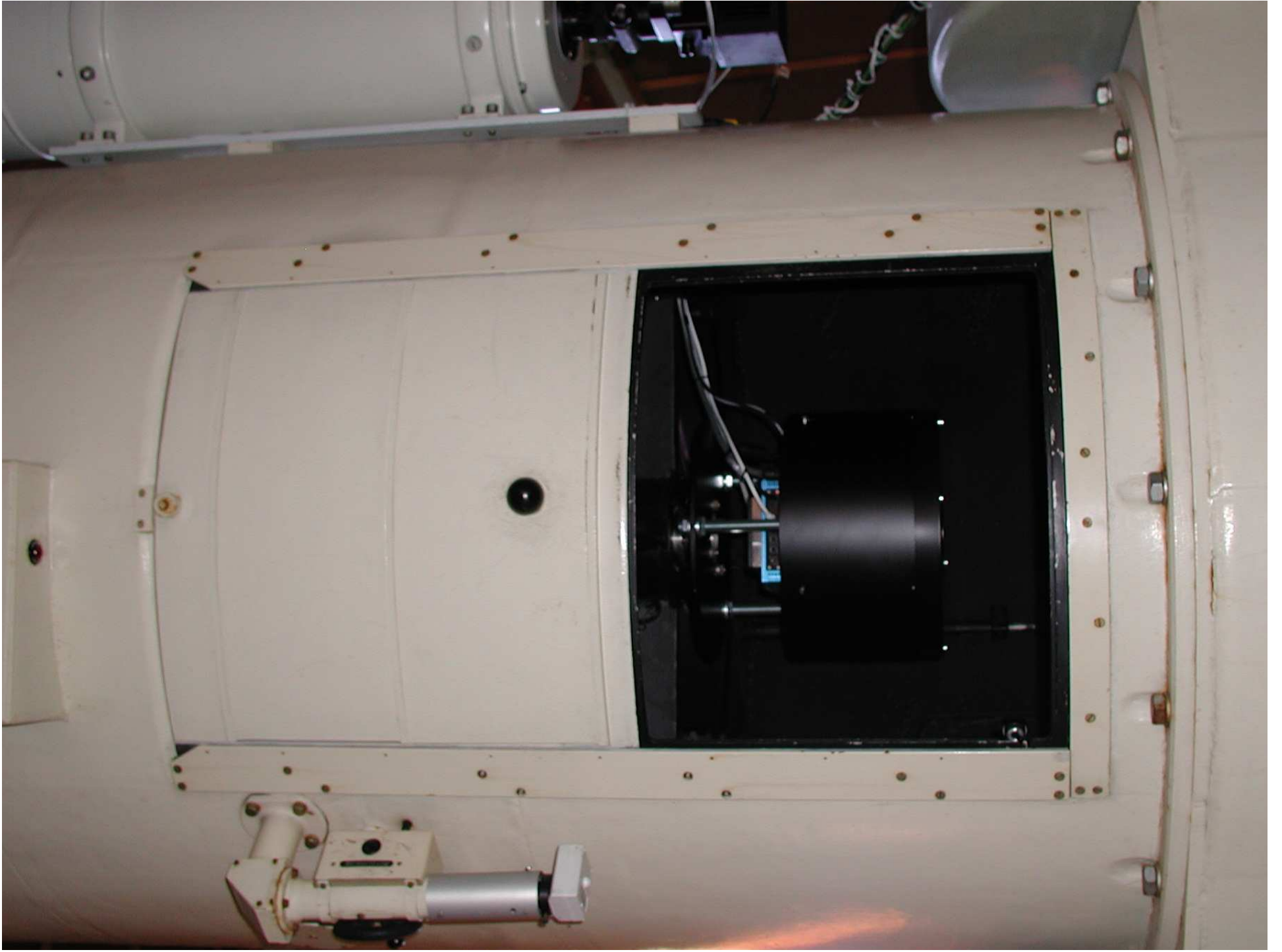
Schmidt Teleskop Kamera (STK)



STK Properties:

- Optics: Schmidt D=60cm (f/D=3)
- Detector:
 - E2V CCD42-40 (2048² 13.5 μ m Pixel)
 - Pixelscale: ~1.55"/Pixel
 - FoV: 52.8' x 52.8'
 - Filter: Bessell B, V, R, I, Gunn-z, clear
- Limit: V=19.2mag @ 1min





Instruments of the University-Observatory

Schmidt Teleskop Kamera (STK)



STK Properties:

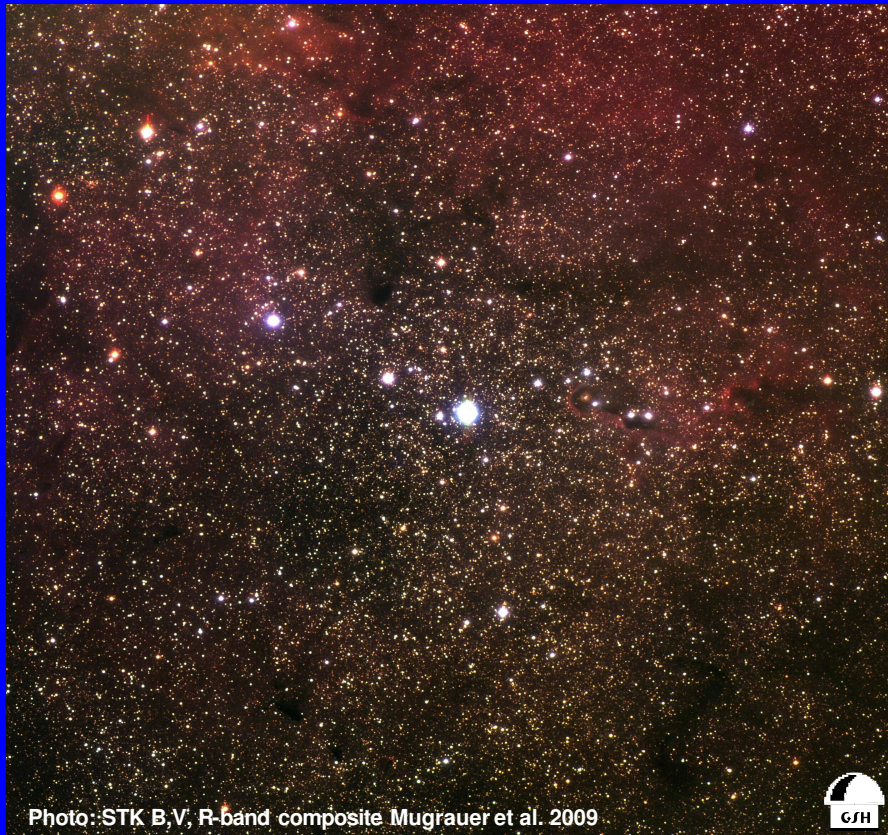
- Optics: Schmidt D=60cm (f/D=3)
- Detector:
 - E2V CCD42-40 (2048² 13.5 μ m Pixel)
 - Pixelscale: ~1.55"/Pixel
 - FoV: 52.8' x 52.8'
 - Filter: Bessell B, V, R, I, Gunn-z, clear
- Limit: V=19.2mag @ 1min

STK FirstLight

$h+\chi$ Per (NGC869 & 884)
Mugrauer et al. 05.02.2009



Scientific Projects at University-Observatory Jena



- Photometric monitoring of young open clusters to detect exoplanets and variable stars
- Long-term monitoring of transiting planets
- Long-term (simultaneous) spectrophotometric monitoring of young variable and active stars
- Observations of binary and multiple stars
- Observations of actual astronomical events (e.g. outburst of comets, SN, ...)

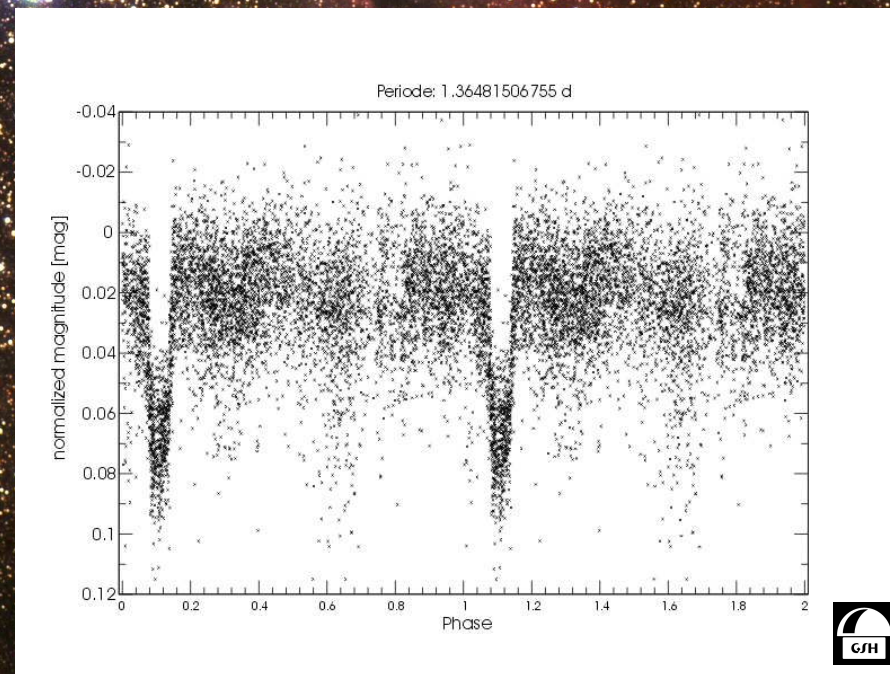
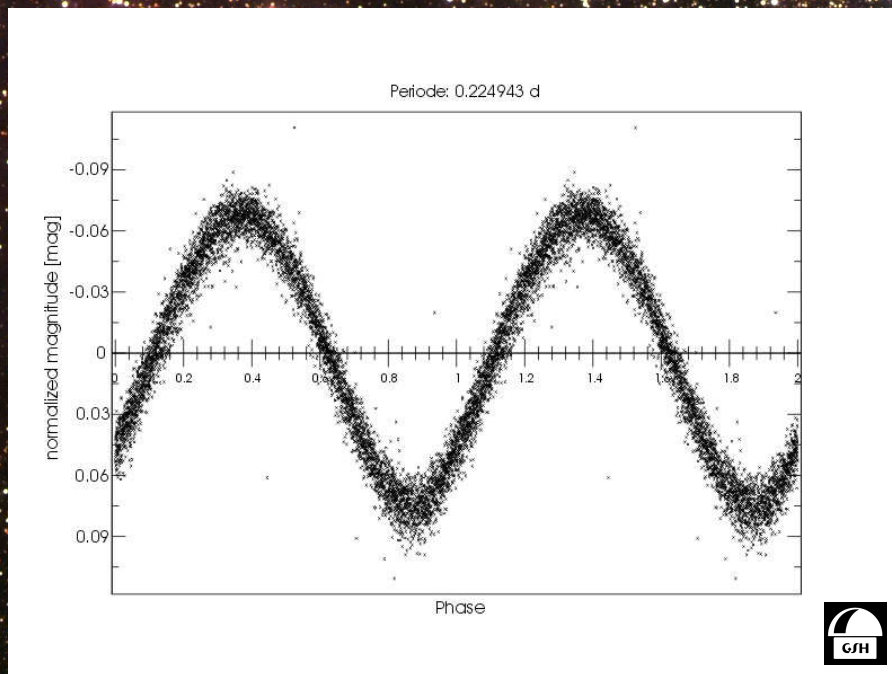
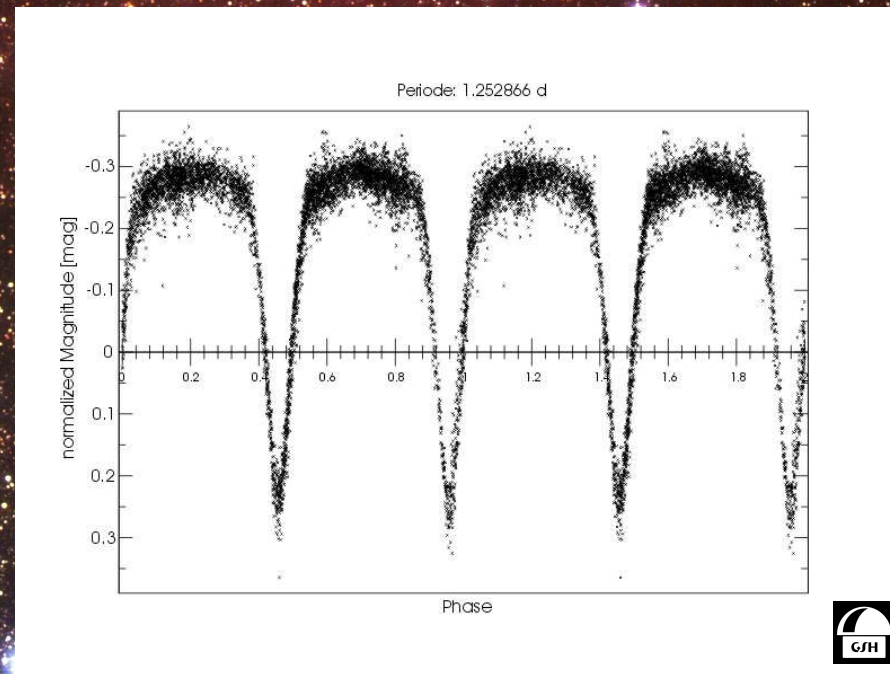
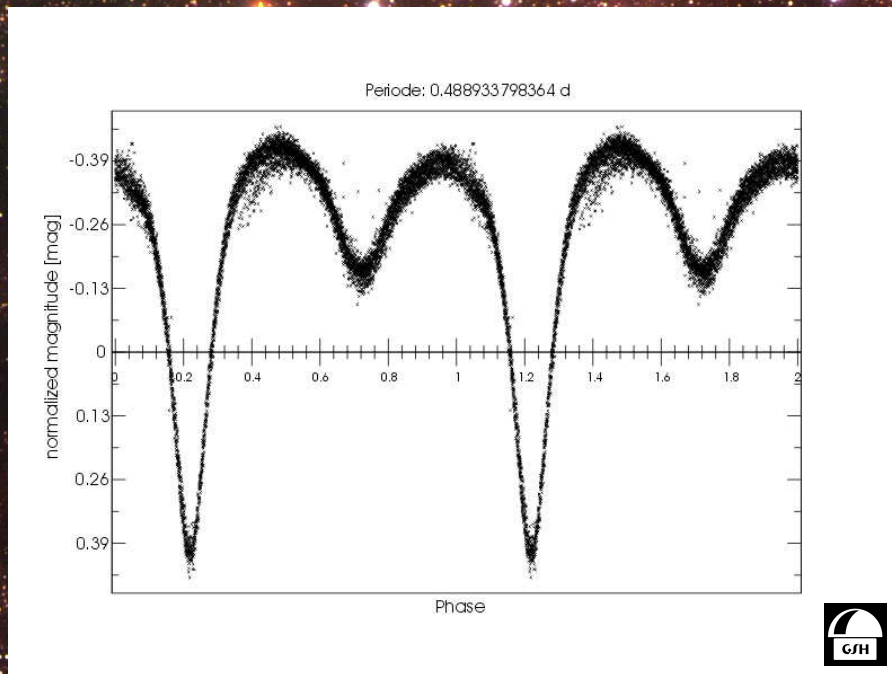


Photo: Trumpler 37

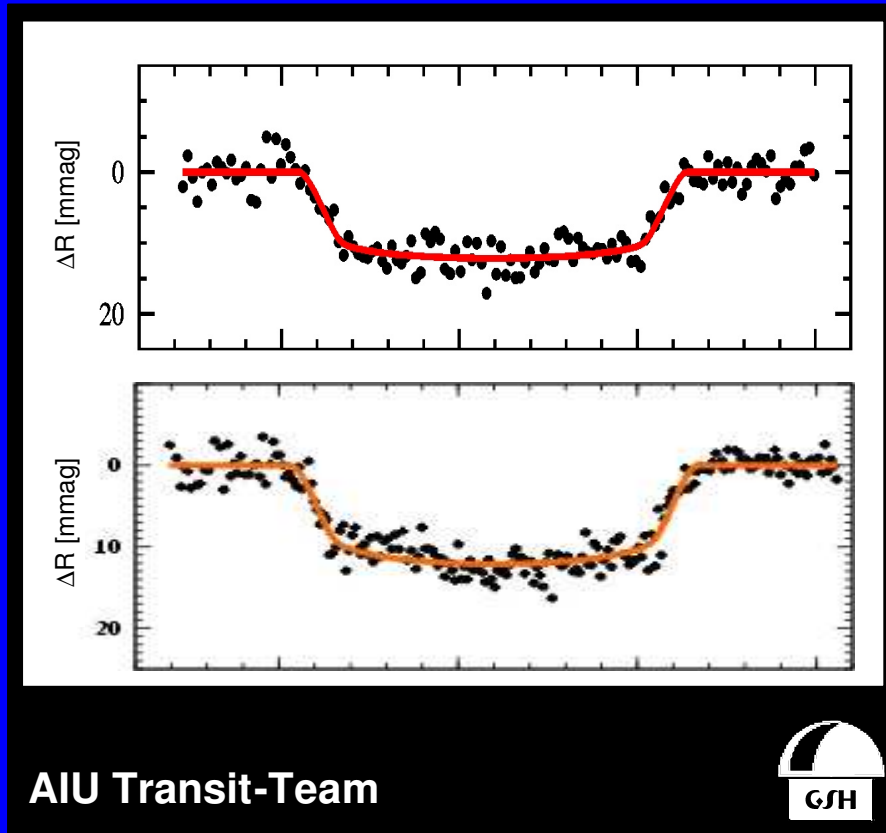
STK B, V, R-band composite

Mugrauer et al. 2009



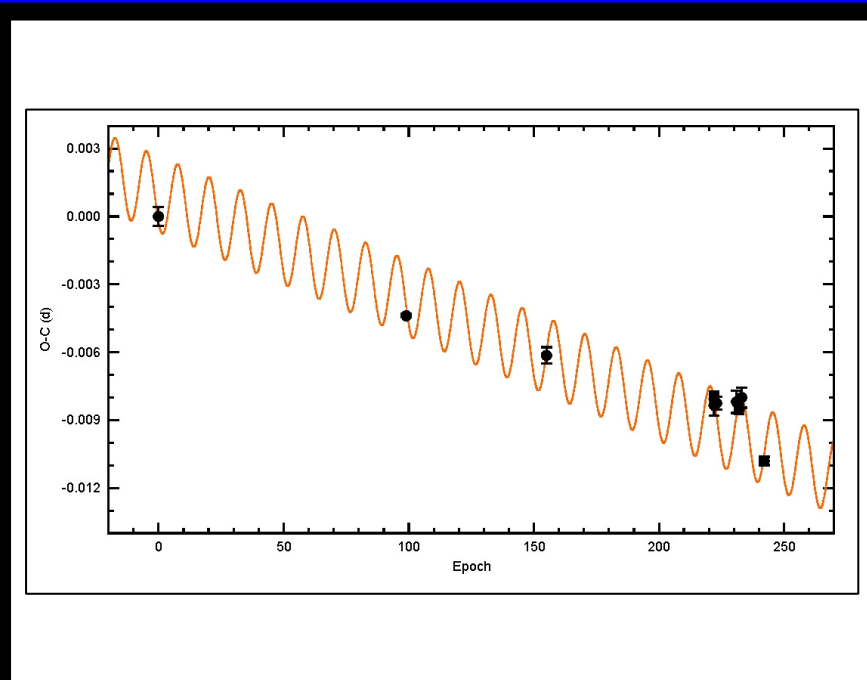


Scientific Projects at University-Observatory Jena



- Photometric monitoring of young open clusters to detect exoplanets and variable stars
- Long-term monitoring of transiting planets
- Long-term (simultaneous) spectrophotometric monitoring of young variable and active stars
- Observations of binary and multiple stars
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Scientific Projects at University-Observatory Jena



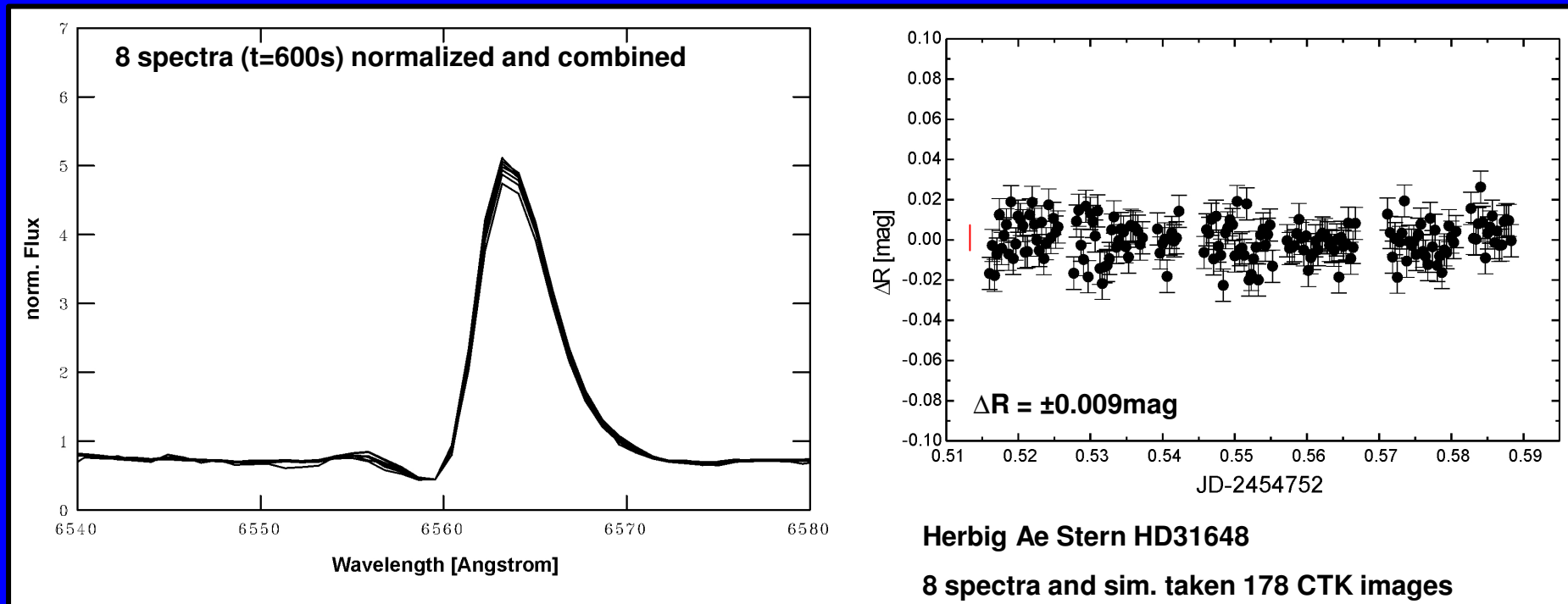
AIU Transit-Team



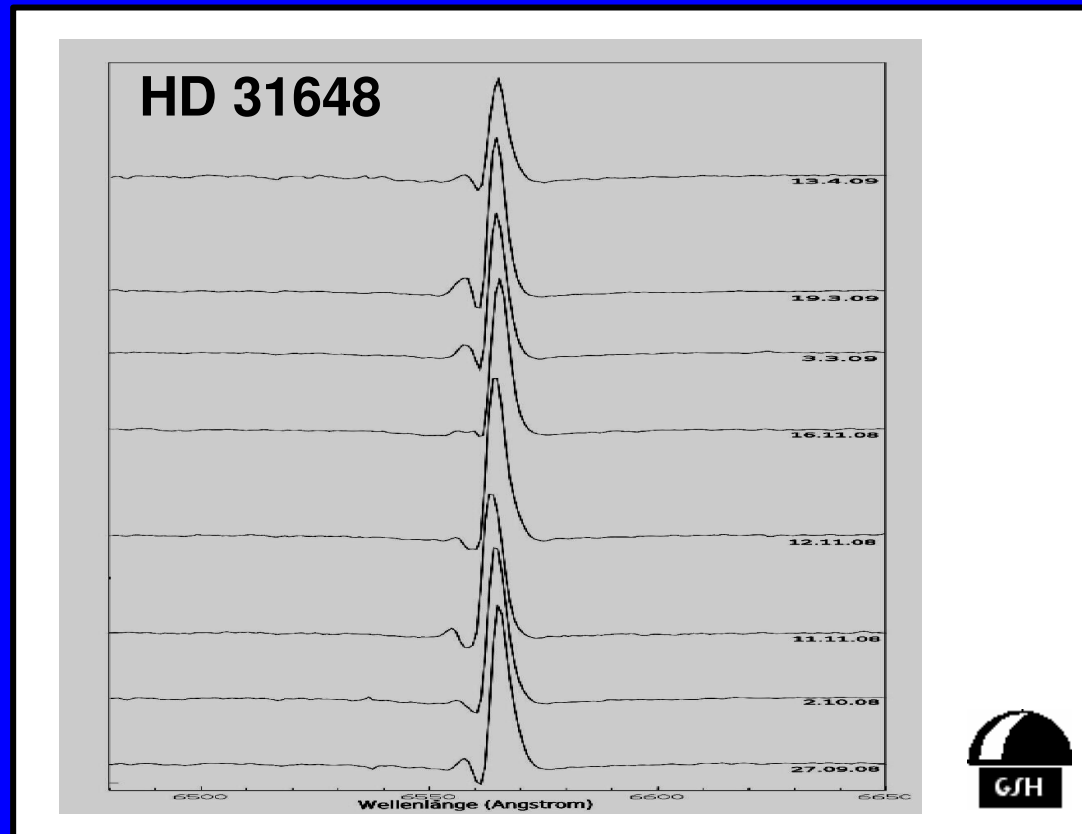
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- Observations of binary and multiple stars
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Scientific Projects at University-Observatory Jena



Scientific Projects at University-Observatory Jena



Scientific Projects at University-Observatory Jena



RTK
Clear



10 arcsec

Scientific Projects at University-Observatory Jena

17P/Holmes on 29.10.2007

CTK VRI 20s each



Mugrauer et al. 2007



- Photometric monitoring of young open clusters to detect exoplanets and variable stars
- Long-term monitoring of transiting planets
- Long-term (simultaneous) spectrophotometric monitoring of young variable and active stars
- Observations of binary and multiple stars
- Observations of actual astronomical events (e.g. outburst of comets, SN, ...)



17P/Holmes on 01.12.2007

CTK-Mosaic 1.6°x1.6° V-Band (300s)

Mugrauer 2008



Teaching at University-Observatory Jena



- Astronomical practical courses for students of physics at FSU Jena
- Astronomy teaching in step with actual practice (use what you have learned)
- Scientific observing projects offered for Diplom-, Bachelor- and Master theses
- Observing campaigns for PhD students