Mt. Suhora Observatory and my stays there ...

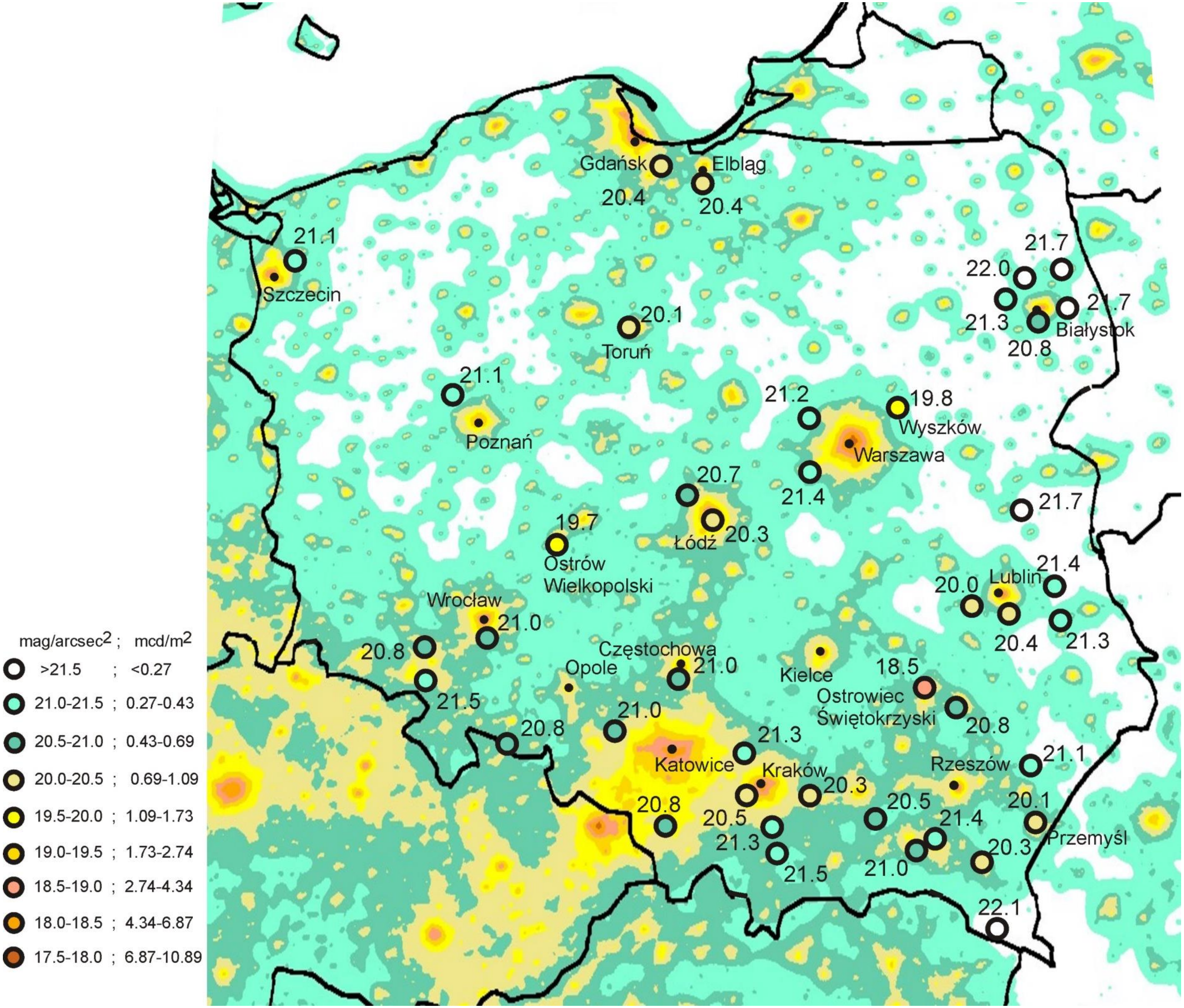
Jan Janík

Dedicated to the 35th anniversary


A bit of history ...

A bit of history

- prof. Jerzy Kreiner (Akademia Pedagogiczna w Krakowie)
  - necessary condition - new observatory
  - good astroclimate
  - not so far from Cracow
  - but where?
    - Bieszczady Mountains
    - Gorce Mountains

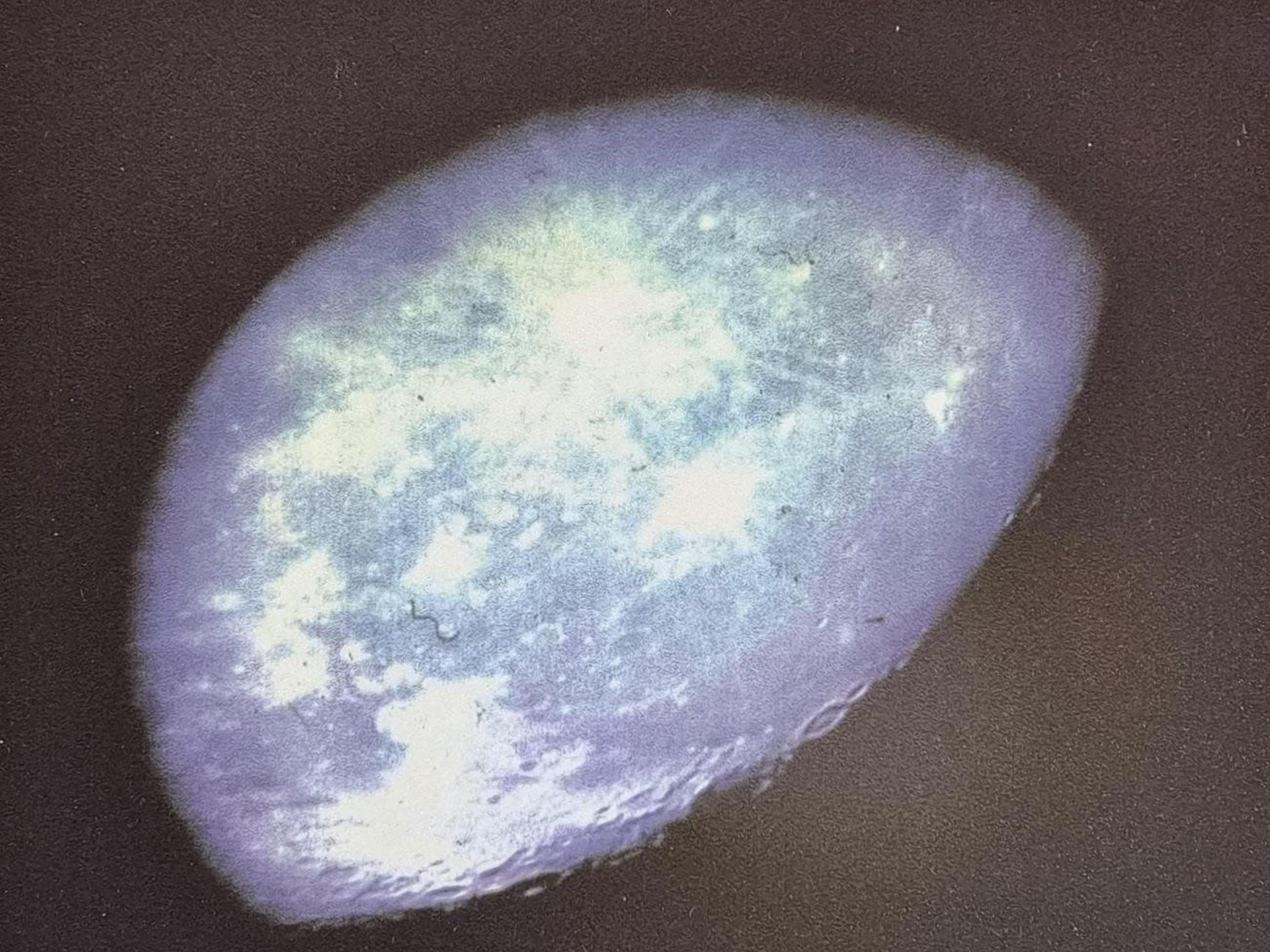

Gdańsk
Elbląg
20.4
20.4
21.1
Szczecin
20.1
Toruń
21.7
22.0
21.7
21.3
Białystok
20.8
21.1
Poznań
21.2
19.8
Wyszków
Warszawa
20.7
21.4
21.7
19.7
Ostrów
Wielkopolski
Łódź
20.3
Lublin
21.4
20.0
20.4
21.3
Wrocław
21.0
20.8
21.5
Częstochowa
21.0
Opole
Kielce
18.5
Ostrowiec
Świętokrzyski
20.8
21.0
20.8
21.3
Katowice
Kraków
20.3
Rzeszów
21.1
20.1
Przemyśl
20.8
20.5
21.3
21.5
20.5
21.4
21.0
20.3
22.1
mag/arcsec^2 ; mcd/m^2
>21.5 ; <0.27
21.0-21.5 ; 0.27-0.43
20.5-21.0 ; 0.43-0.69
20.0-20.5 ; 0.69-1.09
19.5-20.0 ; 1.09-1.73
19.0-19.5 ; 1.73-2.74
18.5-19.0 ; 2.74-4.34
18.0-18.5 ; 4.34-6.87
17.5-18.0 ; 6.87-10.89

A bit of history

- construction 1986-1987 (summer season)

A bit of history

- construction 1986 – 1987 (summer season)
- 4.10.1987 first light (Moon)



A bit of history

- construction 1986 – 1987 (summer season)
- 4.10.1987 first light (Moon)
- 5.11.1987 official opening ceremony

A bit of history

- construction 1986 – 1987 (summer season)
- 4.10.1987 first light (Moon)
- 5.11.1987 official opening ceremony
- 15.2.1988 first photoelectric observations
- 1.9.1991 first CCD light in Poland
- 2002 3-chanell photomultiplier
- 2011 CCD camera in primary focus

First visit
(4. 2. 2006)

Na observatoři na Suhoře jsme teď poprvé, ale rozhodně ne naposledy! Velmi oceňujeme pohostinnost, srdečnost a kvalitu práce celého osazenstva observatoře s profesorem Jerzym Kreinerem v čele.

Bude nám ctí a potěšením pokračovat ve všeobecně výhodné vědecké i lidské spolupráci, jejíž základy byly právě teď položeny.

4.2.2006

Zdeněk Mikulášek
vedoucí oddělení astrofyziky
ÚTFA Masarykovy univerzity
v Brně, Česká republika

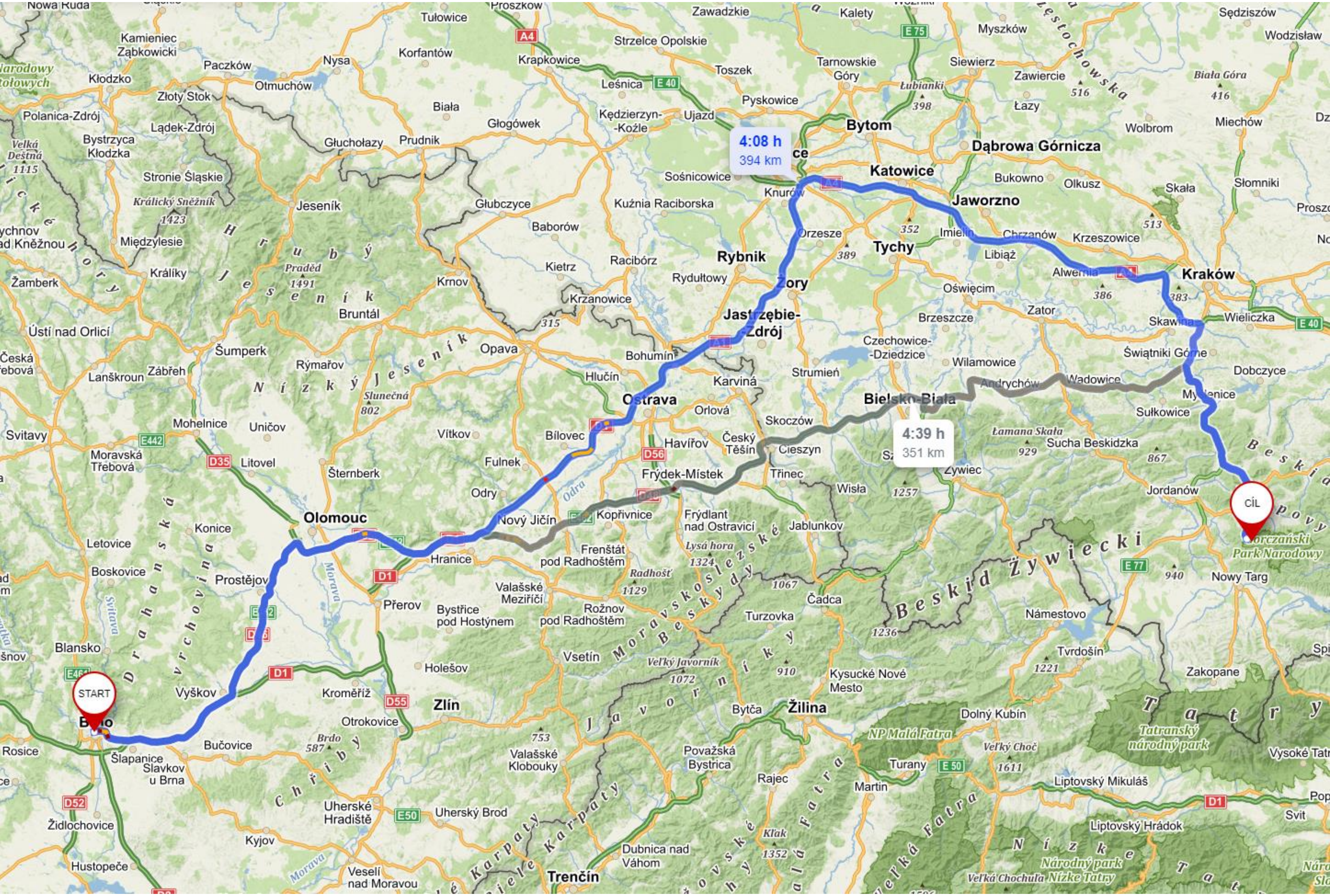
Miloslav Zejda

[illegible]

How to get to Suhora Observatory

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)

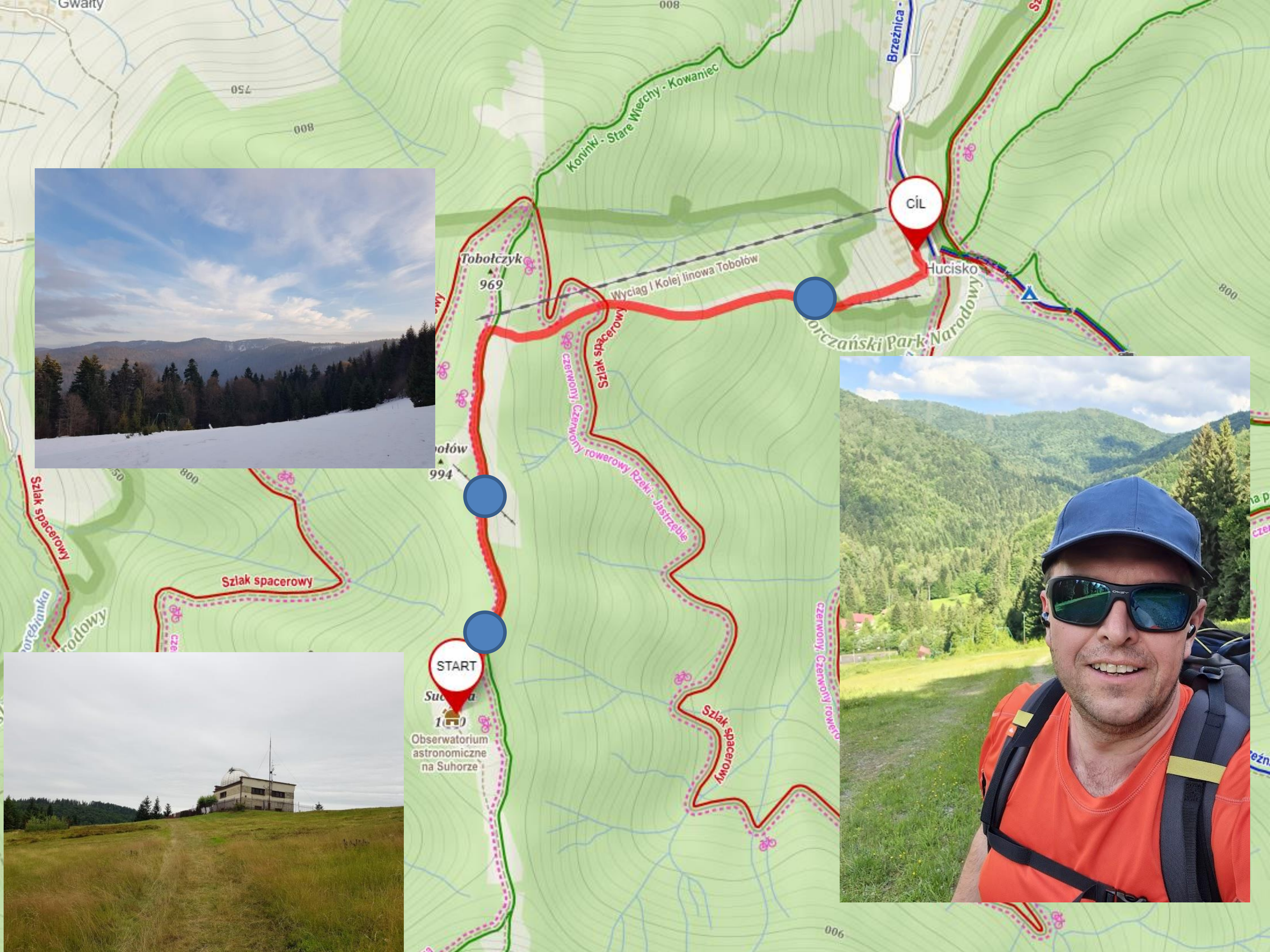

START
CÍL
4:08 h
394 km
4:39 h
351 km
Brno
Vyškov
Prostějov
Olomouc
Přerov
Hranice
Nový Jičín
Kopřivnice
Frýdek-Místek
Ostrava
Bílovec
Bohumín
Karviná
Havířov
Český Těšín
Cieszyn
Třinec
Jastrzębie-Zdrój
Żory
Rybnik
Orzesze
Knurów
Gliwice
Katowice
Bytom
Dąbrowa Górnicza
Tychy
Jaworzno
Chrzanów
Alwernia
Kraków
Skawina
Wieliczka
Myślenice
Bielsko-Biała
Andrychów
Wadowice
Żywiec
Nowy Targ
Zakopane
Zlín
Žilina
Trenčín
Opava
Krnov
Bruntál
Jeseník
Šumperk
Kroměříž
Vsetín
Valašské Meziříčí
Sucha Beskidzka
Jordanów
Oświęcim
Tatry
Beskid Żywiecki
Moravskoslezské Beskydy
Gorczański Park Narodowy
Tatranský národný park
NP Malá Fatra

Chrzanów
Krakov
Balice
Niepołomice
Tarnov
Zátor
Wieliczka
Skawina
Bochnia
Brzesko
Pilzno
Nowy Wiśnicz
Gdów
Dobczyce
Tuchów
Wadowice
Andrychów
Myślenice
Czchów
Ciężkowice
Sucha Beskidzka
Gródek nad Dunajcem
Tymbark
Limanowa
Biecz
Mszana Dolna
Zawoja
Jordanów
Gorlice
Nový Sadec
Grybów
Gorce Mountains
Babia hora
Stary Sącz
Nowy Targ
Szczawnica
Niedzica
Krynica-Zdrój
Wysowa-Zdrój
Tylicz
Námestovo
Białka Tatrzańska
Bukowina Tatrzańska
Trstená
Muszyna
Pieninský-OP
Zakopané
Stará Ľubovňa
Bardejov
Oravský Podzámok
Zuberec
Dolný Kubín
Gerlachovský štít
Vysoké Tatry
Kežmarok
Lipany
Visla


6T3 8435

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)
- hour-long hike app. 2.4 km (on first 1.5 km elevation 350 m)
  - on foot (mainly)



Gwałty
750
800
Koninki - Stare Wierchy - Kowaniec
Brzeżnica
CÍL
Hucisko
Tobołczyk
969
Wyciąg i Kolej linowa Tobołów
994
800
Szlak spacerowy
Szlak spacerowy
Szlak spacerowy
czerwony Czerwony rowerowy Rzeki - Jastrzębie
Szlak spacerowy
START
Obserwatorium astronomiczne na Suhorze

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)
- hour-long hike app. 2.4 km (on first 1.5 km elevation 350 m)
  - on foot (mainly)
  - quad (exceptionally)


ProjectSoft

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)
- hour-long hike app. 2.4 km (on first 1.5 km elevation 350 m)
  - on foot (mainly)
  - quad (exceptionally)
  - on ski (preferable direction downhill in winter ☺)


SHAPE ONE
HEAD


Wedze

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)
- hour-long hike app. 2.4 km (on first 1.5 km elevation 350 m)
  - on foot (mainly)
  - quad (exceptionally)
  - on ski (preferable direction downhill in winter ☺)
  - snowcat (rarely)


KRAFTWAGEN-
VERBANDKASTEN

Pisten Bully

How to get to Suhora Observatory

- trip by car (4 – 4.5 hours from Brno)
- hour-long hike app. 2.4 km (on first 1.5 km elevation 350 m)
  - on foot (mainly)
  - quad (exceptionally)
  - on ski (preferable direction downhill in winter ☺)
  - snowcat (rarely)
  - cableway (depends on season and weather)

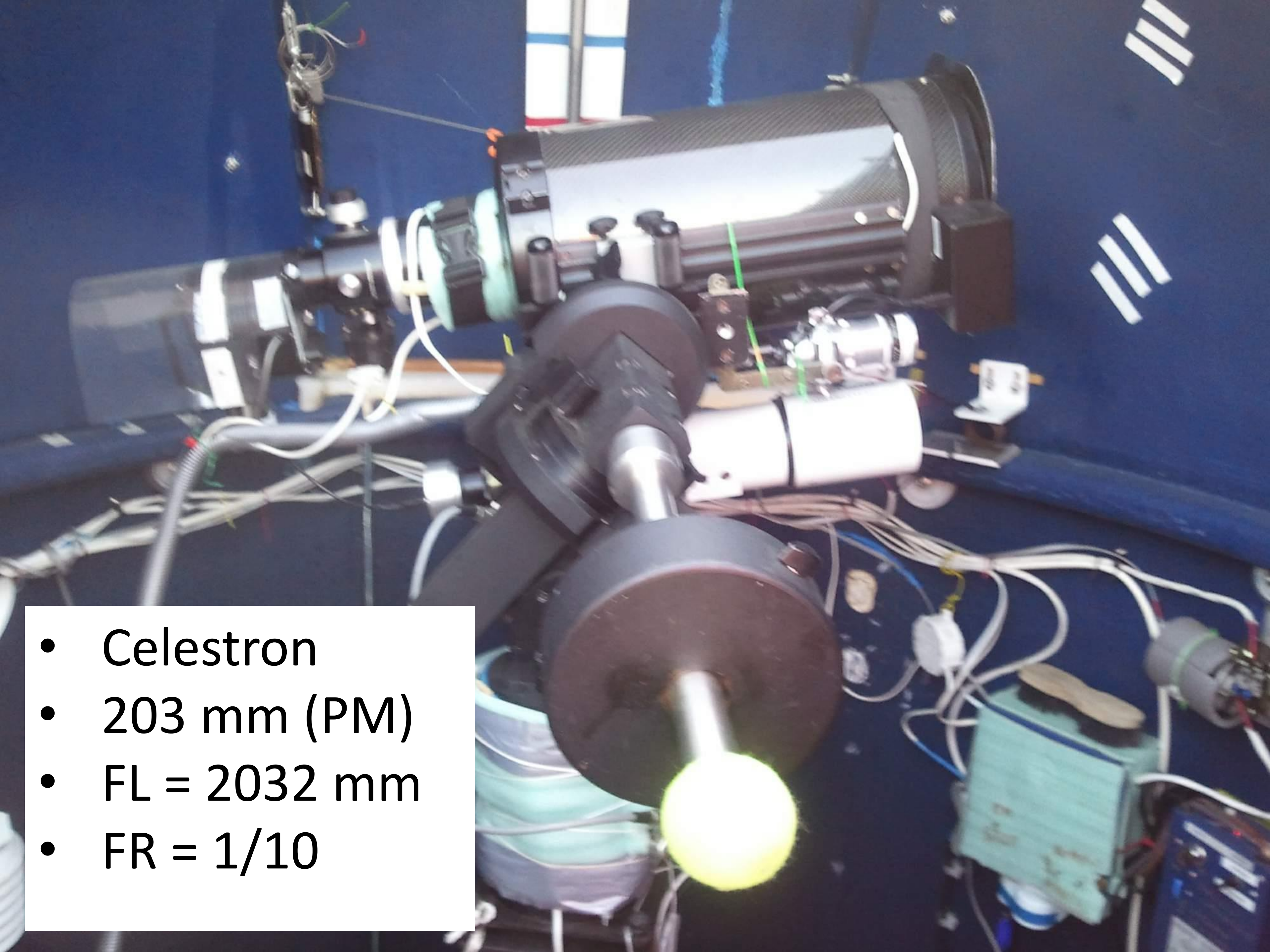

154

Telescopes and equipment

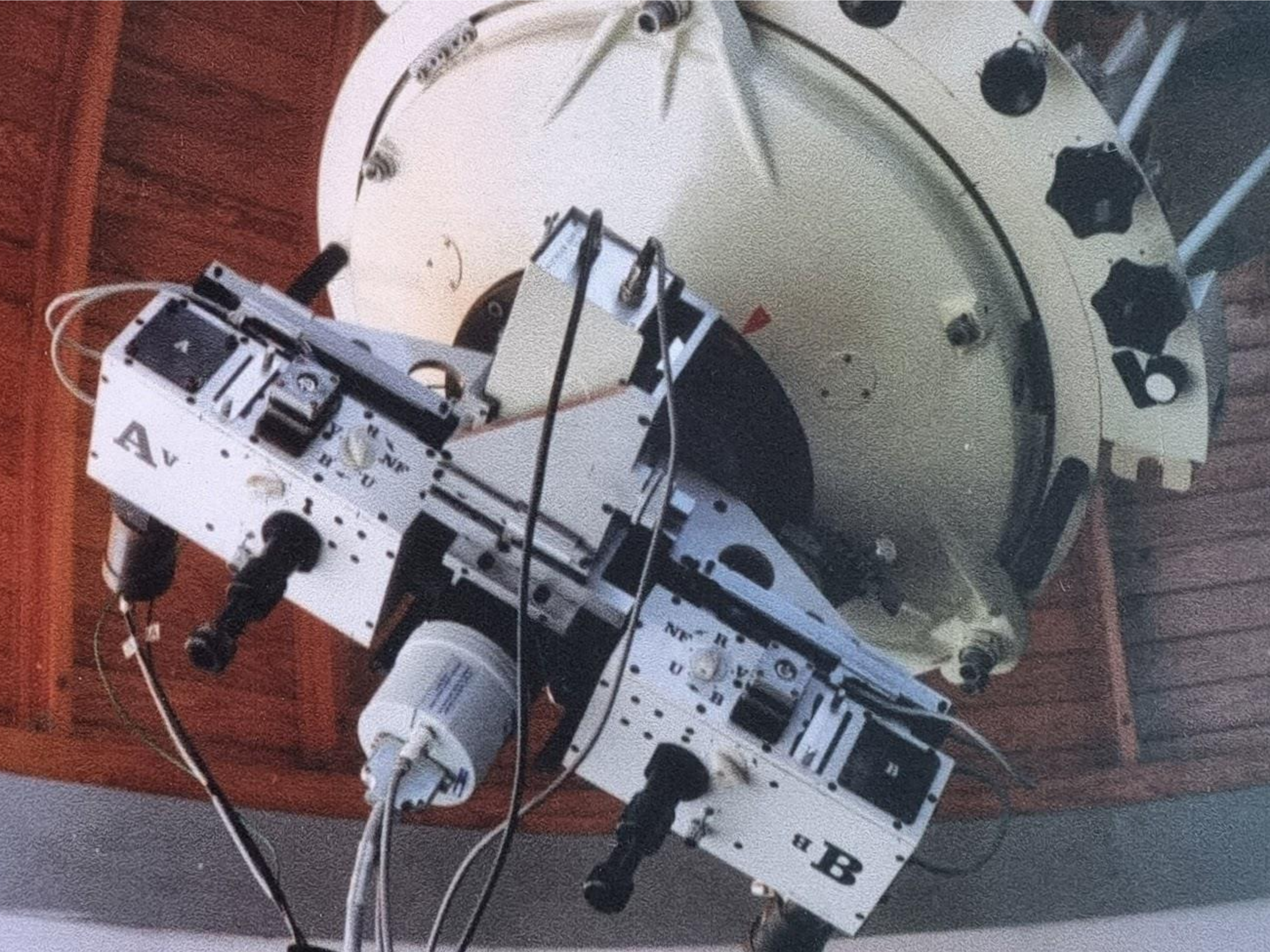
- Zeiss
- German mount
- 600 mm (PM)
- 183 mm (SM)
- Cassegrain focus
- FL = 7500 mm
- FR = 1/12.5

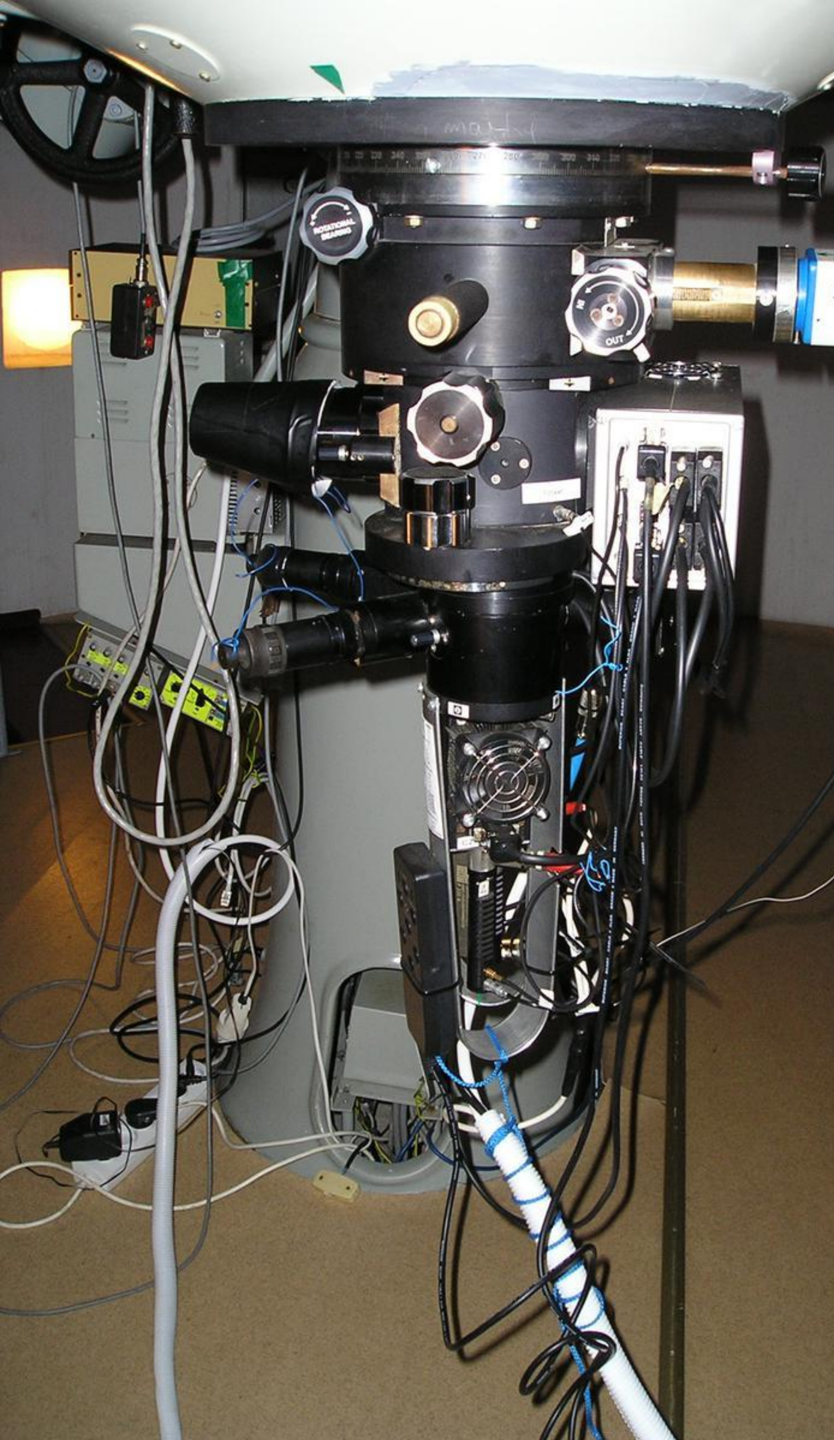
- similar telescopes
  - Bialkow (Poznan)
  - Ostrowik (Warsaw)
  - Piwnice (Torun)

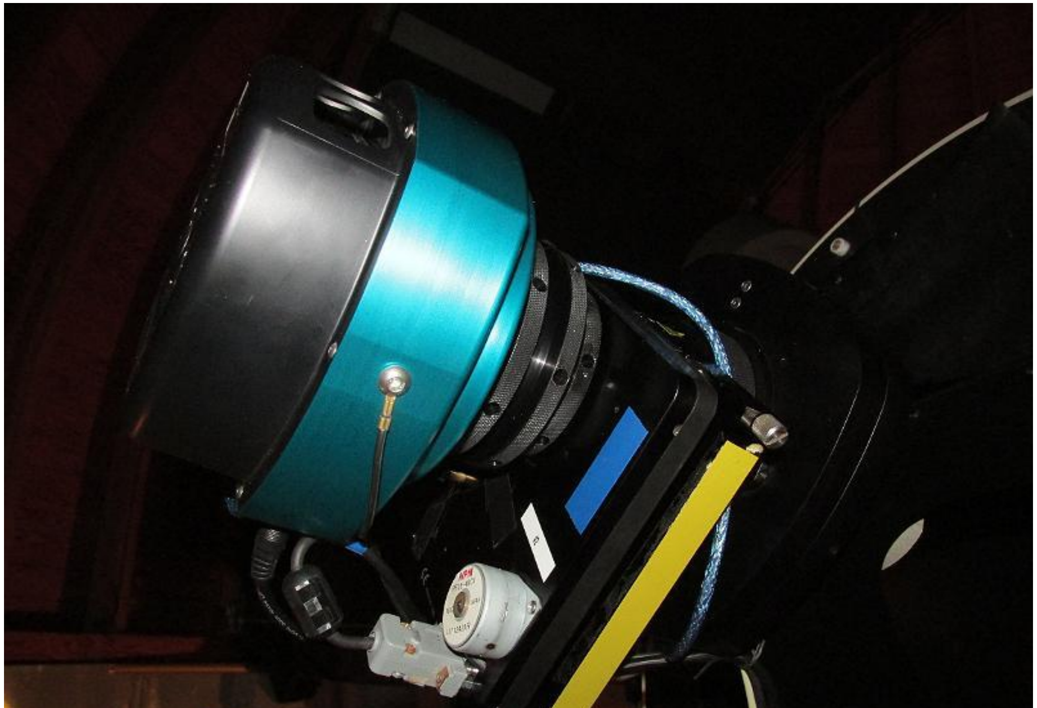
- MEADE
- 355 mm (PM)
- FL = 3556 mm
- FR = 1/10
- polarimetry in *R*



- Celestron
- 203 mm (PM)
- FL = 2032 mm
- FR = 1/10

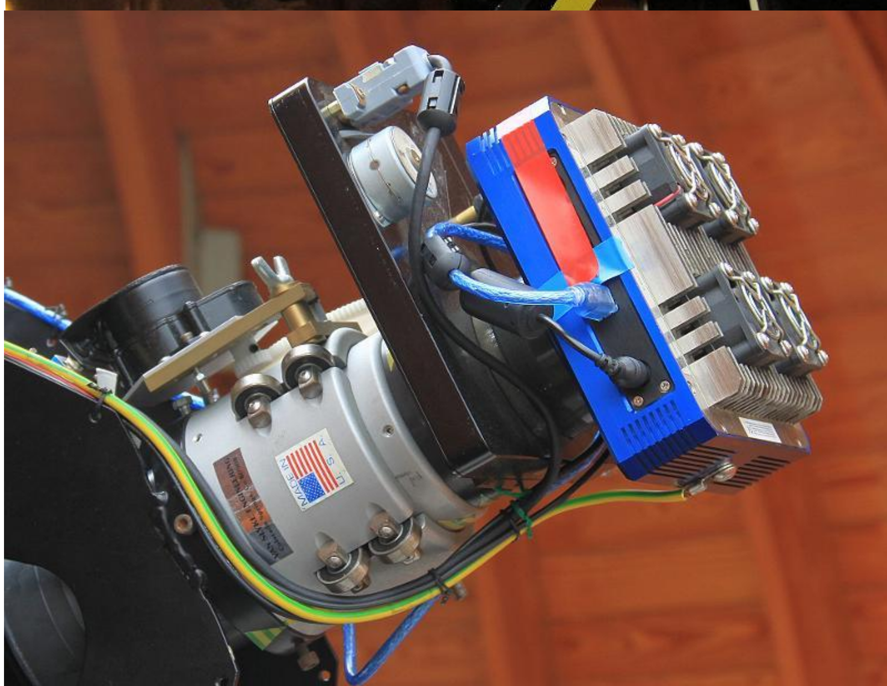

A
B
b





several CCD cameras

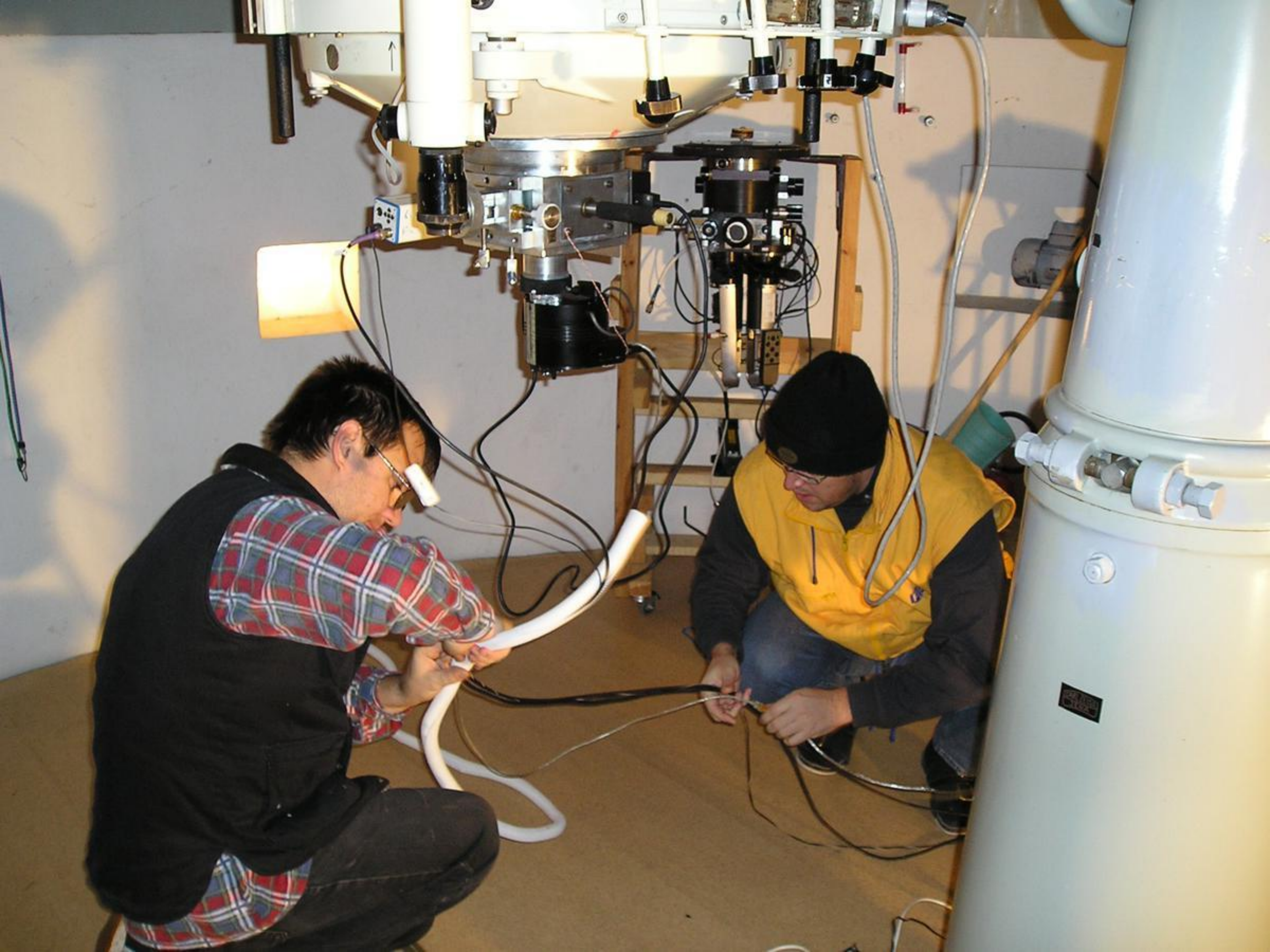
- SBIG ST10XME
- Apogee ALTA U47-MB
- Apogee Aspen CG47
- Atik 314L Mono
- Sbig 340 ALLSKY Colour



Observing runs 2006 – 2022

2006

- photoelectric TW Dra
  - 21.4. – 1.5.(2)
  - 7. – 11.12.(3)



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Observational evidence of interacting processes in the system TW Draconis

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(Received 19 February 2006)

TW Draconis is one of the best studied Algol-type eclipsing binaries. There is significant evidence for miscellaneous interacting physical processes between binary components and these are manifested in period and light curve changes. We studied these processes on the basis of a long-time series of photometric and spectroscopic observations.

Keywords: Close binaries; Eclipsing binaries; Short-time variations in oscillations; TW Dra

1. Introduction

TW Draconis ($\alpha = 15\,\text{h}\ 33\,\text{min}\ 51.1\,\text{s}$, $\delta = 63^\circ\ 54'\ 26''$ (2000.0)) is a well-known and often-observed Algol-type eclipsing binary. The variable star is the A component of the visual binary ADS 9706. The light variations of TW Dra with a B amplitude of about 2.3 magnitude are caused predominantly by eclipses of the hot main-sequence star A8V by the cooler and fainter giant component K0III in the primary minimum and orbital period close to 2.807 days. The eclipses are relatively long: 11.5 h. The system has been studied both photometrically and spectroscopically. However, a satisfactory complex solution of this unique system has not been published up to now.

2. $O - C$ diagram

The unmistakeable indications that interacting processes occur in the binary system are seen in the $O - C$ diagram. In spite of the fact that the eclipsing variability was discovered in 1910, the $O - C$ diagram of the times of the primary minima illustrates changes in the orbital period in the last 150 years—the long oscillations as well as the shorter oscillations of the period after JD 2 432 000 (figure 1).

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http://www.tandf.co.uk/journals
DOI: 10.1080/10556790701312657

Downloaded By: [Bochkarev, N.] At: 13:20 29 November 2007

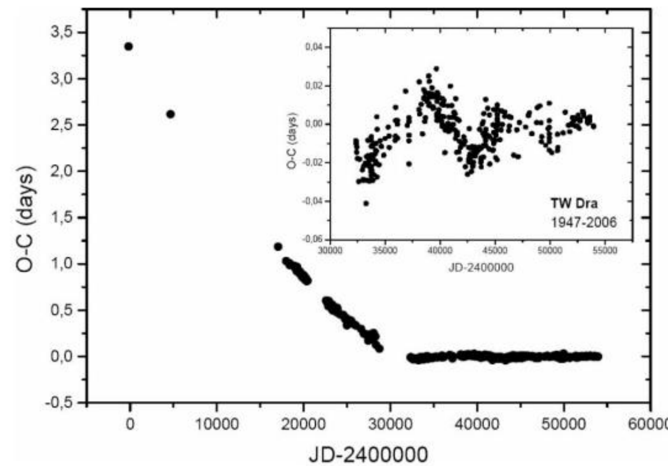


Figure 1. $O - C$ diagram of the times of the primary minima of TW Dra (1858–2006).

3. Photometry

We have caried out charge-coupled device and photoelectric photometry on this star using different telescopes at observatories in Brno (Czech Republic), Hvar (Croatia) and Suhora (Poland) since 2003. In total we have collected more than 45 000 *UBVRI* brightness measurements so far (figure 2). We have confirmed the presence of small variations (equal to hundredths in magnitude) in the light curve on the timescale of tens of minutes as described in [2], [3]. Their incidence during the total minima rules out any δ Scuti-like pulsations of the primary star; however, the nature of the oscillations remains unclear as yet.

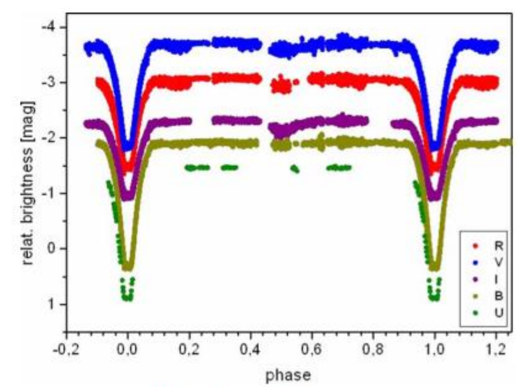
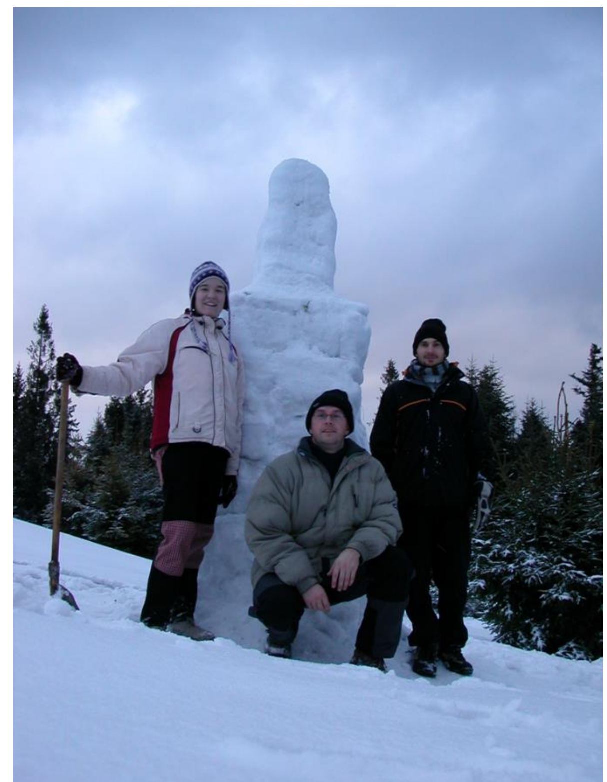
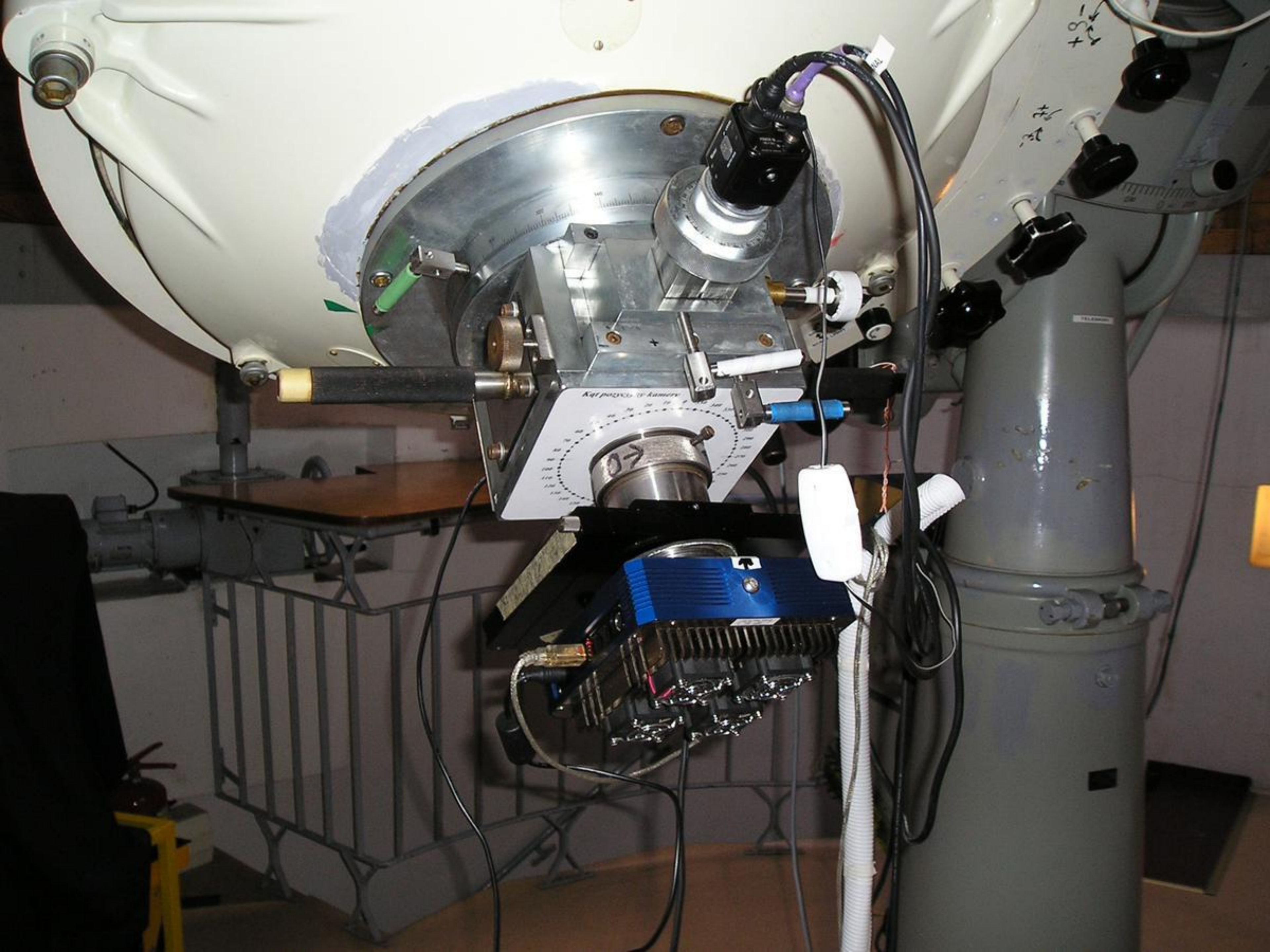


Figure 2. (a) Complete light curve of TW Dra. The secondary minimum is not very noticeable in the B filter. (b) Residuals after subtraction of the orbital light changes in the B filter phased with the period $P = 0.0519(5)$ days.

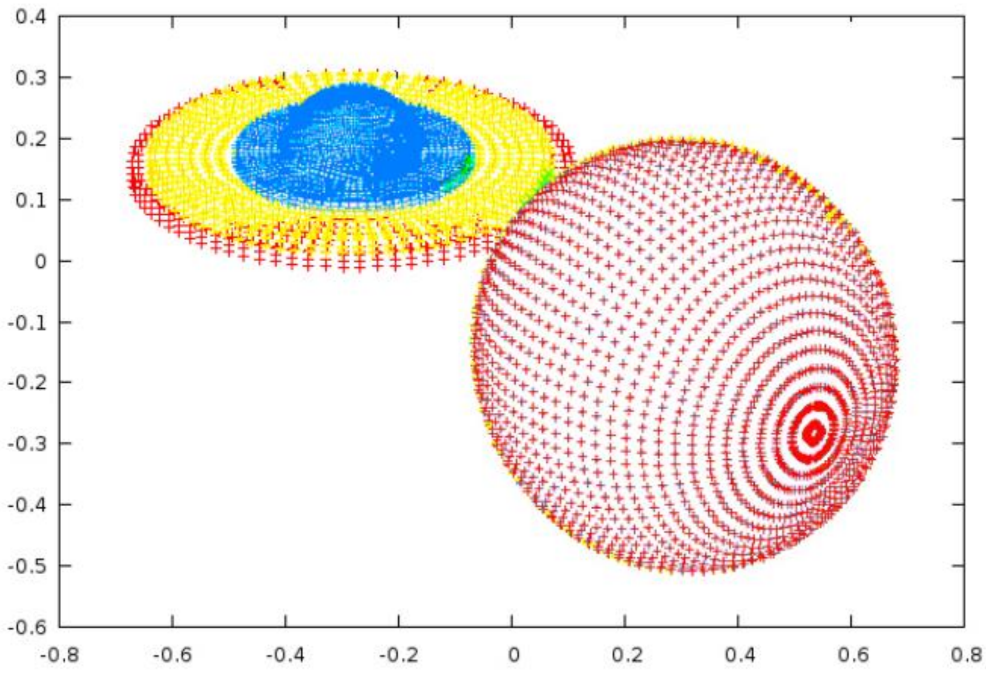
2007

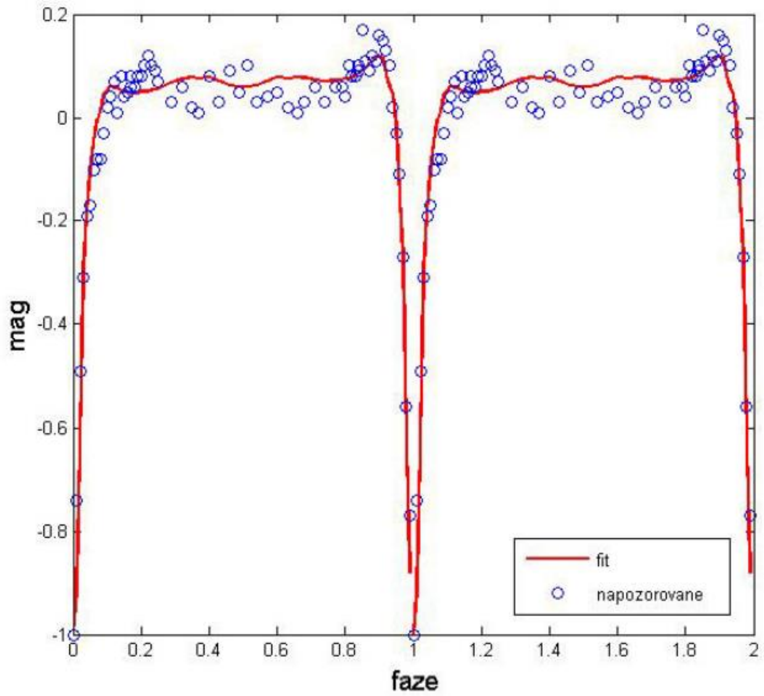
- first master students (2. – 6.12.[(4)])
  - J. Liška “Complex study of binary star UX UMa”
  - T. Krejčová “CCD photometry of exoplanets”





2007



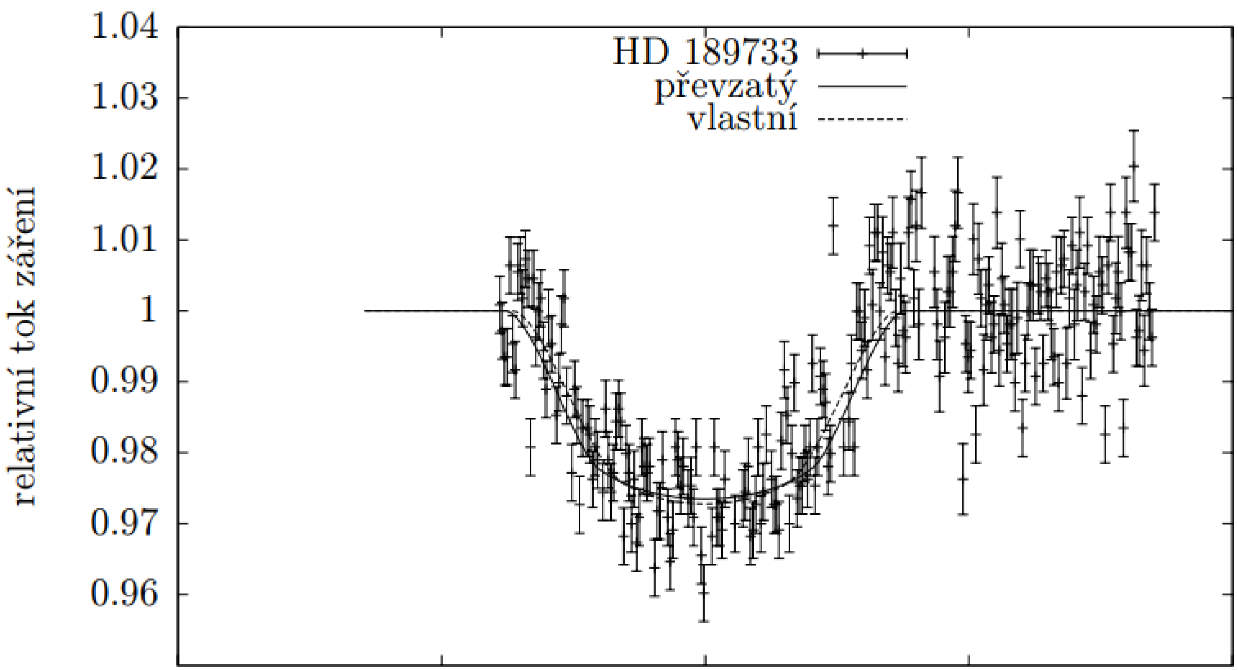


UX UMa - model

2007

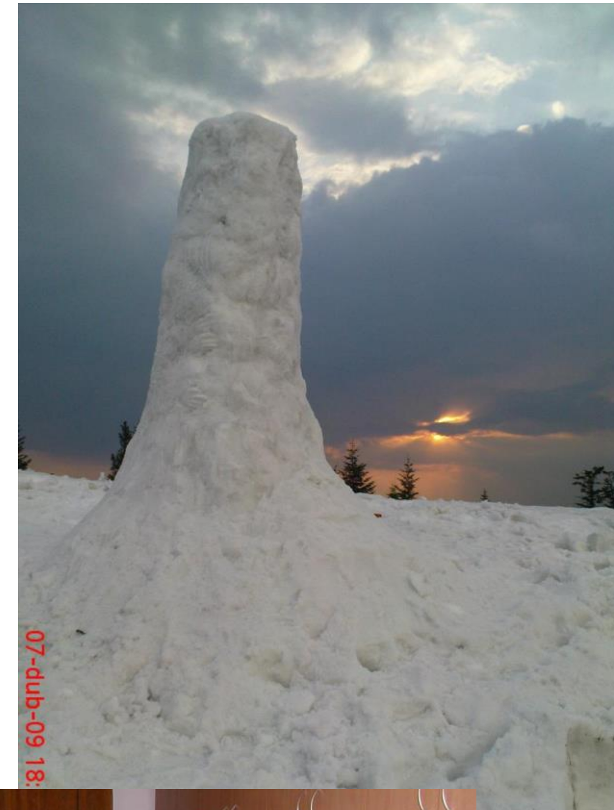
TrES - 2		
Parametry	Publikované	Vlastní
a [AU]	0.0367 ± 0.0012	$0.0366 \pm 1.3 \cdot 10^{-3}$
i [°]	83.9 ± 0.2	84.2 ± 0.3
P [dny]	$2.47063 \pm 1 \cdot 10^{-5}$	$2.47063 \pm 2.1 \cdot 10^{-5}$
M_P [M_J]	1.28 ± 0.09	–
R_P [R_J]	1.24 ± 0.09	1.20 ± 0.21
ΔF	–	0.015 ± 0.005
t_Z [dny]	–	0.079 ± 0.002

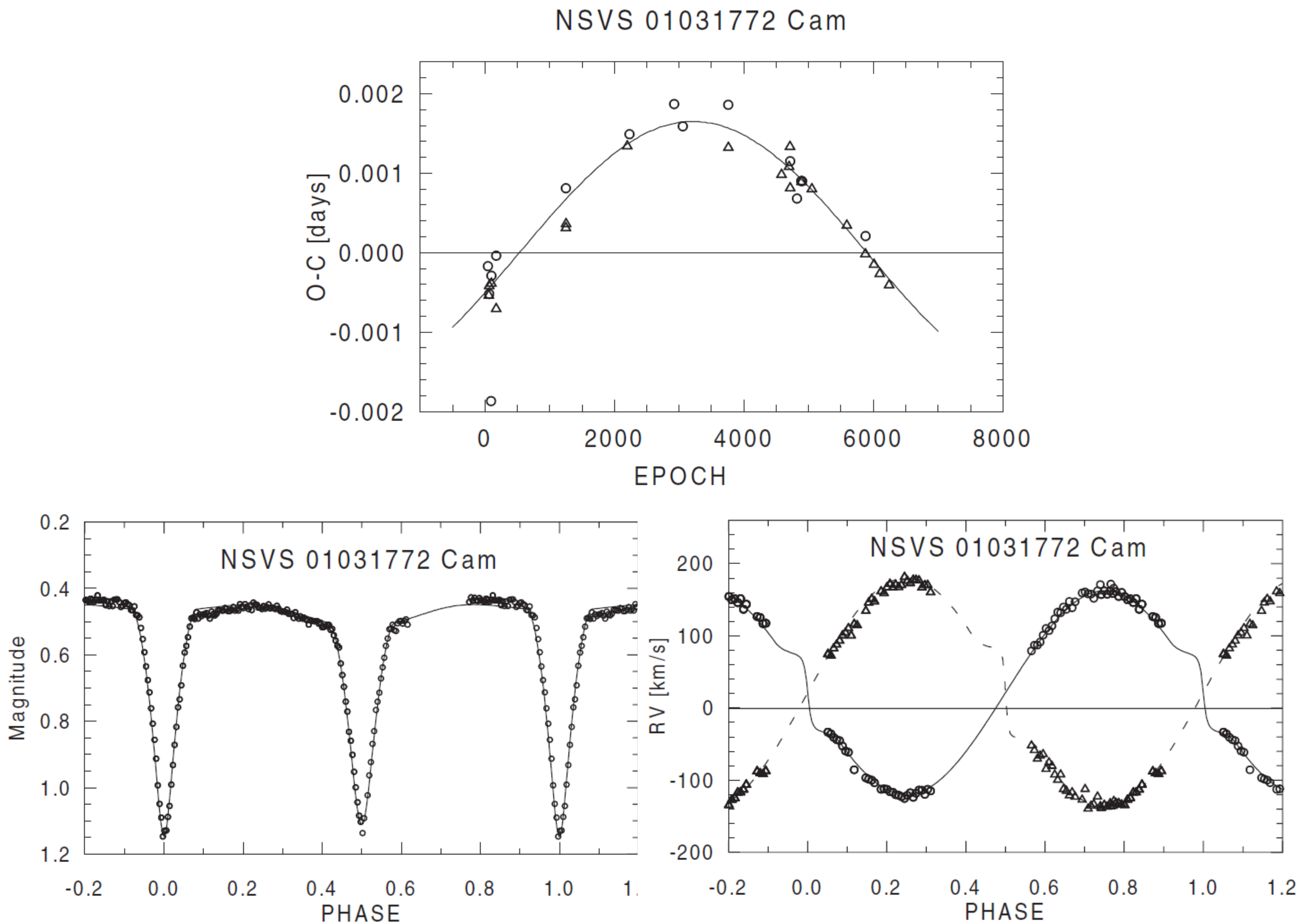
HD 189733 b		
Parametry	Publikovné	Vlastní
a [AU]	0.0313 ± 0.0004	$0.031 \pm 5 \cdot 10^{-3}$
i [°]	85.79 ± 0.24	85.30 ± 0.12
P [dny]	$2.21857 \pm 2 \cdot 10^{-5}$	$2.218584 \pm 6 \cdot 10^{-6}$
M_P [M_J]	1.15 ± 0.04	–
R_P [R_J]	1.154 ± 0.032	1.20 ± 0.11
ΔF	–	0.027 ± 0.005
t_Z [dny]	–	0.079 ± 0.001



2009

- 7. – 10.4.[6]
  - M. Skarka & H. Hanzlová
- 5. – 10.11.[7]
  - J. Liška & T. Krejčová




NSVS 01031772 Cam
O-C [days]
0.002
0.001
0.000
-0.001
-0.002
0
2000
4000
6000
8000
EPOCH
NSVS 01031772 Cam
Magnitude
0.2
0.4
0.6
0.8
1.0
1.2
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
PHASE
NSVS 01031772 Cam
RV [km/s]
200
100
0
-100
-200
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
PHASE

From Interacting Binaries to Exoplanets: Essential Modeling Tools
Proceedings IAU Symposium No. 282, 2011
Mercedes T. Richards & Ivan Hubeny, eds.

doi:10.1017/S1743921311028225

NSVS 01031772 Cam: A New Low-Mass Triple?

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[2]Astronomical Institute, Academy of Sciences, CZ-251 65 Ondřejov, Czech Republic
[3]Institute of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic

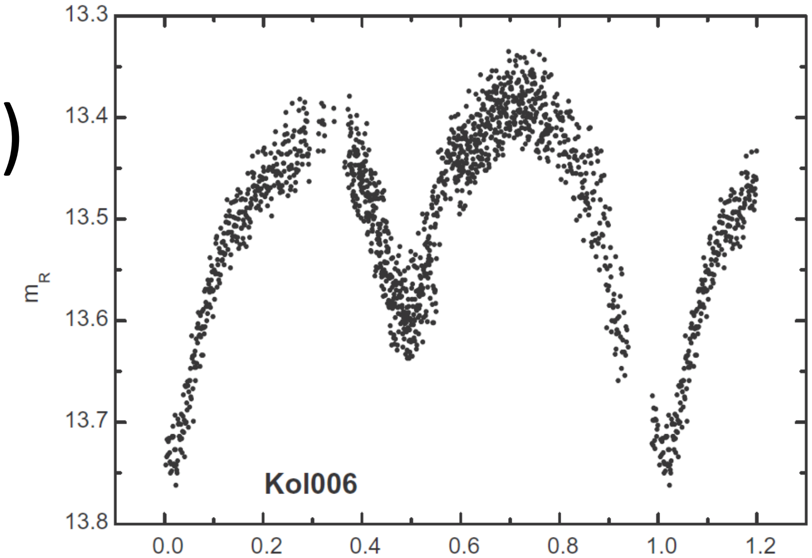
Abstract. We present a photometric study of the newly discovered low-mass eclipsing binary NSVS 01031772 Cam based on observations obtained at Ondřejov observatory from 2007 – 2011.

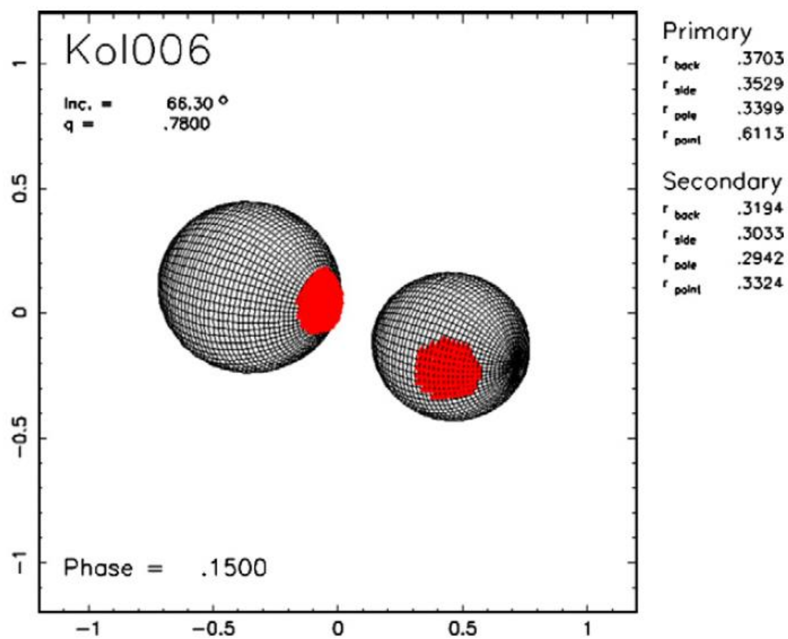
Most determinations of the fundamental parameters of low-mass stars using eclipsing binaries indicate a strong discrepancy between theory and observations. The measurements clearly indicate that the observed radii are generally larger than the predictions by stellar models. The eclipsing binary NSVS 01031772 Cam (GSC 4561.647, V=12.6 mag) was discovered by McIntyre & Shaw (2005) as a low-mass, double-lined and detached eclipsing binary in the Northern Sky Variability Survey (NSVS). The comprehensive study was later presented by López-Morales *et al.* (2006, hereafter LM06), who found the precise masses of both components and discovered that the radius of each component exceeds the evolutionary model by about 8.5% on average. In this paper, we present improved system parameters based on our new photometric observations.

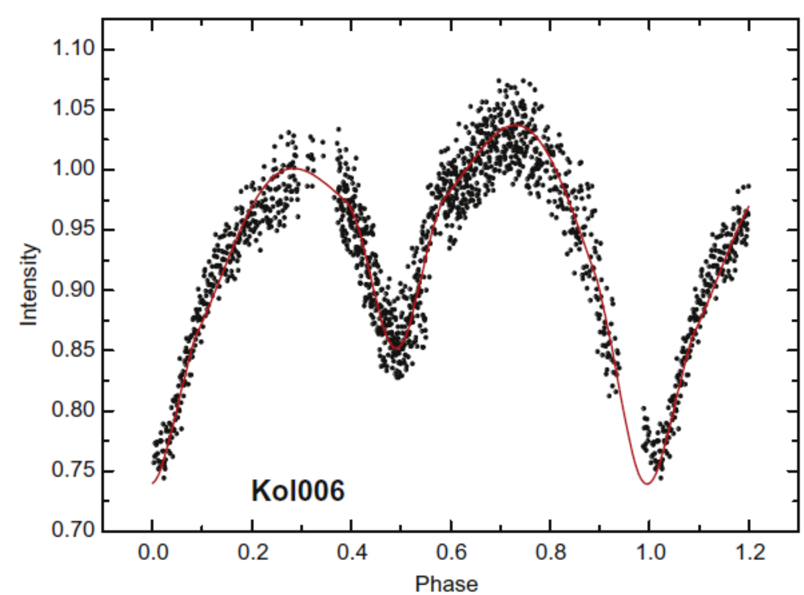
Our new CCD photometry was obtained at Ondřejov Observatory, Czech Republic, during 2007-2011. We used mostly the CCD camera G2-3200 of Moravian Instruments attached to the 0.65-m telescope, and *VR* photometric filters. We used the same comparison star GSC 4561.0787 as done by previous investigators. The processing of CCD frame series was done routinely by the APHOT software package. The supplementary CCD photometry was obtained at Masaryk University Observatory, Brno, during 2009-2011. The 0.62-m reflecting telescope, the CCD camera SBIG ST-8, and *VR* filters were used. The additional measurements were secured by JJ during one night at Mt. Suhora Observatory, Poland, using the 0.65-m telescope and *BVR* filters in November 2009.

2010

- 1. – 6. 5.[8] (new variables)
  - Kol006
  - T1 = 5020 K, T2 = 4800 K







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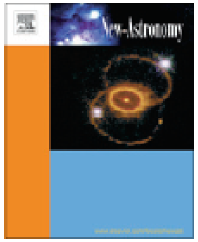

Photometric analysis of 8 newly discovered short-period eclipsing binaries at Astronomical Observatory at Kolonica Saddle

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[b] Vihorlat Observatory, Humenné, Slovakia
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[d] Department of Astronomy, Odessa National University, Odessa, Ukraine

A R T I C L E I N F O

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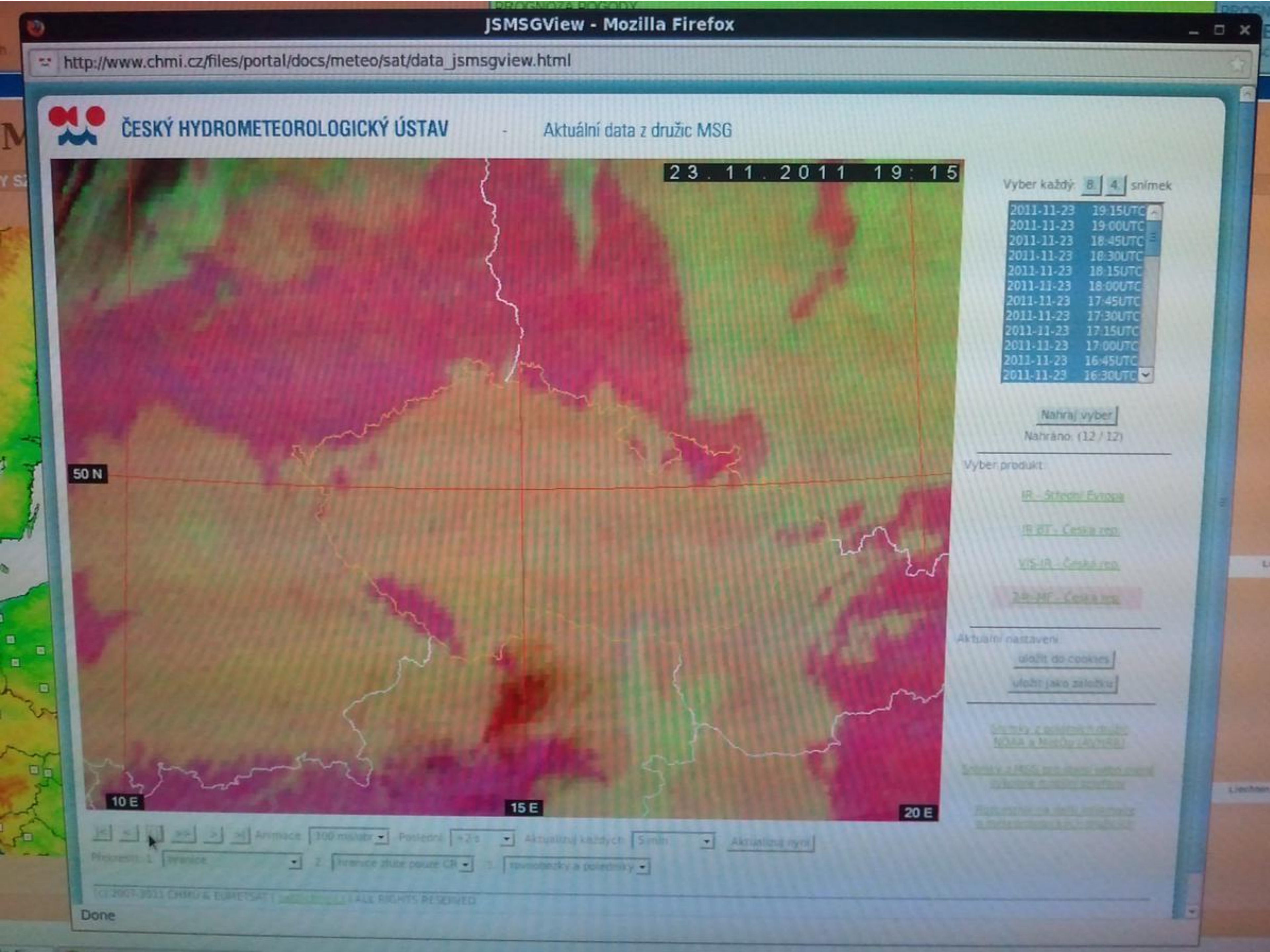
Binaries: close
Binaries: eclipsing
Stars: individual

A B S T R A C T

We present photometric analysis of 8 short-period eclipsing binaries discovered and observed at Astronomical Observatory at Kolonica Saddle between 2007 and 2010 with different instruments. We determined their orbital periods and performed photometric analysis of their light curves. We found that 3 systems are detached binaries, 4 systems are over-contact binaries of W UMa type and one system is semi-detached with the secondary component filling its Roche lobe. Light curves of 2 systems exhibit asymmetries, explained by spot(s) on the surface of the components.

2011

- new tracking refractor
- 15 cm, 1850(?)
- CU Vir (24. – 29.1.[12])


JSMSGView - Mozilla Firefox
http://www.chmi.cz/files/portal/docs/meteo/sat/data_jsmsgview.html
ČESKÝ HYDROMETEOROLOGICKÝ ÚSTAV
Aktuální data z družic MSG
23. 11. 2011 19:15
Vyber každý 8 4 snímek
2011-11-23 19:15UTC
2011-11-23 19:00UTC
2011-11-23 18:45UTC
2011-11-23 18:30UTC
2011-11-23 18:15UTC
2011-11-23 18:00UTC
2011-11-23 17:45UTC
2011-11-23 17:30UTC
2011-11-23 17:15UTC
2011-11-23 17:00UTC
2011-11-23 16:45UTC
2011-11-23 16:30UTC
Nahraj výber
Nahráno: (12 / 12)
Vyber produkt:
50 N
10 E
15 E
20 E
Done

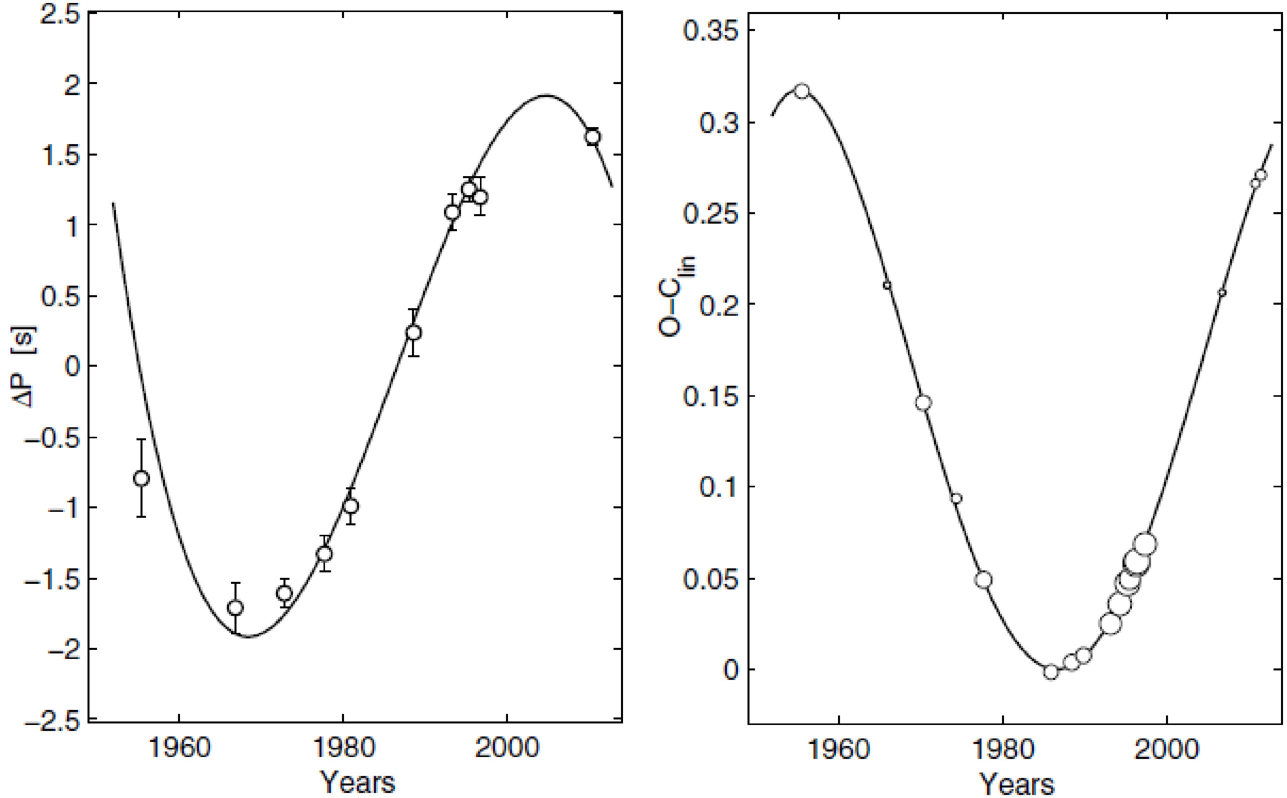


Fig. 1. Long-term variations of the rotation period and O-C values for the magnetic chemically peculiar star CU Vir. *Left*: the model curve of long-term rotational period changes ΔP of CU Vir in seconds with respect to the mean period $P_0 = 0\overset{d}{.}52069415$. The formal accuracy of the polynomial fit is comparable with the thickness of the fitted line. *Right*: the difference of the observed and calculated times of zero phase according to a linear ephemeris in days. Each point represents the average of 498 consecutive individual measurements; the weights of these means are indicated by their areas.

A&A 534, L5 (2011)
DOI: 10.1051/0004-6361/201117784

Astronomy & Astrophysics

Letter to the Editor

Surprising variations in the rotation of the chemically peculiar stars CU Virginis and V901 Orionis*

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Received 29 July 2011/ Accepted 20 September 2011

ABSTRACT

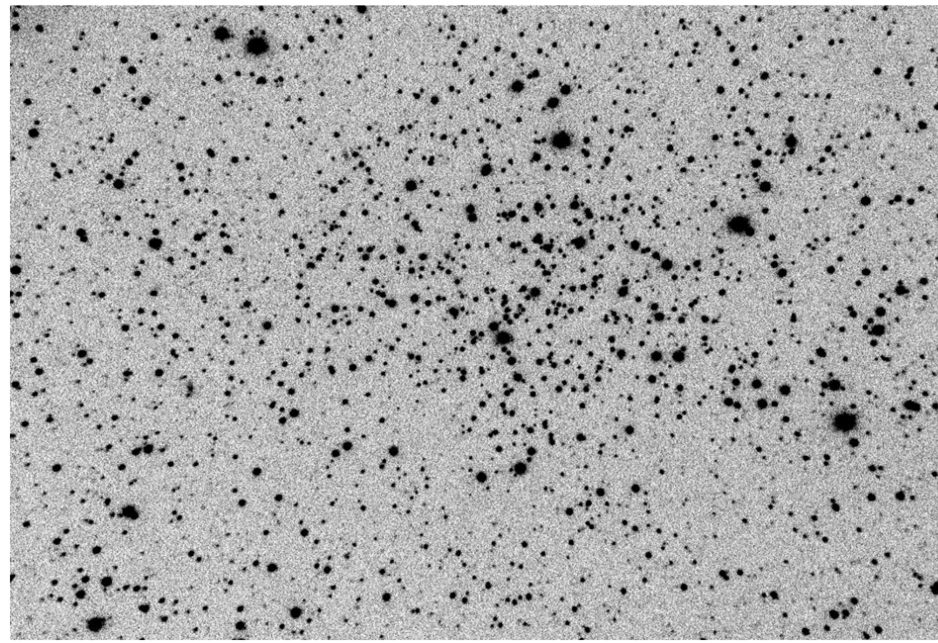
Context. The majority of magnetic chemically peculiar (mCP) stars exhibit periodic light, radio, spectroscopic and spectropolarimetric variations that can be adequately explained by the model of a rigidly rotating main-sequence star with persistent surface structures. CU Vir and V901 Ori belong among these few mCP stars whose rotation periods vary on timescales of decades.

Aims. We aim to study the stability of the periods in CU Vir and V901 Ori using all accessible observational data containing phase information.

Methods. We collected all available relevant archived observations supplemented with our new measurements of these stars and

2012

- CP stars, open clusters and M dwarf CZEV502
- two runs
  - 5. – 11. 5. (15)
  - 11. – 16. 11. (16)



Revista Mexicana de Astronomía y Astrofísica, **58**, 155–168 (2022)

https://doi.org/10.22201/ia.01851101p.2022.58.01.12

CZEV502 – AN M DWARF NEAR THE LEO TRIPLET WITH VERY STRONG FLARES

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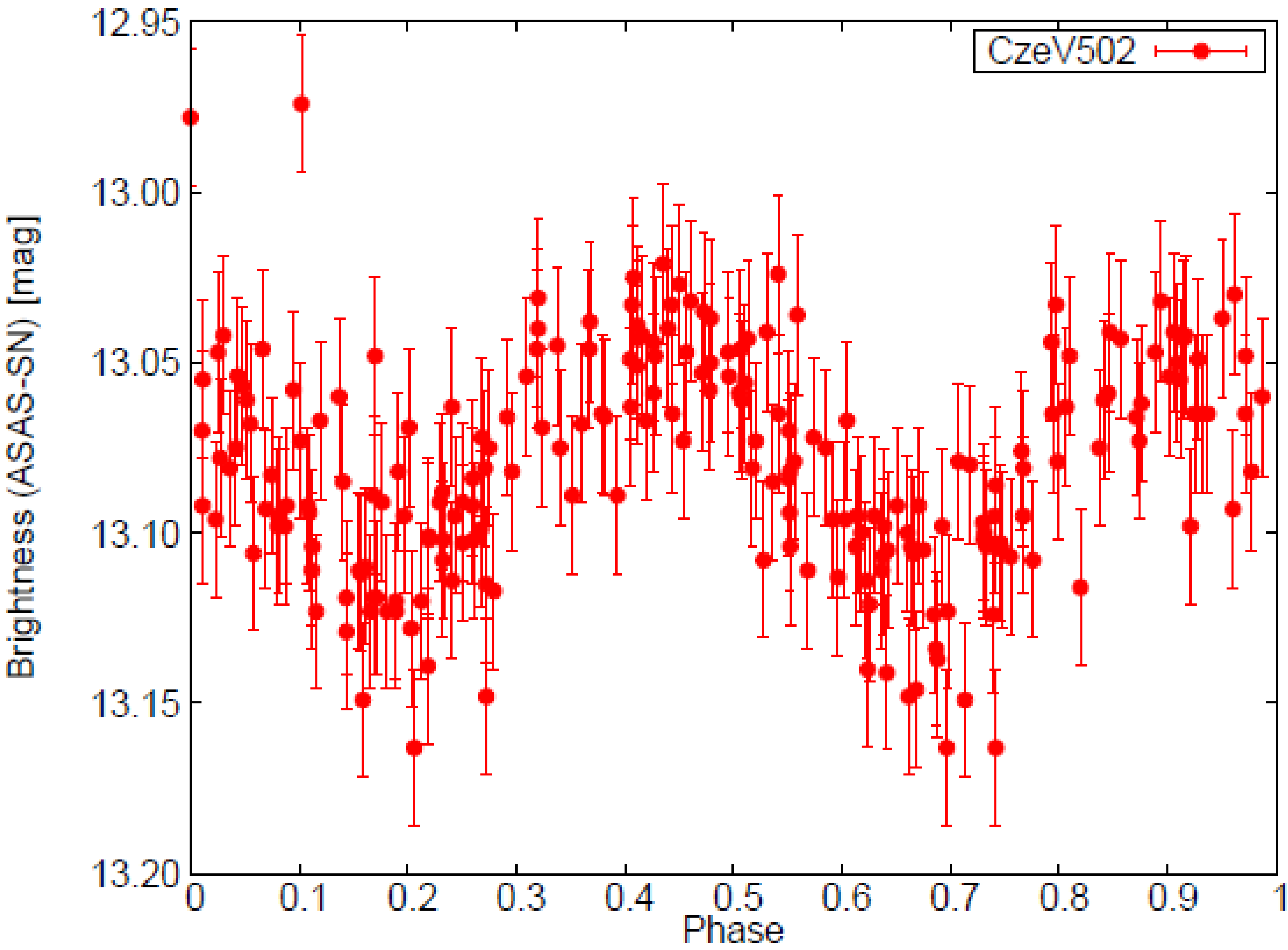
Received November 16 2021; accepted February 15 2022

ABSTRACT

Discovery of flares in the M dwarf CzeV502 and our follow-up results are presented. We classify it as a dMe eruptive variable of UV Ceti type due to the X-ray activity, measured $B-V$ of 1.5 mag, Hα emission, and flares. Our monitoring revealed only one reliable and one suspected superflare in 58 nights (210 hrs). The strongest flare with $\Delta R = 1.5$ mag ($\Delta B \approx$ 6-8 mag) could have a total energy of 3E+34 erg. The ASAS-SN data may contain 4 events up to ΔV of 0.43 mag and 12.55 d periodicity corresponding to the rotation or possible binarity. Other brightenings in sky survey (ASAS-3, CRTS, NSVS, and KWS) are doubtful. No event was unveiled on the 1 600 photographic plates. The upper rate limit of 1-2 superflares/1 640 hrs corresponds to activity several orders higher than for other M-dwarfs, especially, for the slow rotators. The low amplitude flares ($\Delta B < 0.5$ mag) may be common (1 flare/4 hrs).

RESUMEN

Presentamos nuestro descubrimiento de ráfagas en CzeV502, una enana tipo M, así como resultados subsecuentes. Clasificamos a CzeV502 como una variable eruptiva dMe de tipo UV Ceti debido a su actividad en rayos X, su emisión $B-V$ de 1.5 mag, su emisión en Hα, y sus ráfagas. Observamos sólo una ráfaga confiable y una posible superráfaga en 58 noches (210 hrs). La ráfaga más intensa, con ΔR = 1.5 mag ($\Delta B \approx$ 6-8 mag), pudo tener una energía total de 3E+34 erg. Los datos del ASAS-SN pueden contener 4 eventos hasta de ΔV of 0.43 mag y una



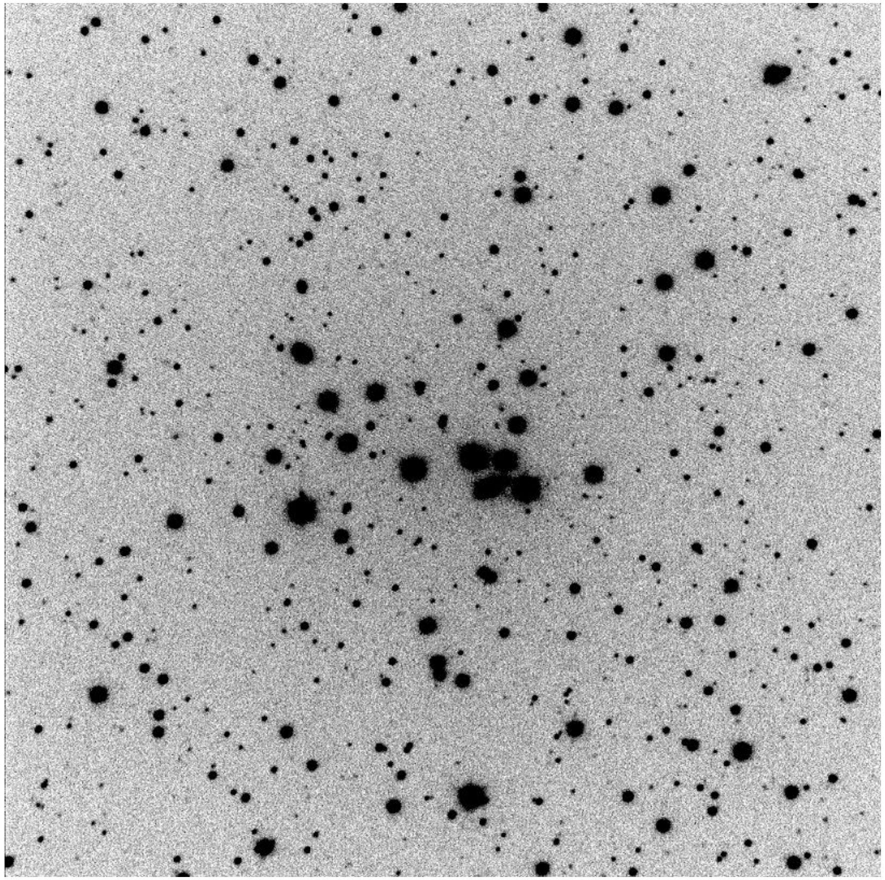
CzeV502
12.95
13.00
13.05
13.10
13.15
13.20
Brightness (ASAS-SN) [mag]
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Phase

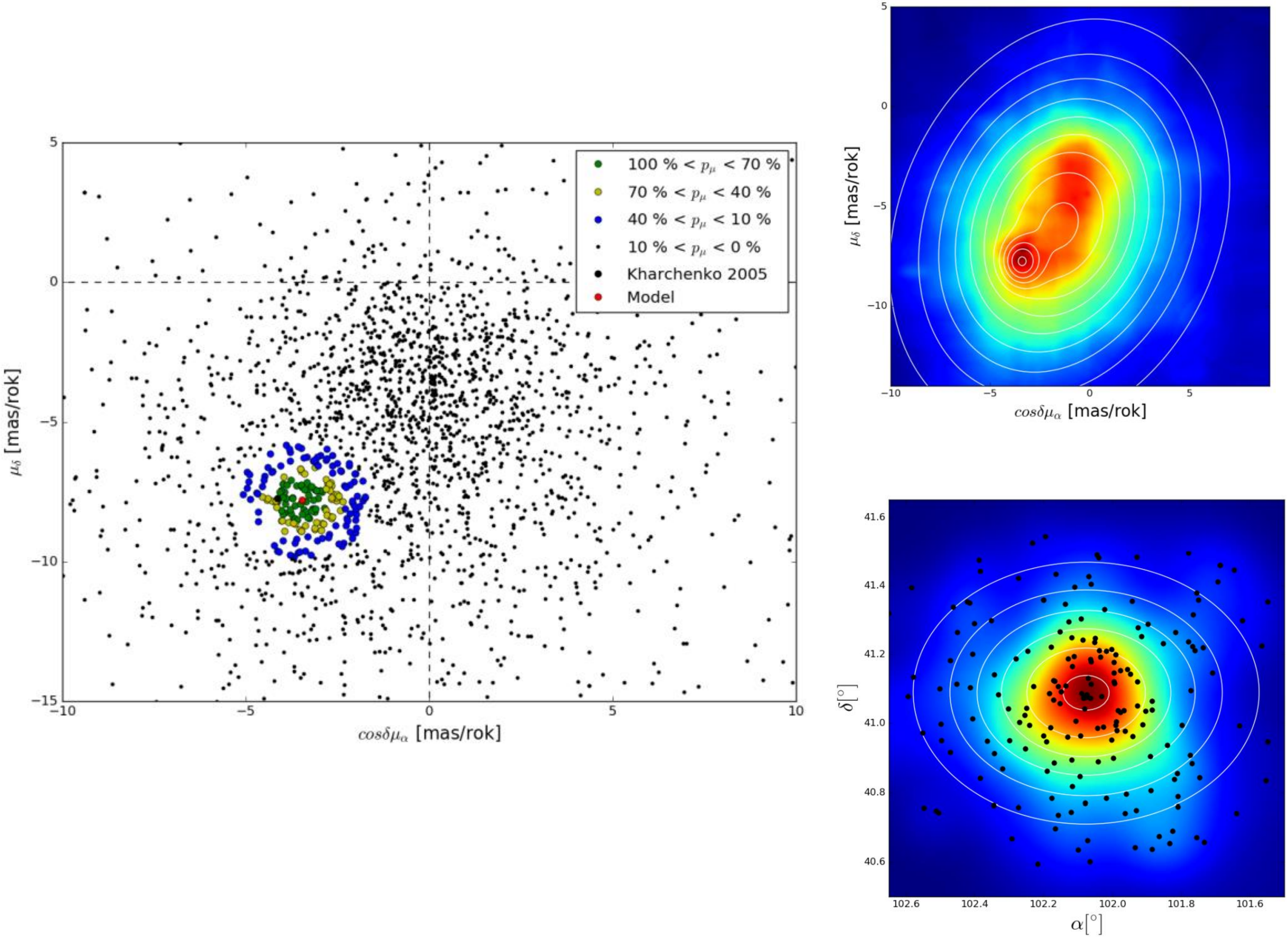
2013

- small dome

2013

- project *Variable stars in and around open clusters*
- database VarSCAN
- 10. – 13. 11. (20)
  - J. Velčovský *Complex study of open cluster NGC 2281* (master)





$100\ \% < p_\mu < 70\ \%$
$70\ \% < p_\mu < 40\ \%$
$40\ \% < p_\mu < 10\ \%$
$10\ \% < p_\mu < 0\ \%$
Kharchenko 2005
Model
μ_δ [mas/rok]
$cos\delta\mu_\alpha$ [mas/rok]
μ_δ [mas/rok]
$cos\delta\mu_\alpha$ [mas/rok]
$\delta[^\circ]$
$\alpha[^\circ]$

Astronomy and Astrophysics in the Gaia sky
Proceedings IAU Symposium No. 330, 2017
A. Recio-Blanco, P. de Laverny, A.G.A. Brown & T. Prusti, eds.

doi:10.1017/S1743921317005993

Complex study of the open cluster NGC 2281

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Abstract. We present the complex study of the open cluster NGC 2281 where both traditional and newly developed methods for study of open clusters have been used. Morphological and dynamical parameters of the cluster were obtained from the accepted astrometric data. The new method "Superposition of Gaussian surfaces" along with proper motion of stars was used to determine membership probabilities which were helpful in selection of stars for further analysis. Metallicity and radial velocity of the cluster were obtained from spectroscopic measurements. Age, colour excess, and distance of the cluster were determined using absolute CCD photometry combined with previous results. The results were compared with those of previous studies.

Keywords. complex study, NGC 2281, membership probability

1. Membership probability

A new method "Superposition of Gaussian surfaces" (SGS) was developed for determination of membership probability p_μ of field stars of the cluster. The SGS method generates three-dimensional proper motion diagram of field stars of the cluster. For each point in diagram the surface density is given by equation:

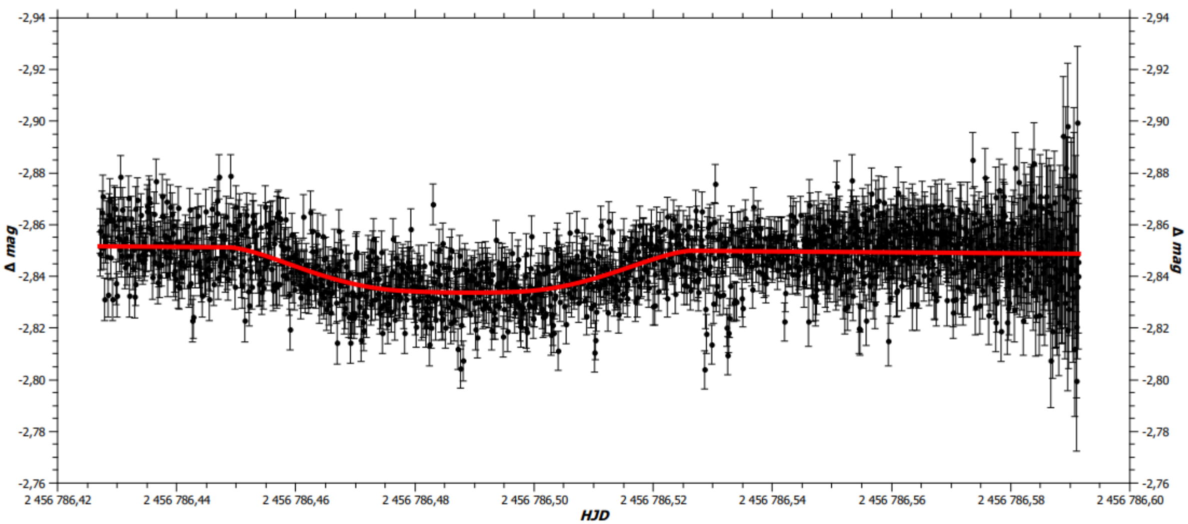
$$f_s(\mu'_\alpha, \mu_\delta) = \sum_i^n R + \frac{K}{m_i^2} \exp\left[-\left(\frac{(\mu'_\alpha - \mu'_{\alpha i})^2}{2\sigma'^2_{\mu_\alpha i}} \frac{(\mu_\delta - \mu_{\delta i})^2}{2\sigma^2_{\mu_\delta i}}\right)\right], \tag{1.1}$$

where R and K are constants, m_i is brightness of i-th star in the V filter, $\mu_{\alpha i}$, $\mu_{\delta i}$, $\sigma_{\mu_\alpha i}$, and $\sigma_{\mu_\delta i}$ are proper motions of i-th star and their uncertainties. Both $\mu'_{\alpha i}$ and $\sigma'_{\alpha i}$ are equal to $\cos\delta_i \mu_{\alpha i}$ and $\cos\delta_i \sigma_{\alpha i}$ respectively to reduce a spherical projection.

Proper motions data from the PPMXL (Roeser *et al.* 2010, reference positions), NO

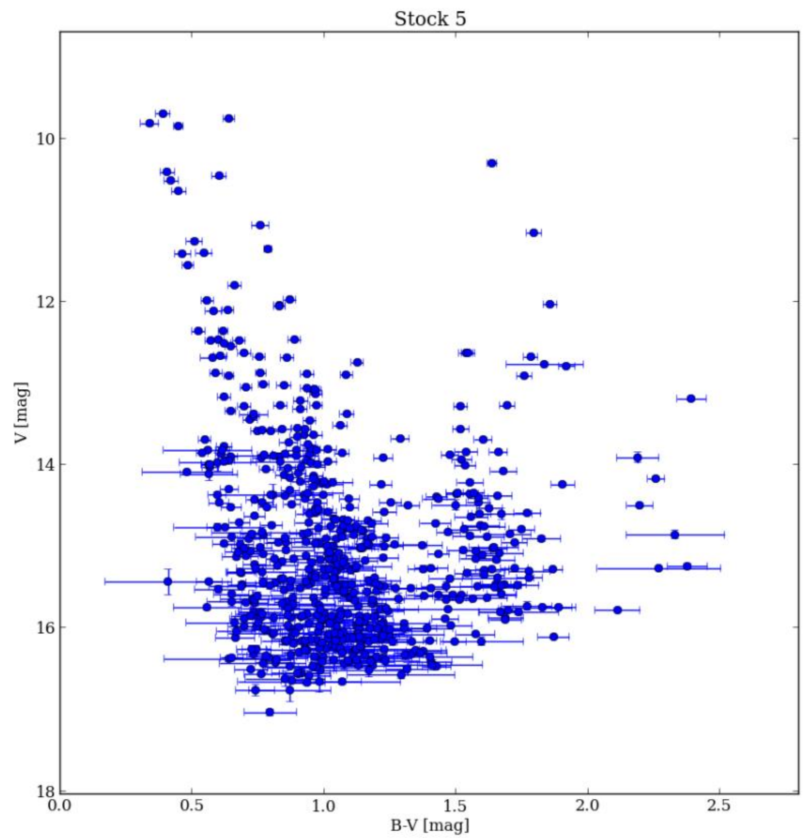
2013

- 6. – 10. 12. (21)
  - M. Blažek *CCD photometry of transiting extrasolar planets* (bachelor thesis)



2014

- 7. – 11. 3. (23)
  - O. Kamenský *CCD photometry of selected open clusters* (bachelor thesis)

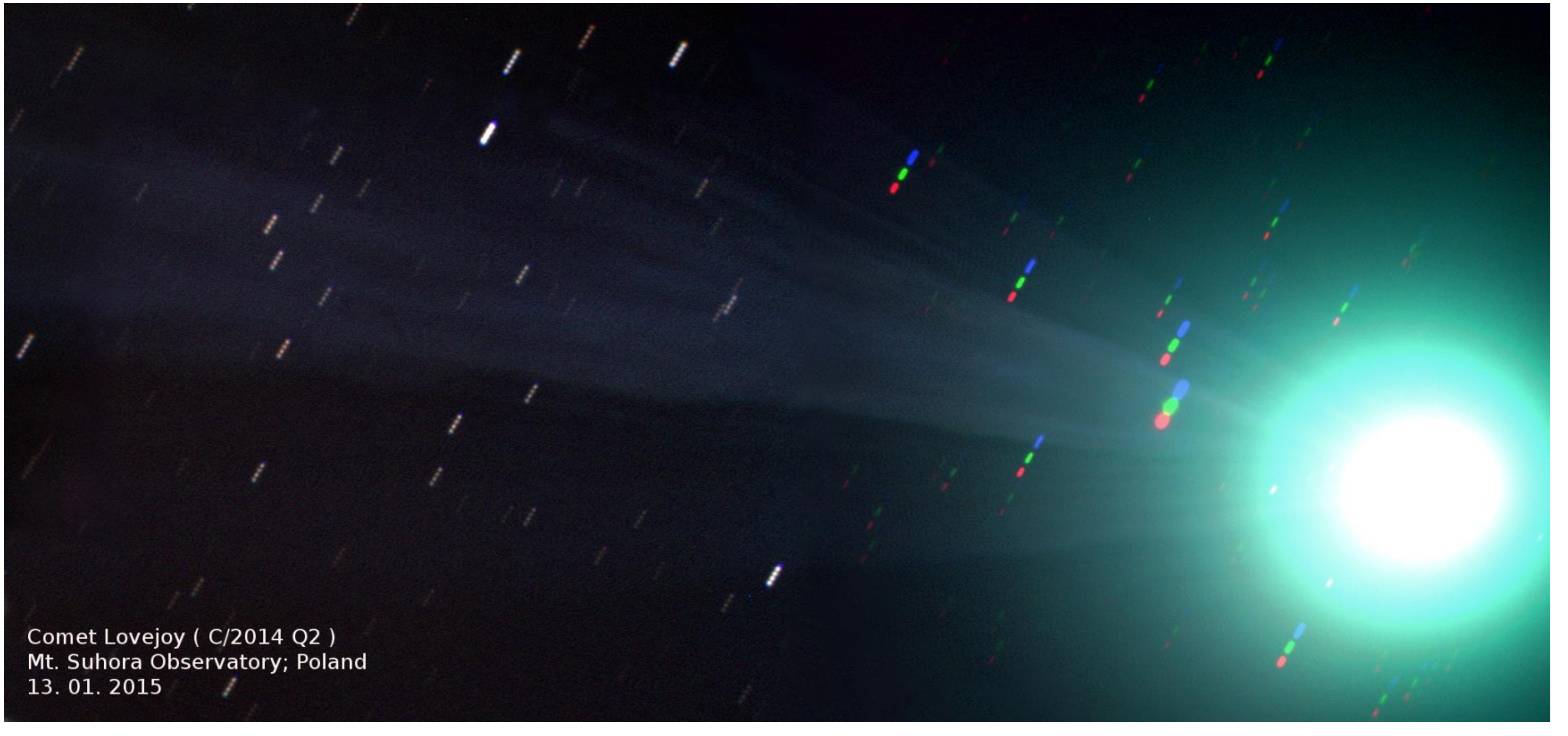


2014

- installed filter g2 – CP stars
- roAp stars (rapidly oscillating Ap stars)
  - 19. – 23. 5. (24)

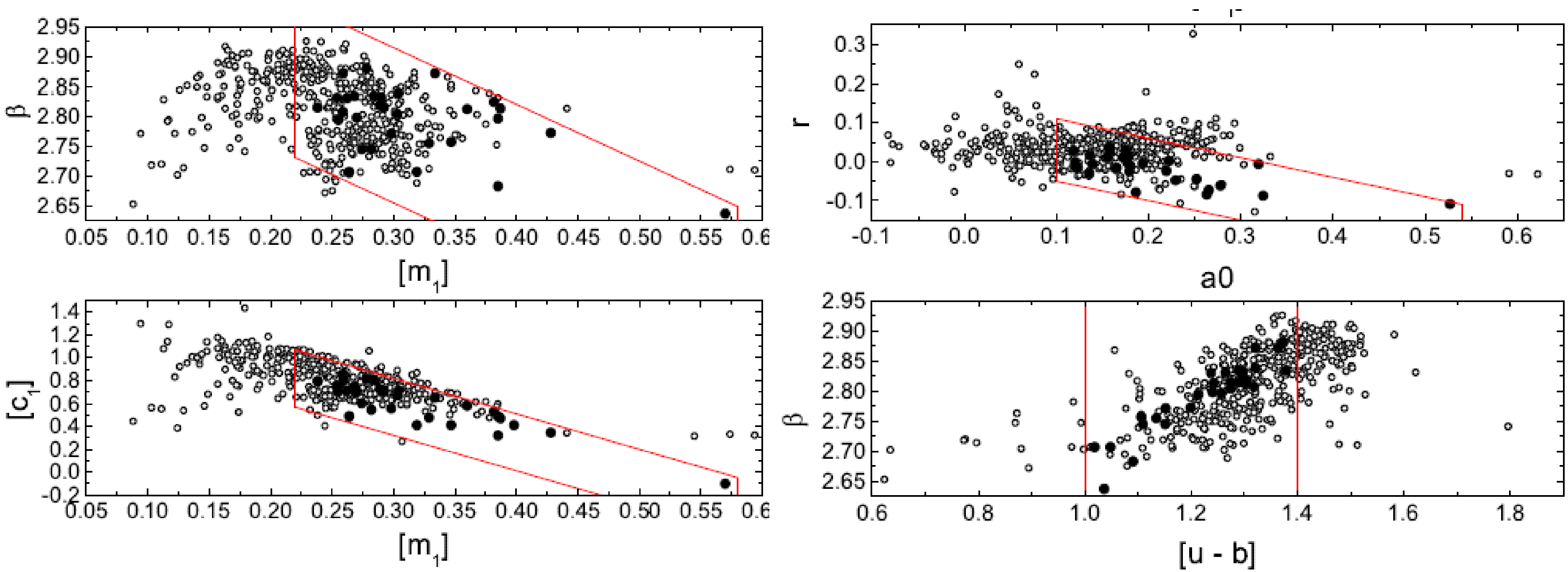
2015

- 12. – 16. 1. [26]
  - comet *Lovejoy*
- roAp stars



2015

- 55 roAp candidates – no detection ☹



RAA 2018 Vol. **18** No. **11**, 135(12pp) doi: 10.1088/1674–4527/18/11/135

http://www.raa-journal.org *http://iopscience.iop.org/raa*

Research in Astronomy and Astrophysics

The search for roAp stars: null results and new candidates from Strömgren-Crawford photometry

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[4] Institute of Physics, The Czech Academy of Sciences, Na Slovance 1999/2, CZ-182 21, Praha, Czech Republic

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[7] Astronomical Institute, Czech Academy of Sciences, (ASU CAS), Ondřejov, Czech Republic

Received 2018 March 26; accepted 2018 May 28

Abstract The rapidly oscillating Ap (roAp) stars exhibit pulsational photometric and/or radial velocity variations on time scales of several minutes, which are essential to test current pulsation models as well as our assumptions of atmospheric structure characteristics. In addition, their chemical peculiarity makes them very interesting for probing stellar formation and evolution in the presence of a global magnetic field. To date, a limited number of only 61 roAp stars is known to show photometric variability. On the other hand, a literature survey yields 619 unique stars that have unsuccessfully been searched for variability of this kind. Strömgren-Crawford $uvby\beta$ photometry of stars from both subgroups was used to investigate whether there is a selection bias for the investigated stars. We also present new photometric

2016

- 11. – 16. 1. [(31)]
- OJ 287 – long term monitoring

galaxies

MDPI

Article

Polarization and Spectral Energy Distribution in OJ 287 during the 2016/17 Outbursts

Mauri Valtonen [1,2], Stanislaw Zola [3,4,*], Helen Jermak [5], Stefano Ciprini [6,7], Rene Hudec [8,9], Lankeswar Dey [10], Achamveedu Gopakumar [10], Daniel L. Reichart [11], Daniel B. Caton [12], Kosmas Gazeas [13], Katsura Matsumoto [14], Waldemar Ogloza [4], Marek Drozdz [4], Fahri Alicavus [15,16], Oleksandr Baransky [17], Andrei Berdyugin [2], Panos Boumis [18], Yurii Bufan [19,20], Bartlomiej Debski [3], Huseyin Er [21], Ahmet Erdem [15,16], Vira Godunova [19], Shirin Haque [22], Vivian L. Hoette [23], Jan Janik [24], Mark Kidger [25], Tomasz Kundera [3], Sebastian Kurowski [3], Alexis Liakos [18], Isa Mohammed [26], Kari Nilsson [1], Urszula Pajdosz [3], Vilppu Piirola [1,2], Tapio Pursimo [27], Brandon Rajkumar [22], Andrii O. Simon [28], Michal Siwak [4], Eda Sonbas [29], Ian A. Steele [5], Volodymir V. Vasylenko [28], Michal Zejmo [30] and Pawel Zielinski [24]

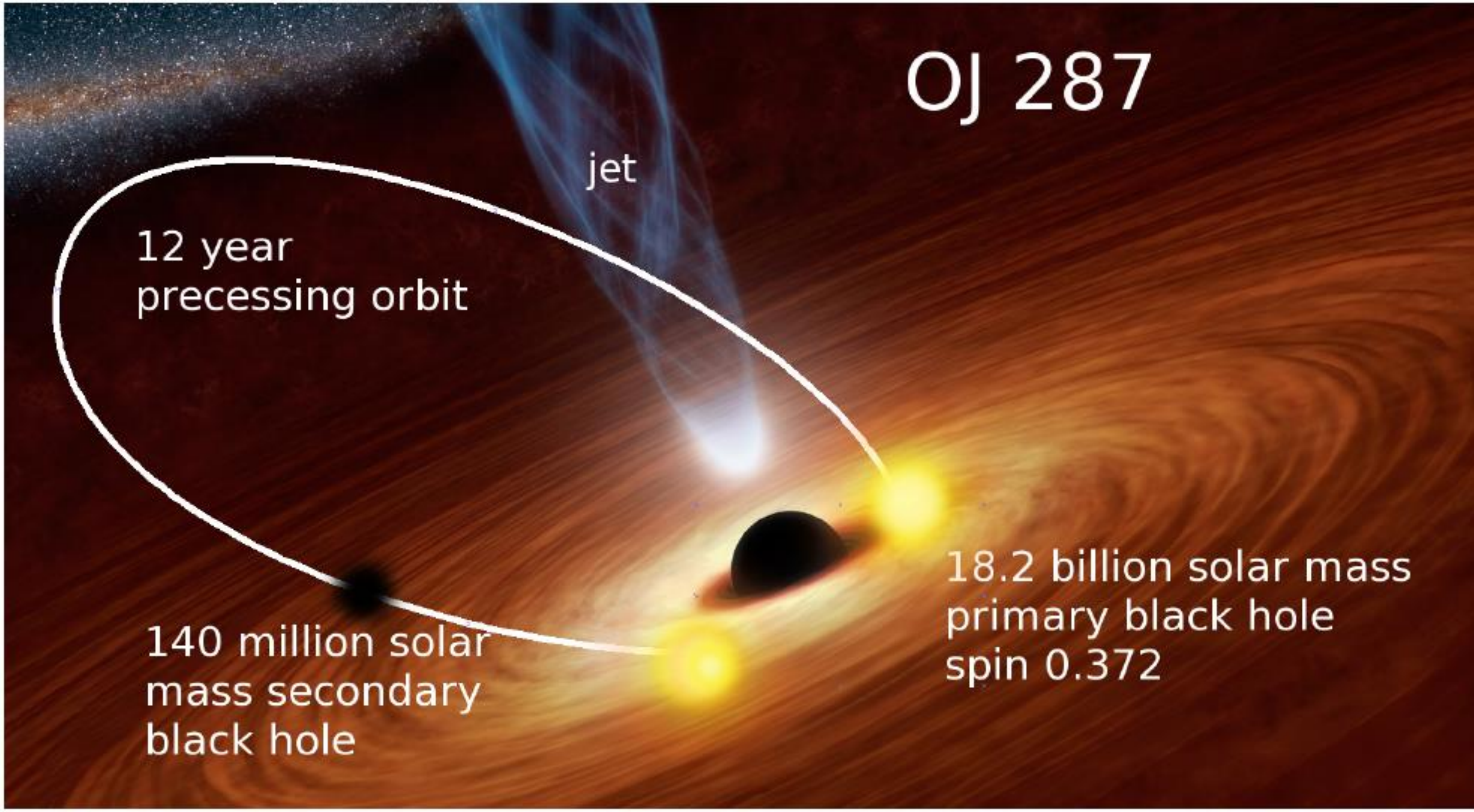


Figure 1. The improved inspiraling binary black hole central engine model for OJ 287. The current period of 12.055 year decreases by 38 days per century (Dey et al. 2017 [6]).

- SMBHs binary model – prediction of flares

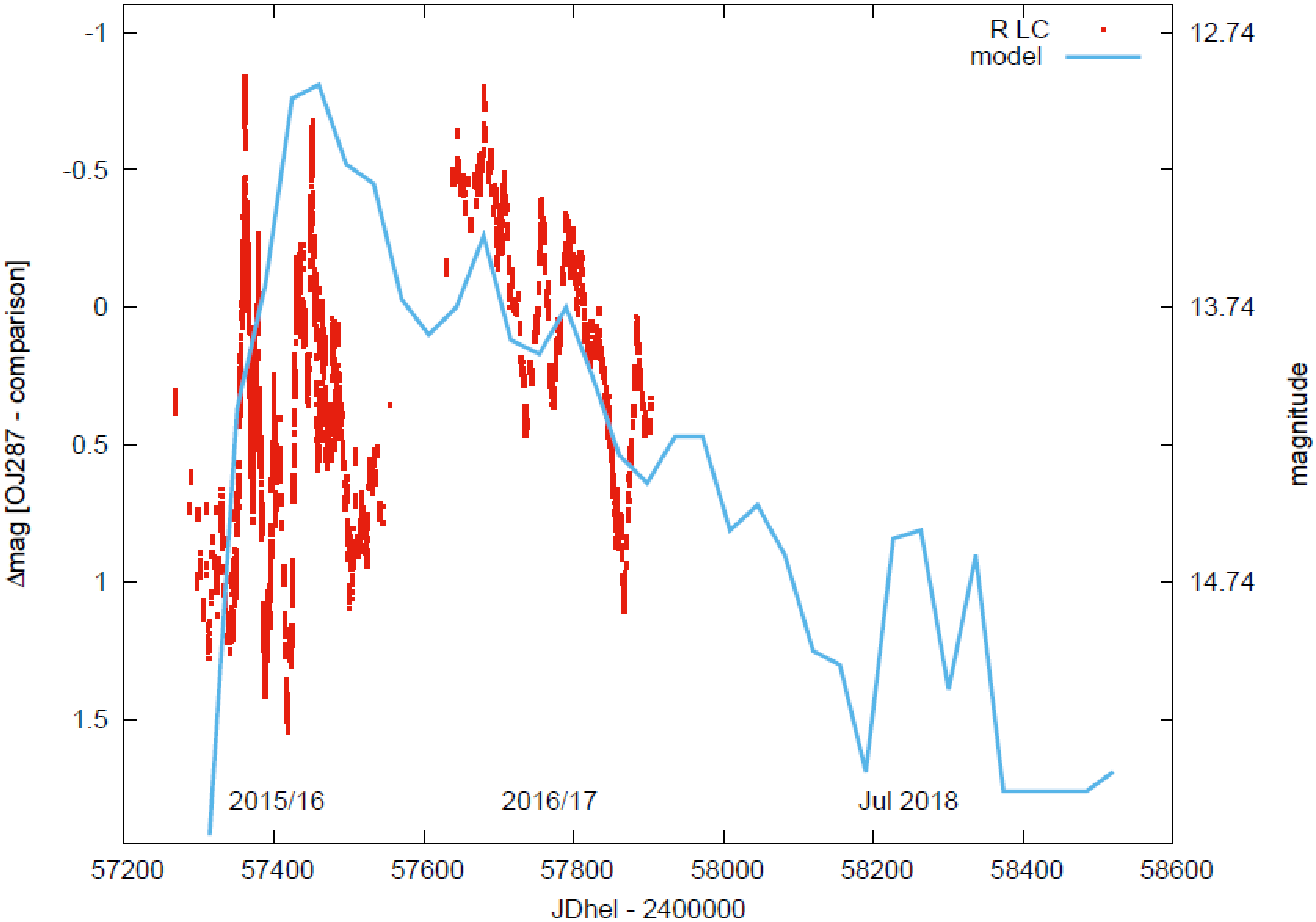


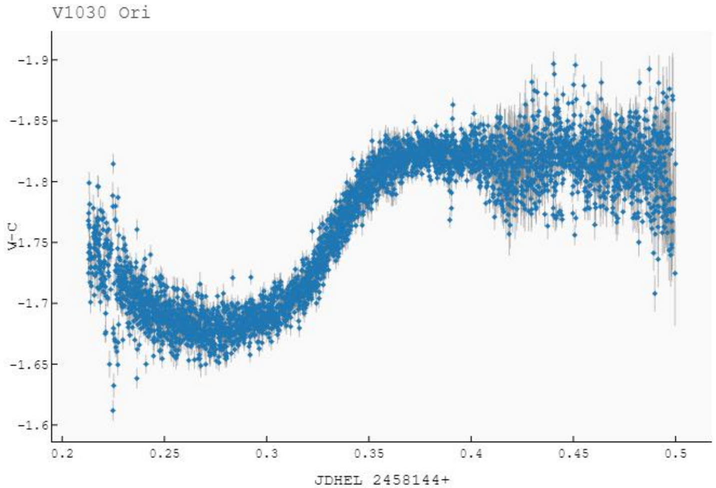
Figure 4. Prediction of OJ 287 brightness changes.

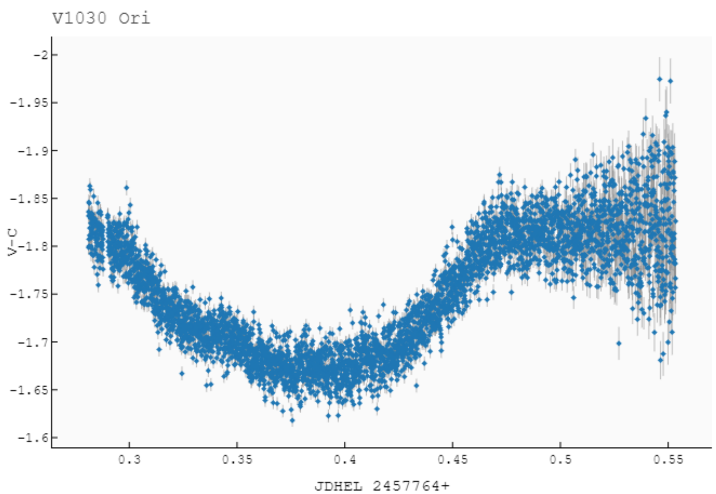
2016

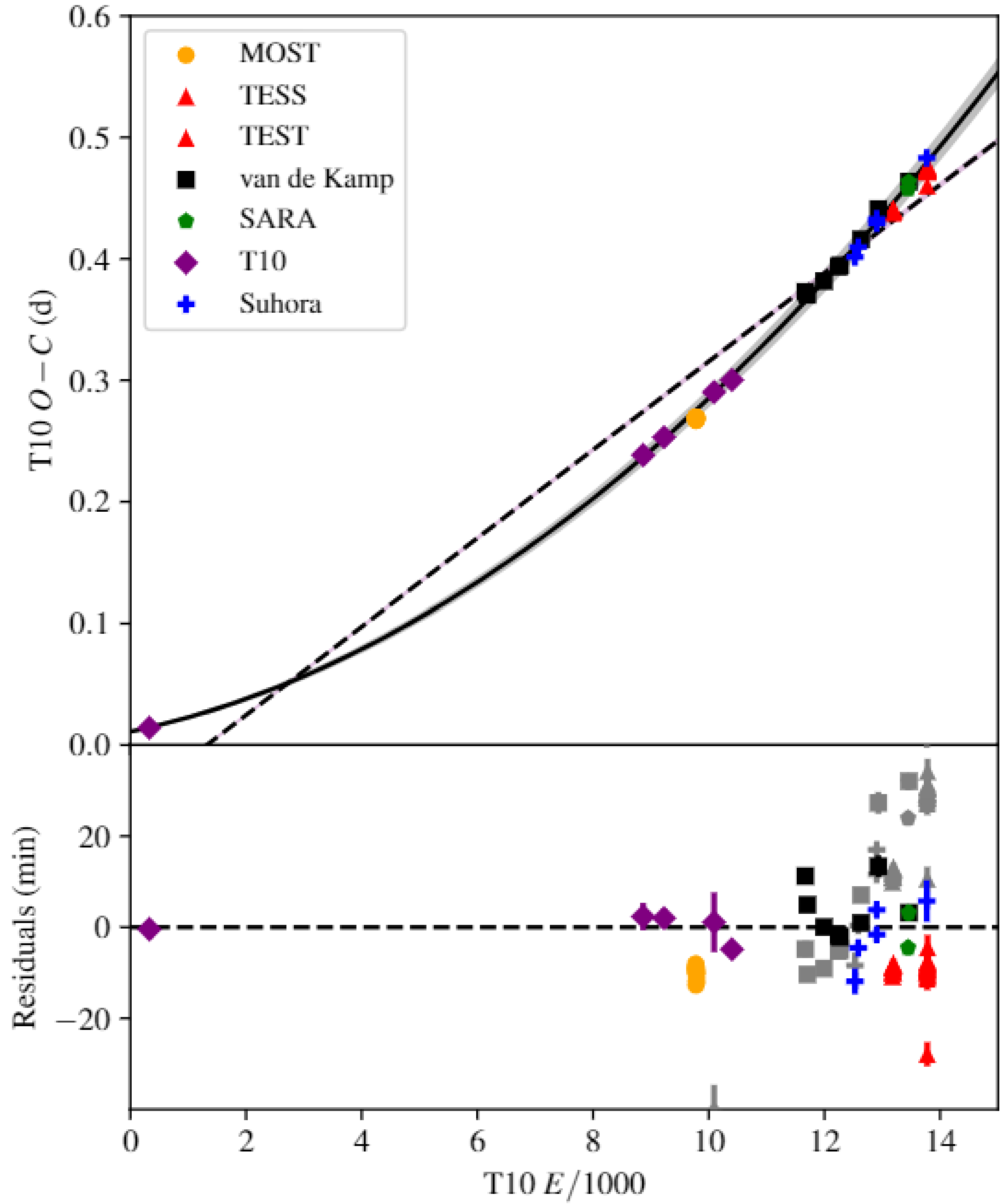
- 21. – 25. 10. (33)
  - sigma Ori E (CP star, period changes)

Table 6. The list of period-changing mCP stars with Maclaurin decomposition centered to 2022. The all relevant observations of all stars denoted as 'this paper' were analyzed for the purposes of this paper. The dependence of $\dot{P}/P$ in recent years is shown in Fig. 9

Name	P [d]	$\dot{P}$ ms yr^{-1}	$\ddot{P}$ ms yr^{-2}	$\dddot{P}$ ms yr^{-3}	Source
V473 Tau	1.4068	-110			Ozuyar & Stevens (2017)
σ Ori E	1.1909	65	-1.4		this paper
V901 Ori	1.5387	-288	10.5	1.3	this paper
V343 Pup	0.4755	7			this paper
CQ UMa	2.4499	-31			this paper
CU Vir	0.5207	-561	-40.7	-1.3	this paper
BS Cir	2.2043	-10	-6.6		this paper
V913 Sco	0.9791	-581			Shultz et al. (2019)
13 And	1.4793	-635			Pyper & Adelman (2020)

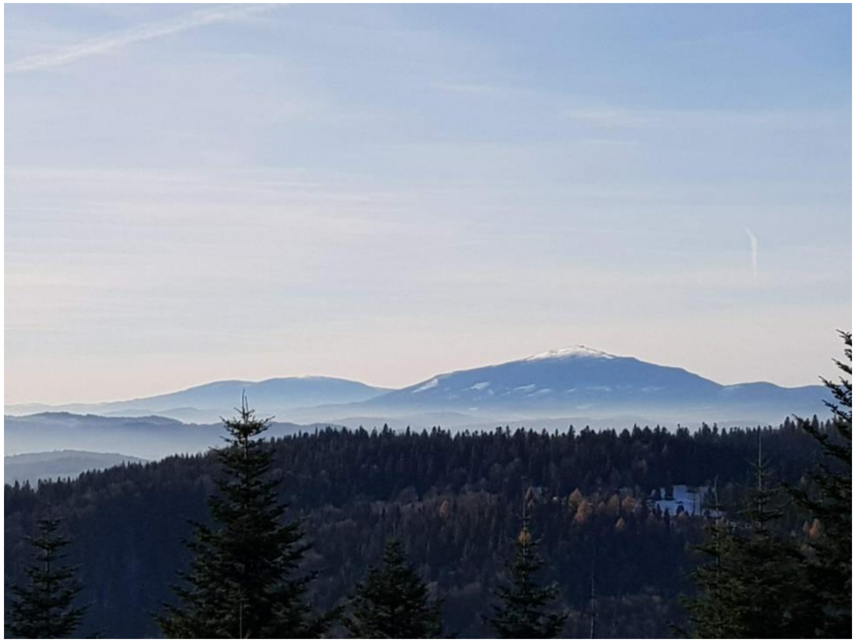

V1030 Ori
V-C
JDHEL 2458144+


V1030 Ori
V-C
JDHEL 2457764+


MOST
TESS
TEST
van de Kamp
SARA
T10
Suhora
T10 O − C (d)
Residuals (min)
T10 E/1000

2017

- project YETI (The Young Exoplanets Initiative)
  - open clusters younger 50 Myr
  - 12. – 26.10. [38]
  - 20. – 24. 11. [39]



Search for young transiting exoplanets within YETI project

Paweł Zieliński[1], Jan Janík[2], Ralph Neuhäuser[3], Markus Mugrauer[3], Zoltan Garai[4], Theodor Pribulla[4], Marek Dróżdż[5], Waldemar Ogłoza[5] and YETI Team

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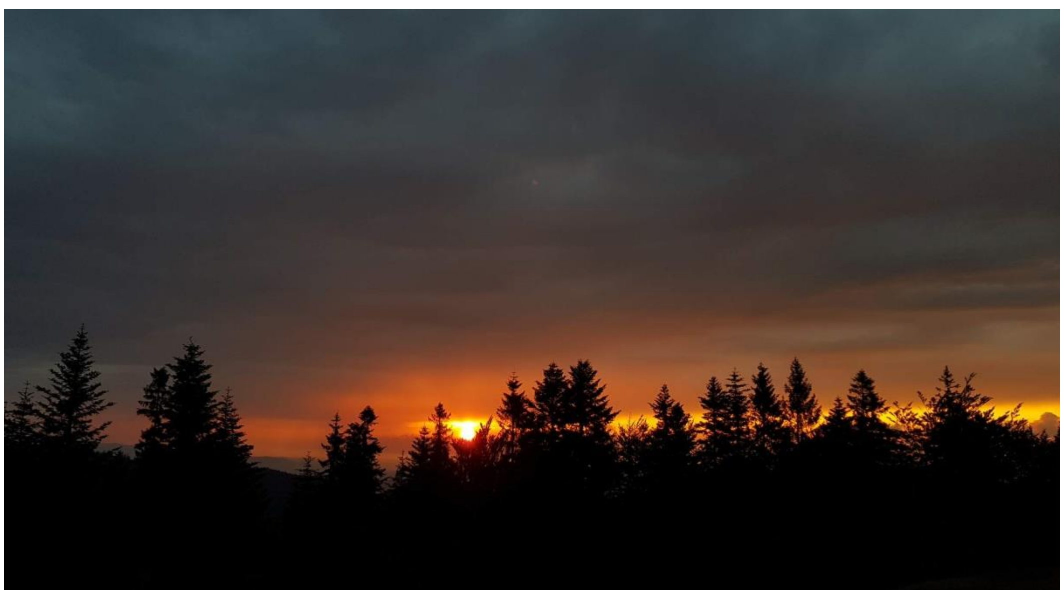
4. Astronomical Institute, Slovak Academy of Sciences, 059 60 Tatranská Lomnica, Slovak Republic
5. Mt. Suhora Astronomical Observatory, Cracow Pedagogical University, Podchorążych 2, 30–084 Kraków, Poland

The Young Exoplanet Transit Initiative (YETI) is a project focused on the photometric monitoring of stellar open clusters in order to find new young transiting exoplanets, eclipsing binaries and study other variability phenomena. Here, we present the status of the initiative and plans for future photometric campaigns of three open clusters younger than 50 Myr: NGC 869, NGC 884 and IC 4665, by using the world-wide one meter-class telescope network. Based on the experience gained by several astronomical observatories included in this network, dedicated numerical algorithms and recent results obtained during the first observing campaigns, we expect to confirm several young transiting objects: low-mass stars, brown dwarfs and exoplanets. The photometric precision given for a typical telescope used in this project, allows for transit detection of Jupiter-size planets at close-in orbits with periods up to $\sim$ 30 days and also hundreds of new various variable stars.

2018

- project YETI
- OJ 287
  - 12. – 26.10. (38)
  - 20. – 24. 11. (39)



The Astrophysical Journal, 863:175 (20pp), 2018 August 20 https://doi.org/10.3847/1538-4357/aad2de

Stochastic Modeling of Multiwavelength Variability of the Classical BL Lac Object OJ 287 on Timescales Ranging from Decades to Hours

A. Goyal[1], Ł. Stawarz[1], S. Zola[1,2], V. Marchenko[1], M. Soida[1], K. Nilsson[3], S. Ciprini[4,5], A. Baran[2], M. Ostrowski[1], P. J. Wiita[6], Gopal-Krishna[7], A. Siemiginowska[8], M. Sobolewska[8], S. Jorstad[9,10], A. Marscher[9], M. F. Aller[11], H. D. Aller[11], T. Hovatta[3], D. B. Caton[12], D. Reichart[13], K. Matsumoto[14], K. Sadakane[14], K. Gazeas[15], M. Kidger[16], V. Piirola[3,17], H. Jermak[18], F. Alicavus[19,20], K. S. Baliyan[21], A. Baransky[22], A. Berdyugin[6], P. Blay[23], P. Boumis[24], D. Boyd[25], Y. Bufan[26,27], M. Campas Torrent[28], F. Campos[29], J. Carrillo Gómez[30], J. Dalessio[31], B. Debski[1], D. Dimitrov[32], M. Drozdz[2], H. Er[33], A. Erdem[19,20], A. Escartin Pérez[34], V. Fallah Ramazani[3], A. V. Filippenko[35,36], E. Gafton[37], F. Garcia[38], V. Godunova[26], F. Gómez Pinilla[39], M. Gopinathan[40], J. B. Haislip[41], S. Haque[42], J. Harmanen[3], R. Hudec[43,44], G. Hurst[45], K. M. Ivarsen[41], A. Joshi[40], M. Kagitani[46], N. Karaman[47], R. Karjalainen[48], N. Kaur[21,49], D. Kozieł-Wierzbowska[1], E. Kuligowska[1], T. Kundera[1], S. Kurowski[1], A. Kvammen[37], A. P. LaCluyze[41], B. C. Lee[50], A. Liakos[24], J. Lozano de Haro[51], J. P. Moore[41], M. Mugrauer[52], R. Naves Nogues[28], A. W. Neely[53], W. Ogloza[2], S. Okano[46], U. Pajdosz[1], J. C. Pandey[40], M. Perri[4,54], G. Poyner[55], J. Provencal[31], T. Pursimo[37], A. Raj[56], B. Rajkumar[42], R. Reinthal[3], T. Reynolds[37], J. Saario[37], S. Sadegi[57], T. Sakanoi[46], J. L. Salto González[58], Sameer[21,59], A. O. Simon[60], M. Siwak[2], T. Schweyer[61,62], F. C. Soldán Alfaro[63], E. Sonbas[47], J. Strobl[43], L. O. Takalo[3], L. Tremosa Espasa[64], J. R. Valdes[65], V. V. Vasylenko[60], F. Verrecchia[4,54], J. R. Webb[66], M. Yoneda[67], M. Zejmo[68], W. Zheng[35], P. Zielinski[69], J. Janik[69], V. Chavushyan[65], I. Mohammed[70], C. C. Cheung[71], and M. Giroletti[72]

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[4] Agenzia Spaziale Italiana (ASI) Science Data Center, I-00133 Roma, Italy
[5] Istituto Nazionale di Fisica Nucleare, Sezione di Perugia, I-06123 Perugia, Italy

The Astrophysical Journal, 866:11 (20pp), 2018 October 10 https://doi.org/10.3847/1538-4357/aadd95

Authenticating the Presence of a Relativistic Massive Black Hole Binary in OJ 287 Using Its General Relativity Centenary Flare: Improved Orbital Parameters

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2019

- Ap star in eclipsing binary system HD 99458
  - 20. – 24.1. (42)
  - snow calamity


Stars and their variability observed from space
C. Neiner, W. W. Weiss, D. Baade, R. E. Griffin, C. C. Lovekin, A. F. J. Moffat (eds)

DISCOVERY OF THE FIRST AP STAR IN AN ECLIPSING BINARY SYSTEM

M. Skarka[1], P. Kabáth[2], E. Paunzen[1], M. Mašek[3], J. Žák[1] and J. Janík[1]

Abstract. We report the discovery of a very special object, the first star of its kind. HD 99458 appeared to be a chemically peculiar star of Ap type, showing overabundances of Si, Ti and other heavy elements which are concentrated into spots. The spots produce rotational modulation of light variations. In addition, the star shows pulsations of a δ Scuti type, which has never before been reported in Ap stars. The star is in a binary system with a red-dwarf companion, which is also very rare among magnetic chemically-peculiar stars. In this paper we discuss new observations and results concerning the pulsation period and chemical peculiarity of this object.

Keywords: Stars: chemically peculiar, inidividual: HD 99458, binaries: eclipsing

1 Introduction

HD 99458 was originally identified as a candidate exoplanetary host star by Barros et al. (2016). We report here on the analysis performed by Skarka et al. (2019). We utilized *Kepler/K2* data (Howell et al. 2014) and new radial-velocity (RV) observations gathered in the Czech and Slovak Republic to confirm the exoplanetary nature of the companion. We found that the companion is a low-mass red-dwarf star of mass 0.45 $M_\odot$ and not an exoplanet. High-resolution spectra enabled us to perform a basic chemical-abundance analysis; it revealed that the primary star in the binary system shows overabundance of Si, Ti and other elements. We explain the out-of-transit variations with a period of 2.722 days, which is the same as the orbital period, to be a consequence of chemical spots. The primary of HD 99458 is therefore a magnetic chemically-peculiar star (CP2 type, Preston 1974).

CP2 stars are only rarely reported to be found in binary systems (e.g. Carrier et al. 2002; Mathys 2017)

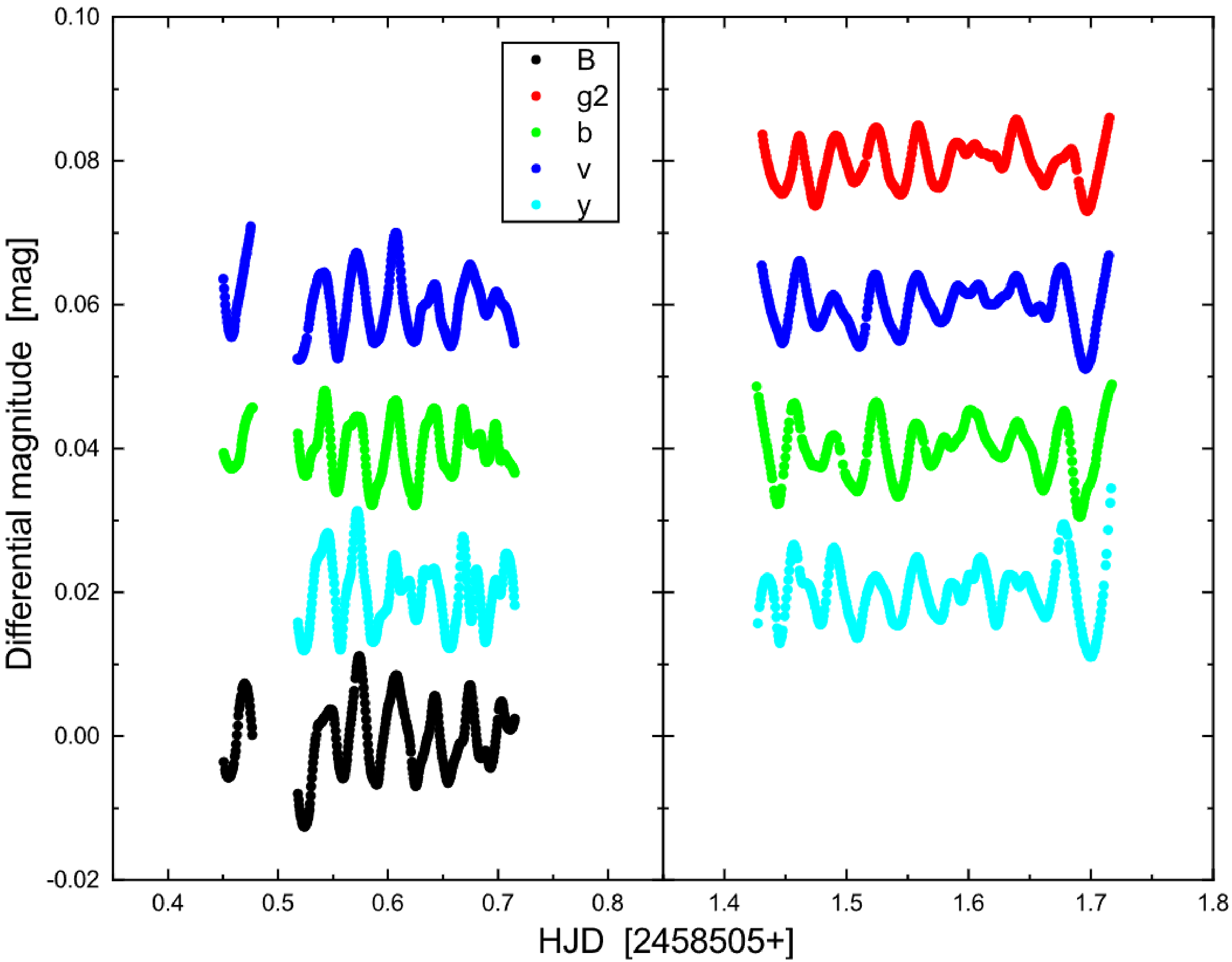

Fig. 1. The differential light curves of HD 99458 for Johnson *B*, Strömgren-Crawford *vby* and Δa g_2, respectively.

Astronomy & Astrophysics manuscript no. output
October 6, 2022

HD 99458 revised: a δ Sct-type pulsator with an active companion star in a triple system

E. Paunzen[1], J. Janík[1], E. Semenko[2], M. E. Shultz[3], P. Walczak[4], and Z. Mikulášek[1]

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[3] Department of Physics and Astronomy, University of Delaware, 217 Sharp Lab, Newark, Delaware, 19716, USA
[4] Astronomical Institute, University of Wrocław, PL-51-622 Wrocław, Poland

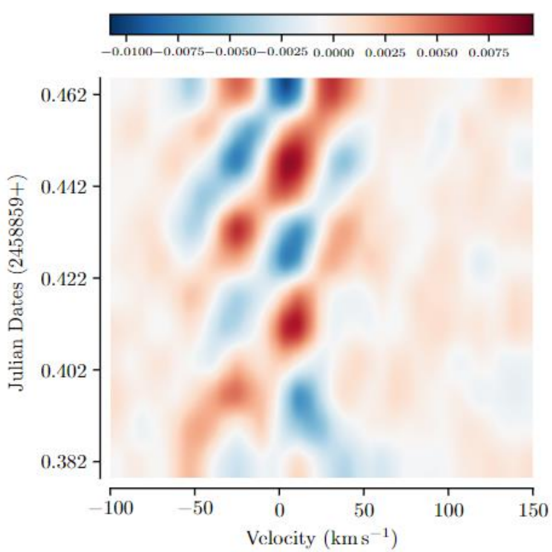
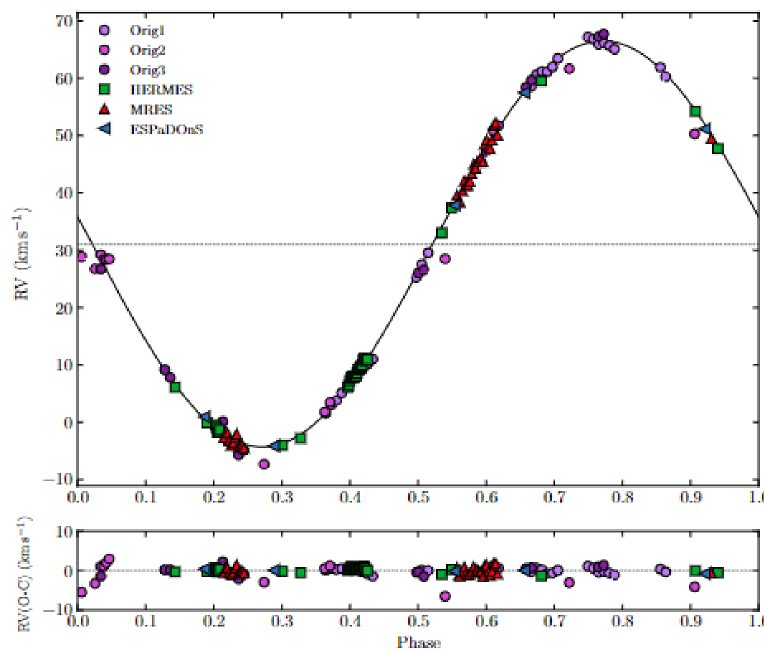


Fig. 4. Residual intensity of the LSD profiles showing the spectral variability of HD 99458 in HERMES (top) and MRES (bottom) data.



2019

- high school project – Zorka Zemanová
- pulsation of WDs
  - 16. – 20.11. (46)
  - 5. – 8.12. (47)

STŘEDOŠKOLSKÁ ODBORNÁ ČINNOST

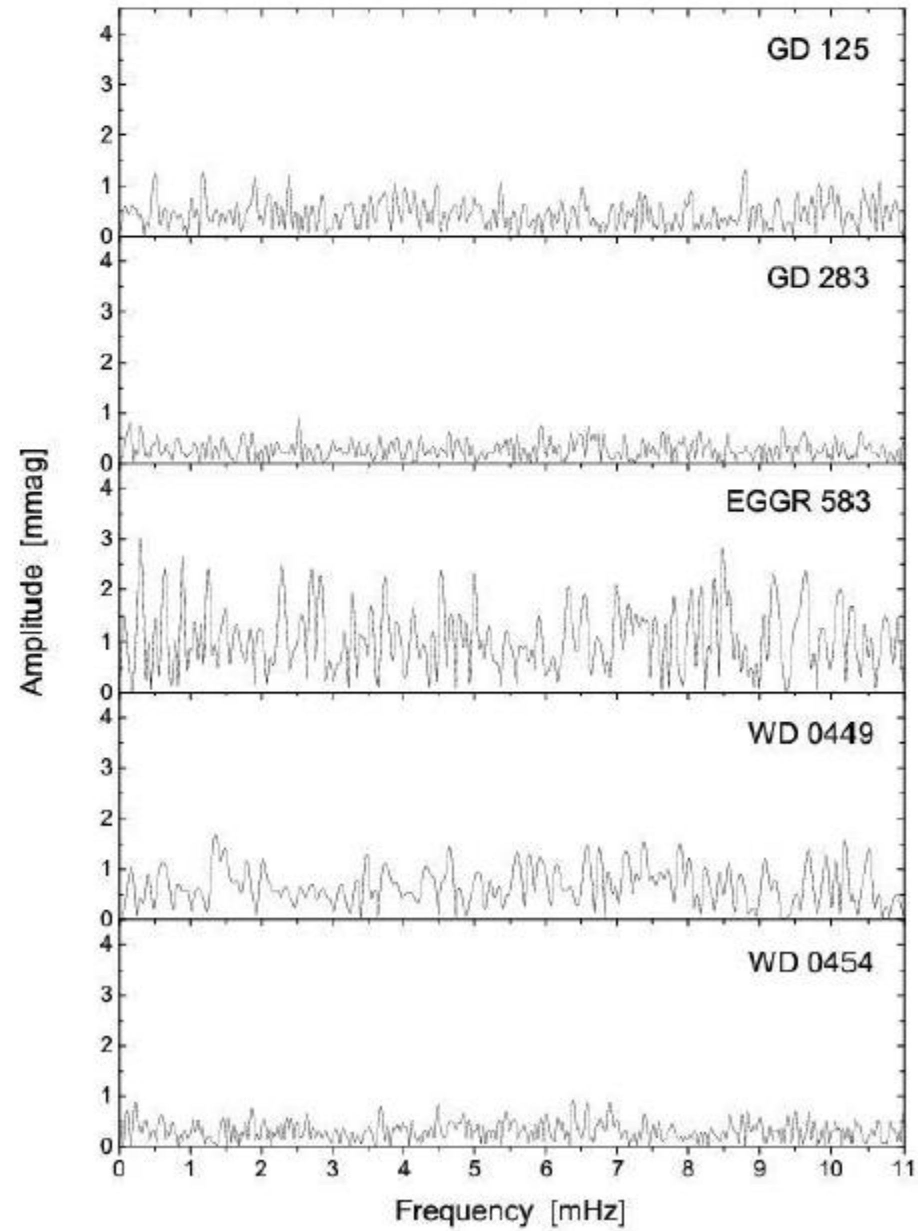
Obor č. 2: Fyzika

Hledání nových proměnných bílých trpaslíků typu ZZ Ceti v pásu nestability

Research of a new variable white dwarfs ZZ Ceti in the instability strip

Autoři: Zora Zemanová
Škola: Gymnázium Uherské Hradiště, Velehradská tř. 218, 686 01 Uherské Hradiště
Kraj: Zlínský kraj
Konzultant: RNDr. Jan Janík, Ph.D., Masarykova univerzita

Uherské Hradiště 2019



Revista Mexicana de Astronomía y Astrofísica, **56**, 1–7 (2020)

https://doi.org/10.22201/ia.01851101p.2020.56.02.02

A SEARCH FOR PULSATION IN TWENTY-ONE WHITE DWARFS

E. Paunzen[1], G. Handler[2], J. Janík[1], Z. Zemanová[3], M. Rode-Paunzen[4], M. S. O'Brien[5], T. K. Watson[6], and M. Dróżdż[7]

Received February 5 2020; accepted April 24 2020

ABSTRACT

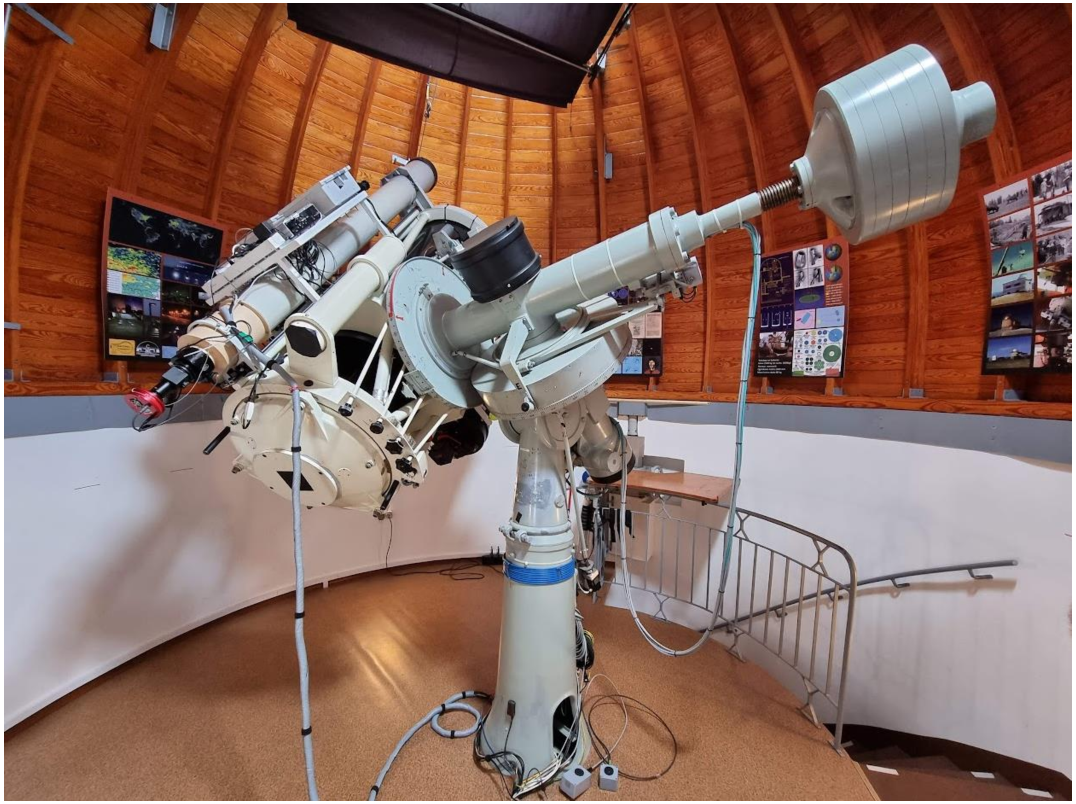
Well-defined astrophysical constraints of white dwarfs (WDs), such as on the presence or absence of pulsational variability, are very much needed to refine and develop current models. Because these stars are rather faint and variability periods are mostly below one hour, only a very limited amount of space-based data is currently available for these objects. We present about 68 hours of high-quality ground-based photometric time-series data for twenty-one WDs acquired at five different observatories. No new pulsators were detected but the derived upper limits of variability, which are typically on the order of only a few mmags, provide important input for pulsation models.

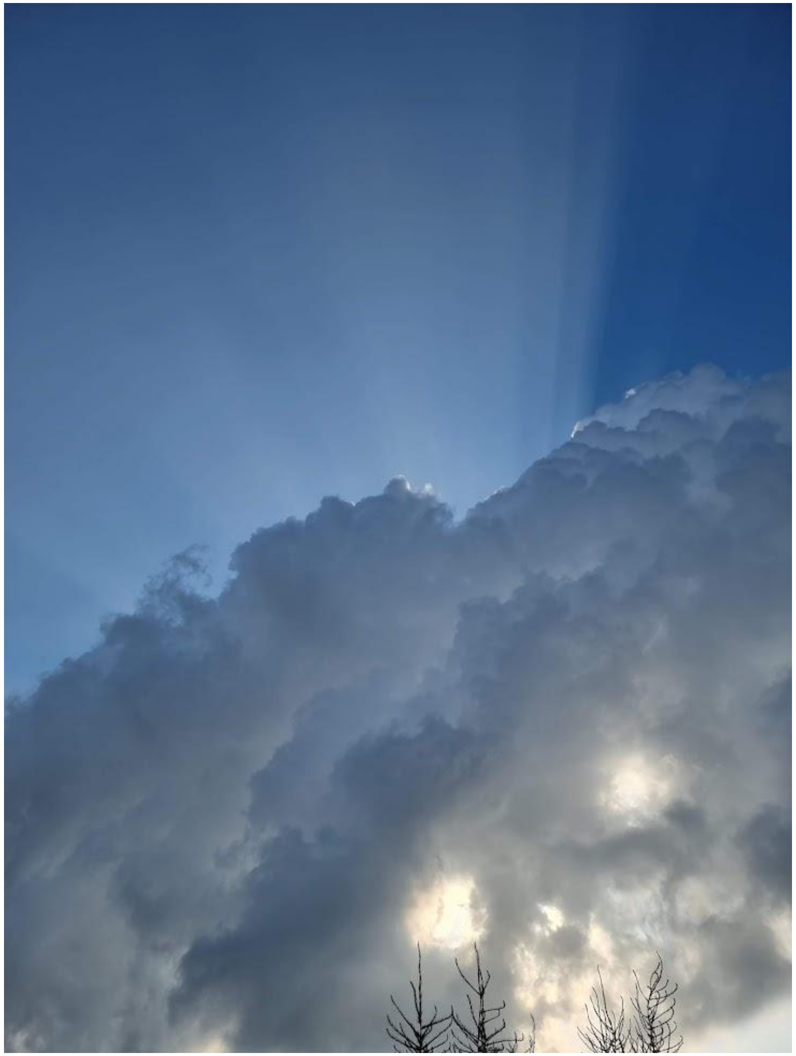
RESUMEN

Es muy necesario contar con cotas astrofísicas bien definidas para los parámetros de las enanas blancas (WD) con el objeto de mejorar los modelos actuales. Dado que estas estrellas son débiles y tienen períodos de variabilidad de menos de una hora, actualmente sólo contamos con datos muy limitados basados en observaciones espaciales. Presentamos 68 horas de datos fotométricos de alta calidad obtenidos en cinco obsevatorios terrestres para 21 enanas blancas. No se encontraron pulsadores nuevos, pero los límites superiores para la variabilidad que determinamos, del orden de unas cuantas mmags, son importantes para la construcción de modelos de pulsación.

2020 – 2021

- COVID ...
  - 15. – 16.7.2021[50]





2022

- absolute photometry *UBVRI*
  - 14. – 17.6.[54]
  - Adam Přadka
    Absolut photometry of open cluster NGC 6811
    (bachelor thesis)

Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY

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Host galaxy magnitude of OJ 287 from its colours at minimum light

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Affiliations are listed at the end of the paper

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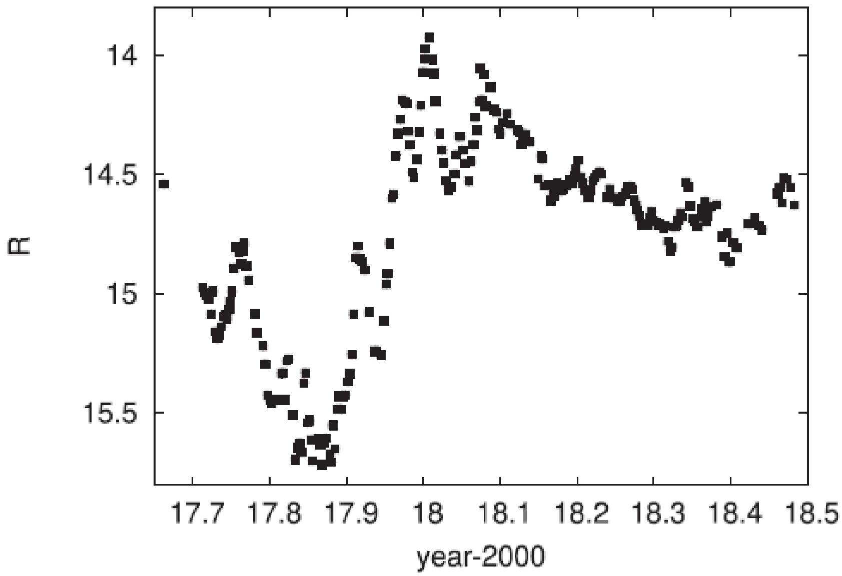
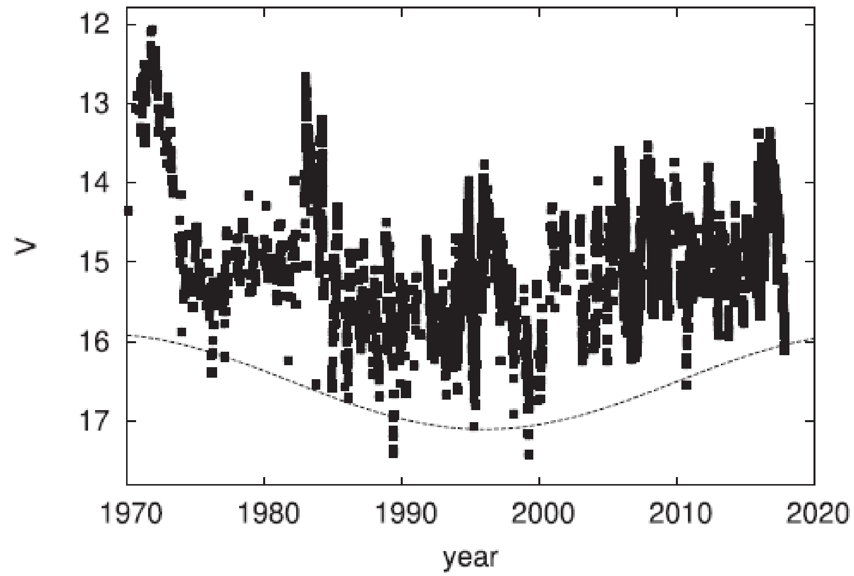
ABSTRACT

OJ 287 is a BL Lacertae type quasar in which the active galactic nucleus (AGN) outshines the host galaxy by an order of magnitude. The only exception to this may be at minimum light when the AGN activity is so low that the host galaxy may make quite a considerable contribution to the photometric intensity of the source. Such a dip or a fade in the intensity of OJ 287 occurred in 2017 November, when its brightness was about 1.75 mag lower than the recent mean level. We compare the observations of this fade with similar fades in OJ 287 observed earlier in 1989, 1999, and 2010. It appears that there is a relatively strong reddening of the $B-V$ colours of OJ 287 when its V-band brightness drops below magnitude 17. Similar changes are also seen in $V-R$, $V-I$, and $R-I$ colours during these deep fades. These data support the conclusion that the total magnitude of the host galaxy is $V = 18.0 \pm 0.3$, corresponding to $M_K = -26.5 \pm 0.3$ in the K-band. This is in agreement with the results, obtained





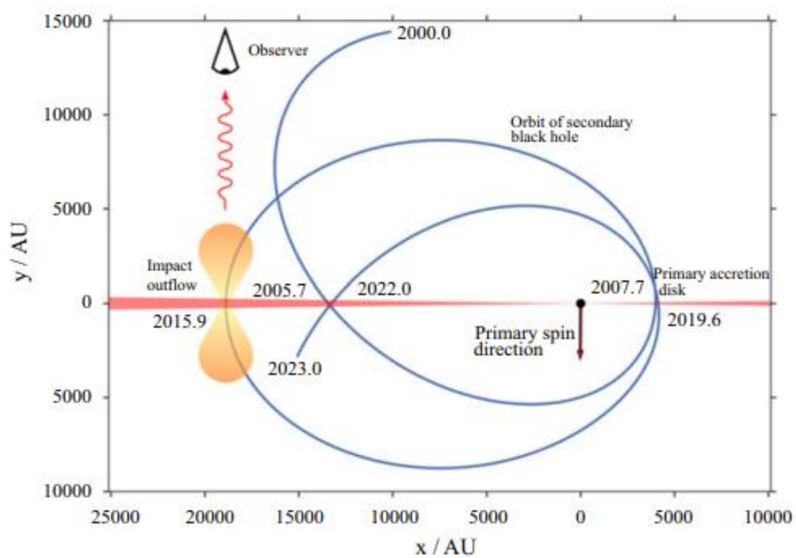
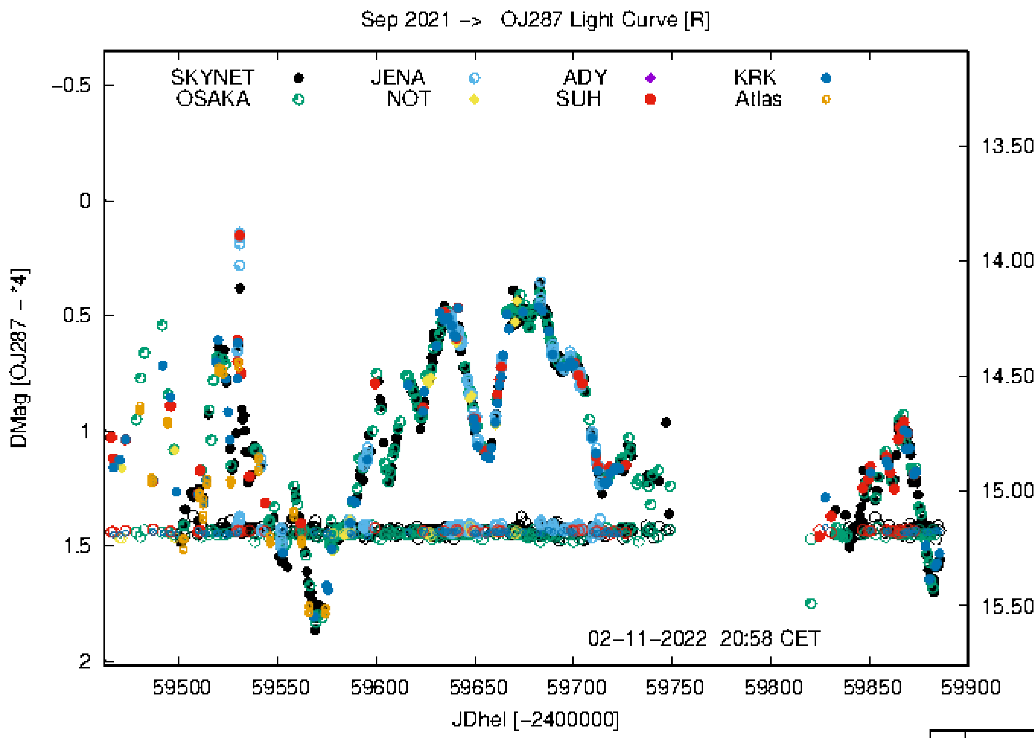
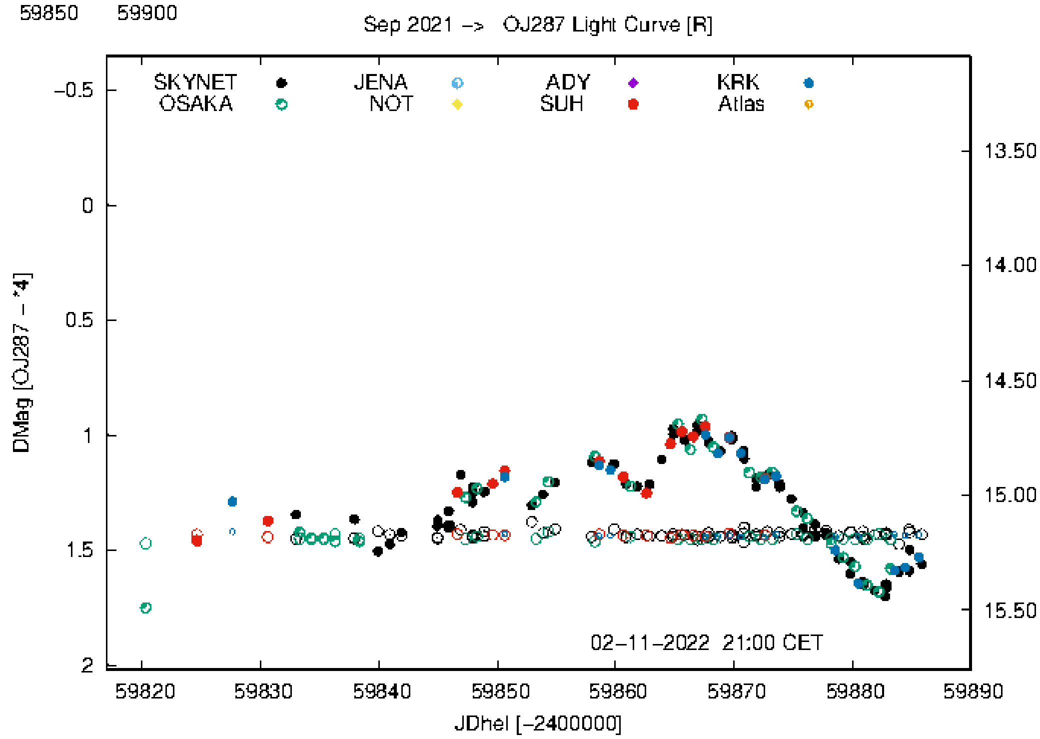


Figure 1. Orbit of the secondary black hole in OJ 287 from 2000 to 2023. The present thermal outburst comes from the disk crossing in 2013 while the nonthermal flux arises from a jet, parallel to the primary spin axis. The next two thermal outbursts are due in 2019 and 2022, following the crossing of the secondary black hole through the accretion disk of the primary black hole.

Valtonen et al. (2016, ApJL, 819, 37)



Sep 2021 -> OJ287 Light Curve [R]
SKYNET OSAKA JENA NOT ADY SUH KRK Atlas
DMag [OJ287 - *4]
JDhel [-2400000]
02-11-2022 20:58 CET



Sep 2021 -> OJ287 Light Curve [R]
SKYNET OSAKA JENA NOT ADY SUH KRK Atlas
DMag [OJ287 - *4]
JDhel [-2400000]
02-11-2022 21:00 CET

Thank you for your attention