Przemysław Mikołajczyk

mikolajczyk@astro.uni.wroc.pl

Status of the Białków Observatory

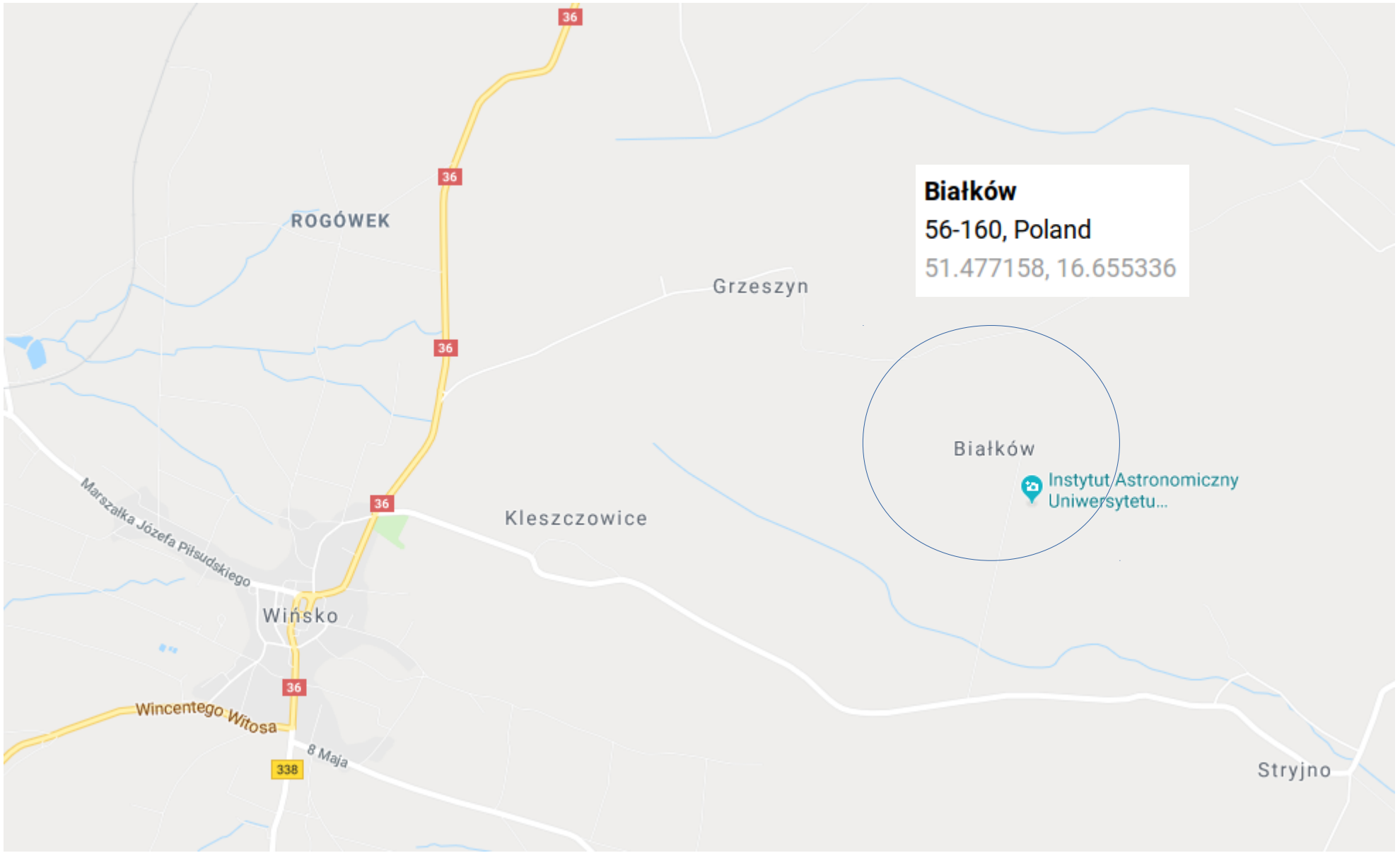
9th Gaia Science Alerts Workshop

8-10 October, Vipava, Slovenia

Location

Uniwersytet Wrocławski

Location


Białków
56-160, Poland
51.477158, 16.655336
ROGÓWEK
Grzeszyn
Białków
Instytut Astronomiczny Uniwersytetu...
Kleszczowice
Marszałka Józefa Piłsudskiego
Wińsko
Wincentego Witosa
8 Maja
Stryjno
36
338

Location

Uniwersytet Wrocławski

Location

Photo by Aeroklub Dolnośląski

Location


WINNICE WZGÓRZ TRZEBNICKICH
Blanc
WINO BIAŁE
WYTRAWNE
WYPRODUKOWANO I ZABUTELKOWANO
W WINNICY
75 cl e
12,5% vol.

Location

- Up to 100 clear nights per year
- No big cities within 50 km radius
- Surrounded by small villages and agricultural areas
- Quite high humidity :(

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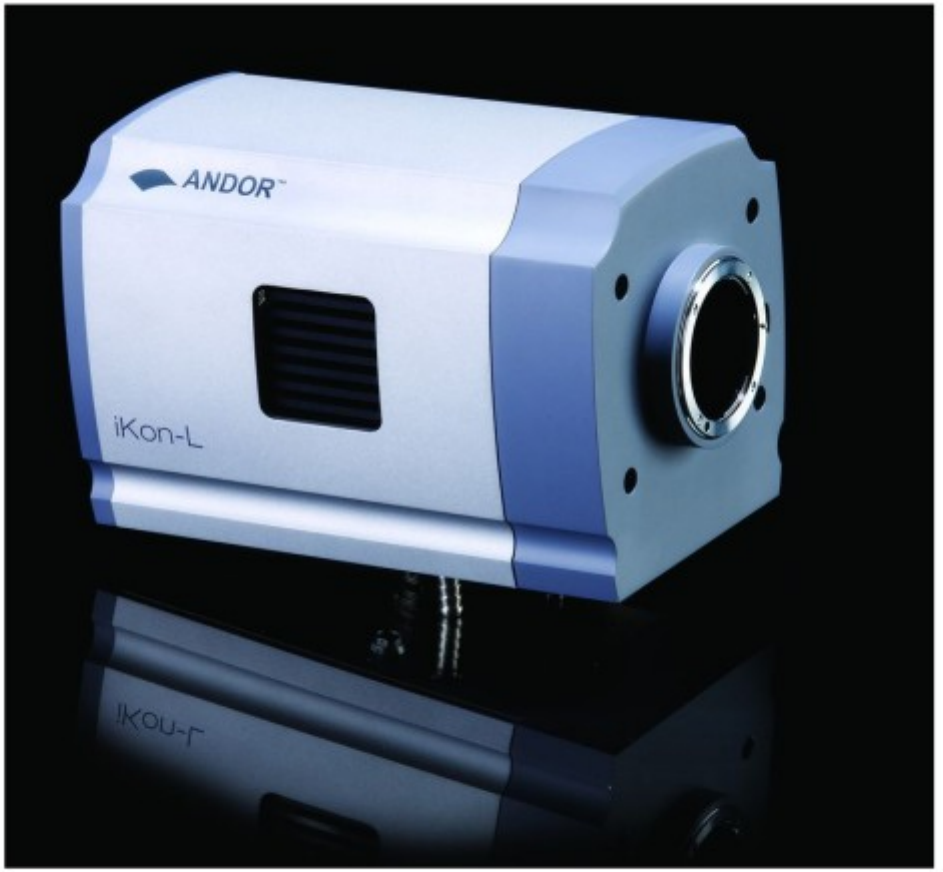
More:

http://tinyurl.com/
BialkowTimelapse

Location

Gear



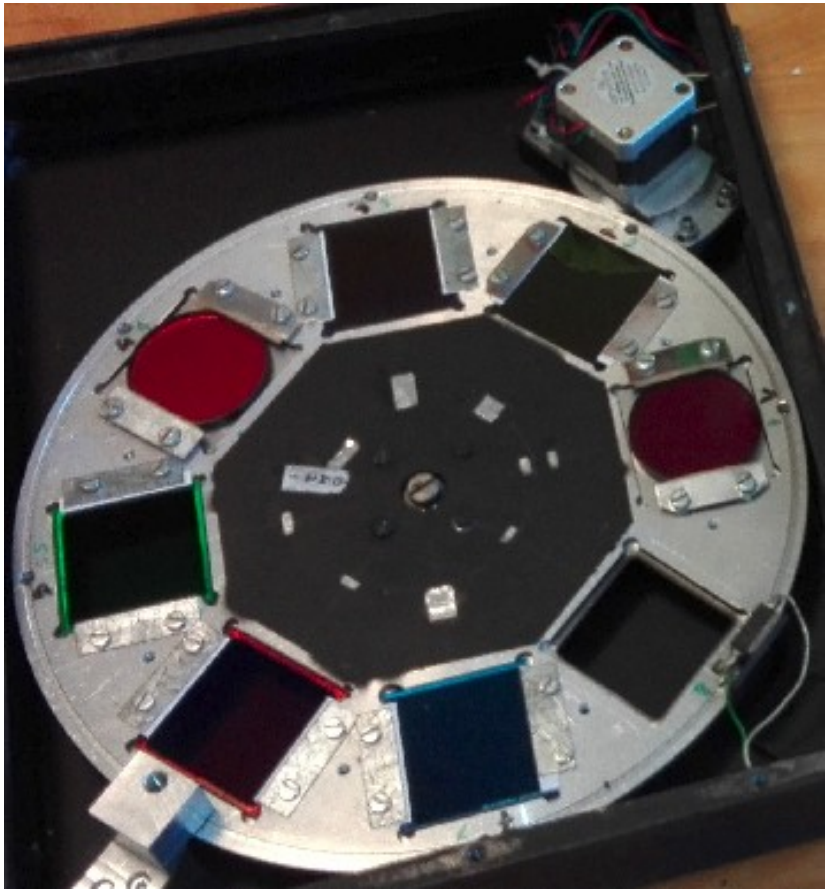
Rys. 1.14: Kamera Andor iKon-L

Źródło: http://www.andor.com/scientific-cameras/ikon-ccd-camera-series/ikon-l

Gear

- 60–cm Cassegrain telescope
- Andor iKon–L CCD camera (cooled down to -50^{o}C)
- Guider camera (Atik 314L+ mono)
- Filters of Johnson–Cousins photometric system: (U), B, V, R_C, I_C

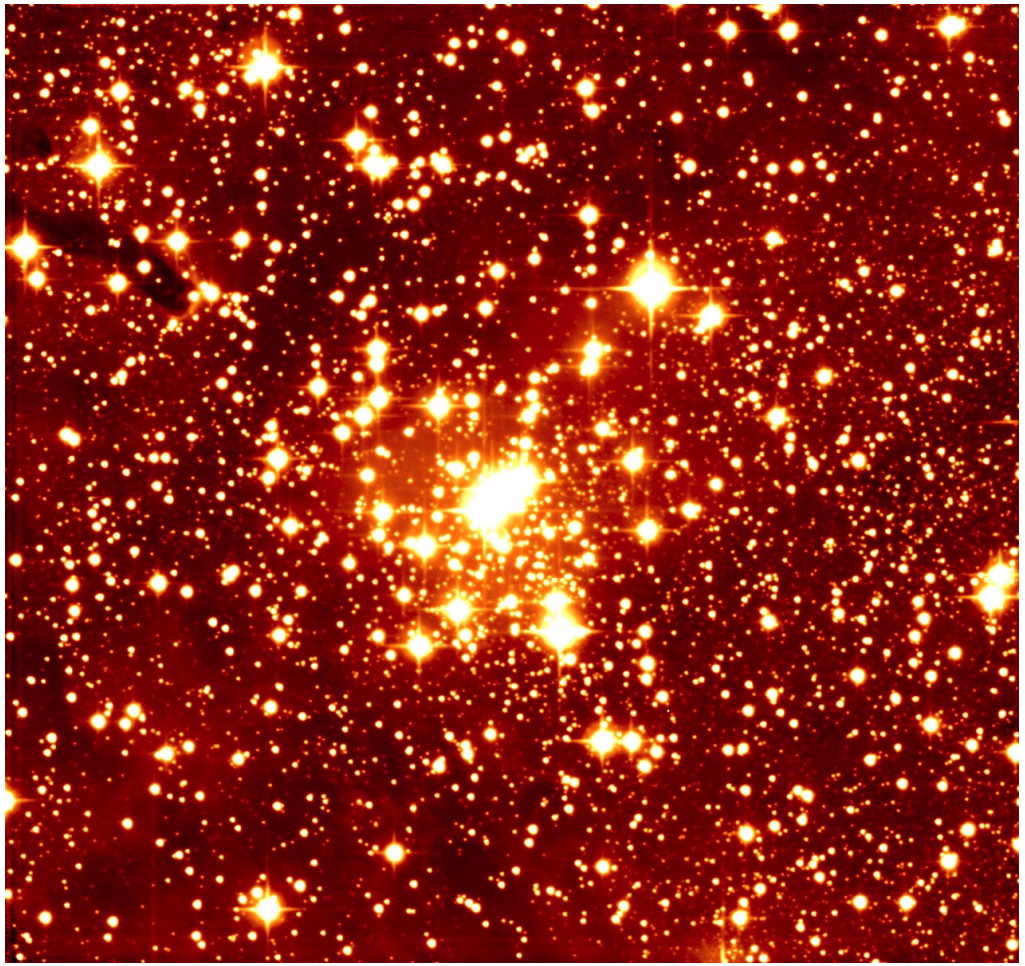
  + two Hα filters (narrow and wide)



Ongoing observation programs

Uniwersytet Wrocławski

- **Open clusters survey in Hα**



NGC 6823
dr Zbigniew Kołaczkowski

NGC 7380
prof. dr hab. Andrzej Pigulski

Ongoing observation programs

- **Open clusters survey in Hα**

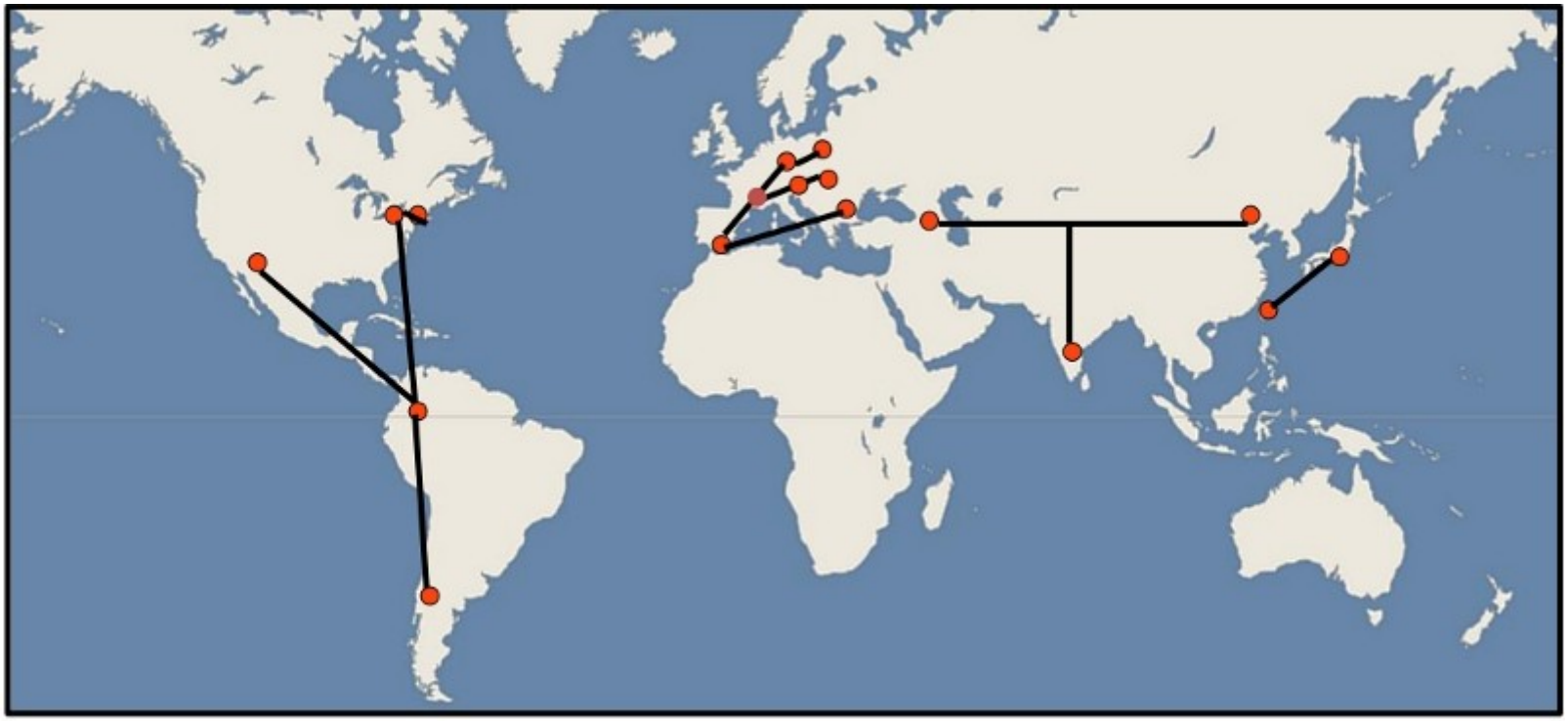
Stock 8
Przemek Mikołajczyk

GOALS:

- Obtaining standard photometry
- Variability survey with the emphasis on discovering pulsating B-type stars
- Age estimation
- Distance measurements
- Clusters' proper motions determination
- Members/Non-members
- Probing for emission stars (and YSOs) using Hα photometry

Ongoing observation programs

- **Planetary transits (YETI = Young Exoplanet Transit Initiative)**

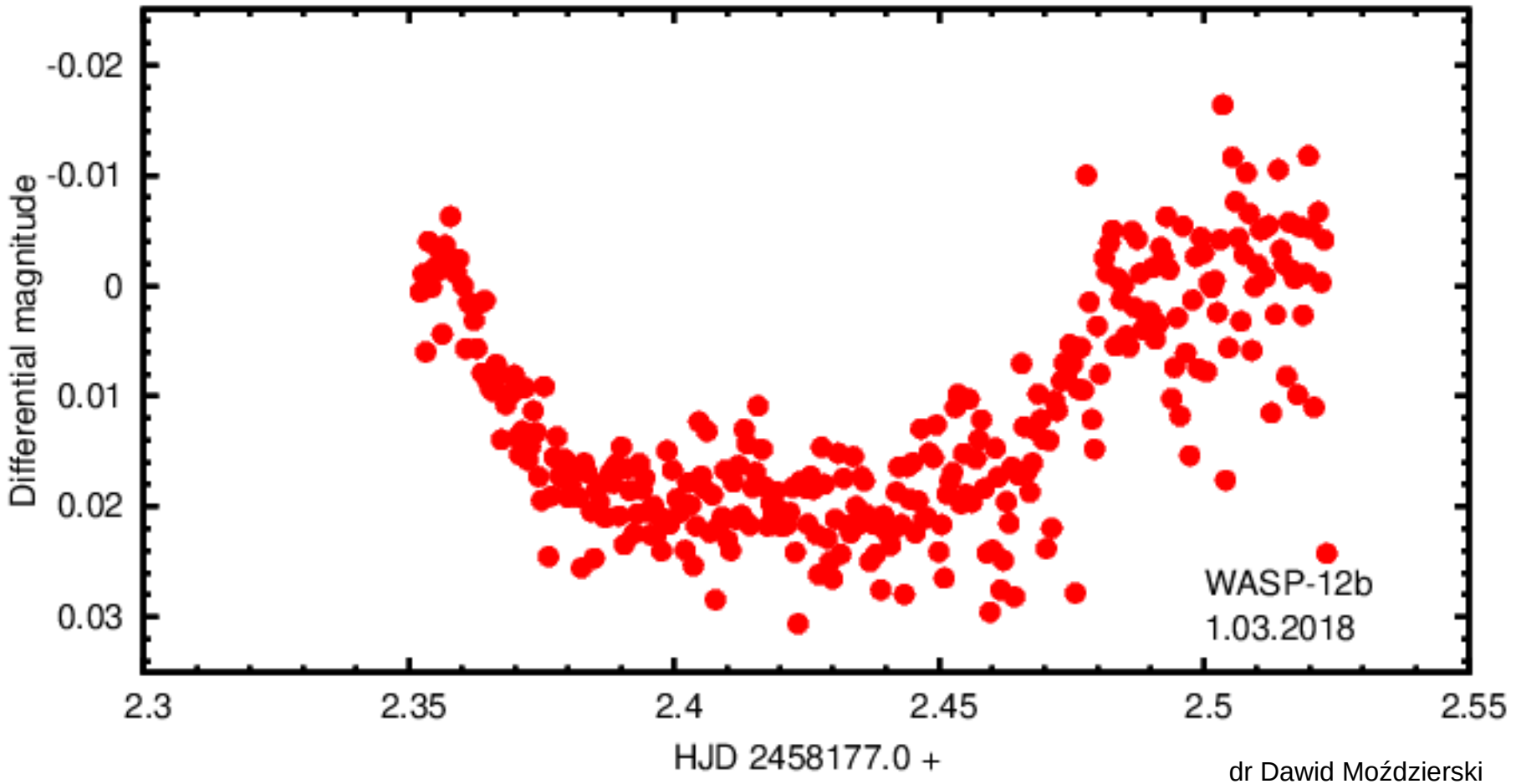


Timing known transits for Gracjan Maciejewski (Toruń, Poland)

Ongoing observation programs

Uniwersytet Wrocławski

- **Planetary transits (YETI = Young Exoplanet Transit Initiative)**



dr Dawid Moździerski

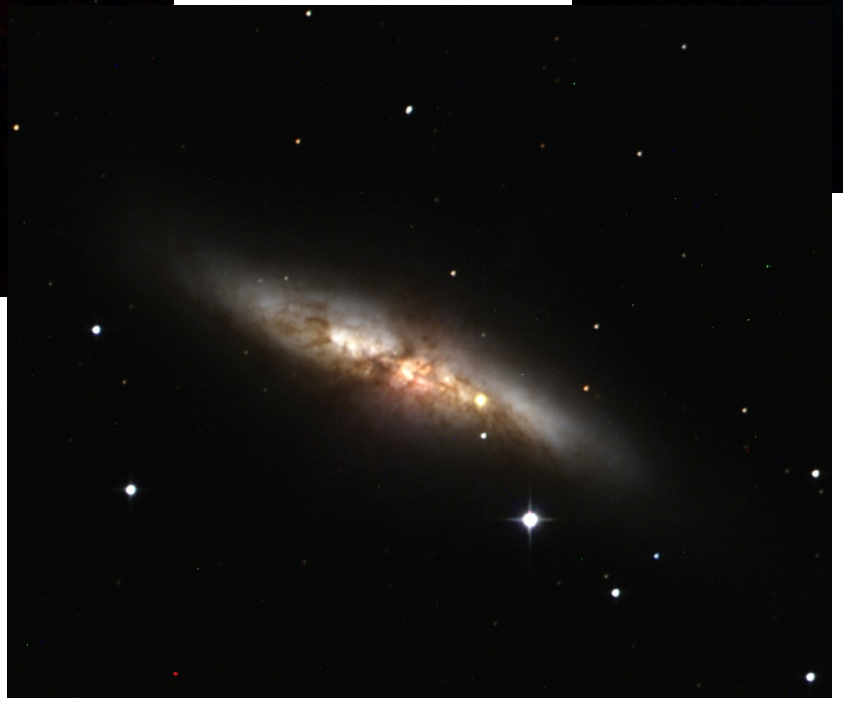
Ongoing observation programs

Uniwersytet Wrocławski

- **Observations of bright supernovae**

SN2018aoq
Przemek Mikołajczyk

SN2016bkv
Przemek Mikołajczyk



SN2014J in M82
dr Dawid Moździerski

Ongoing observation programs

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

➔ So far we gathered photometric data for more than 100 events

Gaia14aae Gaia14aaf Gaia14aat Gaia14abg Gaia14abh Gaia14acd Gaia14acf Gaia14acj Gaia14acq Gaia14acx Gaia14adf Gaia14adl Gaia14aea Gaia15aad Gaia15aag Gaia15aal Gaia15aax Gaia15abh Gaia15abu Gaia15abz Gaia15acd Gaia15acn Gaia15acu Gaia15acy Gaia15adt Gaia15aek Gaia15ael Gaia15aet Gaia15aev Gaia15aey Gaia15afa Gaia15afc Gaia15afd Gaia15afe Gaia15aff Gaia15afi Gaia15afq Gaia15aft Gaia15agc Gaia15agh Gaia15agi Gaia16abk Gaia16abw Gaia16adb Gaia16ael Gaia16afy Gaia16ahq Gaia16ahw Gaia16aib Gaia16aiu Gaia16aiz Gaia16ajm Gaia16ajq Gaia16akk Gaia16alb Gaia16alf Gaia16alk Gaia16alo Gaia16alq Gaia16alt Gaia16alz Gaia16amg Gaia16aml Gaia16aoz Gaia16apu Gaia16avf Gaia16aye Gaia16bbi Gaia16bbs Gaia16bbz Gaia16bei Gaia16bes Gaia16bnz Gaia16bza Gaia16cdy Gaia16cfa Gaia16cfv Gaia17aah Gaia17agj Gaia17agk Gaia17aue Gaia17aur Gaia17biu Gaia17biu Gaia17bjv Gaia17bjw Gaia17btr Gaia17bts Gaia17bum Gaia17byc Gaia17caj Gaia17cal Gaia17cav Gaia17cay Gaia17dka Gaia18anr Gaia18azh Gaia18bes GaiaV14ahj GaiaV14ahl

Gaia Alerts examples: Gaia16aye

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

We observed Gaia16aye in four photometric bands

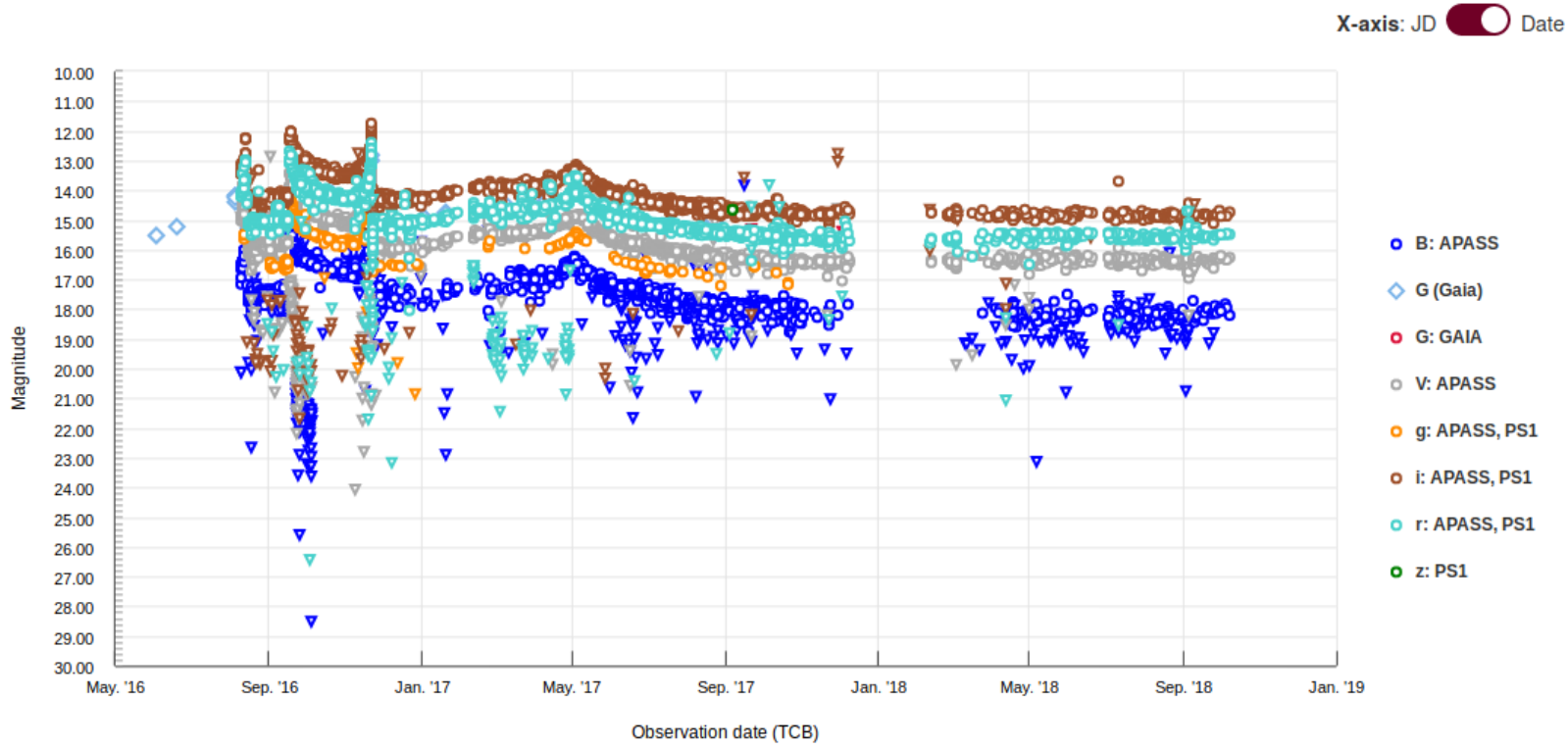
Gaia16aye

Details | Follow-up

The figure shows the Gaia lightcurve combined with photometric follow-up photometry generously provided by the astronomical community using the Cambridge Photometry Calibrat Server (CPCS). Multiple filters are shown in one figure and can be toggled on/off using the legend on the side. Click and drag in the chart to zoom in. Clicking on datapoints provides additional information of the observation.

Access to these photometric data may be requested from the individuals who took the data. Please contact us if you would like to ask for access and we will pass on your request.

Warning: The follow-up data is obtained using rough calibrations and we can not guarantee its complete correctness at this stage.

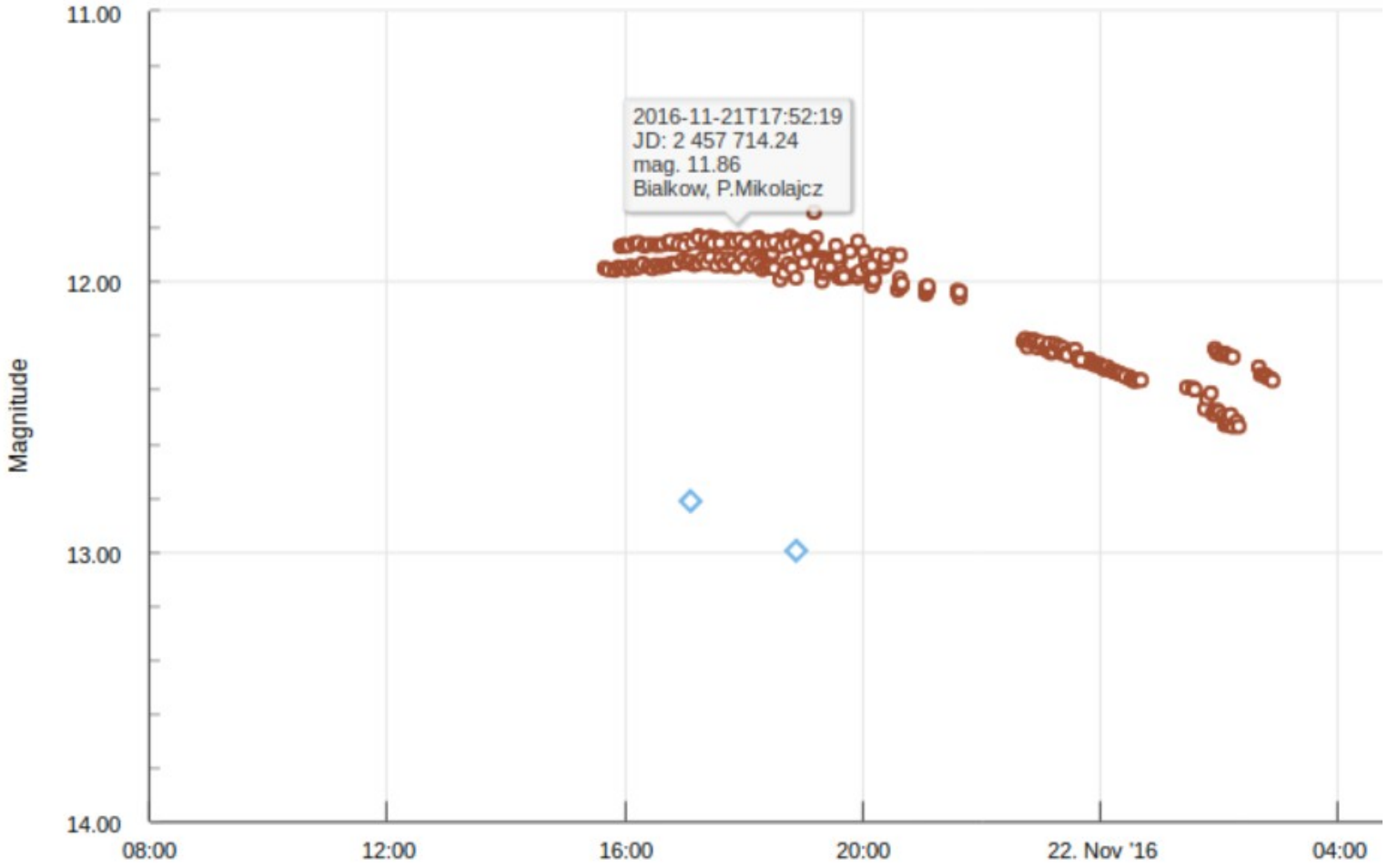


Gaia Alerts examples: Gaia16aye

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

  We observed Gaia16aye in four photometric bands



Gaia Alerts examples: Gaia16aye

- **Folle**

  We ob

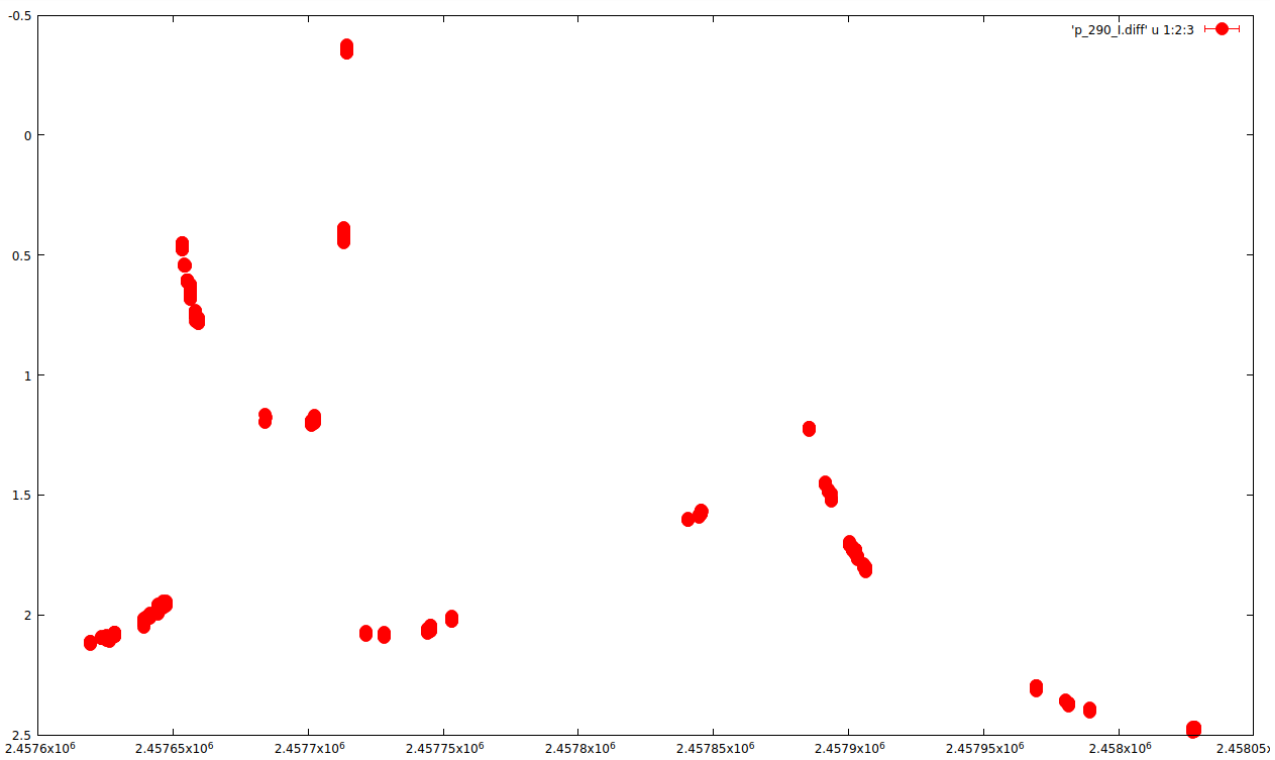
Ayers Rock star field
dr Zbigniew Kołaczkowski

Gaia Alerts examples: Gaia16aye

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

  We observed Gaia16aye in four photometric bands



IC band differential photometry (~85% of gathered data)
637 data points plotted

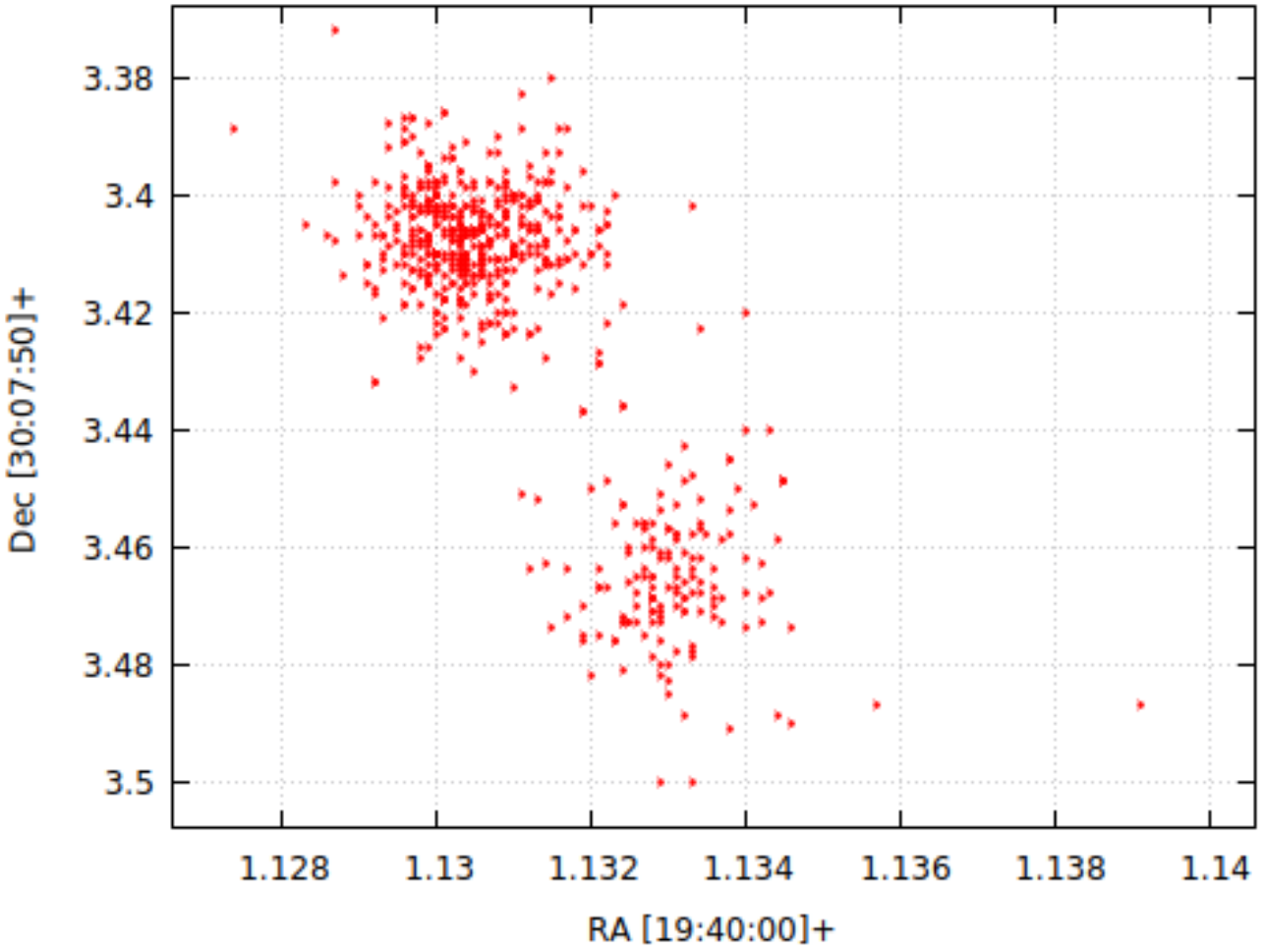
Kołaczkowski & Mikołajczyk

Gaia Alerts examples: Gaia16aye

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

  Precise astrometry for Gaia16aye field of stars



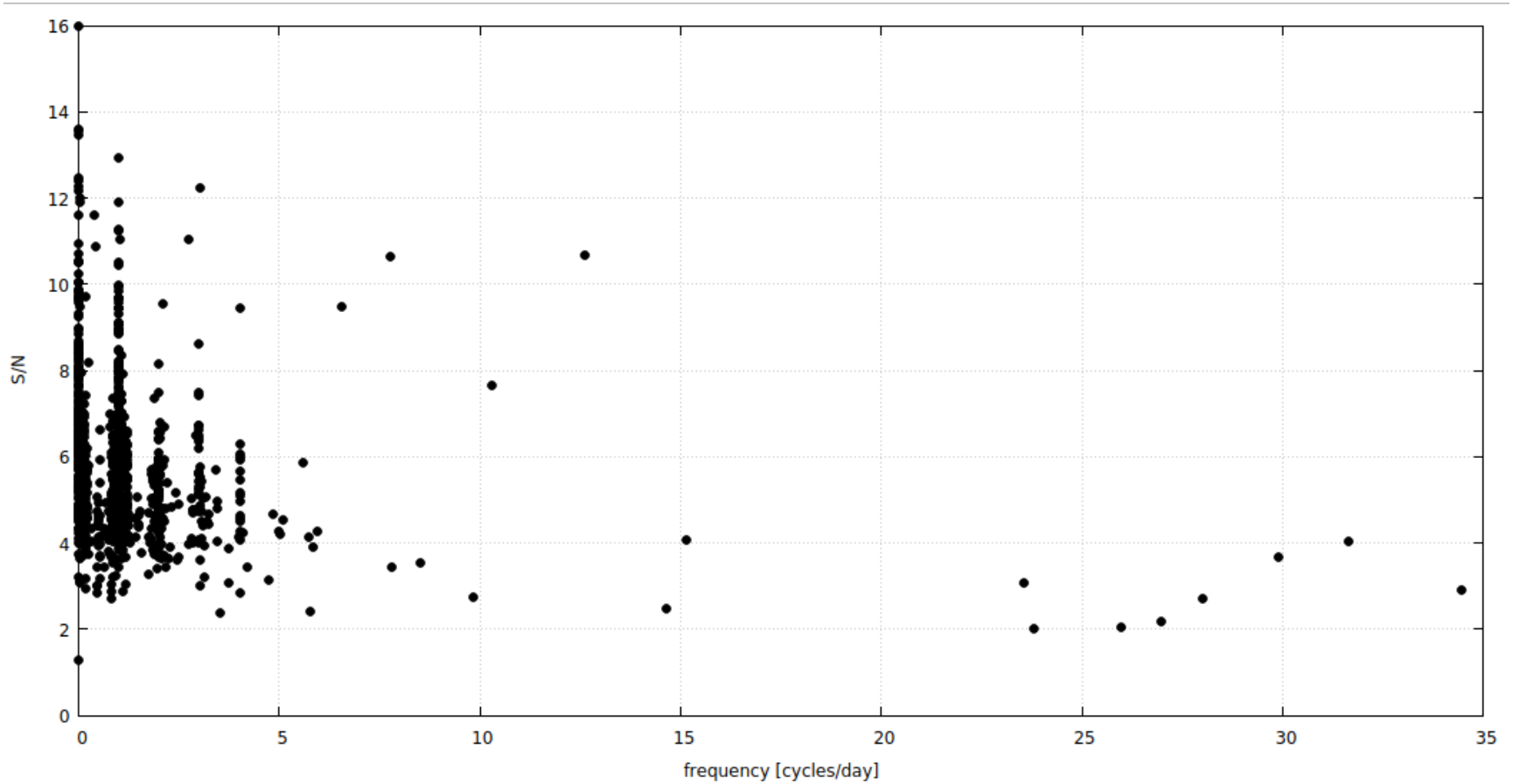
Kołaczkowski & Mikołajczyk

Gaia Alerts examples: Gaia16aye

Uniwersytet Wrocławski

- **Follow-up for Gaia Science Alerts**

➔ Variability search in Gaia16aye field of stars (using Białków & Liv.Tel. data)



Examining only 1000 brightest sources we found ~30 variables, including δ Sct pulsators, HADS star, eclipsing binaries

Mikołajczyk & Przyłuski

Gaia Alerts examples: GaiaVerif14ahj

Uniwersytet Wrocławski

- **Investigation of GaiaV14ahj star – type II Cepheid**

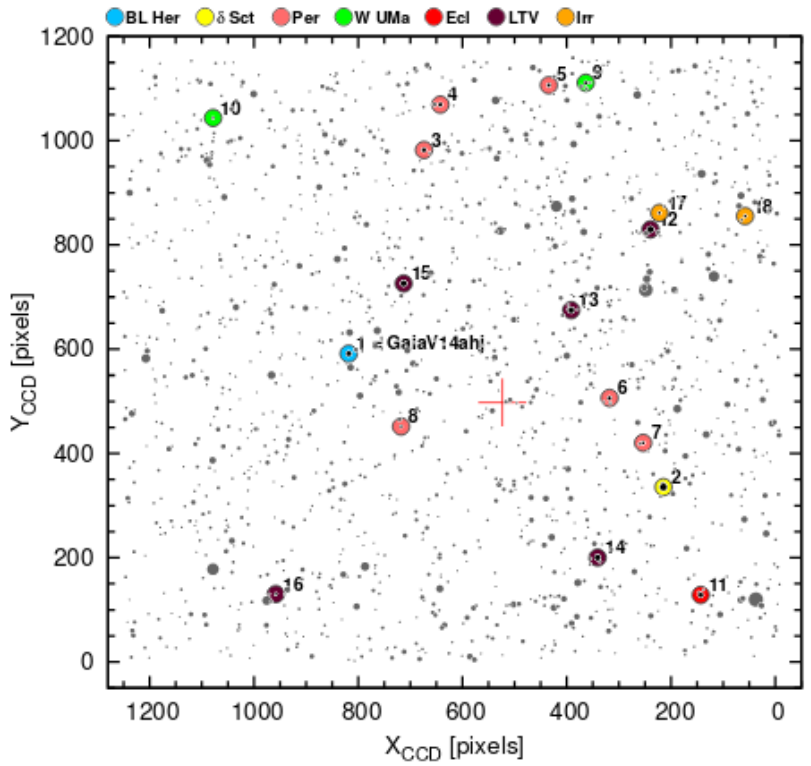
GaiaV14ahj field of stars in Lacerta
Mikołajczyk & Kołaczkowski

Gaia Alerts examples: GaiaVerif14ahj

Uniwersytet Wrocławski

- **Investigation of GaiaV14ahj star – type II Cepheid**

band	frames	Seeing [arcsec] best	worst	average	exposure times [s]
GaiaV14ahj					
B	205	2.080	4.825	3.022	169×120, 33×100, 3×60
V	228	1.980	4.348	2.983	145×120, 54×100, 26×90, 3×60
R_c	223	1.843	4.091	2.842	110×120, 71×100, 42×90
I_c	235	1.783	4.133	2.761	124×69, 54×100, 13×90, 29×60
total	891				
NGC7654					
B	9	1.811	2.166	1.990	9×60
V	9	1.599	1.948	1.807	9×60
R_c	9	1.501	1.963	1.710	9×40
I_c	9	1.482	1.735	1.586	9×40
total	36				



GaiaV14ahj: BL Her type Cepheid found by Gaia Space Observatory

P. Mikołajczyk[1], Z. Kołaczkowski[1,2], A. Pigulski[1], D. Moździerski[1], P. Bruś[1] and Ł. Wyrzykowski[3]

[1]Astronomical Institute, University of Wrocław, ul. M. Kopernika 11, 51-622 Wrocław
[2]Nicolaus Copernicus Astronomical Center, ul. Bartycka 18, 00-716 Warsaw
[3]Warsaw University Observatory, al. Ujazdowskie 4, 00-001 Warsaw
e-mail: mikolajczyk@astro.uni.wroc.pl

ABSTRACT

We present results of a BV(RI)$_C$ variability survey in the GaiaV14ahj field of stars. Observations were obtained using 60-cm Cassegrain reflector owned by Astronomical Observatory of University of Wrocław located in Białków, Poland over the period of two years. Our primary interest was to examine variability nature of GaiaV14ahj, discovered by Gaia Space Observatory. We classified it as BL Her type Cepheid pulsating in fundamental mode with period of about 4.7 days. Using period-luminosity relations for type II Cepheids we determined distance to GaiaV14ahj as 16.1 ± 1.6 kpc. Moreover, analizing available data we determined, that with high probability GaiaV14ahj is a member of Canis Majoris Overdensity at distance of 19.1 kpc from the Galactic Centre. In the observed field we found one more classical pulsator which we later identified as High Amplitude δ Scuti star, pulsating in fundamental mode ($P_0 = 0.056$ d) and first overtone ($P_1 = 0.073$ d). We also present the results of variability survey.

Key words:
stars: type II Cepheids – stars: BL Her – stars: δ Sct – stars: binary stars – galaxies: Canis Majoris Overdensity

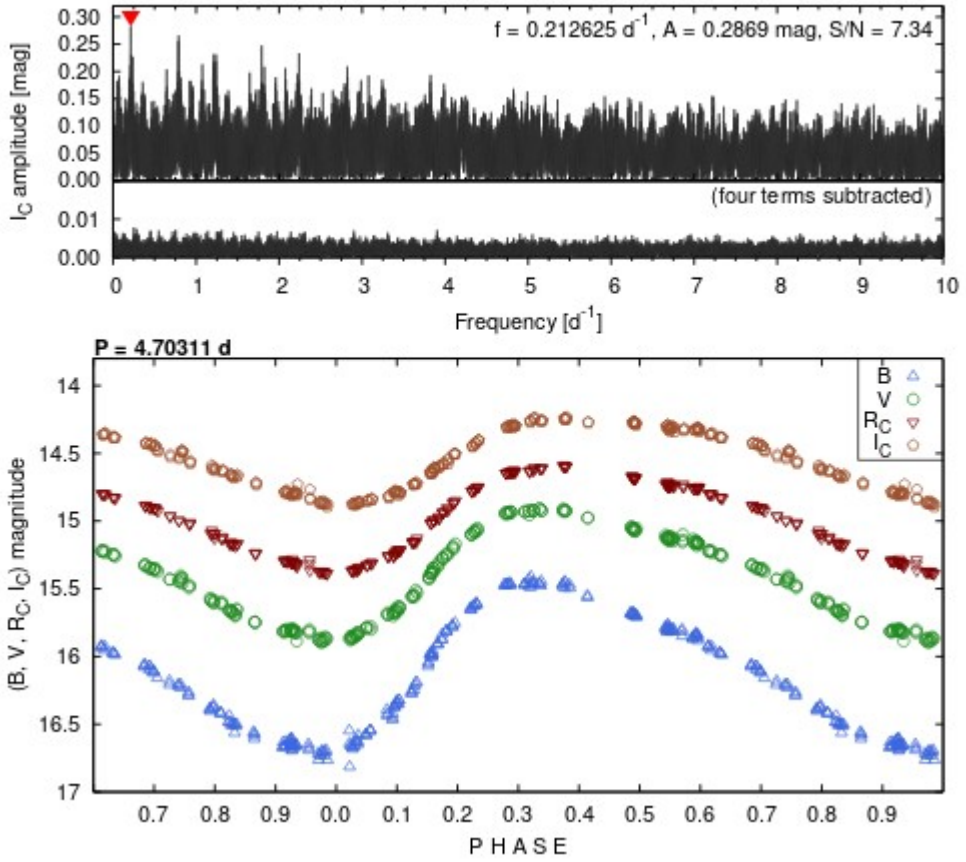
1. Introduction

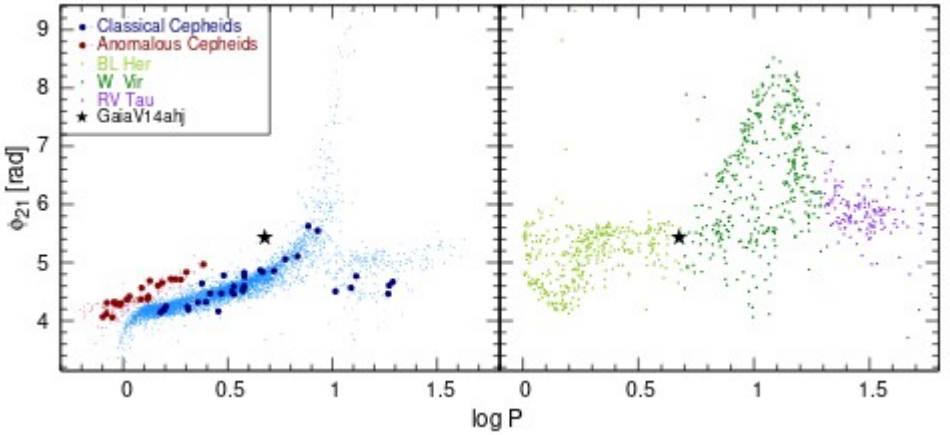
Launched in December 2013, Gaia is a satellite mission oparated by European Space Agency (ESA) and designed for astrometry. It's primary objective is to measure positions for stars of magnitude 5.7 to ∼20, using Astro instrument. By combining the measurements made over the five-year mission, it will be possible to determine parallaxes of stars (and therefore distances) and their proper motions. A part of this primary scientific goal has already been achievied, when on September 14 2016, ESA released the first set of data (Gaia DR-1). It contains measurements for over a billion sources. The second release is planned for April 2018. Apart from its primary goal, Gaia will also provide an immense amount of photometric data. The mission has been equipped with a photometer consisting of low-resulotion fused-silica prisms. It operates in two bands: blue (BP) – from 330

Paper in preparation (October 2018)

Gaia Alerts examples: GaiaVerif14ahj

- **Investigation of GaiaV14ahj star – type II Cepheid**





Distance: **16.1 +/- 1.6 kpc**
19.1 kpc from GC

P-L relation from LMC (OGLE data) – Pietrukowicz et al. (2015), Groenewegen & Jurkovic (2017)

Paper in preparation (October 2018)

Gaia Alerts examples: GaiaVerif14ahj

- **Investigation of GaiaV14ahj star – type II Cepheid**

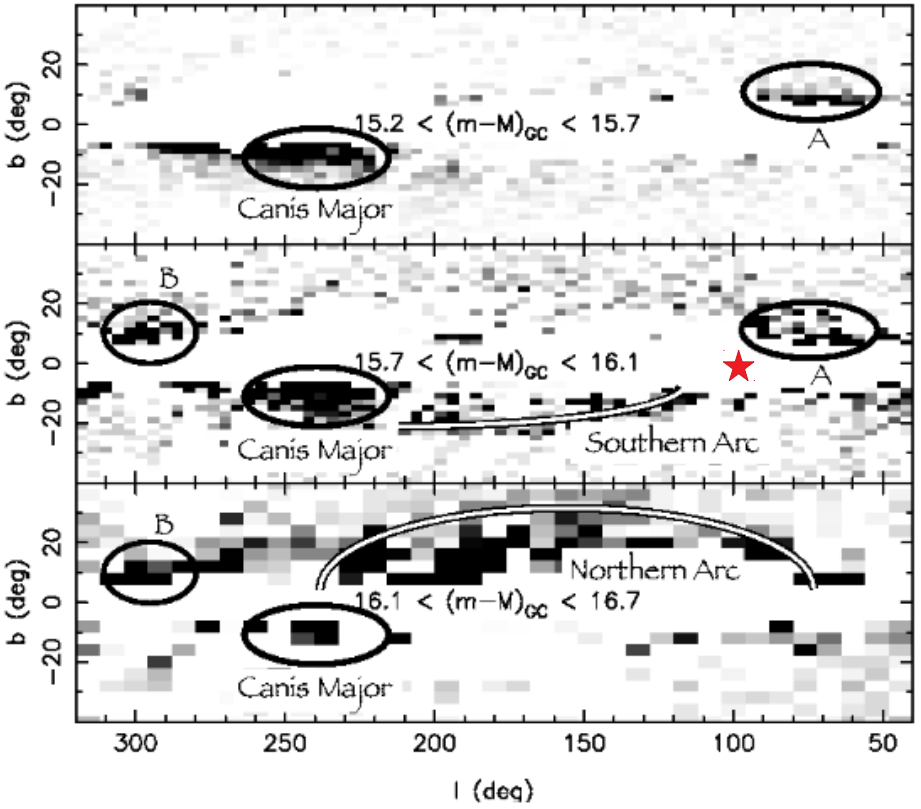


Figure 5. As Figure 4, with an overlay of the main asymmetries in the Galactic M-giant distribution detected in Figures 3 and 4. The strongest of these is the Canis Major over-density, followed by the Northern Arc. A fainter Southern Arc is also visible, as are two structures at $\ell = 70°$, and $\ell = 300°$, which we label structures A and B respectively.

GaiaV14ahj location:

$l = 97^{o}.658$ $b = -3^{o}.538$

$(m\text{-}M)_{GC} = 16.03$ mag

Distance: **16.1 +/- 1.6 kpc**
19.1 kpc from GC

P-L relation from LMC (OGLE data) – Pietrukowicz et al. (2015), Groenewegen & Jurkovic (2017)

Martin et al. (2003)

Paper in preparation (October 2018)

Gaia Alerts examples: Gaia18anr

- **Automatic photometry of type IIn supernova (SN2018zq)**

SDSS

Ga

Gaia18anr

Details | Follow-up

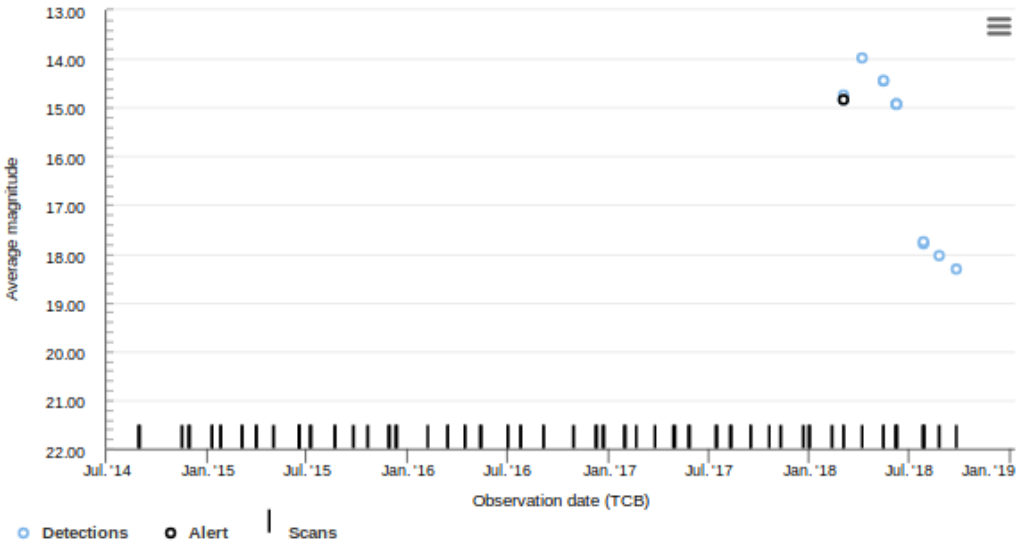
rsytet
awski

Other surveys detections
None
Comments
bright confirmed SN IIn near galaxy NGC2146, aka SN2018zd
ATels
11379 11405 11411 12079

TNS ID
SN2018zd

RA - DEC
94.51329 78.36699
06:18:03.19 78:22:01.16
Galactic coords.
135.63509 24.87048

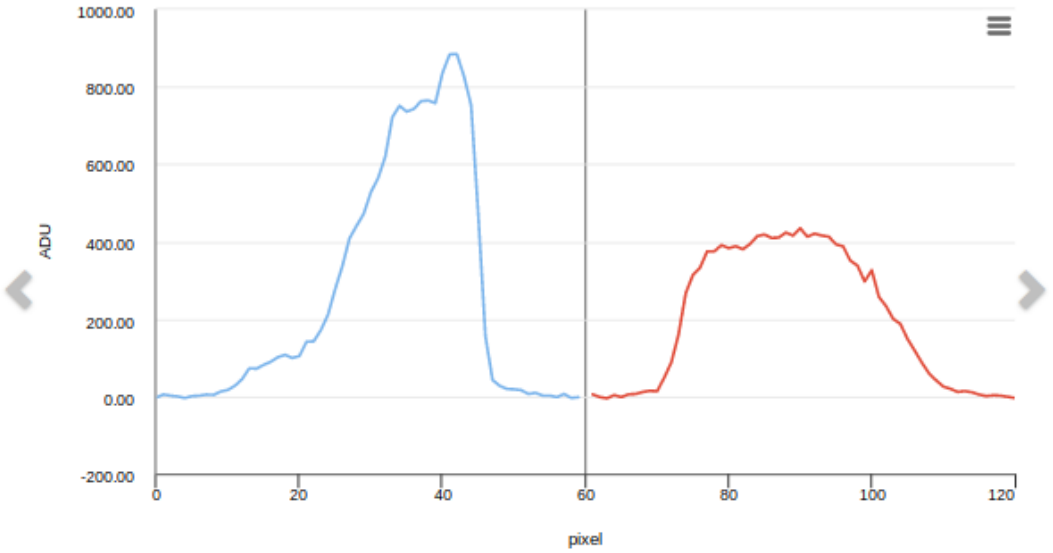
Alerting date
2018-03-05 08:11:31
Julian date
2458182.84
Alerting magnitude
14.84
Historic magnitude
None
Historic StdDev
None
Class
SN IIn
Publication date
March 7, 2018, 12:17 p.m.



Get lightcurve data

Click and scroll down and select one row in the table below to display the corresponding spectrum.

Date	JD	Average Mag.
2018-03-05 12:25:10	2458183.02	14.75
2018-04-08 05:49:23	2458216.74	13.98
2018-05-16 07:09:28	2458254.80	14.46
2018-05-16 11:23:08	2458254.97	14.44
2018-06-09 13:16:33	2458279.05	14.92
2018-06-09 17:30:13	2458279.23	14.94
2018-06-09 19:16:47	2458279.30	14.93
2018-07-29 05:11:23	2458328.72	17.80



Gaia Alerts examples: Gaia18anr

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- **Automatic photometry of type IIn supernova (SN2018zq)**

Photometry of this supernova has been performed automatically: calibration, cosmic rays removal, list of stars, FITS headers standardization, profile, aperture & SExtractor photometry, data upload to CPCS 1.0

Białków (BVR)
Mikołajczyk, May 2018

Gaia Alerts examples: Gaia18anr

Uniwersytet Wrocławski

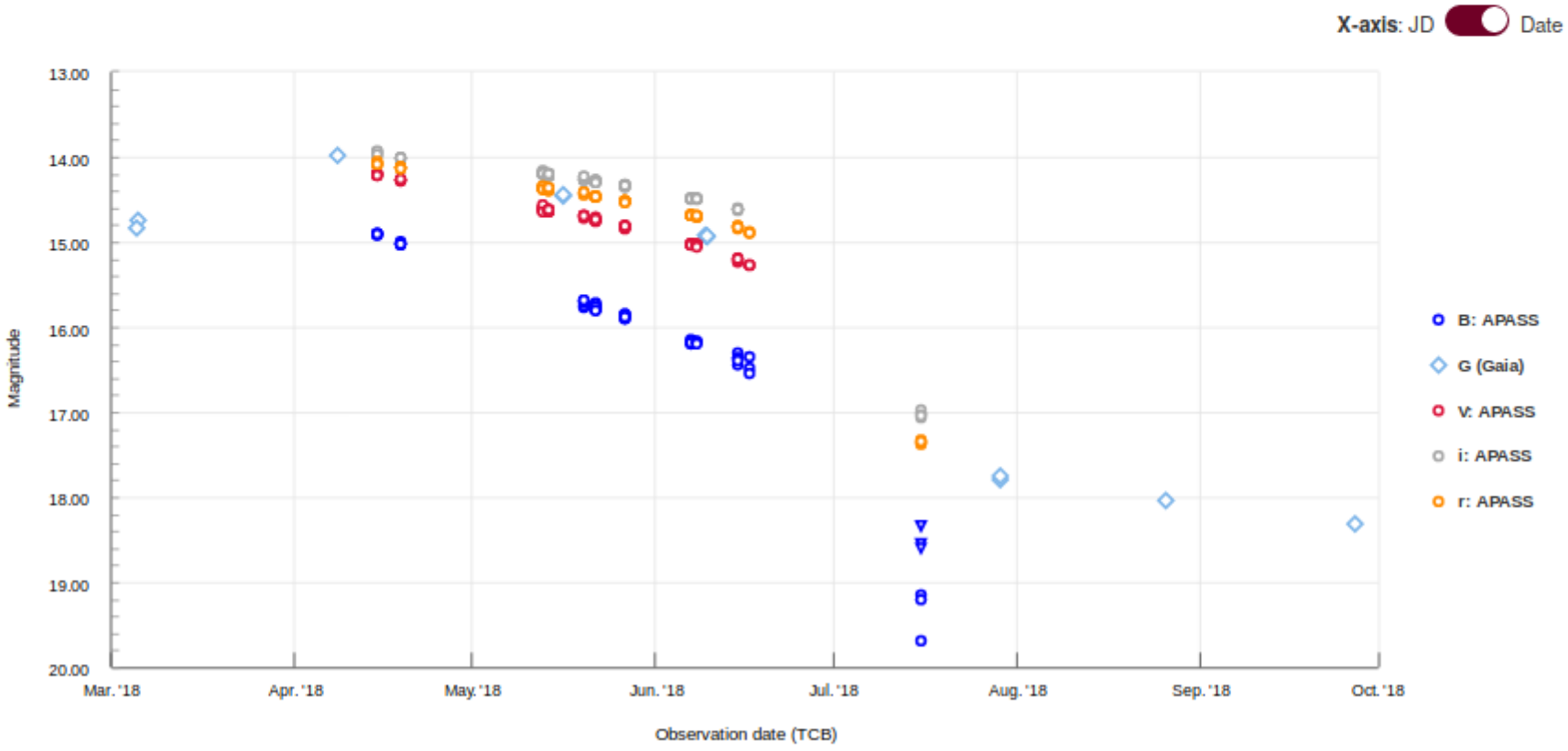
Gaia18anr

Details | Follow-up

The figure shows the Gaia lightcurve combined with photometric follow-up photometry generously provided by the astronomical community using the Cambridge Photometry Calibration Server (CPCS). Multiple filters are shown in one figure and can be toggled on/off using the legend on the side. Click and drag in the chart to zoom in. Clicking on datapoints provides additional information of the observation.

Access to these photometric data may be requested from the individuals who took the data. Please contact us if you would like to ask for access and we will pass on your request.

Warning: The follow-up data is obtained using rough calibrations and we can not guarantee its complete correctness at this stage.



Gaia Alerts

- **Automatic**
(SN2018z

Photometric follow-up of SN2018zd/Gaia18anr from Bialkow

ATel #12079; *P. Mikolajczyk (Wroclaw University Astronomical Observatory), L. Wyrzykowski (Warsaw University Astronomical Observatory)*
*on **4 Oct 2018; 15:21 UT***
Credential Certification: Lukasz Wyrzykowski (wyrzykow@astrouw.edu.pl)

Subjects: Optical, Supernovae, Transient

We report here on the photometric observations of the Type IIn supernova SN 2018zd (otherwise known as Gaia18anr), discovered by Koichi Itagaki and classified by Zhang et al. (ATel #11379), with the 60-cm Cassegrain reflector in Astronomical Observatory of the University of Wroclaw (Bialkow, Poland) over the period of 3 months (from April 14 2018 to July 15 2018). Observations took place during twelve photometric nights and data has been collected in four bands of the Johnson-Cousins photometric system: B, V, Rc and Ic. I observed substantial and consistent decrease in brightness in all four photometric bands, till the point where measurements became partly unreliable due to the limitations of aforementioned telescope. We found that Gaia measurements in G-band are more or less consistent with Rc band measurements over long period of time. We also found that during two nights: May 13, 2018 and May 19, 2018 a little increase in brightness may be spotted in all used photometric bands. Such an effect may be spotted also in the data taken from other nights. Taking into account the precision of Gaia18anr photometry (especially during the first month of observations), we suggest it may be a photometric manifestation of decay processes of radioactive elements.

The follow-up photometric data are shown on Gaia alerts follow-up webpage and can be requested from the author.

We acknowledge the Gaia Photometric Alerts group (http://gsaweb.ast.cam.ac.uk/alerts). We also acknowledge the use of the Cambridge Photometric Calibration Server (http://gsaweb.ast.cam.ac.uk/followup), developed and maintained by Lukasz Wyrzykowski, Sergey Koposov, Arancha Delgado, Pawel Zielinski, funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 730890 (OPTICON).

Follow-up observations on Gaia Alerts webpage

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

- **CCDPhot** is a pipeline for performing precise photometry and astrometry

- Proposed and created by **dr Zbigniew Kołaczkowski** (IA UWr., CAMK Warsaw). Team members: P. Mikołajczyk (IA UWr.), P. Bruś (IA UWr.), M. Kałuszyński (CAMK Warsaw), K. Kotysz (IA UWr.), P. Kołaczek – Szymański (IA UWr.)

- Pipeline is able to perform photometry of stars and galaxies.

- CCDPhot utilizes known and popular software:

    + DAOPHOT II (Stetson P.)

    + IRAF / PyRAF

    + SExtractor (Bertin)

    + SCAMP (Bertin)

    + ESO Eclipse

    + WCS Tools

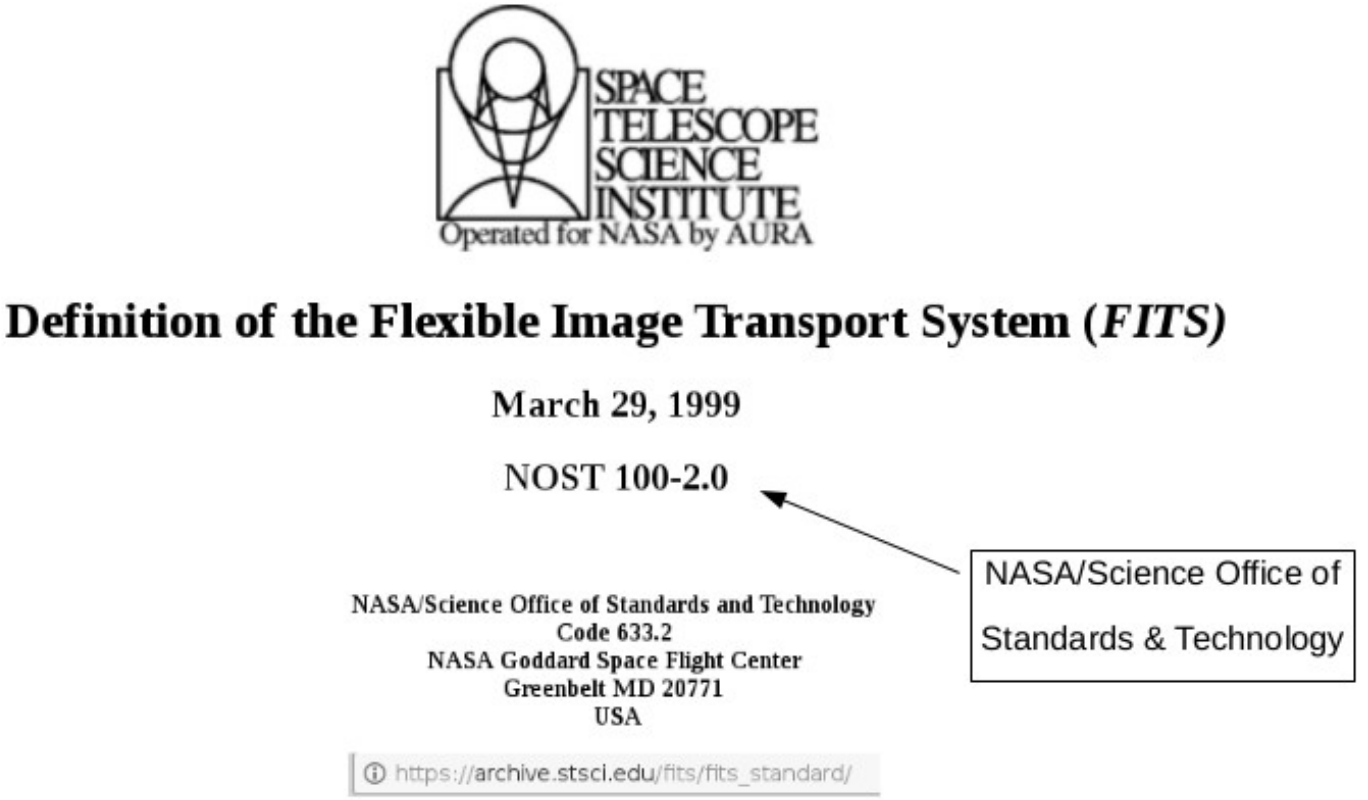
    + and many more...

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

- Furthermore CCDPhot provides wide variety of tools for data manipulation and analysis:

  + std_hdr.py – Python 2.7 script for setting FITS files' headers to STScI standards



(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

- Furthermore CCDPhot provides wide variety of tools for data manipulation and analysis:

  + std_hdr.py – Python 2.7 script for setting FITS files' headers to STScI standards

GIRAF.2007-09-28T07:09:19.186.fits

File Edit Font

```
SIMPLE  =                    T          / Standard FITS format (NOST-100.0)
BITPIX  =                   16          / # of bits storing pix values
NAXIS   =                    2          / # of axes in data array
NAXIS1  =                 2148          / # pixels/axis
NAXIS2  =                 4096          / # pixels/axis
EXTEND  =                    T          / Extension may be present
PCOUNT  =                    0          / Number of parameters per group
GCOUNT  =                    1          / Number of groups
BZERO   =              32768.0          / pixel=FITS*BSCALE+BZERO
BSCALE  =                  1.0          / pixel=FITS*BSCALE+BZERO
ORIGIN  = 'ESO     '                    / European Southern Observatory
DATE    = '2007-10-30T09:21:26.044'     / Date this file was written
TELESCOP= 'ESO-VLT-U2'                  / ESO Telescope Name
INSTRUME= 'GIRAFFE '                    / Instrument used
OBJECT  = 'SMC_DPVs_field'              / Target description
RA      =           12.779250           / 00:51:07.0 RA (J2000) pointing
DEC     =           -73.04159           / -73:02:29.7 DEC (J2000) pointing
EQUINOX =              2000.            / Standard FK5 (years)
RADECSYS= 'FK5     '                    / Coordinate reference frame
EXPTIME =           1350.0027           / Total integration time
MJD-OBS =      54371.29813873           / MJD start (2007-09-28T07:09:19.186)
DATE-OBS= '2007-09-28T07:09:19.186'     / Date of observation
UTC     =           25754.000           / 07:09:14.000 UTC
LST     =           10461.855           / 02:54:21.855 LST
PI-COI  = 'UNKNOWN '                    / Name of PI-COI.
OBSERVER= 'UNKNOWN '                    / Name of observer.
CTYPE1  = 'PIXEL   '                    / Pixel coordinate system
CTYPE2  = 'PIXEL   '                    / Pixel coordinate system
CRVAL1  =                  1.0          / value of ref pixel
CRVAL2  =                  1.0          / value of ref pixel
CRPIX1  =                -49.0          / Ref. pixel of center of rotation
CRPIX2  =                  1.0          / Ref. pixel of center of rotation
CDELT1  =                  1.0          / Binning factor
CDELT2  =                  1.0          / Binning factor
ORIGFILE= 'FLAMES_GIRAF_OBS271_0003.fits' / Original File Name
ARCFILE = 'GIRAF.2007-09-28T07:09:19.186.fits' / Archive File Name
UT      = '07:09:14.000'                / UT at start
ST      = '02:54:21.855'                / ST at start
AIRMASS =              1.59200          / Averaged air mass
IMAGETYP= 'OBJECT,SimCal'               / Observation type
GRAT    = 'HR      '                    / Grating name
WLEN    =                447.1          / Grating central wavelen
ORDER   =                   12          / Grating order used
HIERARCH ESO OBS DID        = 'ESO-VLT-DIC.OBS-1.11' / OBS Dictionary
```

BH_Oph-0296.fits

File Edit Font

```
SIMPLE  = T
BITPIX  = 16
NAXIS   = 2
NAXIS1  = 1250
NAXIS2  = 1152
BSCALE  = 1.00000
BZERO   = 32768.00000
OBS-DATE= '20/05/2018'
UT      = '00:40:28'
EXPOSURE= 25.000
DATA-TYP= 'OBJECT'
FILTER  = 'V'
GAIN    = 16  // Speed in microsec/pix
BIN     = 1
CCDTEMP = -50.0 C
OBJECT  = BH_Oph
OBSERVER= PM
ORIGIN  = Bialkow Observatory
END
```

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# DESCRIPTION	KEYWORD (in FITS)	KEYWORD (standard)	FORMAT	VALUE(s)	COMMENT	CONF FLAG (True/False)
OBSERVATORY						
Observatory	-	OBSERVAT	str	PT5M_La_Palma	observatory ID	False
Observer	-	OBSERVER	str	Liam_K_Hardy	observer ID	False
Observatory longitude [deg]	-	LONGITUD	float	28.76075	deg	False
Observatory latitude [deg]	-	LATITUDE	float	-17.88144	deg	False
Observatory altitude [m]	-	ALTITUDE	float	2383	meters	False
Telescope	TELE	TELESCOP	str	Dall-Kirkham_0.5	telescope ID	False
Organization	ORIGIN	ORIGIN	str	PT5M	institution ID	False
TIME (start of exposition)						
Time system	-	TIMESYS	str	UTC	used time standard	False
Date	DATE-OBS	DATE-OBS	yyyy/mm/dd	-	date of exposure	False
Time	-	TIME-OBS	hh:mm:ss	-	time of exposure	False
Julian date	-	JD	float	-	middle of exposure	False
Exposition time	EXPOSURE	EXPTIME	float	-	seconds	False
INSTRUMENT						
Instrument name	INSTRUME	INSTRUME	str	QSI_532	camera ID	False
Detector X size [pix]	NAXIS1	NAXIS1	int	1092	pixels	True
Detector Y size [pix]	NAXIS2	NAXIS2	int	736	pixels	True
Binning	XBINNING	BIN	int	2	binning-2	False
Instr. mode, readout speed	-	READTIME	int	3000	ns/pix	False
Gain	EGAIN	GAIN	float	1.3	e/ADU	True
Read-out noise	-	RDNOISE	float	8 : 11 & 14 ADU for 2x2 & 3x3 binning respectively		True
Saturation limit	-	SATURATE	int	65535	ADU	True
Pixel scale along x-axis	-	CDELT1	float	0.000077778	deg/pix (for 1x1 bin)	True
Pixel scale along y-axis	-	CDELT2	float	0.000077778	deg/pix (for 1x1 bin)	True
Position angle	-	ORIENTAT	float	0.0	deg	False
Image type	TYPE	OBSTYPE	str	SCIENCE | OBJECT	type of data	True
Filters	FILTER	FILTER	str	B, V, R, I	passband ID	True
Pixel size along x-axis	XPIXSZ	PIXSIZE1	float	13.6	microm	False
Pixel size along y-axis	YPIXSZ	PIXSIZE2	float	13.6	microm	False
X reference pixel (center)	CRPIX1	CRPIX1	int	546	X reference pixel	True
Y reference pixel (center)	CRPIX2	CRPIX2	int	368	Y reference pixel	True
OBJECT & WCS						
Object name	OBJECT	OBJECT	str	-	object name	False
Epoch of coord. system	EQUINOX	EQUINOX	float	2000.0	year	False
Coord. system	RADECSYS	RADECSYS	str	FK5	coord. ref. system	False
Coord. type projection RA	CTYPE1	CTYPE1	str	RA---TAN	RA projection type	False
Coord. type projection DEC	CTYPE2	CTYPE2	str	DEC--TAN	DEC projection type	False
Coord. unit RA	-	CUNIT1	str	deg	RA unit	False
Coord. unit DEC	-	CUNIT2	str	deg	DEC unit	False
Right Ascension	RA2	RA	float	-	deg	False
Declination	DEC2	DEC	float	-	deg	False
Right Ascension WCS	CRVAL1	CRVAL1	float	-	deg	False
Declination WCS	CRVAL2	CRVAL2	float	-	deg	False
OTHER						
Original filename	-	FILENAME	str	-	original filename	False

FITS file extension	.fits
Time system shift (t - UTC)	0
Time accuracy [s]	100ms
Linearity range [ADU]	1:45000
Photometric system	Johnson B, Johnson V, Cousins R, Cousins I
Useful detector area	[1:2184,1:1472]
WCS included in header	Yes, usually
Image orientation	Depends on TRACKING value (1 or 3). 1= East down, North to right. 3= East up, North to left.

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

- Furthermore CCDPhot provides wide variety of tools for data manipulation and analysis:

  + std_hdr.py – Python 2.7 script for setting FITS files' headers to STScI standards

Otwórz

objpos.dat
~/Pulpit/DAY1/OBS_INFO

```
 73 Gaia15afh            18 58 41   43 28 08   2000
 74 Gaia15agc            12 18 23   35 37 06   2000
 75 Gaia15agh            12 04 05   14 04 05   2000
 76 Gaia16apd            12 02 52   44 15 27   2000
 77 Gaia16abw               10 33 51   60 51 07   2000
 78 Gaia16alt            21 43 04   66 07 44   2000
 79 Gaia16aye            19 40 01   30 07 53   2000
 80 Gaia16bbi            23 59 16   22 03 01   2000
 81 Gaia16bbz            19 16 39   46 21 07   2000
 82 %Comet_ISON 06.03.2013:
 83 Comet_ISON           06 47 00   31 24 22   2000
 84 Comet_PS             00 34 32   11 07 00   2000
 85 CZ_Cam               03 58 44   69 01 00   2000
 86 DI_Cam               04 28 42   79 42 06   2000
 87 %Comet_Lovejoy 31.12.2013 4UT:
 88 Lovejoy              17 26 41   20 39 42   2000
 89 CygOB2               20 33 04   41 18 00   2000
 90 del_Ser              15 34 48   10 32 20   2000
 91 Dembowska            10 33 29   15 08 27   2000
 92 EE_Cep               22 09 23   55 45 24   2000
 93 eps_Cep              22 15 02   57 02 37   2000
 94 FG_Sge               20 11 56   20 20 06   2000
 95 FR1                   4 30  0   55  0  0   2000
 96 G93_48               21 52 26   02 23 00   2000
 97 Gaia14aaa            13 21 02   45 28 26   2000
 98 GSC0321              14 29 15    2 30 06   2000
 99 GSC2566                 15 22 22   32 58 45   2000
100 GSC2977               8 19 18   41 59 00   2000
101 GSC2988               8 46 10   43 04 31   2000
102 GSC3004              10 21 35   40 31 41   2000
103 GSC3832              11 48 42   54 43 08   2000
104 GSC3863              14 41 38   56 26 17   2000
105 GSC4552              11 24 25   77 42 16   2000
106 GSC4556              12 03 17   80 33 43   2000
107 HD256413             06 24 02   19 54 32   2000
108 QSOB1215             12 17 52   30 07 00   2000
109 Saturn               13 32 14   -6 43 00   2000
110 Veil                 20 45 44   31 02 11   2000
111 M71                  19 53 47   18 46 45   2000
112 NovaCep2014          20 54 24   60 17 07   2000
113 NvCyg2014            20 21 43   31 03 30   2000
114 NGC6543              17 58 34   66 38 00   2000
115 NGC7662              23 25 54   42 32 06   2000
116 NGC7640              23 22 07   40 50 43   2000
117 NGC7318              22 35 58   33 57 56   2000
118 PTF12gzk             22 12 42   00 30 43   2000
119 PSN0413+2528         04 13 38   25 28 46   2000
120 R1_Lovejoy           16 35 00   30 45 00   2013.95
121 RRCaeli              04 21 06 -48 39 07   2000
122 TY_UMi               15 17 57   83 51 34   2000
123 V454_Aur             06 22 03   34 35 50   2000
124 V455_Aur             06 28 54   52 07 33   2000
125 V572_Per             03 15 49   50 57 21   2000
126 V821_Cas             23 58 49   53 40 19   2000
127 V1125_Tau            03 38 59   00 47 48   2000
128 FK_Dra               12 30 12   63 53 21   2000
```

```
mikolajczyk@winston:~/Pulpit/DAY1$ cd BIALKOW_test_files/
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ ls *fits > in.cat
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ cat in.cat
BH_Oph-0296.fits
Gaia18anr-0129.fits
NGC6823-0336.fits
WZ_Oph-0151.fits
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ ../std_hdr.py -f in.cat -o BIALKOW --verbose
[PROCESS] Handling headers...
[WARNING] BH_Oph-0296.fits: Found no matching object name in 'objpos.dat'! Trying SESAME... [OK]
[INFO] Updated 'objpos.dat' with new object: BH_Oph
[OK] BH_Oph-0296.fits > BH_Oph-0296h.fits
[WARNING] Gaia18anr-0129.fits: Found no matching object name in 'objpos.dat'! Trying SESAME... [ERROR]  Tryi
ng Gaia Alerts Server... [OK]
[INFO] Updated 'objpos.dat' with new object: Gaia18anr
[OK] Gaia18anr-0129.fits > Gaia18anr-0129h.fits
[OK] NGC6823-0336.fits > NGC6823-0336h.fits
[WARNING] WZ_Oph-0151.fits: Found no matching object name in 'objpos.dat'! Trying SESAME... [OK]
[INFO] Updated 'objpos.dat' with new object: WZ_Oph
[OK] WZ_Oph-0151.fits > WZ_Oph-0151h.fits
[DONE]
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ ls *fits
BH_Oph-0296.fits   Gaia18anr-0129.fits   NGC6823-0336.fits   WZ_Oph-0151.fits
BH_Oph-0296h.fits  Gaia18anr-0129h.fits  NGC6823-0336h.fits  WZ_Oph-0151h.fits
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ ../std_hdr.py -f in.cat -o BIALKOW --verbose --names
[PROCESS] Handling headers...
[OK] BH_Oph-0296.fits > BIALKOW_BH_Oph_58258.02825.fits
[OK] Gaia18anr-0129.fits > BIALKOW_Gaia18anr_58257.88135.fits
[OK] NGC6823-0336.fits > BIALKOW_NGC6823_58258.06774.fits
[OK] WZ_Oph-0151.fits > BIALKOW_WZ_Oph_58257.93002.fits
[DONE]
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$ ls *fits
BH_Oph-0296.fits                    BIALKOW_NGC6823_58258.06774.fits  NGC6823-0336.fits
BH_Oph-0296h.fits                   BIALKOW_WZ_Oph_58257.93002.fits   NGC6823-0336h.fits
BIALKOW_BH_Oph_58258.02825.fits     Gaia18anr-0129.fits               WZ_Oph-0151.fits
BIALKOW_Gaia18anr_58257.88135.fits  Gaia18anr-0129h.fits              WZ_Oph-0151h.fits
mikolajczyk@winston:~/Pulpit/DAY1/BIALKOW_test_files$
```

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

- Furthermore CCDPhot provides wide variety of tools for data manipulation and analysis:

  + std_hdr.py – Python 2.7 script for setting FITS files' headers to STScI standards

BH_Oph-0296.fits

File Edit Font

```
SIMPLE  = T
BITPIX  = 16
NAXIS   = 2
NAXIS1  = 1250
NAXIS2  = 1152
BSCALE  = 1.00000
BZERO   = 32768.00000
OBS-DATE= '20/05/2018'
UT      = '00:40:28'
EXPOSURE= 25.000
DATA-TYP= 'OBJECT'
FILTER  = 'V'
GAIN    = 16  // Speed in microsec/pix
BIN     = 1
CCDTEMP = -50.0 C
OBJECT  = BH_Oph
OBSERVER= PM
ORIGIN  = Bialkow Observatory
END
```

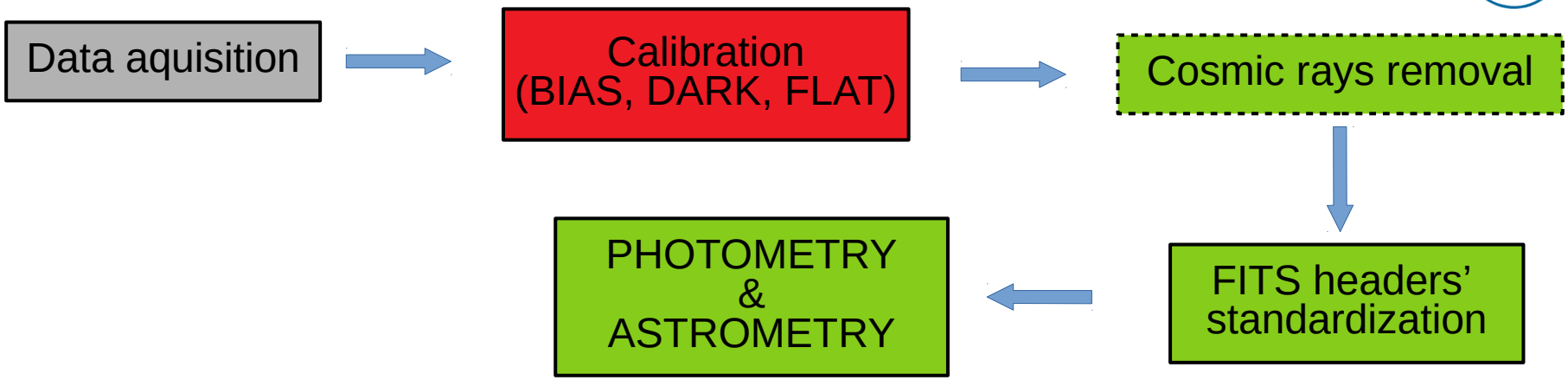
BH_Oph-0296h.fits

File Edit Font

```
SIMPLE  = T
BITPIX  = 16
NAXIS   = 2
NAXIS1  =                 1250 / pixels
NAXIS2  =                 1152 / pixels
BSCALE  = 1.00000
BZERO   = 32768.00000
OBS-DATE= '20/05/2018'
UT      = '00:40:28'
EXPOSURE= 25.000
DATA-TYP= 'OBJECT'
FILTER  = ' V      '           / passband ID
CCDTEMP = '-50.0 C '
ORIGIN  = 'Bialkow Observatory' / institution ID
OBSERVAT= 'BIALKOW '           / observatory ID
LONGITUD=           343.341944 / deg
LATITUDE=            51.474167 / deg
ALTITUDE=                150.0 / meters
TELESCOP= 'Cassegrain_0.6'     / telescope ID
TIMESYS = 'UTC     '           / used time standard
INSTRUME= 'ANDOR_CCD'          / camera ID
BIN     =                    1 / no binning
CDELT1  =            0.0001702 / deg/pix
CDELT2  =            0.0001702 / deg/pix
ORIENTAT=                  0.0 / deg
PIXSIZE1=                 22.5 / microm
PIXSIZE2=                 22.5 / microm
CRPIX1  =                  625 / X reference pixel
CRPIX2  =                  575 / Y reference pixel
EQUINOX =               2000.0 / year
RADECSYS= 'FK5     '           / coord. ref. system
CTYPE1  = 'RA---TAN'           / RA projection type
CTYPE2  = 'DEC--TAN'           / DEC projection type
CUNIT1  = 'deg     '           / RA unit
CUNIT2  = 'deg     '           / DEC unit
OBSERVER= 'PM      '           / observer ID
DATE-OBS= '2018-05-20T00:40:28.0' / date & time (beginning of exposition)
TIME-OBS= '00:40:28'           / time (beginning of exposition)
EXPTIME =                 25.0 / seconds
OBSTYPE = 'OBJECT  '           / type of data
```

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski



2457619.35344	19:40:01.1306	30:07:53.423	550.075	522.321	15.2359	0.0121	15.2970	0.0214	12.3403	0.0190	2.06	1.0756	619.9	1
2457619.35488	19:40:01.1296	30:07:53.410	552.642	526.545	14.7989	0.0072	14.8400	0.0115	11.8876	0.0111	2.07	1.0752	355.09	2
2457619.35632	19:40:01.1311	30:07:53.383	554.636	524.520	14.8150	0.0078	14.8720	0.0108	11.9029	0.0112	1.89	1.0748	360.53	3
2457619.37253	19:40:01.1309	30:07:53.398	542.815	525.682	14.5645	0.0066	14.6080	0.0072	11.6250	0.0076	2.08	1.0737	176.43	4
2457619.37397	19:40:01.1306	30:07:53.412	543.752	524.055	14.5735	0.0065	14.6020	0.0079	11.6191	0.0079	2.19	1.0740	197.25	5
2457619.37541	19:40:01.1291	30:07:53.412	545.985	522.477	14.5611	0.0067	14.5970	0.0086	11.6275	0.0084	2.29	1.0742	219.91	6
2457623.41504	19:40:01.1299	30:07:53.399	644.733	564.851	14.5289	0.0059	14.5436	0.0059	11.6371	0.0063	2.36	1.1176	61.79	7
2457623.41637	19:40:01.1306	30:07:53.413	647.957	563.537	14.5257	0.0056	14.5336	0.0059	11.6359	0.0062	2.29	1.1197	62.19	8
2457623.41770	19:40:01.1306	30:07:53.406	651.862	562.741	14.5295	0.0056	14.5236	0.0066	11.6227	0.0070	2.73	1.1218	62.47	9
2457623.43315	19:40:01.1307	30:07:53.408	641.099	561.960	14.5684	0.0048	14.5846	0.0064	11.6649	0.0073	2.31	1.1505	68.33	10

2457619.353440	19:40:01.1306	30:07:53.423	550.075	522.321	2.1120	0.0122	2.1453	0.0214	2.1956	0.0190	2.06	1.0756	619.90	1
2457619.354880	19:40:01.1296	30:07:53.410	552.642	526.545	2.1161	0.0074	2.1249	0.0115	2.1936	0.0111	2.07	1.0752	355.09	2
2457619.356320	19:40:01.1311	30:07:53.383	554.636	524.520	2.1113	0.0080	2.1236	0.0108	2.1853	0.0112	1.89	1.0748	360.53	3
2457619.372530	19:40:01.1309	30:07:53.398	542.815	525.682	2.1202	0.0071	-9.9999	-9.9999	2.1759	0.0076	2.08	1.0737	176.43	4
2457619.373970	19:40:01.1306	30:07:53.412	543.752	524.055	2.1217	0.0069	2.1276	0.0079	2.1700	0.0079	2.19	1.0740	197.25	5
2457619.375410	19:40:01.1291	30:07:53.412	545.985	522.477	2.1157	0.0069	2.1237	0.0086	2.1933	0.0084	2.29	1.0742	219.91	6
2457623.415040	19:40:01.1299	30:07:53.399	644.733	564.851	2.0984	0.0061	-9.9999	-9.9999	2.1099	0.0063	2.36	1.1176	61.79	7
2457623.416370	19:40:01.1306	30:07:53.413	647.957	563.537	2.0960	0.0057	-9.9999	-9.9999	2.1126	0.0062	2.29	1.1197	62.19	8
2457623.417700	19:40:01.1306	30:07:53.406	651.862	562.741	2.0974	0.0057	2.0835	0.0066	2.1234	0.0070	2.73	1.1218	62.47	9
2457623.433150	19:40:01.1307	30:07:53.408	641.099	561.960	2.0971	0.0050	2.0934	0.0064	2.0924	0.0073	2.31	1.1505	68.33	10

(Semi)Automatic photometry with **CCDPhot**

Uniwersytet Wrocławski

```
Script ccdphot.sh
CCD photometry and astrometry tool

Usage: ccdphot.sh <log_file> <object_name>
requirements: Python, Pyraf, Sextractor, Scamp, objpd,
              DAOPHOT/ALLSTAR, WCS_Tools, LDAC_tools
Log file should be created by pyfits_mklog_ccdphot.py !

Version: 2018.06.05
Written by Z. Kolaczkowski, I.A. U.Wr. (www.astro.uni.wroc.pl)
```

If you want to start using CCDPhot,

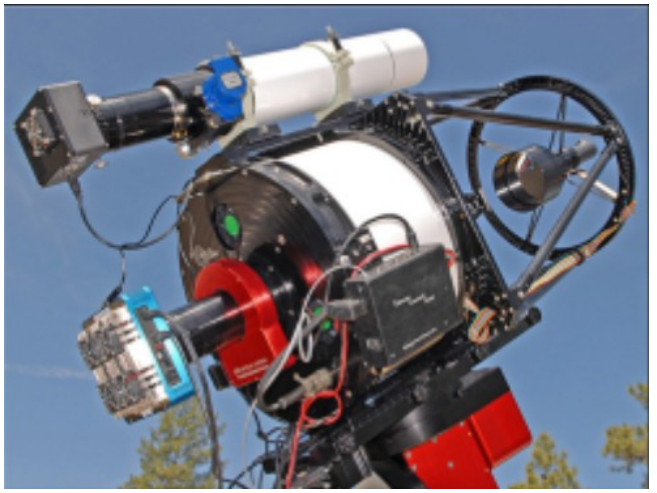
please contact me:

mikolajczyk@astro.uni.wroc.pl

Other ongoing projects

- Development of software for **easy observations planning** (along with my student Aneta Foks)

- Installation of new telescope: 32-cm Ritchey-Chretien



Other ongoing projects

Uniwersytet Wrocławski

- Installation of new telescope: 32-cm Ritchey-Chretien

First light: spring 2019, limiting magnitude: ~15.5 in V band

Purpose:

+ bright supernovae (measurements)
+ supernova detection
+ binary systems
+ **Gaia Science Alerts follow-up**

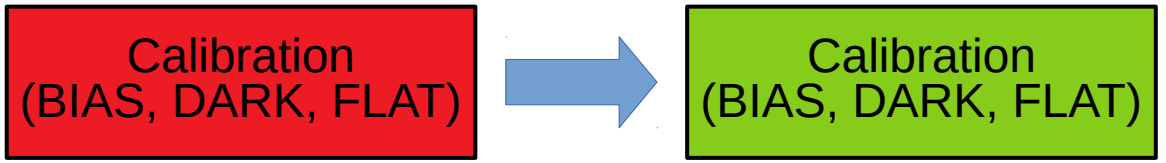
Photometric bands: V, R_C, I_C, L

Camera: FLI - MicroLine Series - KAF-50100 Full Frame CCD Camera

proposed (FOV: 0.5^o x 0.5^o)

Other ongoing projects

- **CCD**Calib (now working for Białków Observatory & IAC80 Telescope located in Observatorios de Canarias)




Comet C/2006 A1 (Pojmański)
23 Mar 2006, 2:39 - 3:35 UT
Białków Observatory
Images by:
A. Pigulski
P. Mikołajczyk
Z. Kołaczkowski