

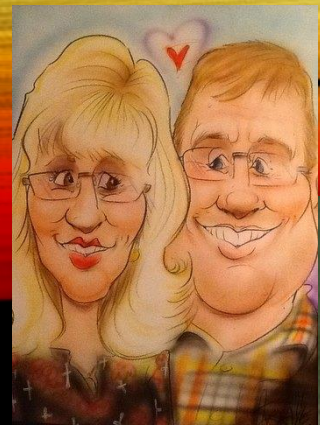


PHOTOMETRY FOR AMATEURS

Using iTelescopes to do Citizen Science

Gord Tulloch,
RASC, Winnipeg Centre
AAVSO:TGR





UPDATE!









WHY CHANGE?



iTELESCOPES



New Mexico USA



Siding Spring Australia



California USA

T5 NEW MEXICO

- 250mm Reflector - SBIG ST-10XME
- Paramount PME Mount
- Medium Wide - Deep Field. Entry level Science Platform.
- Typically used for Science Missions. Photometry and Narrowband Imaging.
- **T5** is one of the busiest remote telescopes on the iTelescope Network. It allows its many drivers to gather valuable science data with its moderate wide angle FoV and sharp Takahashi optics.
- Includes photometric BVRI filters as well as RGB Ha SII OIII
- Up to 300s subs





T17 SIDING SPRING

- 430mm (17") Corrected Dall-Kirkham Astrograph - FLI ProLine PL4710 CCD
- T17 is a **Science Platform**. Normally used for Science Missions, Deep Photometry, Narrowband and 'Extended Red' light IR imaging. It is equipped with a FLI ProLine E2V CCD47-10-1-109 CCD. that has 'extended red sensitivity' when compared to standard CCD's. Giving it an almost 'Near Infrared' mission profile.
- **T17** is a unique telescope. T17 holds multiple **world record** achievements for the most distant objects imaged by amateur astronomers.
- T17 can detect **extremely distant galaxies** in 300 sec exposures. Some of its targets have been the most distant and oldest ever imaged on a publicly accessible telescope.
- If you wanted to bring out stars hidden in nebula with its Helium filter or chase targets that are very faint, then this CCD will do the job. Its extremely sensitive, so much so that OVER exposure becomes an issue and users should take care since its CCD is of the **NABG** variety.
- Includes BVRIU Clr RGBL g2 r2 i2 z2 H α OIII HII filters
- Star-Analyser 200 - Spectroscopic Grating

ITELESCOPES

The screenshot displays the iTelescope.net website interface. At the top, there is a navigation bar with the logo and links for 'Launchpad', 'Telescopes', and 'Links'. A green banner at the top reads 'Advancing your Horizons in Astronomy ... No Network Messages'. Below this is a blue notification box titled '★ Updated Launchpad!' with a close button, containing text about the new version of the Launchpad and a link to a video.

The main content area is divided into several panels:

- Map:** A world map with a yellow dot indicating a location. Below the map are two buttons: 'Start planning here' and 'Download my data'. At the bottom of this panel are links for 'Support' and 'Account Overview'.
- Siding Spring Observatory:** A panel showing the observatory's status as 'Open' on '01:01, 15 Sep (UTC +10)'. It includes a moon phase icon, moonrise (19:39) and moonset (06:20) times, and current conditions: -27°C, 27% humidity, and -59°C. Below this is a list of telescopes:

T8	In Use: ckwadrat
T9	Available
T12	In Use: djcolton
T13	Available
T17	In Use: annaspace
T30	Available
T31	In Use: rreed3
T32	Available
T33	Offline
- Astrocamp:** A panel showing the status as 'Day' on '17:01, 14 Sep (UTC +2)'.
- New Mexico Skies:** A panel showing the status as 'Open (twilight)' on '09:01, 14 Sep (UTC -6)'. It includes a 'All Sky Camera Off During The Day' status, moonrise (18:53) and moonset (05:01) times, and current conditions: -34°C, 28% humidity, and +27°C. Below this is a list of telescopes:

T3	Closed: Day Time
T5	Closed: Day Time
T11	Closed: Day Time
T14	Closed: Day Time
T20	Closed: Day Time
T21	Closed: Day Time
- Sierra Remote Observatory:** A panel showing the status as 'Day' on '08:01, 14 Sep (UTC -7)'.

Advancing your Horizons in Astronomy ... No Network Messages

★ Updated Launchpad!

We have been toiling behind the scenes to create this new version of the Launchpad. Please see Dr Christian Sasse's fantastic introductory video [here](#) for a tour of the new features.

Map



Start planning here

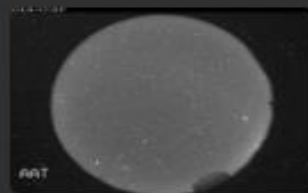
Download my data

Support

Account Overview

Siding Spring Observatory

Open 01:01, 15 Sep (UTC +10)



19:39 06:20

-27° 27%

-59°

T8 In Use: ckwadrat

T9 Available

T12 In Use: djcolton

T13 Available

T17 In Use: annaspace

T30 Available

T31 In Use: rireed3

T32 Available

T33 Offline

Astrocamp

Day 17:01, 14 Sep (UTC +2)

New Mexico Skies

Open (twilight) 09:01, 14 Sep (UTC -6)

**All Sky Camera
Off
During The Day**

18:53 05:01

-34° 28%

+27°

T3 Closed: Day Time

T5 Closed: Day Time

T11 Closed: Day Time

T14 Closed: Day Time

T20 Closed: Day Time

T21 Closed: Day Time

Sierra Remote Observatory

Day 08:01, 14 Sep (UTC -7)

RESERVE

iTelescope.Net Reservations Pilot -- Telescope 5

[Return to Telescope](#) Welcome, Gord Tulloch Reservation quota usage (h:mm): 1:30 / 4:00 (refresh page to update)

Choose Telescope: ----- New Mexico -----

Zoom Out Zoom In Show Almanac Columns
 Show My Deleted and Past Events

More Days Fewer Days

Observatory OPEN to CLOSE, starting the night of:

	Wednesday, February 21, 2018	Thursday, February 22, 2018	Friday, February 23, 2018	Saturday, February 24, 2018	Sunday, February 25, 2018	Monday, Feb
17:00	Sun is still up					
18:00	Roof is not yet open					
19:00	Still not fully dark					
20:00	179556 rcweir Cas.txt	308411 ThomasK 50Mroz_269.txt 179552 rcweir Tau_all.txt	179553 rcweir Tau_all.txt		179558 rcweir Cas.txt	
21:00	308278 csmart M42.txt					
22:00	308455 308516 hafnt 4.txt					
23:00	180440					
	308447 gordtulloch AG Dra.txt	308448 gordtulloch AG Dra.txt	308449 gordtulloch AG Dra.txt			
		308353				

iTelescope.Net Reservations Pilot -- Telescope 5

[Return to Telescope](#)

Welcome, Gord Tulloch

Reservation quota usage (h:mm): 1:30 / 4:00 (refresh page to update)

Choose Telescope:

---- New Mexico ----

Zoom Out

Zoom In

 Show Almanac Columns

More Days

Fewer Days

 Show My Deleted and Past Events

Observatory OPEN to CLOSE, starting the night of:

January 2018						
Su	Mo	Tu	We	Th	Fr	Sa
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

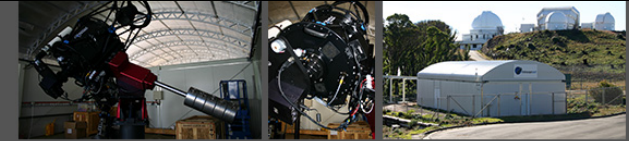
February 2018						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

March 2018						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

April 2018						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12

	Wednesday, February 21, 2018	Thursday, February 22, 2018	Friday, February 23, 2018	Saturday, February 24, 2018	Sunday, February 25, 2018	Monday, February 26, 2018
	Opening Hours	Reservations	Reservations	Reservations	Reservations	Reservations
17 ⁰⁰	Sun is still up					
18 ⁰⁰	Roof is not yet open					
19 ⁰⁰	Still not fully dark	179556 rcweir Cas.txt	308411 Thomask 50Miror_269.txt 179552 rcweir Tau_all.txt	179553 rcweir Tau_all.txt	179558 rcweir Cas.txt	
20 ⁰⁰		308278 csmart M42.txt				
21 ⁰⁰						
22 ⁰⁰		308455 308516 hafsnt 4.txt				
23 ⁰⁰		180440				
0 ⁰⁰		308447 gordtulloch AG Dra.txt	308448 gordtulloch AG Dra.txt	308449 gordtulloch AG Dra.txt		
			308353			

CONTROL



Welcome Gord Tulloch

Basic Imaging

- [One Click Image](#)
- [One Click Comet](#)
- [Single Image](#)

Imaging

- [Run Image Series](#)
- [Run Scripted Plan](#)
- [Acquire Comet/NEO](#)

Toolbox

- [System Status](#)
- [Plan Generator](#)
- [Make a Reservation](#)
- [Pending Reservations](#)
- [Cal. \(Dark/Bias\)](#)
- [Deep Sky Catalog](#)
- [Welcome Page](#)
- [AAVSO VPhot](#)

My Documents

- [My Observing Plans](#)
- [Run Logs](#)
- [My Image Files](#)

Support

- [Contact Support](#)
- [Video Tutorials](#)
- [FAQ](#)

Observatory

- [View Observatory](#)
- [Preview Last Image](#)
- [All Sky Camera](#)
- [Weather Data](#)
- [Telescope Info](#)
- [Abort Script](#)
- [Release Observatory](#)

System Status

[Preview Last Image](#)

[Auto-Guider Preview](#)

If the System Status page isn't refreshing correctly or seems to be hung, please hit the reload button on your browser.

Observatory	Telescope	Imager	Activity
In use	Sidereal Track	Expose 180 sec.	Imaging
UTC: 17:25:03	RA: 13:32:37.69	Filter Custom	Target BV Cen
LST: 13:59:11	Dec: -55°00'16.1"	Binning 1:1	
Local: 04:25:03	Az: 189.3°	Cooler -35°C/76%	
Date: 02-03-18	Alt: 65.8°	Guider	
Owner Gord Tulloch	Air: 1.1	Guiding	
Weather n/a	RA/Dec local topo	Error Ex: 0.06	
<i>Hover mouse over links</i>		Ey: 0.02	

Current Running Script Output:

```
04:22:11 (taking 180 sec. exposure, Custom filter, binning = 1)
04:22:11 == Dither HA: 0.4165 ==
04:22:11 == Guided Dither ==
04:22:12 (guided dither, 1 good cycles)
04:22:17 (guided dither, 2 good cycles)
04:22:24 (guided dither, 3 good cycles)
04:22:30 (guided dither, 4 good cycles)
04:22:38 (guided dither, 5 good cycles)
04:22:42 Guider X=0.06 Y=0.02
04:22:56 Guider X=0.09 Y=0.06
04:23:08 Guider X=0.05 Y=0.06
04:23:22 Guider X=0.08 Y=0.08
04:23:36 Guider X=-0.01 Y=0.04
04:23:51 Guider X=0.02 Y=-0.10
04:24:03 Guider X=0.02 Y=0.02
04:24:18 Guider X=0.02 Y=-0.03
04:24:32 Guider X=0.04 Y=-0.02
04:24:45 Guider X=0.07 Y=0.10
04:24:59 Guider X=0.06 Y=0.02
```



Abort Script

[All Sky Camera](#)



Welcome Gord Tulloch

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- One Click Comet
- Single Image

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Observatory		Telescope		Imager		Activity	
In use		Sidereal Track		Expose 180 sec.		Imaging	
UTC:	17:25:03	RA:	13:32:37.69	Filter	Custom	Target	BV Cen
LST:	13:59:11	Dec:	-55°00'16.1"	Binning	1:1		
Local:	04:25:03	Az:	189.3°	Cooler	-35°C/76%		
Date:	02-03-18	Alt:	65.8°	Guider			
Owner	Gord Tulloch	Air:	1.1	Guiding			
Weather	n/a	<i>RA/Dec local topo</i>		Error	Ex:	0.06	
<i>Hover mouse over links</i>					Ey:	0.02	

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04:23:36 Guider X=-0.01 Y=0.04
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04:24:18 Guider X=0.02 Y=-0.03
04:24:32 Guider X=0.04 Y=-0.02
04:24:45 Guider X=0.07 Y=0.10
04:24:59 Guider X=0.06 Y=0.02
  
```



Abort Script

All Sky Camera

;

; AG Draconis Photometric Imaging VBI

;

#vphot

#count 4,4,4

#interval 30,30,30

#binning 1,1,1

#filter V,B,I

AGDra 16.028055555555557 66.80277777777778

SCRIPTS

Maxim DL Pro 3 - CCD Image 3433

150307 15.sky - TheSky6

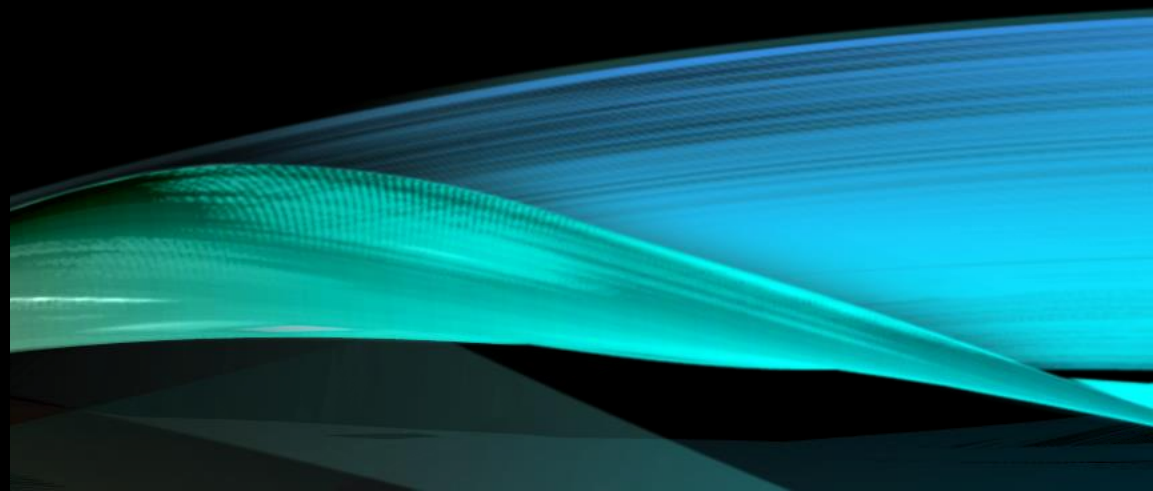
Camera Control

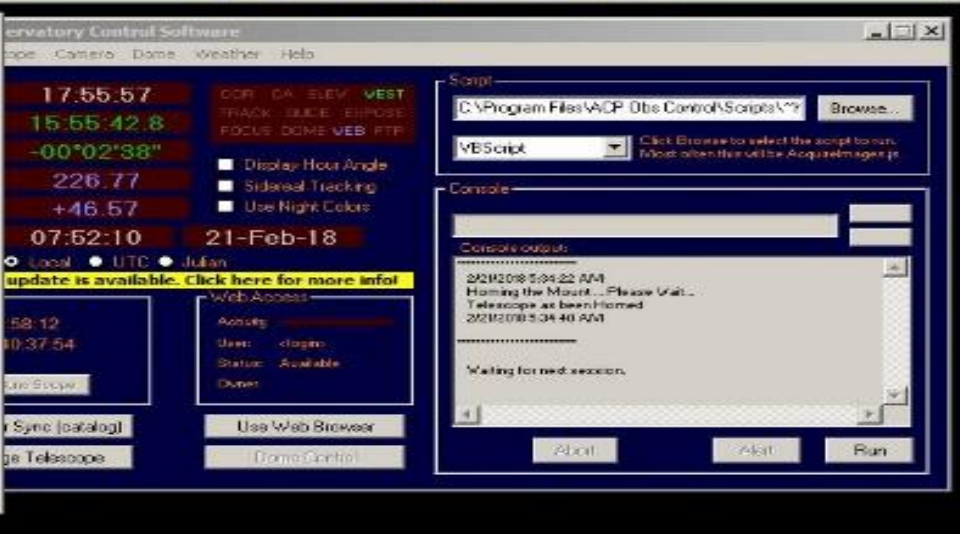
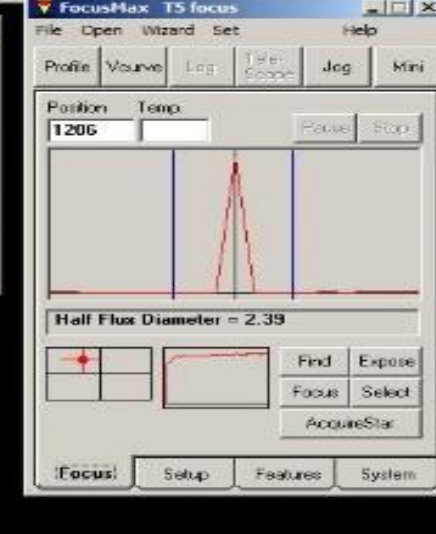
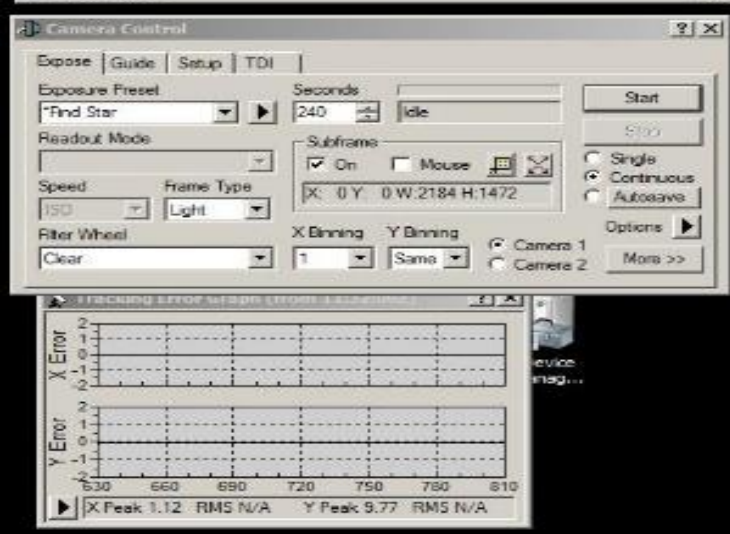
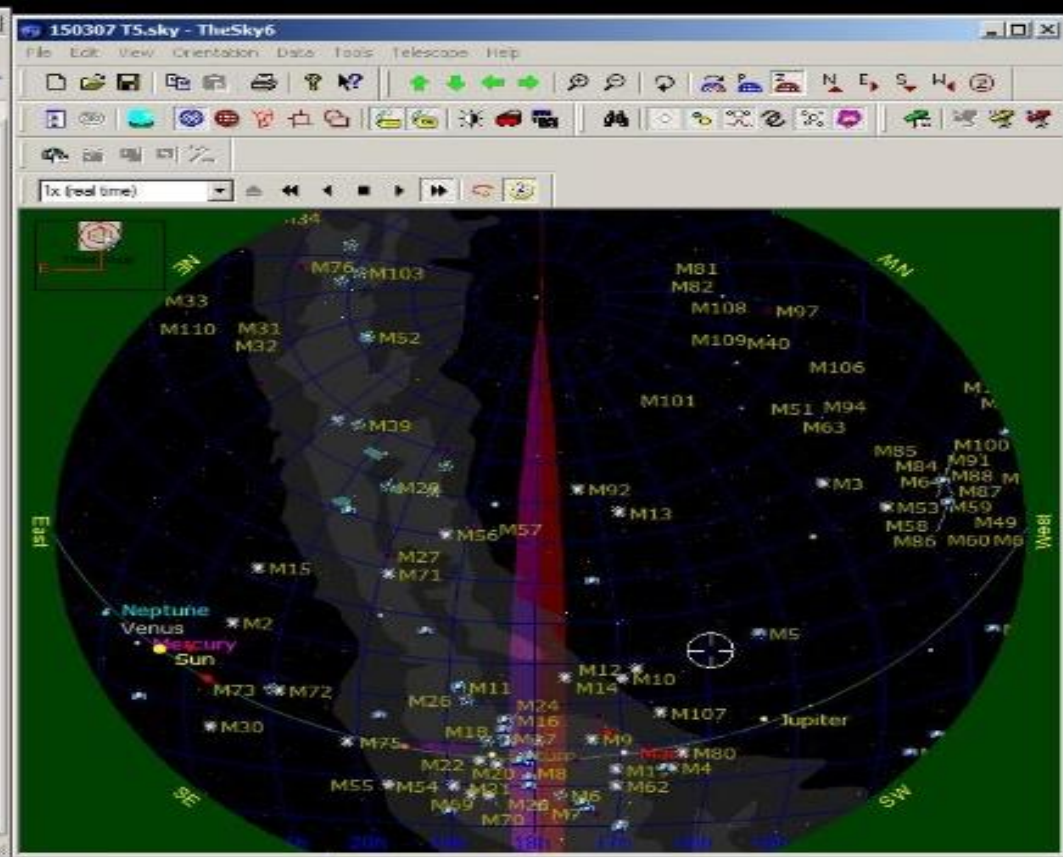
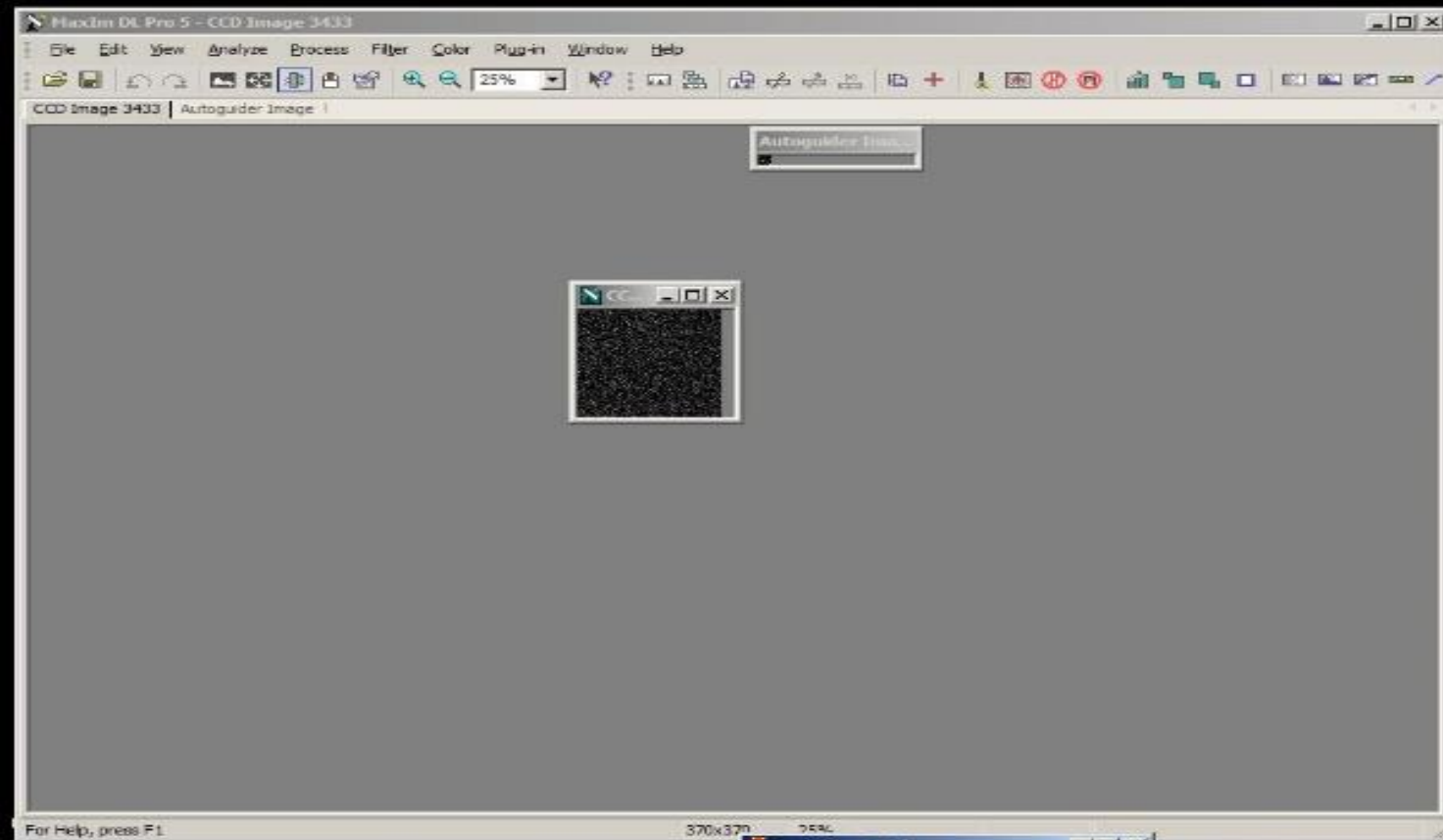
FocusMax TS focus

Telescope Control Software

Start | ADP Observ... | FUpload | 150307 15.sky... | Maxim DL Pro... | Activity Check... | Log | Telescope | FocusMax T... | Autofocus 1.2... | 7:52 AM

BACK END





AREN'T TELESCOPES EXPENSIVE?

- Cost is per imaging minute not slew, focus, calibrate etc.
- Each imaging minute is perfect or they refund your points
- How much per imaging minute for your own scope?
 - Cost of Equipment: \$5,000 - \$20,000
 - How many perfect image mins do you collect per year? (12 hrs/mo x 12mo x $\frac{1}{2}$ setup/teardown/equipment) say 4300
 - 4300mins or 350mins/month
 - iTelescope cost \$200-300 (incl moon discounts)
 - Breakeven = 2-8 years
 - Monthly subscription = accumulate minutes
 - Don't image = don't consume points
 - No up front costs to buy gear

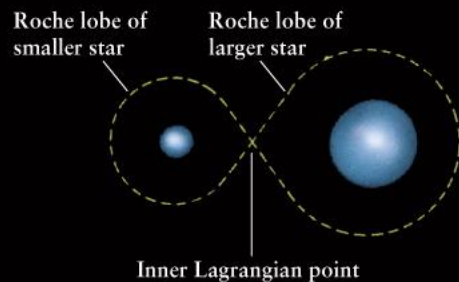
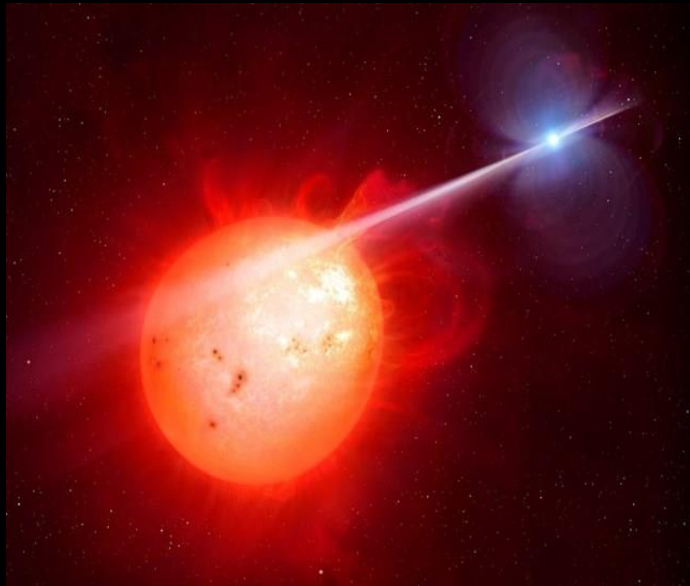


VARIABLE STARS

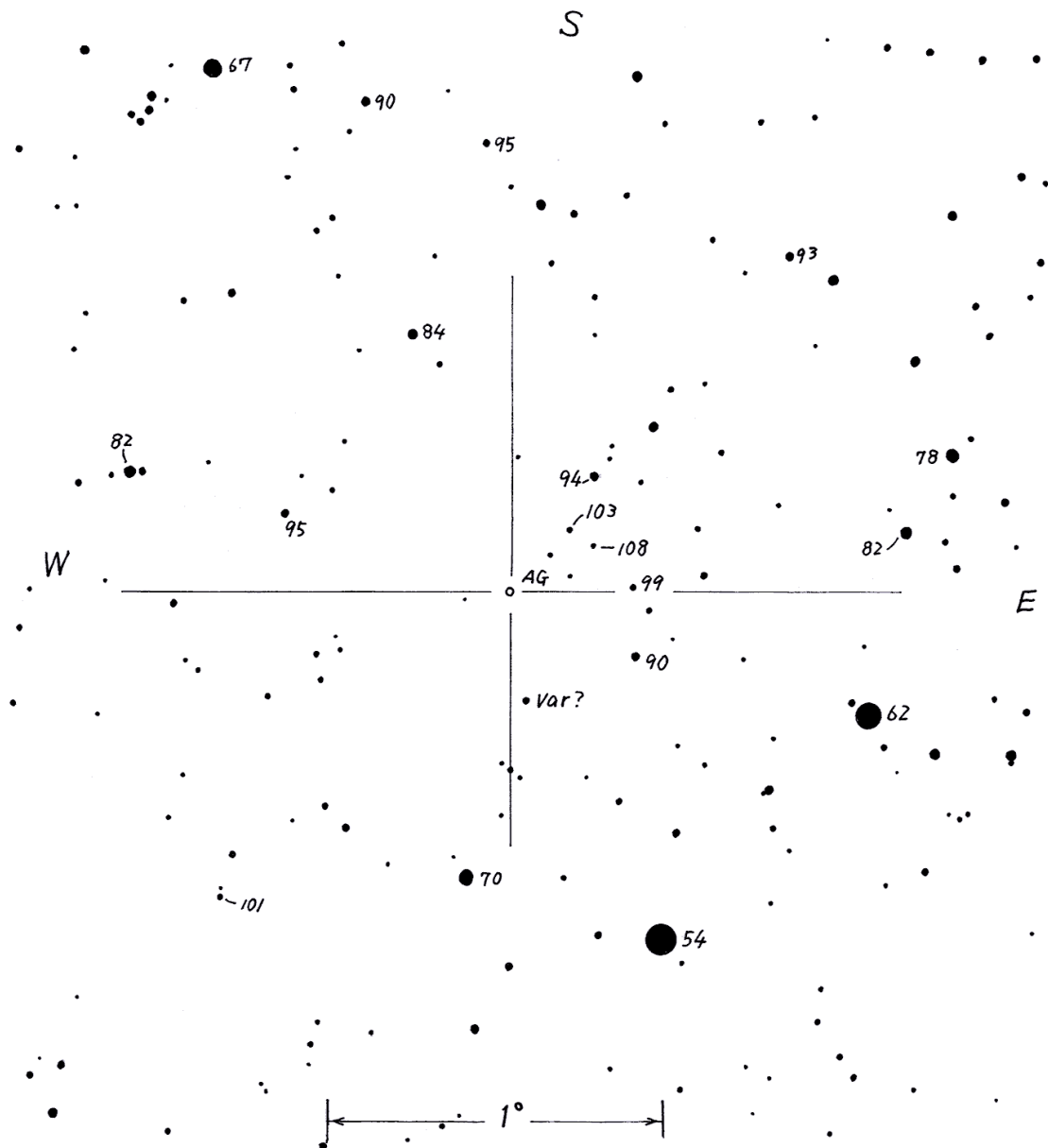
- One of the best ways for amateurs to contribute to scientific knowledge
- Variable star primer
 - Intrinsic vs extrinsic
 - Cepheids – yardsticks of the universe
 - Common types (per GCVS5.1)
 - Eruptive (generally intrinsic)
 - Cataclysmic (generally extrinsic)
 - Pulsating – eg Cepheids
 - Rotating
 - Eclipsing Binaries



AG DRACONIS



- 9.8m symbiotic detached binary nova variable of Z And type consisting of an orange-red star (temp 3.5-5k), along with a white dwarf (80k), both of which revolve around a centre of gravity every 550 days.
- The transfer of material from the larger companion to the smaller causes periodic outbursts once every 15 years which last about 3-6 years.
- A reason to watch AG Dra is it was due an outburst - doing interesting things

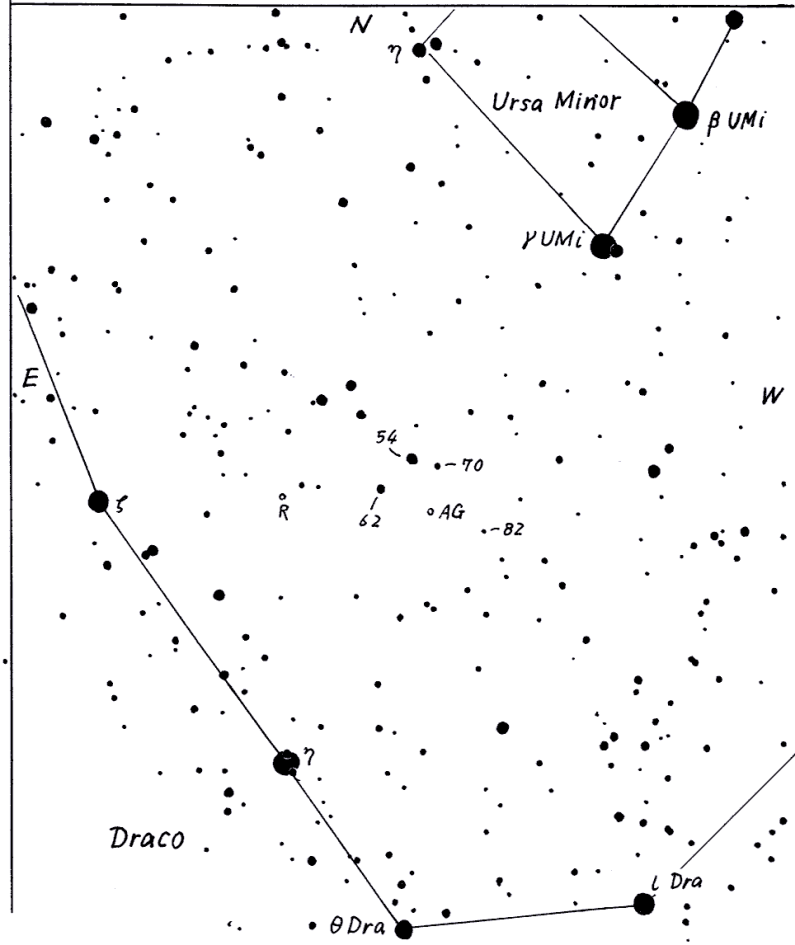


AAVSO (b) Chart

1601+67 AG Dra (AG Draconis)
 Magn. 8.9 ~ 11.8 P
 Period -
 Type Z And
 Spec. Killep

(2000) 16^h01^m41^s +66°48.1'

Drawn by Hirasawa 2004 Jan 5



VPHOT

Image 2 of 4 Regular mode Pixel/ADU mode Catalogs Tools FITS Header | Images | Help

Load Sequence: (User Defined Files)

Name	SNR	FWHM		
AG Dra	457	3.04		
105	336	3.17		
111	231	3.35		
117	173	2.58		
119	152	2.84		
120	151	3.09		
123	117	3.02		
129	89	3.01		
132	67	2.31		
89	664	4.09		
93	565	2.92		
99	436	1.95		

1 targets 11 comps 0 checks
[Clear All](#) [Save](#) [Save As...](#)

Aperture radius is 5 pixels: [Change](#)
[View Photometry Report](#)

AG Dra 09-02-12 10:07:29 System: IT005 Filter: V

1 arc min

Click and drag to pan
[Zoom Out](#) Zoom factor: 1 [Zoom In](#)



AAVSO

American Association of Variable Star Observers



The AAVSO website is undergoing several maintenance procedures this week (Feb 27th -March 6th) in order to improve efficiency and speed. As a result different aspects of the website may be temporarily inaccessible. We apologize for any inconvenience.

[Home](#) » [Data](#) » [Data Analysis](#)

[Print This Page](#)

VPhot

[Click here to login to VPhot.](#)

VPhot is an online tool for photometric analysis. You can upload your own FITS images to VPhot or have images taken via the AAVSONet robotic telescope network automatically sent to your VPhot account.

To use VPhot you must:

- Be an AAVSO member ([Apply for membership](#).)
- Have an AAVSO observer code ([Apply for an observer code](#) - its free and automatic)
- Be logged into our web site. ([Register for a web site account](#).)

All VPhot processing is done via a web browser. All of the basic photometry tools exist (stacking, time series analysis, control of annulus', transformation, etc.) and the algorithms have been rigorously checked and confirmed to be of the highest quality. Results of the processing are automatically exported in [AAVSO Extended Format](#), meaning you can directly load them into our database via [WebObs](#) without having to make any changes to the data file.

AAVSO

#TYPE=EXTENDED

#OBSCODE=TGR

#SOFTWARE=VPhot 3.1

#DELIM=,

#DATE=JD

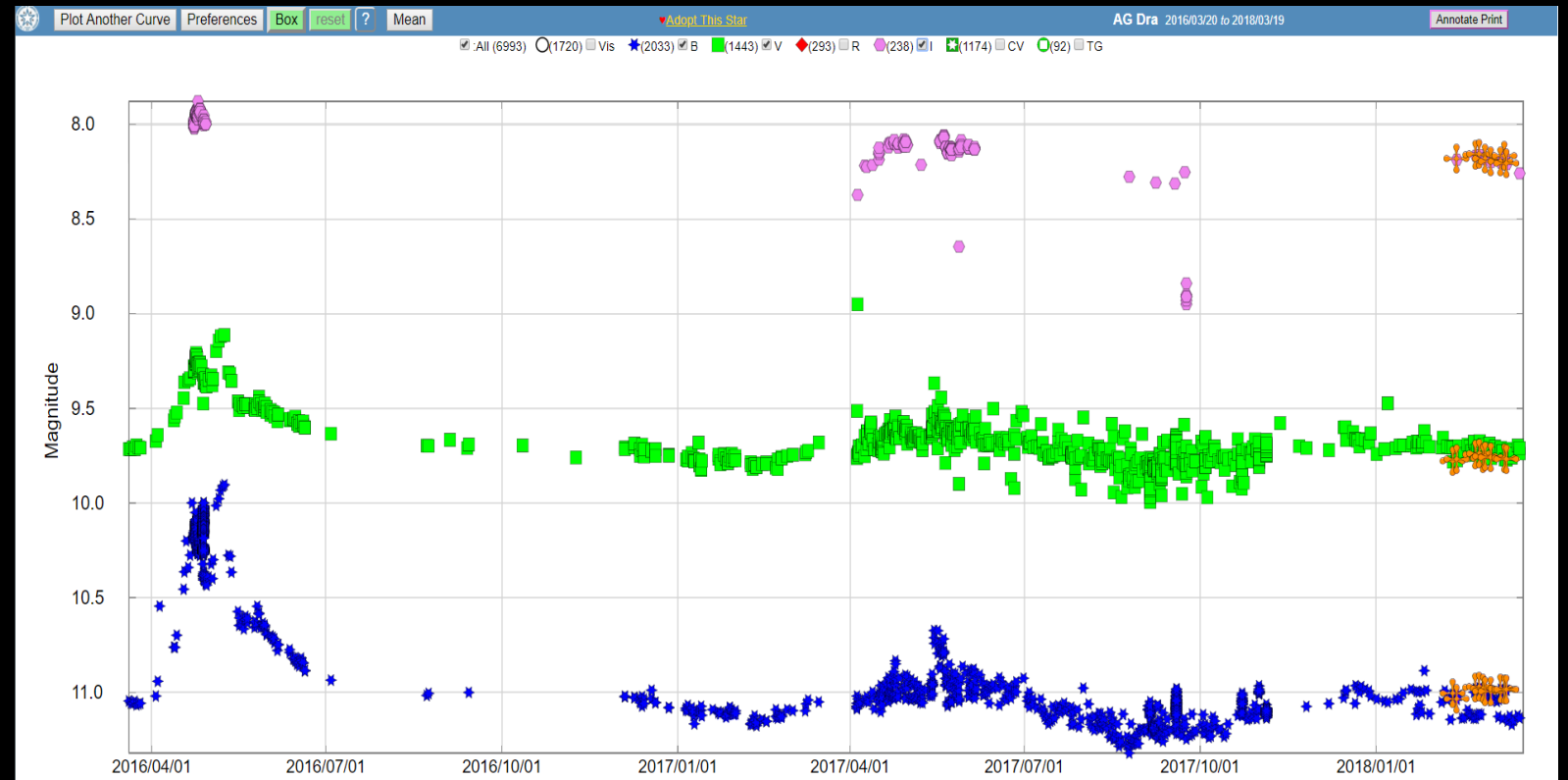
#OBSTYPE=CCD

#NAME,DATE,MAG,MERR,FILT,TRANS,MTYPE,CNAME,CMAG,KNAME,KMAG,AMASS,GROUP,CHART,NOTES

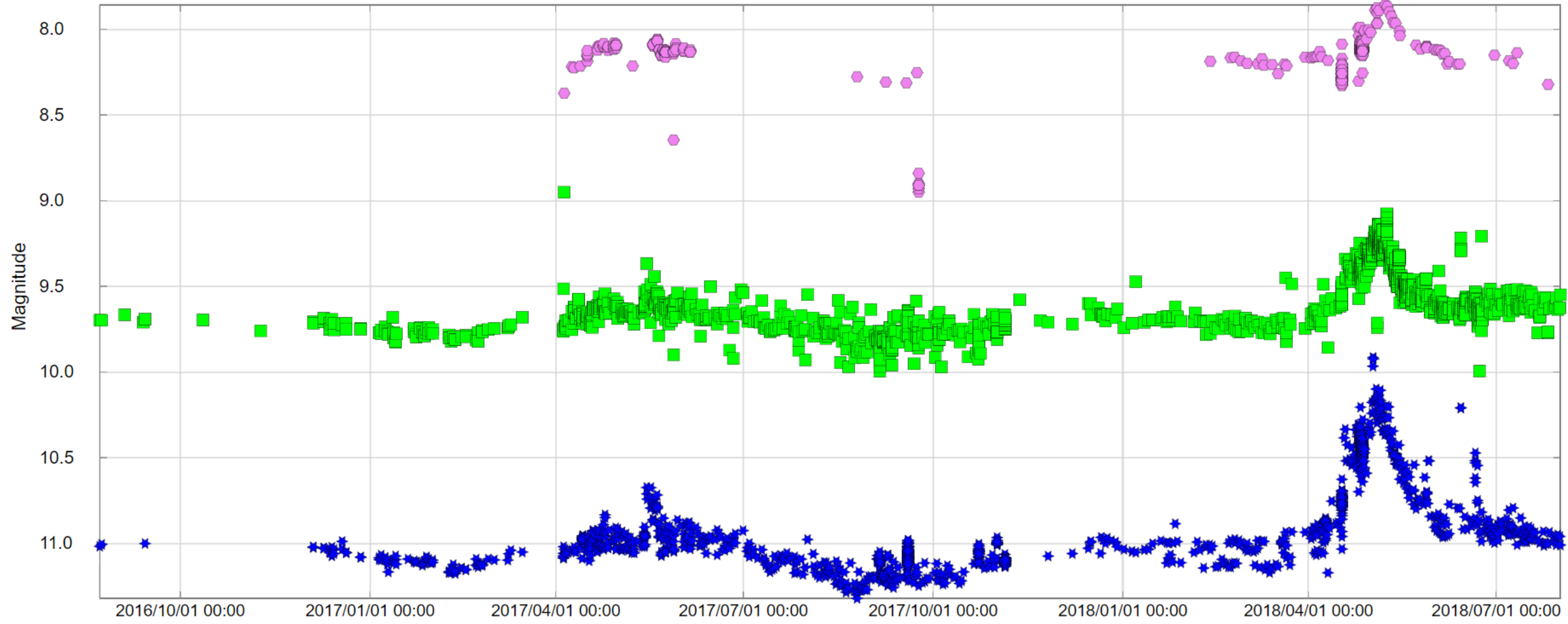
AG Dra,2458161.92834,11.036,0.005,B,NO,STD,ENSEMBLE,na,117,12.302,1.3969,na,X22691LM,na



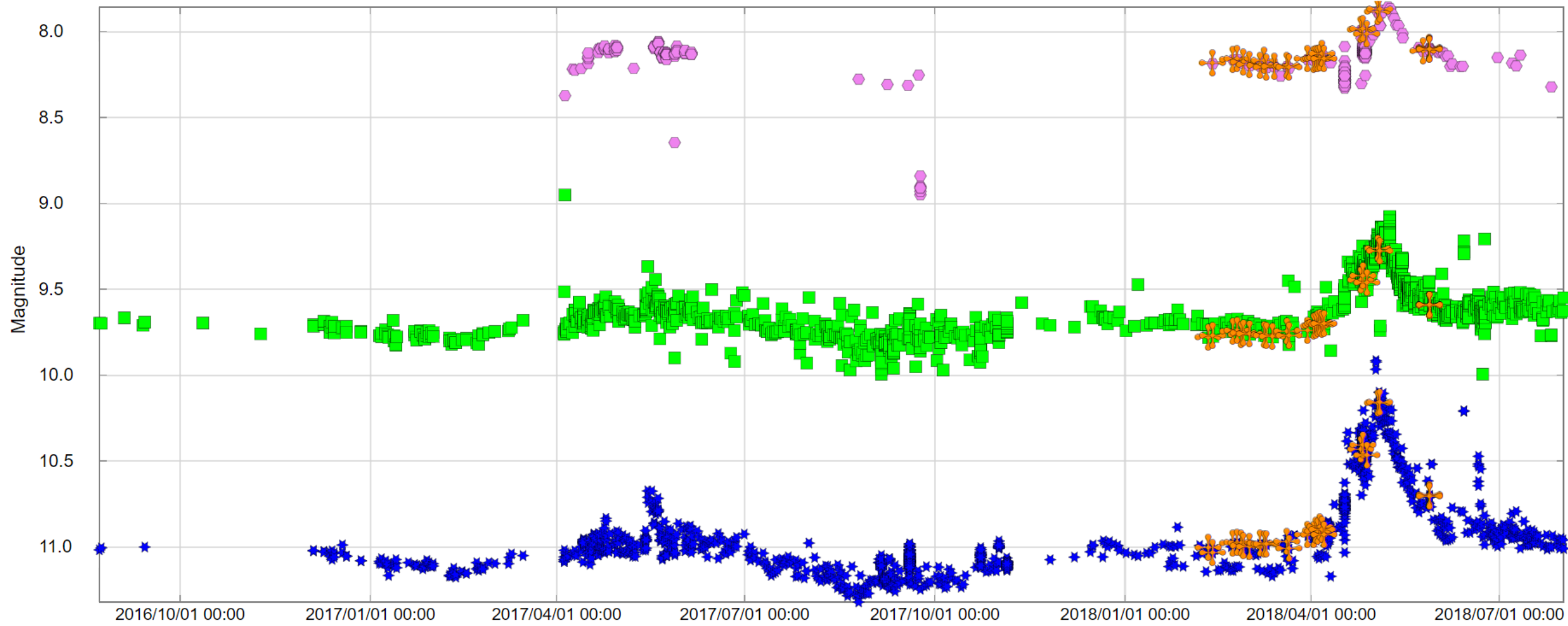
LIGHT CURVES

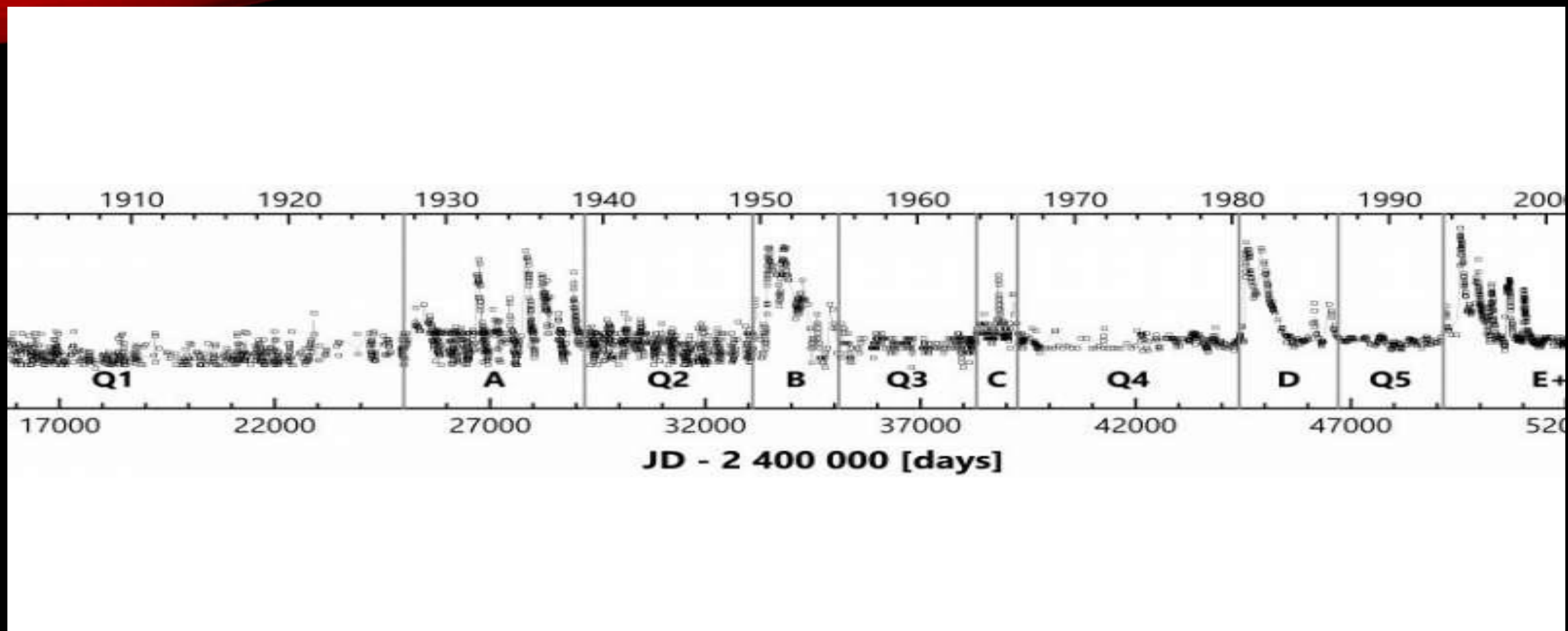


☐:All (4739) ★(1361) ☐:B (2962) ☐:V (416) ☐:I



☑ :All (4739) ★ (1361) ☑ B (2962) ☑ V (416) ☑ I





The historical light curve (LC) of AG Dra over the period 1889 - 2017, constructed on the basis of the photographic and the B band observations. The LC is divided into active (A - G) and quiescence (Q1 - Q6) stages by vertical lines. The thin curve shows spline fit to the data points. Credit: Šafárik et al., 2017. Read more at: <https://phys.org/news/2017-10-astronomers-unusual-outburst-binary-star.html#jCp>

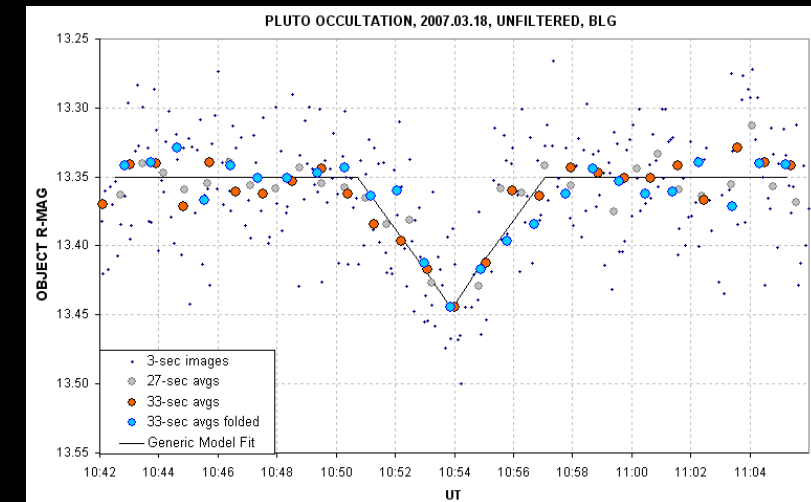


OTHER PROJECTS

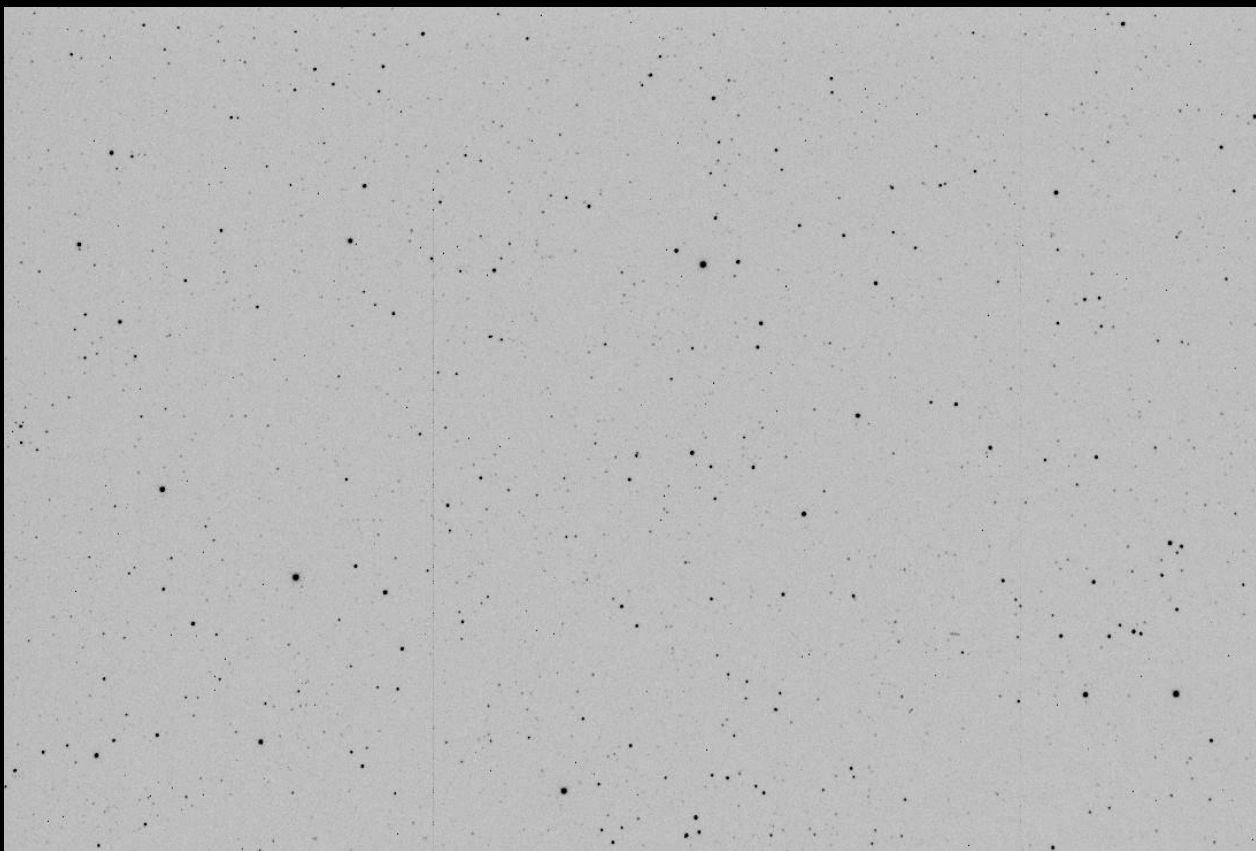
- Occultations
- Spectroscopy
- Exoplanet Transits

OCCULTATIONS

- On 19 July 2016, Pluto passed in front of the faint star UCAC4 345-180315
- Offered rare chance to study it's atmosphere
- Image 1 – pre-disappearance
- Image 2 – mid-occultation
- Image 3 - post-occultation
- Short duration makes these excellent iTelescope targets for time series imaging
- See right for a light curve from a 2007 even

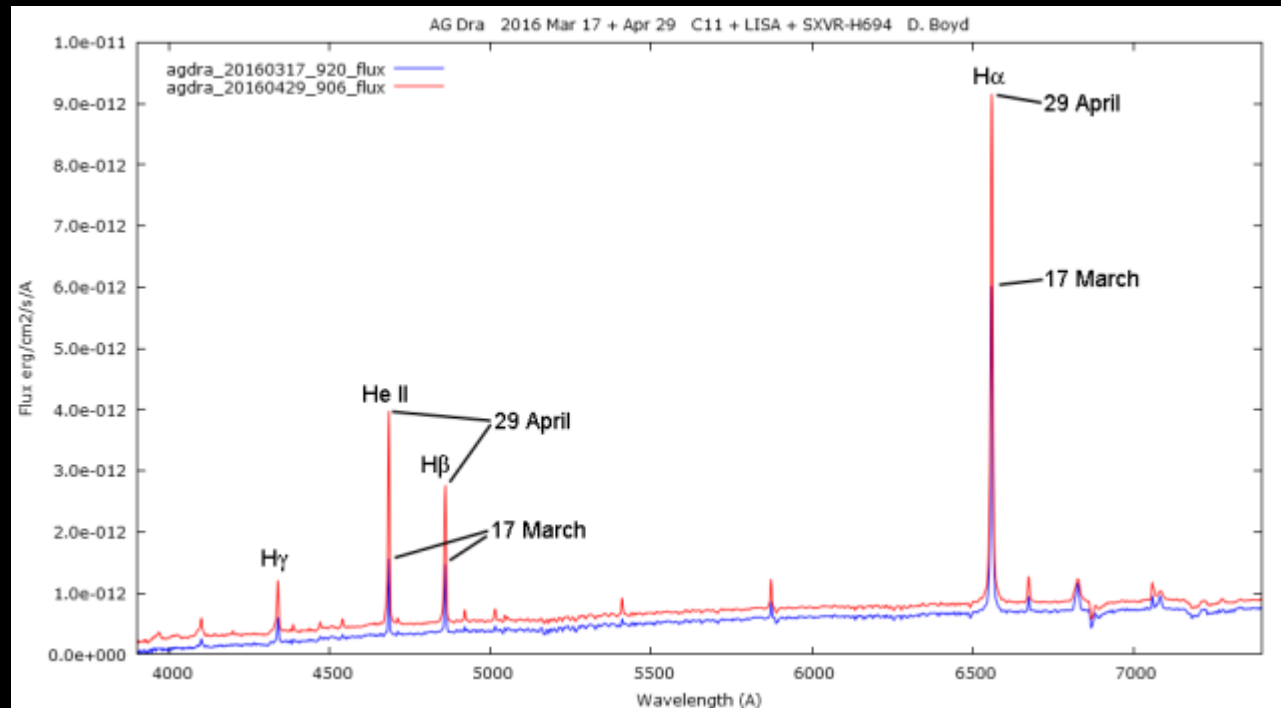


AUGUST 14/15 2018 OCCULTATION

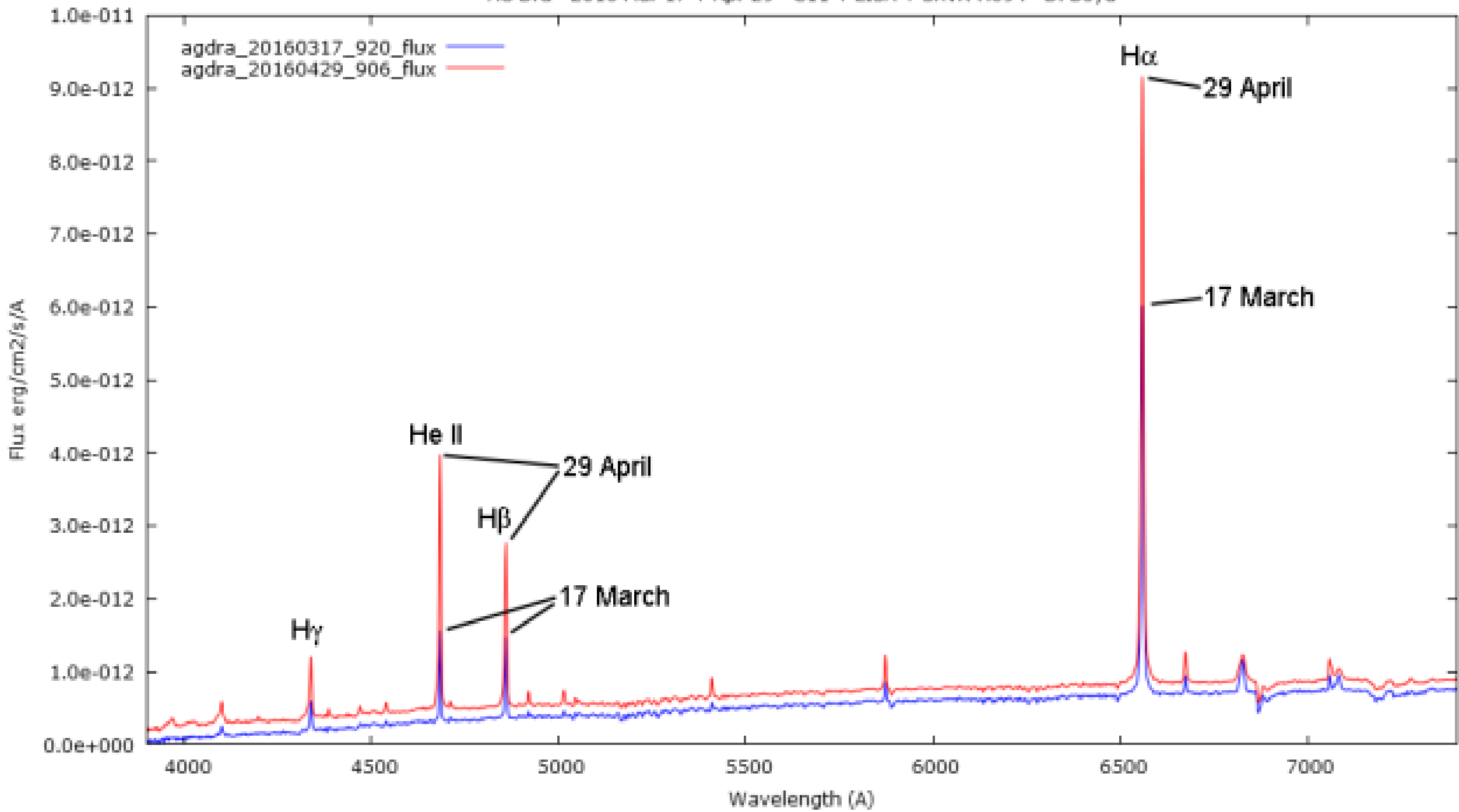


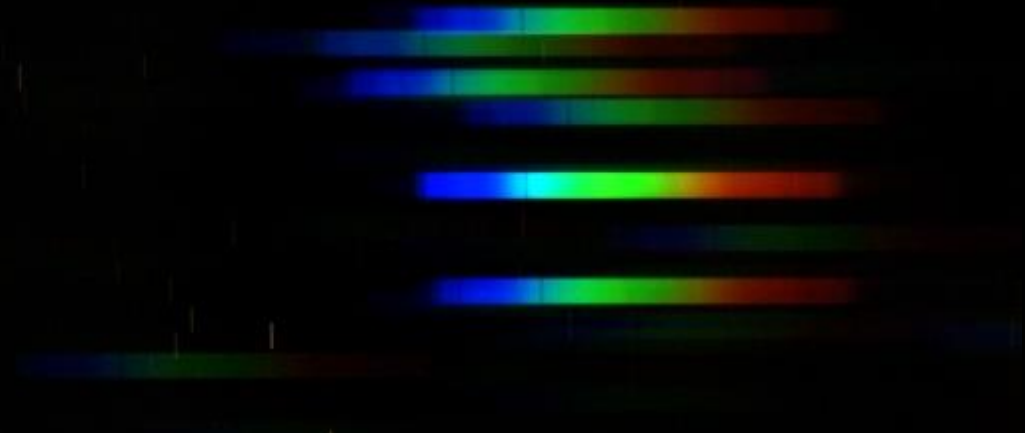
- Used T5 in New Mexico for this occultation (approx. Aug 14 11:30MT or Aug 15 5:30UT)
- 70 images over 20 mins 2 secs exp (about every 18 secs) 5:20-5:40UT
- Flats / bias / darks processed in AstrolmageJ
- Plate solved with astronomy.net standalone server (ansvr)
- Still doing data reduction

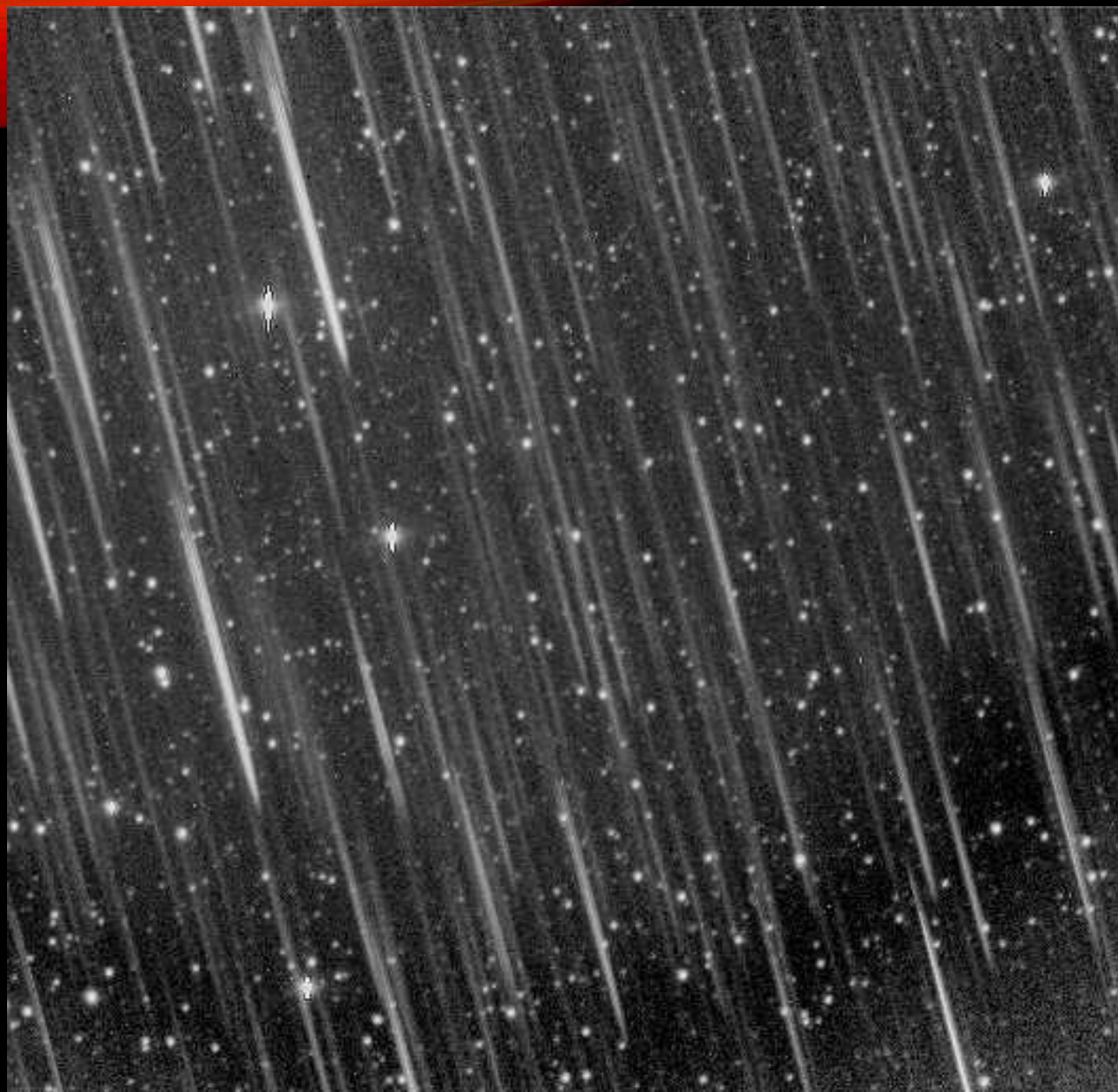
SPECTROSCOPY



Dave Boyd (BAA) - Retrieved from <https://britastro.org/node/7320>



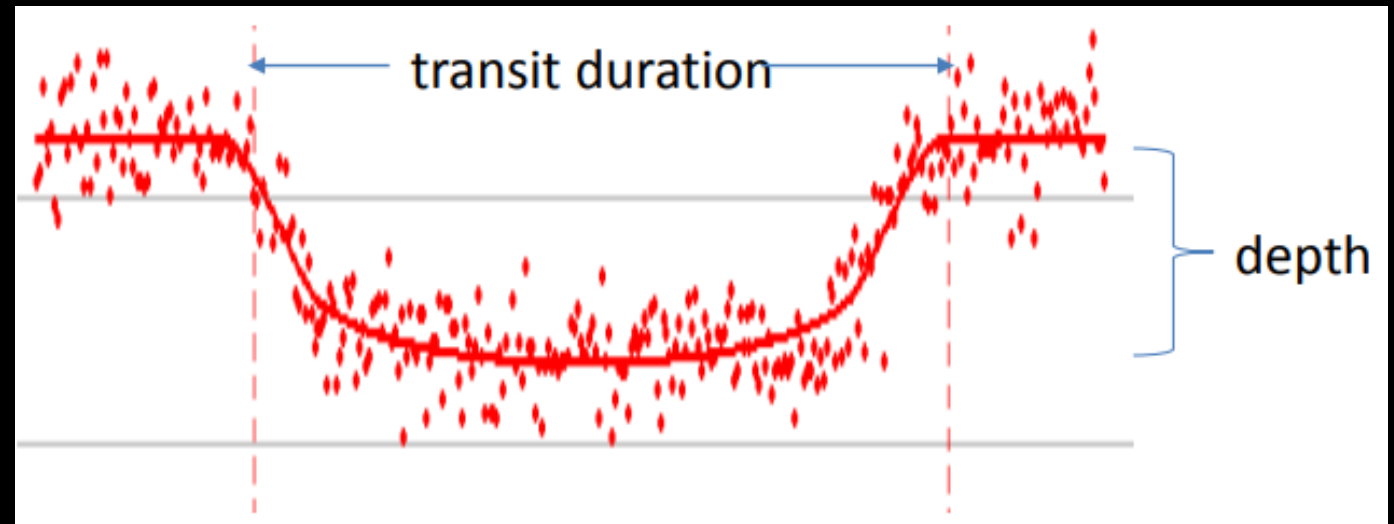




SO FAR NO GOOD

EXOPLANET TRANSITS

- Just completed an AAVSO CHOICE course in Exoplanet Observing conducted by Dennis M. Conti, Ph.D. Chair of the AAVSO Exoplanet Section (highly recommended)
- Course included processing of exoplanet photometry data using AstrolmageJ

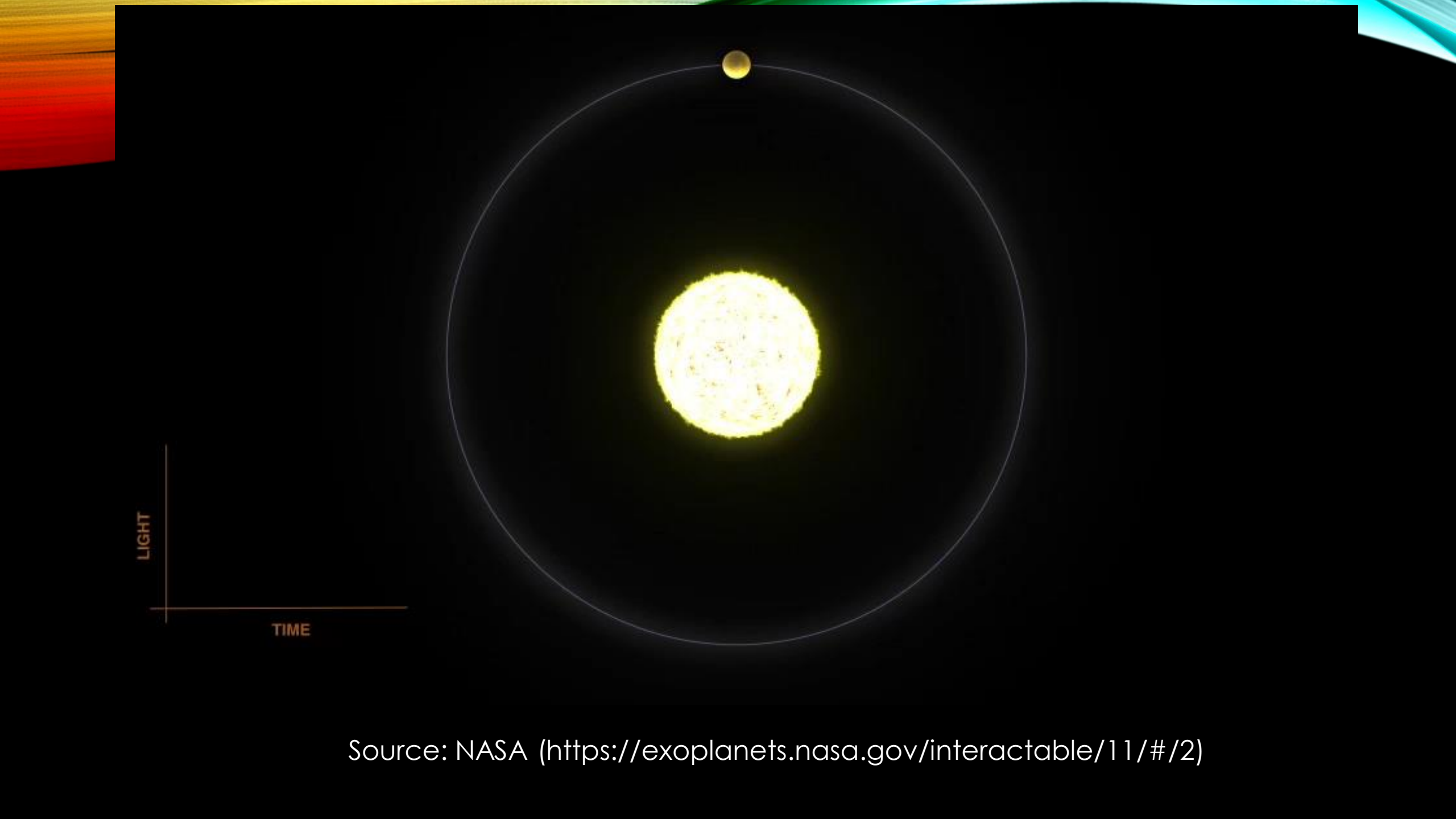




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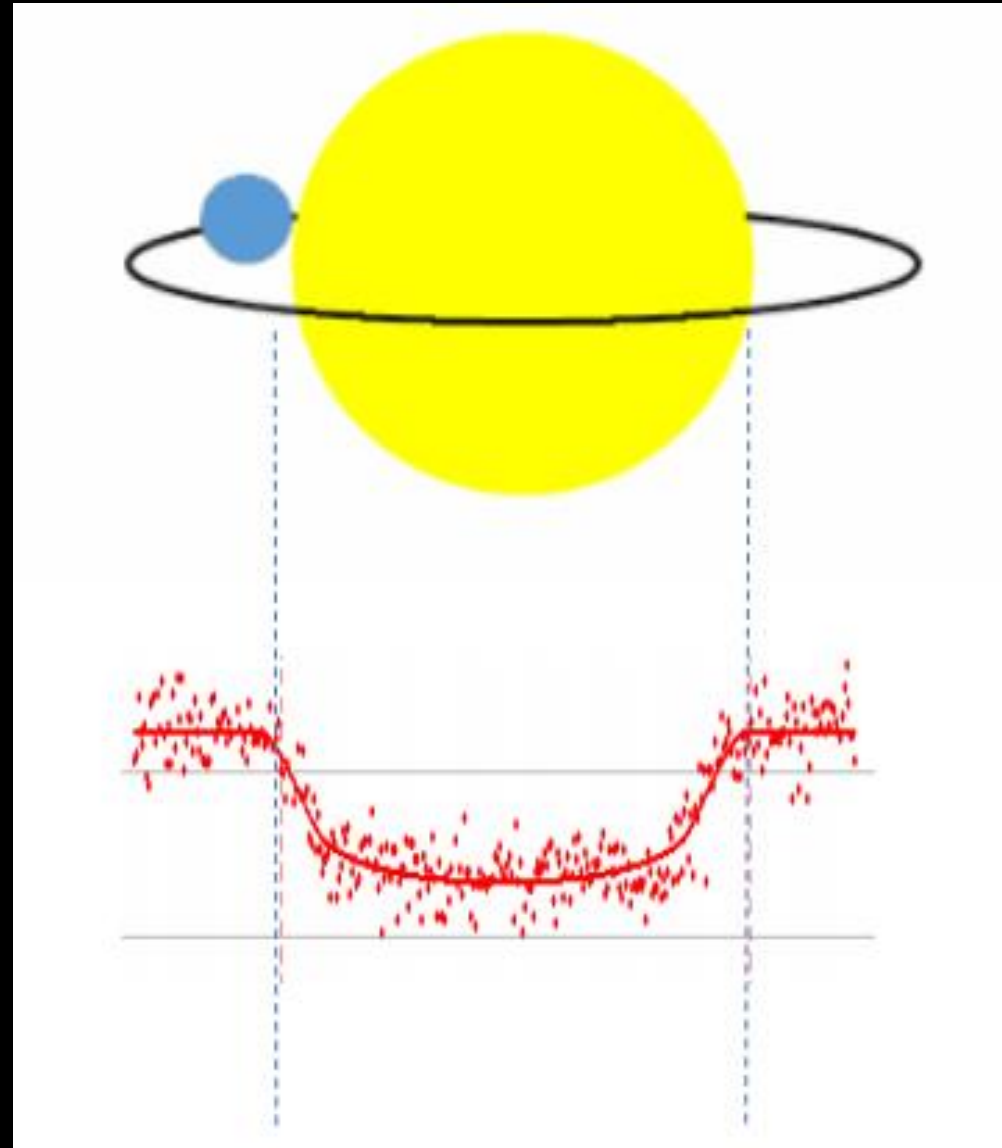
Jason Wang /
Christian Marois



Source: NASA (<https://exoplanets.nasa.gov/interactable/11/#/2>)

OBSERVING EXOPLANETS

- Exoplanet transits can be observed with amateur telescopes via CCD photometry
- Not well suited to iTelescopes due to duration of transits (hours / days)
- AAVSOnet offers roboscopes that can be reserved via proposal to Time Allocation Committee in New Mexico, Arizona, Australia and NZ



WHEN TO OBSERVE?

AAVSO Home

The International Variable Star Index

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Current Time: 19 Mar 2018 17:53:00 UTC Welcome, Guest. You are not logged in. >> Log in

Latest Details

Log in to retrieve additional aliases from SIMBAD.

Name	<input checked="" type="checkbox"/> WASP-76
AAVSO UID	000-BLT-405 (127 observations)
Constellation	Pisces
J2000.0	01 46 31.86 +02 42 02.0 (26.63275 +2.70056)
B1950.0	01 43 56.65 +02 27 05.6
Proper motion	RA: 46.4 +/- 0.7 mas/y Dec: -40.0 +/- 0.6 mas/y
Galactic coord.	149.085 -57.347
Other names (Internal only)	1SWASP J014631.86+024202.0 GSC 00032-00111 TYC 32-111-1 2MASS J01463185+0242019 PPM 144970
Variability type	EP
Spectral type	F7
Mag. range	9.52 (0.013) V
Discoverer	--
Epoch	29 Jun 2012 (HJD 2456107.85507)
Outburst	--
Period	1.809886 d
Rise/eclipse dur.	8.5%

Remarks

Some references may be clicked to view in new window. Roll over index number to view submission details.

1	Otero, Sebastian Alberto	WASP-76b is a bloated hot Jupiter.
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(Not logged in) >> Add remark

References

Click reference title/citation to view in new window. Roll over index number to view submission details.

VSX - Google Chrome

Secure | https://www.aavso.org/vsx/index.php?view=detail.ep...

Ephemeris for WASP-76 (HJD/UT)

Epoch	Start	Mid	End
2458192.844	15 Mar 2018 06:24	15 Mar 2018 08:14	15 Mar 2018 10:05
2458194.654	17 Mar 2018 01:50	17 Mar 2018 03:41	17 Mar 2018 05:31
2458196.464	18 Mar 2018 21:16	18 Mar 2018 23:07	19 Mar 2018 00:58
2458198.273	20 Mar 2018 16:42	20 Mar 2018 18:33	20 Mar 2018 20:24
2458200.083	22 Mar 2018 12:09	22 Mar 2018 13:59	22 Mar 2018 15:50
2458201.893	24 Mar 2018 07:35	24 Mar 2018 09:26	24 Mar 2018 11:16
2458203.703	26 Mar 2018 03:01	26 Mar 2018 04:52	26 Mar 2018 06:43
2458205.513	27 Mar 2018 22:27	28 Mar 2018 00:18	28 Mar 2018 02:09
2458207.323	29 Mar 2018 17:54	29 Mar 2018 19:44	29 Mar 2018 21:35
2458209.133	31 Mar 2018 13:20	31 Mar 2018 15:11	31 Mar 2018 17:01
2458210.943	02 Apr 2018 08:46	02 Apr 2018 10:37	02 Apr 2018 12:28
2458212.752	04 Apr 2018 04:12	04 Apr 2018 06:03	04 Apr 2018 07:54
2458214.562	05 Apr 2018 23:39	06 Apr 2018 01:29	06 Apr 2018 03:20
2458216.372	07 Apr 2018 19:05	07 Apr 2018 20:56	07 Apr 2018 22:46
2458218.182	09 Apr 2018 14:31	09 Apr 2018 16:22	09 Apr 2018 18:13
2458219.992	11 Apr 2018 09:57	11 Apr 2018 11:48	11 Apr 2018 13:39
2458221.802	13 Apr 2018 05:23	13 Apr 2018 07:14	13 Apr 2018 09:05

>> Close Window

- Many exoplanets have well established published ephemeris entries
- “Trial run” highly recommended

AAVSO TARGET TOOL

AAVSO Target Tool Print Export CSV Help Feed

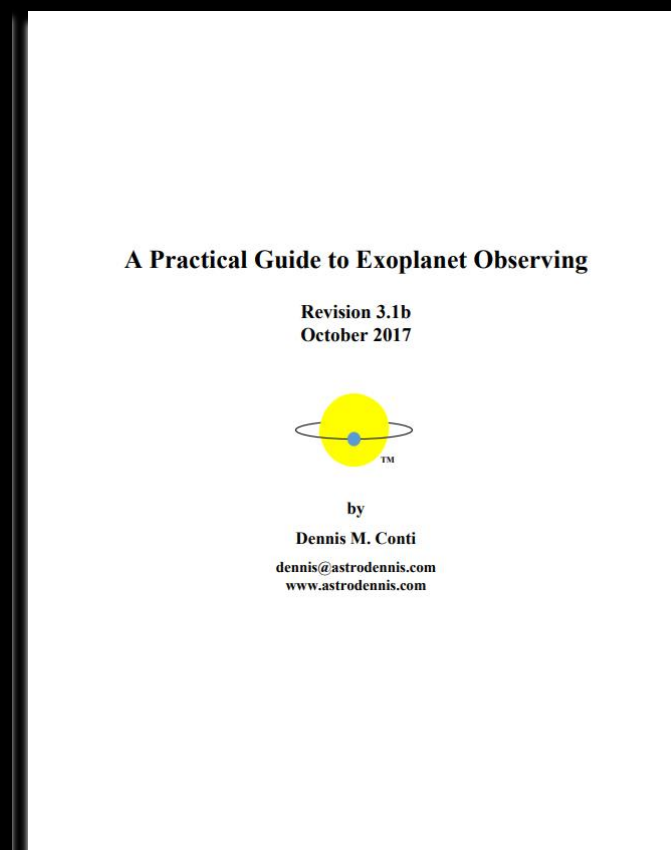
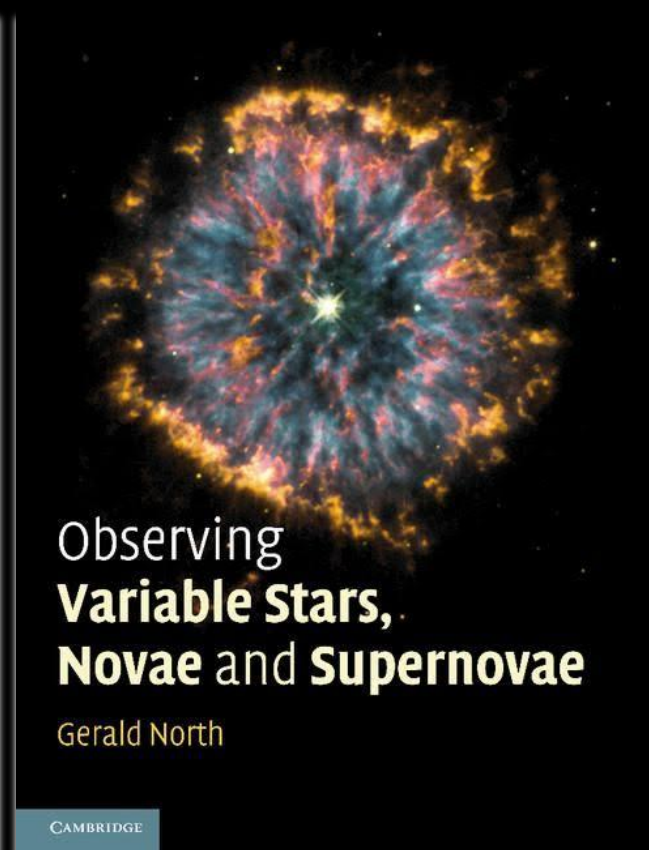
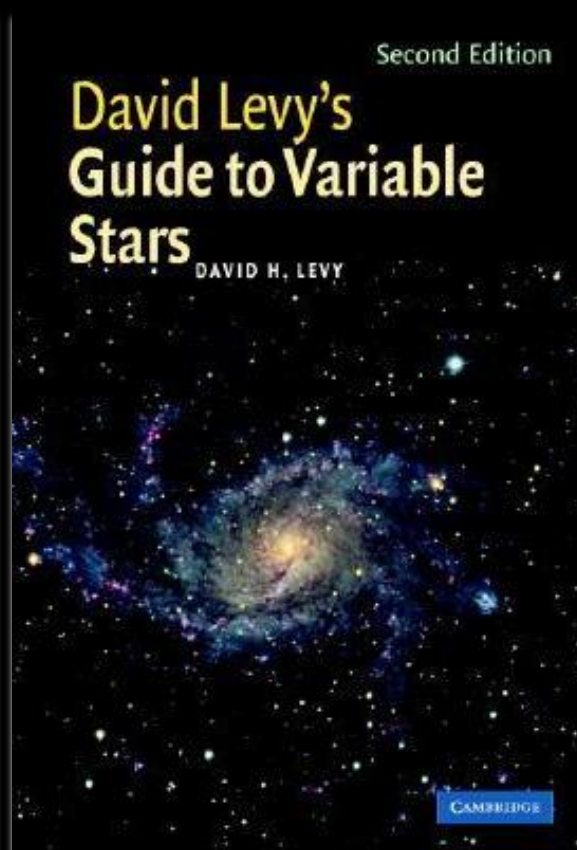
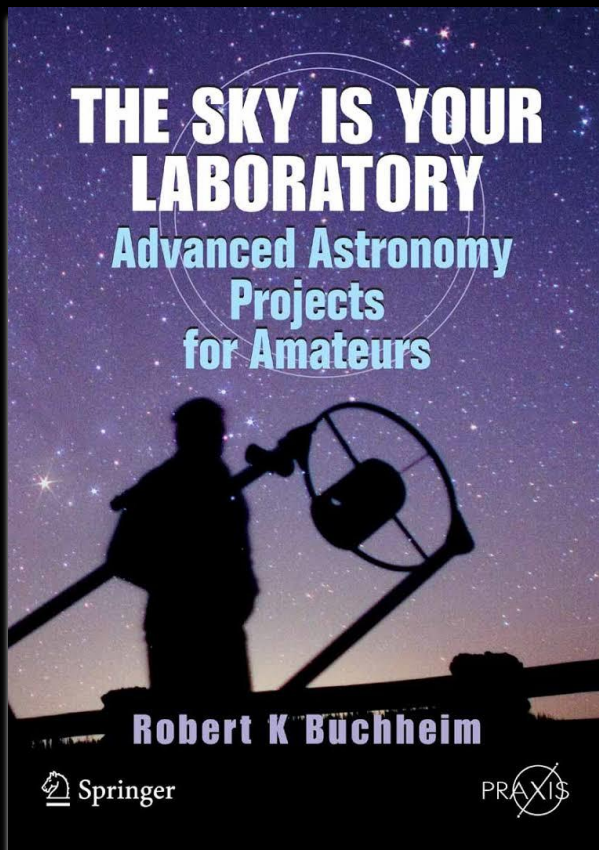
Observing section: Alerts/Campaigns Exoplanets (EP) Cataclysmic Variables (CV) Eclipsing Variables (EB) Short Period Pulsators (SPP) Long Period Variables (LPV) Young Stellar Objects (YSO) High Energy Targets (HET) Miscellaneous All Filter observing sections

Observability: To show only targets that are visible tonight at your telescope location, [sign up](#) or [login](#).

Star Name	RA (J2000.0)	Dec (J2000.0)	Constellation	Var. Type	Min Mag	Max Mag	Period (d)	Observing Cadence (d)	Observing Section	Filter/Mode	Last Observed	High Priority	Notes
WASP-76	01 ^h 46 ^m 31 ^s	+2° 42' 02"	Psc	EP	—	9.52 V	1.809886	0.2	EP	All	Near Solar Conjunction		Ephemeris info
HAT-P-12	13 ^h 57 ^m 33 ^s	+43° 29' 36"	CVn	EP	—	12.84 V	3.2130598	0.3	EP	All	9 months ago		Ephemeris info
HAT-P-32	02 ^h 04 ^m 10 ^s	+46° 41' 16"	And	EP	—	11.29 V	2.150008	0.2	EP	All	6 months ago		Ephemeris info
HAT-P-18	17 ^h 05 ^m 23 ^s	+33° 00' 45"	Her	EP	—	12.76 V	5.508023	0.6	EP	All	9 months ago		Ephemeris info
HAT-P-3	13 ^h 44 ^m 22 ^s	+48° 01' 43"	UMa	EP	—	11.86 V	2.899703	0.3	EP	All	8 months ago		Ephemeris info
HAT-P-38	02 ^h 21 ^m 31 ^s	+32° 14' 46"	Tri	EP	—	12.56 V	4.640382	0.5	EP	All	No Observation		Ephemeris info
HD 149026	16 ^h 30 ^m 29 ^s	+38° 20' 50"	Her	EP	—	8.16 V	2.8758887	0.3	EP	All	9 months ago		Ephemeris info
HAT-P-26	14 ^h 12 ^m 37 ^s	+4° 03' 36"	Vir	EP	—	11.7 V	4.234516	0.4	EP	All	No Observation		Ephemeris info

<https://filtergraph.com/aavso?exo=on&settype=true>

GOOD BOOKS





QUESTIONS?