

american association of variable star observers.

The AAVSO program: A Resource for Variable Star Astronomy

4th European Variable Star meeting

Stella Kafka, Exec. Director





The 2019 AAVSO Merit award





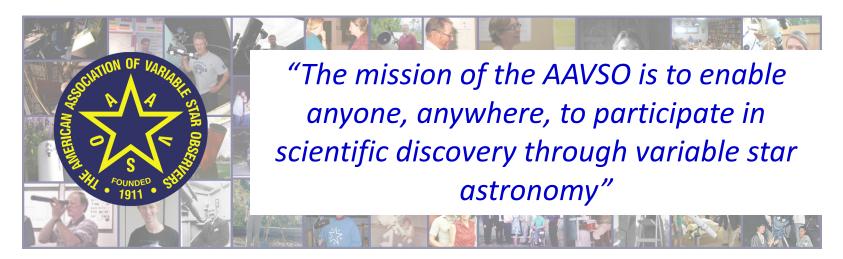
The 2019 AAVSO Merit award



"Patrick Wils, for his volunteer work for AAVSO supporting the International Variable Star Index (VSX). Patrick imported many published lists of stars into VSX, mentored amateurs who identified new variable stars, and reviewed new submissions. He also provided enhancements to VSX and developed numerous Application Programming Interfaces for AAVSO software. He's been a member of AAVSO for 16 years."

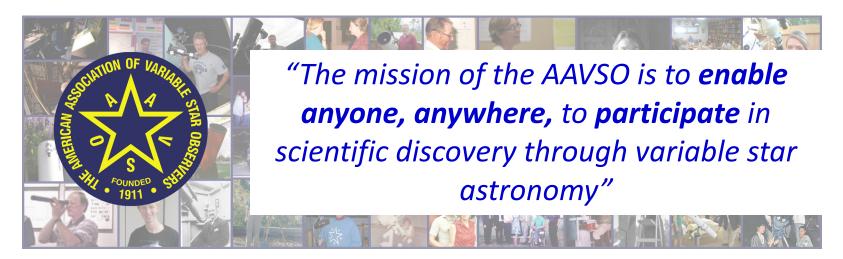


AAVSO: Our mission



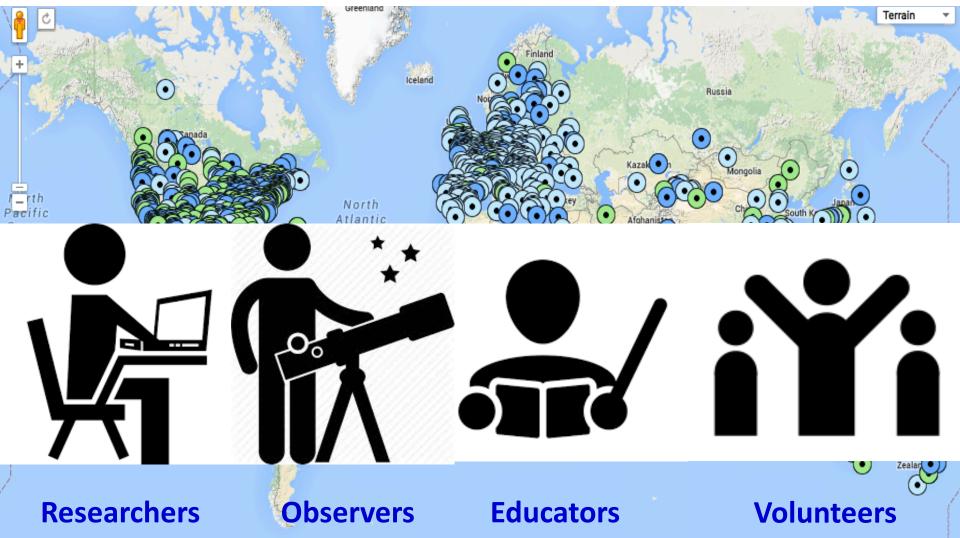


AAVSO: Our mission





The AAVSO International Community





The AAVSO International Community



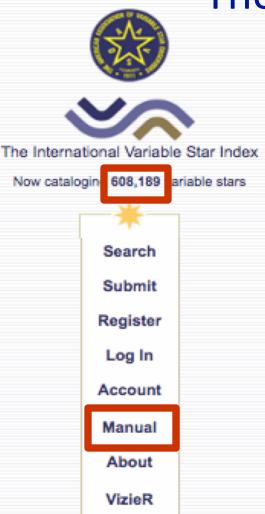


AAVSO Progress report



The Variable Star Index (VSX) Sebastian Otero, Patrick Wils

OOVSO



Help Us

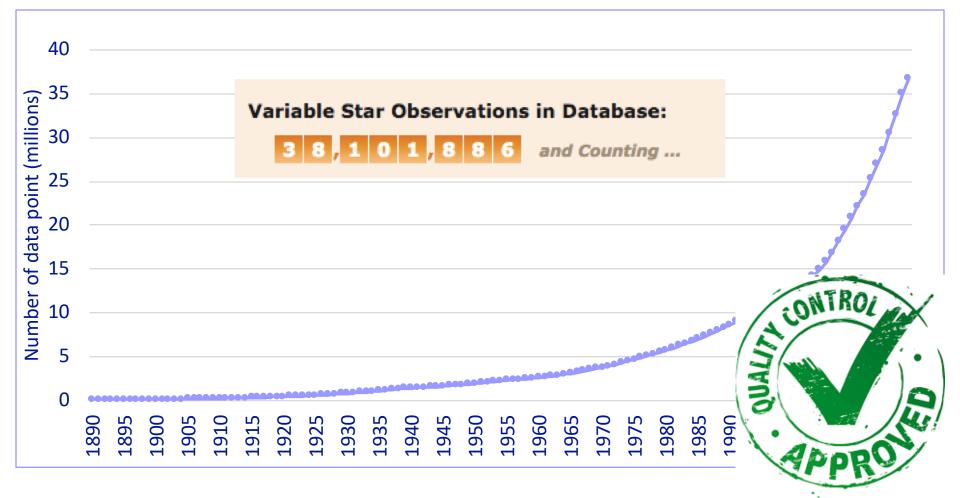
	# objects
Kepler flare stars	6
ZZ stars	119
Red variables	3
K2 EB and EPs	351
ASAS-SN variables Paper I - part 2	3170
NISE variables	24326
RR Lyrae Pan-STARRS1 candidates	30035
JV-type variables	5
Jnpublished Otero new bright variables	281
CoRoT variables	2176

New survey lists imported in FY 2019

The AAVSO International Database (AID) Photometry

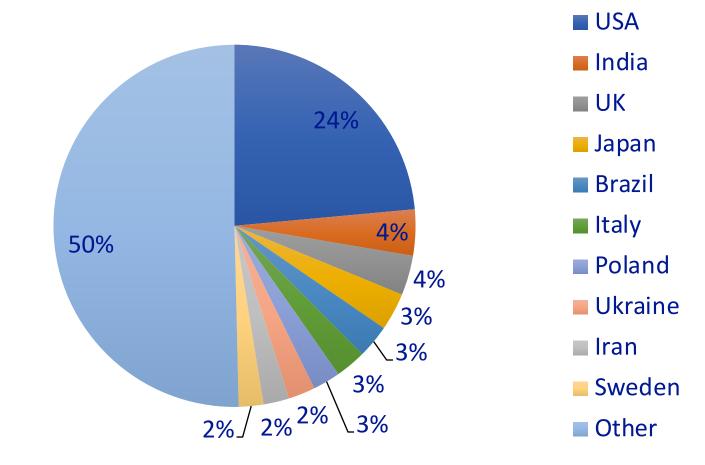
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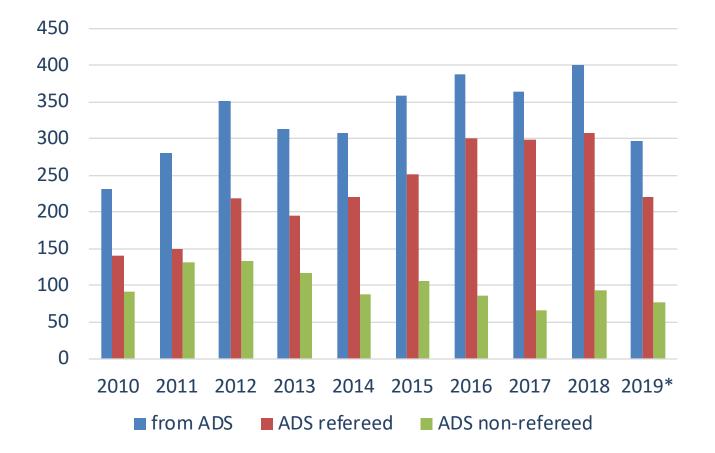
The AAVSO International Database (AID) Photometry – Data Downloads FY19

O O V S O





AAVSO in scientific Publications



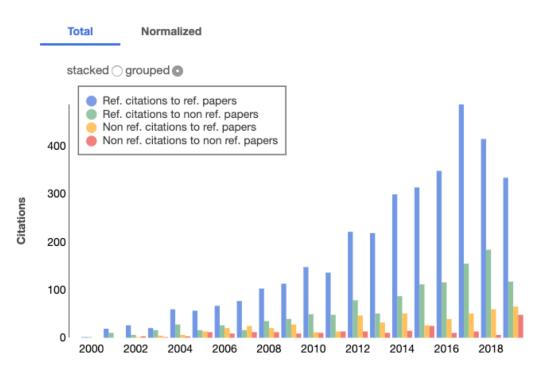
*end of July 2019



Our scientific audience

Citations

		Totals	Refereed
Number of citing papers	0	2787	2145
Total citations	0	3721	2747
Number of self-citations	0	353	253
Average citations	0	2.4	5.2
Median citations	0	0	1
Normalized citations	0	1386.9	1083.7
Refereed citations	0	3215	2394
Average refereed citations	0	2.1	4.6
Median refereed citations	0	0	1
Normalized refereed citations	0	1201.6	960.5



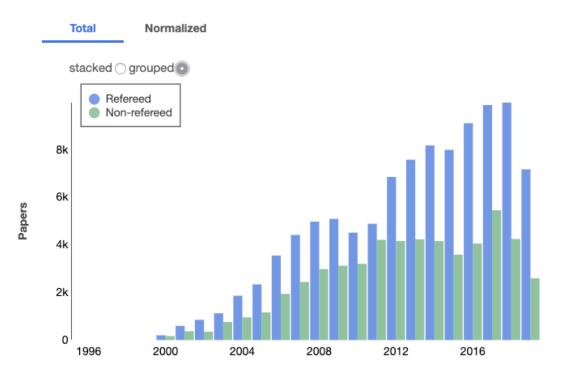
Source: NASA/ADS



Our scientific audience

Reads

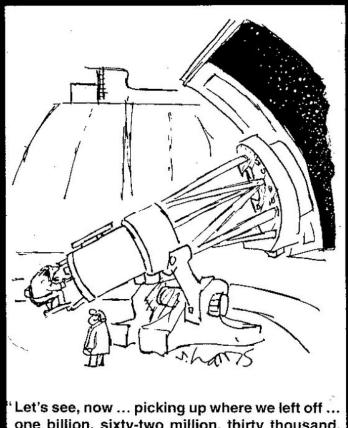
		Totals	Refereed
Total number of reads	0	101151	65878
Average number of reads	0	77.2	134.2
Median number of reads	0	31	55
Total number of downloads	0	45566	36483
Average number of downloads	0	34.8	74.3
Median number of downloads	0	9	9



Source: NASA/ADS



Observer training



one billion, sixty-two million, thirty thousand, four hundred and thirteen ... one billion, sixtytwo million, thirty thousand, four hundred and fourteen ... "



S

The Hitch-hiker's Guide to Photoelectric Photometry (PEP)

Version 1.0

Tom Calderwood

Our vision: High quality photometry of bright, astrophysically interest

The AAVSO photoelectric section was founded in the late 1970s. We use old-school tec superior results on bright stars. Compared to CCD or DSLR systems, our equipment is fu calibrate and operate, and data reduction is straightforward. What we lack in sensitiv quality. With properly chosen targets and careful technique, we remain a viable resean we're friendly people, and there is no substitute' for conversations with experienced obse at https://www.aavso.org/content/aavso-photoelectric-photometry-pep-program.

This document is a work-in-progress, representing my best understanding of PEP as p lacks the polish of other AAVSO manuals, but I think you will find it entertaining rea somewhere in between a cookbook and a reference book. I will try to provide a wide, bu of the equipment and practice of photometry with single-channel photometers. I wil occasionally, in the service of clarity.

Readers should also check out the Optec photometer manuals on-line. See Appendix find pointers to more advanced works on photometry, which will hopefully be less intit this guide. A Practical Guide to Exoplanet Observin

Revision 2.2 December 2016



by Dennis M. Conti

dennis@astrodennis.com www.astrodennis.com

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+ translations

The AAVSO Solar Observing Guide



AAVSO 49 Bay State Road Cambridge, MA 02138 phone: +1 617 354-0484 email: arvso@aavso.org

Copyright 2017 AAVSO ISBN 978-1-939538-26-0

https://www.aavso.org/observing-manuals

Training Observers: 2019 CHOICE courses

O O V S

Completed courses:

- CCD Photometry Part 1; Ed Wiley
- CCD Photometry Part 2; Phil Sullivan
- Variable Star Classification & Light Curves; Blake Crosby
- Exoplanet Observing; Dr. Jeff Robertson
- How to use Vstar; JoDee Baker-Maloney
- Observing and Counting Sunspots; Rafaello Braga
- Developing a Visual Observing Program; Michael Cook

Upcoming courses:

- Photometry Using VPhot; Ken Menzies (Sept. 9 Oct. 11)
- Exoplanet Observing; Dr. Brian Hill (Nov. 4 Dec. 6)

https://www.aavso.org/choice-astronomy



Training Observers: Mentor program

O O V S O

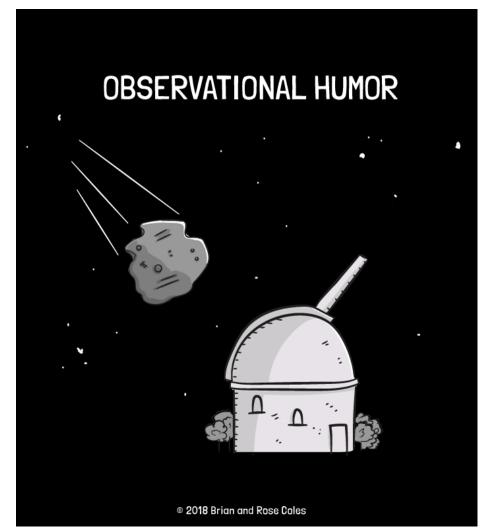
Thank you to Sebastian Otero 27 mentors from 12 countries



	Mentor	Country	Mentor	Country
Thank you to Sebastian Otero	Sebastian Otero	ARGENTINA	Gordon Myers	USA
27 mentors from 12 countries	David Benn	AUSTRALIA	Kristine Larsen	USA
	Peter Nelson	AUSTRALIA	Barbara Harris	USA
And the original and th	Alexandre Amorim	BRAZIL	Mike Linnolt	USA
Field Related Streton Normy Russia	Michael J. Cook	CANADA	Keith Graham	USA
Canada United Ringdom Poland Cernany Urainie Kazahintan Mongola	Patrick Abbott	CANADA	John Centala	USA
orth United States . North Spain Ditay	Michel		Chuck	
Merico Aders Lays Storing Sand Arabia India Thaland	Deconinck	FRANCE	Cynamon	USA
Vicanzeles Nageria Elizada Colombas Registrational Dec. Kenya Dec. Kenya Tanzalia	Roger Pieri	FRANCE	Ken Menzies	USA
Perro Appola Bolvis Namibia South Bistevina Madagascar Indian Deale Atlantico Ocean Ocean	Stelios Kleidis	GREECE	John Blackwell	USA
Apentina OCCUM Source Area	Umair Asim	PAKISTAN	James Fox	USA
	Tugca Sener	TURKEY	Ron Fournier	USA
	Carlos Morales			
	Socorro	SPAIN	William Wilson	USA
		SWITZERLAND		
	Ivaldo Cervini	/ITALY	Brad Vietje	USA
https://www.aavso.org/mentor-program	ı		Stella Kafka	USA

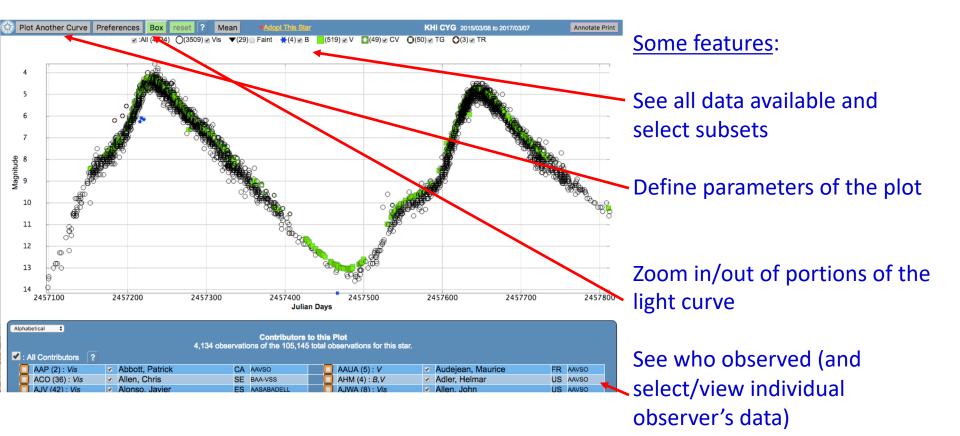
RODVSO

Observer support



New Light Curve Generator (LCG-2)

OOVS



Targets of interest: AAVSO Target Tool

O O V S

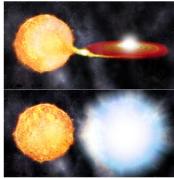
AAVSO Ta Observing s Observe	 High E ability: Nighttim 		Exoplanets (El) 🕝 📄 All 🌘	▼ Filter observir	aclysmic Var		Eclipsing Variation	ables (EB) 🕜 🛛 🛛	Short Period Pulsators (SPP) 🗭 🍵	Long Period Variables		Print - 🖺 Export CSV 🛛 Help Young Stellar Objects (YSO) 📝
Star Name	RA (j2000.0)	Dec (J2000.0)	Const- ellation	♂ Var. Type	Min Mag	Max Mag	Period (d)	₽ Observing Cadence (d)	Observing Section	∂ Filter/ Mode	ပွ Last Observed	High Priority	Notes
🖋 CH Cyg	19 ^h 24 ^m 33 ^s	+50° 14' 29"	Cyg	ZAND+SR	10.1 V	5.6 V		3.0	Alert/Campaign	В	<mark>⊘1 day ago</mark> Visible all night	A	B and V especially needed Alert Notice 454 Special Notice #320
🖋 AG Dra	16 ^h 01 ^m 41 ^s	+66° 48' 10"	Dra	ZAND	10.3 V	7.9 V	548.65	1.0	Alert/Campaign	В	0 19 hours ago Visible all night	A	Alert Notice 572
🖋 AG Peg	21 ^h 51 ^m 01 ^s	+12° 37' 32"	Peg	ZAND+R	9.4 V	6.0 V	816.5	1.0	Alert/Campaign	В	© 9 hours ago Rises 13:39	A	Alert Notice 521
🤌 RW Aur	05 ^h 07 ^m 49 ^s	+30° 24' 05"	Aur	CTTS/ROT	13.6 p	9.6 p	2.64	1.0	Alert/Campaign	В	© Near Solar Conjunction	A	Alert Notice 514 Special Notice #402
🖋 R Aqr	23 ^h 43 ^m 49 ^s	-15° 17' 04"	Aqr	M+ZAND	12.4 V	5.2 V	387.0	10.0	Alert/Campaign	В	⊘ 4 days ago Rises 17:16	A	multi-year observing campaign Alert Notice 535
 Proxima Cen 	14 ^h 29 ^m 33 ^s	-62° 40' 31"	Cen	BY	11.3 V	11.1 V	82.8	8.3	Alert/Campaign	I	© 7 months ago	A	lc (not Johnson) transits of exoplanet Proxima Cen b

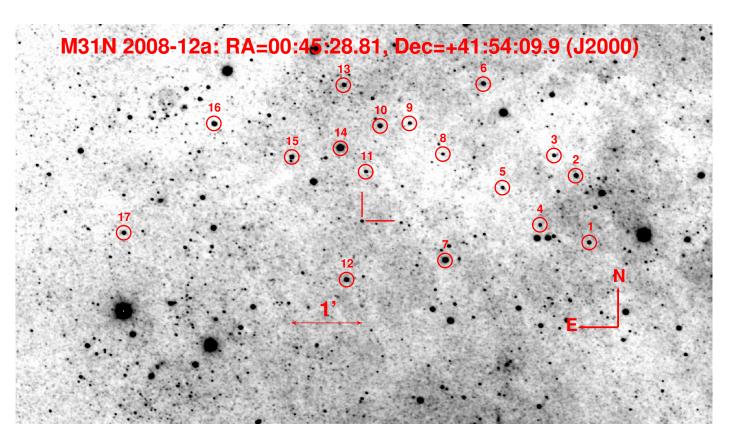
- Target information (RA, Dec, constellation, min/max mag, var type, filter/mode)
- Observing cadence
- When target was observed last (whether it needs observations)
- Notes (alerts, ephemerides, etc)



Detecting the predicted 2019 eruption of the RN M31N 2008-12a







From Henze et al. 2015, 2016, 2017...

Site and Equipment Registration Page

OOVS

George Silvis, Bert Pablo, Phil Manno, Sara Beck

Account Sites Equipment Email Settings MyNewsFlash	Account Sites Equipment Email Settings MyNewsFlash
Sites (documentation)	Equipment (documentation)
Select Site: add new \$	Select equipment package: add new
My Site Name Latitude (deg) Longitude (deg, west is minus) Altitude (m)	My Equipment Name: Observing Type: Telescope/Binoculars: Aperture (mm): Focal Length (mm):
Save Delete Please note that the information you are saving here is considered personal information and will be governed by GDPR standards. All AAVSO data and information are being used for astronomical research purposes only and, as such, they are shared with the international community as appropriate.	Camera characteristics: Camera: Gain (e/ADU): Readout Noise (e): Dark Current (e/pixel/sec): Linearity Threshold (ADU):

AAVSO Exoplanet Database + Observing Section (ExoDB)

OOVS

The AAVSO Exoplanet section (Chair: Dennis Conti)

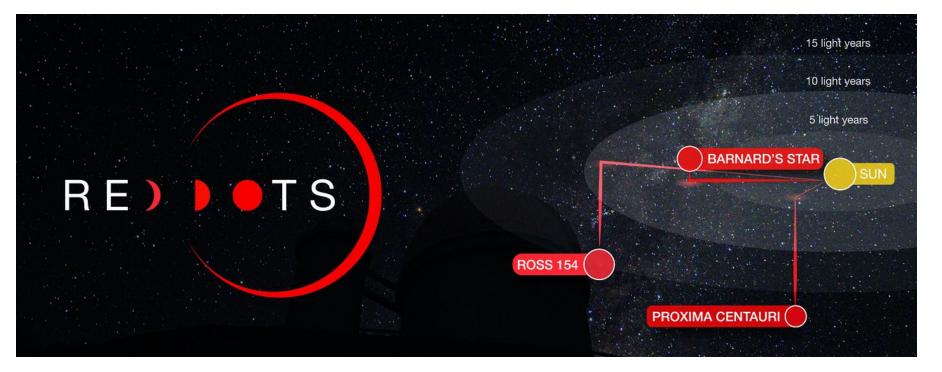
- Observer Education/Training to conduct high-precision exoplanet observations
 - 1. CHOICE course online instruction
 - 2. "A Practical Guide to Exoplanet Observing"
 - 3. "Exoplanet False Positive Detection with Sub-meter Telescopes"
 - 4. "Amateur Participation in the TESS Exoplanet Mission"
 - 5. "TESS SG1 Submission Guidelines"
- Data validation
- AAVSO guidelines for data submission

https://www.aavso.org/exoplanet-section https://www.aavso.org/apps/exosite/



Key partnerships: Pale Red Dot Campaign

O O V S

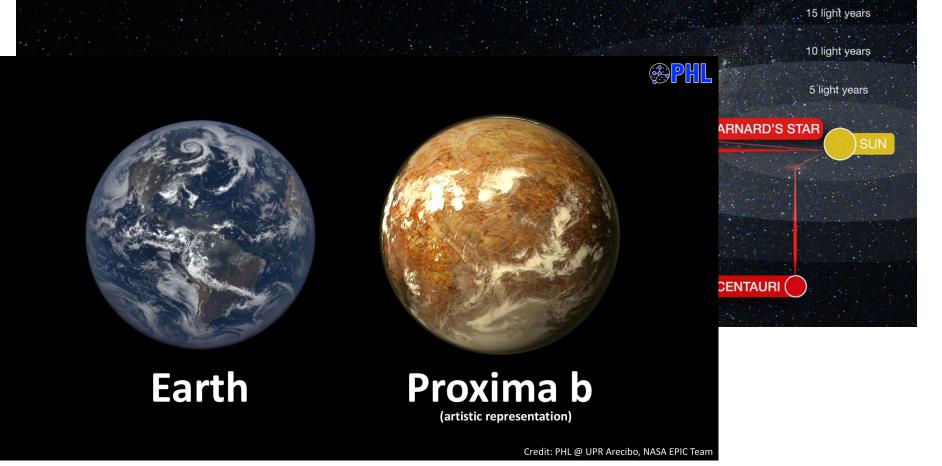


Project to attempt detection of the nearest terrestrial planets to the Sun (Proxima Cen, Barnard's Star, Gliese 729)

PI: Guillem Anglada-Escudé, Queen Mary University of London

Key partnerships: Pale Red Dot Campaign

O O V S

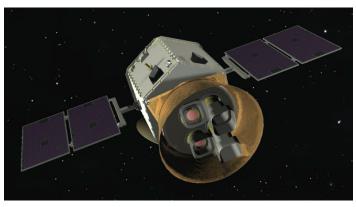


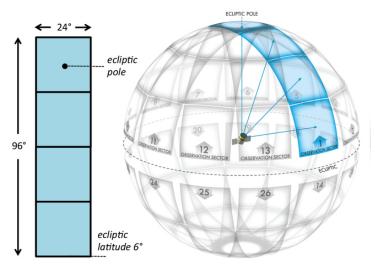
PI: Guillem Anglada-Escudé, Queen Mary University of London

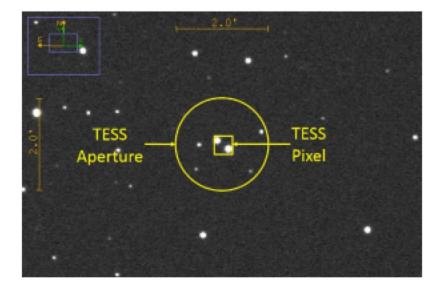


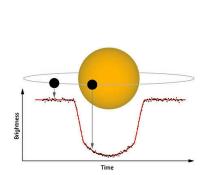
Key partnerships: TESS/TFOP

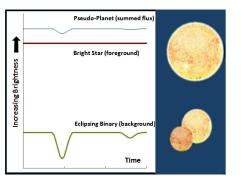
Transiting Exoplanet Survey Satellite











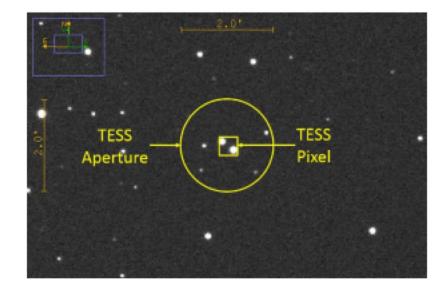


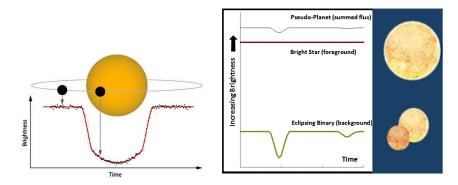
Key partnerships: TESS/TFOP

Transiting Exoplanet Survey Satellite



- Identify false positives due to nearby eclipsing binaries that contaminate the TESS image of a candidate transiting planet
- Provide long-term light curves of interesting targets
- •AAVSO guidelines for data submission -- adopted by SG1







AAVSO Exoplanet Database + Observing Section (ExoDB)

Submit Search Documentation	
Exoplanet Database: Submit Observation	Submit Search Documentation
Upload Here	Exoplanet Database Search
Select Site *	Observer Code (Primary or Secondary)
Select Equipment Package Echelle/SITE2K-1	Star
Report form: * Choose File No file chosen	Exoplanet Name

Goal: Long-term light curves of a select number of exoplanet transits

- Improved ephemerides
- Measure possible transit timing variations (TTVs)
- <unknown science>

Details	Download	GSC 03020-02221	HAT-P-36 b	20190223 223628	LDIA	148 in 4.21 hrs	Delete
Details	Download	GSC 3281-00800	HAT-P-32 b	20190203_205603	LDIA	215 in 4.45 hrs	Delete
Details	Download	Tres-3	Tres-3b	20171113_001532	BSEC	99 in 2.48 hrs	Delete
Details	Download	GSC 04240-00470	Qatar-1b	20181213_210747	LDIA	100 in 3.04 hrs	Delete
Details	Download	Wasp-12	Wasp-12b	20160106_022250	CDEC	336 in 4.72 hrs	Delete
Details	Download	WASP-12	WASP-12b	20160106_022250	KKS	336 in 4.72 hrs	Delete
Details	Download	WASP-12	WASP-12b	20160108_022250	CDEC	336 in 4.72 hrs	Delete
Details	Download	WASP-12	WASP-12b	20160106_022250	CDEC	336 in 4.72 hrs	Delete

https://www.aavso.org/exoplanet-section https://www.aavso.org/apps/exosite/

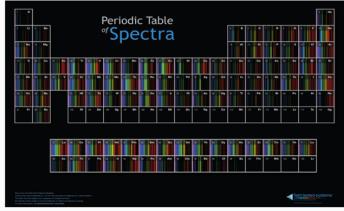


OV S



Spectroscopy Observing Section

View Edit





by Ryan Maderak (Section Leader)

Contributions from Ulisse Munari and Stella Kafka

Introduction

Spectroscopic monitoring of variable stars is a relatively unexplored domain within astronomy, with the

https://www.aavso.org/apps/specdb/ https://www.aavso.org/spectroscopy-observing-section

Spectroscopy Observing Section

AAVSO resources

- AAVSO Spectroscopy Manual
- AAVSO Spectroscopic Database: submit your spectra
- Help file to submit your spectra
- Quick guide for submitting spectra to the AAVSO Database

Other resources

- Get started: Participate in SCOPE (Stellar Classification Online Public Exploration), a citizen science project by PARI
- Guide to Spectroscopy and Spectral Lines from Astrobites
- Video:

oture star our backyard

ed reading:

Starting in

Manuals

- Targets
- Resources
- Database

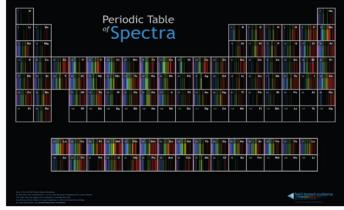
AAVSO Variable Star Spectroscopic Database

O O V S



Spectroscopy Observing Section

View Edit



Periodic Table of Spectra (Tom Field)

by Ryan Maderak (Section Leader)

Contributions from Ulisse Munari and Stella Kafka

Introduction

Spectroscopic monitoring of variable stars is a relatively unexplored domain within astronomy, with the

https://www.aavso.org/apps/specdb/ https://www.aavso.org/spectroscopy-observing-section

Spectroscopy Observing Section

AAVSO resources

- AAVSO Spectroscopy Manual
- AAVSO Spectroscopic
 Database:
- submit your spectra
 Help file to submit your spectra
- Quick guide for submitti spectra to the AAVSO Database

Other resources

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- Guide to Spectroscopy and Spectral Lines from Astrobites

Video:
 ture star
 our backy

d ded reading: ly Starting in ■ Recent Q Search + Submit ■ Forum & MyDB @ Help

Recently Published

SpecDB is currently hosting 363 observations by 13 observers. Please find below some of the most recently published observations.

Published 20/08/19 19:02:09

SS Cyg -- by FJQ Equipment: CDK17HA | Site: UniversityHills-LosAngeles, CA

Published 20/08/19 19:02:08

del Sco -- by FJQ Equipment: CDK17HA | Site: UniversityHills-LosAngeles, CA

Published 20/08/19 19:02:07

AG Dra -- by FJQ Equipment: CDK17HA | Site: UniversityHills-LosAngeles, CA

Published 20/08/19 04:13:42

SS Cyg -- by MJAK Equipment: C11-Lisa-Atik460EX | Site: StAubanOuveze

Published 19/08/19 20:12:59

bet Lyr -- by CCMB Equipment: GSO | Site: DYEHILL

Published 16/08/19 20:18:55

CI Cyg -- by FJQ Equipment: CDK17 | Site: UniversityHills-LosAngeles, CA

Published 16/08/19 20:18:32

SS Cyg -- by FJQ

Equipment: CDK17 | Site: UniversityHills-LosAngeles, CA

Published 16/08/19 20:18:32

alf Lyr -- by FJQ

ture star our backyard Published 16/08/19 20:18:29

d reading: CI Cyg -- by FJQ

Equipment: CDK17 | Site: UniversityHills-LosAngeles, CA

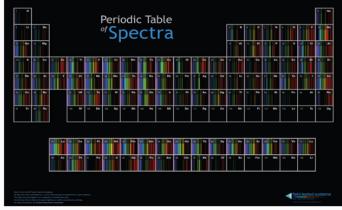
AAVSO Variable Star Spectroscopic Database

<u>o</u> N



Spectroscopy Observing Section

View Edit





by Ryan Maderak (Section Leader)

Contributions from Ulisse Munari and Stella Kafka

Introduction

Spectroscopic monitoring of variable stars is a relatively unexplored domain within astronomy, with the

https://www.aavso.org/apps/specdb/ https://www.aavso.org/spectroscopy-observing-section

Spectroscopy Observing Section

S

AAVSO resources

- AAVSO Spect Manual
- AAVSO Spect Database: submit your sp
- Help file to sul spectra
 Quick guide fc spectra to the

Other resources

Database

- Get started: Participate in SCOPE (Stellar Classification Online Public Exploration), a citizen science project by PARI
- Guide to Spectroscopy and Spectral Lines from Astrobites

• Video:

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led reading: y Starting in

Focus on observer support and data quality!



Publications: JAAVSO

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Editor-in-Chief: Nancy Morrison (U. Toledo)



JAAVSO

Journal of the American Association of Variable Star Observers

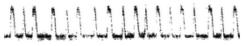
JAAVSO Volumes

Most Recent Volume

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Scope: What We Publish Editorial Policies Types of Articles Publication Schedule, Page Charges, and Subscriptions Information for Authors Information for Referees Editorial Staff and Editorial Board

Collections

Review Papers

Current Issue

- Variable Star Research
 - · New Variable Stars Discovered by the APACHE Survey. II. Results After the Second Observing Season

Mario Damasso, Lorenzo Gioannini, Andrea Bernagozzi, Enzo Bertolini, Paolo Calcidese, Albino Carbognani, Davide Cenadelli, Jean Marc Christille, Paolo Giacobbe, Luciano Lanteri, Mario G. Lattanzi, Richard Smart, Allesandro Sozzetti

The Curious Case of ASAS J174600-2321.3: an Eclipsing Symbiotic Nova in Outburst?

Stefan Hümmerich, Sebastián Otero, Patrick Tisserand, Klaus Bernhard

Long Term Photometric and Spectroscopic Monitoring of Semiregular Variable Stars

Robert R., Jr. Cadmus

 Photometric Analyses and Spectral Identification of the Early-Spectral Type W UMa Contact Binary V444 Andromedae

Ronald G. Samec, Russell Robb, Danny R. Faulkner, Walter Van Hamme

Sudden Period Change and Dimming of the Eclipsing Binary V752 Centauri

Anthony Mallama, Hristo Pavlov

Publications: JAAVSO



Editor-in-Chief: Nancy Morrison (U. Toledo)

OV S

Percy, JAAVSO Volume 47, 2019 Editorial

Citizen Science

John R. Percy Editor-in-Chief, Journal of the AAVSO

Department of Astronomy and Astrophysics, and Dunlap Institute for Astronomy and Astrophysics, University of Toronto, 50 St. George Street, Toronto, ON M5S 3H4, Canada; john.percy@utoronto.ca

Received May 23, 2019

Citizen science, according to the Oxford English Dictionary, is: "Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions." It's a new name for an old activity, but it's exactly what AAVSO observer/ researchers do.

Long ago, there wasn't much distinction between professionals and amateurs. Much of science was done by well-educated, well-to-do generalists, but that began to change in the 19th century, as science became more professionalized. AAVSO citizen science goes back to the words of John Herschel who in 1822 acid "this (wrights attac absorption) is a branch of observers have photometers and CCDs. On cloudy nights, our idle computers can be used by SETI@home (though I don't consider that as true citizen science, because the human brain is not engaged).

Technology can increase our opportunities for citizen science in other ways. My student Lucas Fenaux and I have just published (Percy and Fenaux 2019) a critique of the automated analysis and classification of tens of thousands of pulsating red giants in the massive All-Sky Automated Survey for Supernovae (ASAS-SN: www.astronomy.ohio-state.edu/~assassin/index. shtml), and showed that the majority of the automated analyses and classifications are incorrect or incomplete. There is still a and

Q

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Work in progress: Curating our infrastructure

OOVS

- Cybersecurity (system vulnerability assessment + security)
- Live and development Server Redesign
- Web page Drupal 7 to 8 update and new web page design and implementation
- Seeking key partnerships







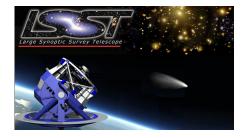
Planning for the future The AAVSO Strategic Planning



Join the conversation; please fill in questionnaire







LSST



Evryscope

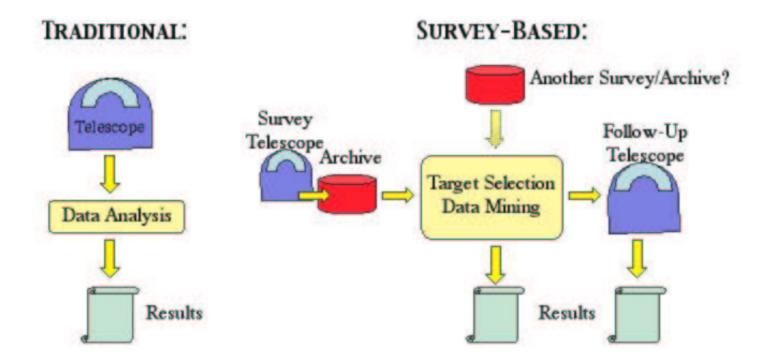


Pan-STARRS



KELT

O O V S



A schematic outline of the traditional and the survey-based astronomy (from Djorgovski, 2002)

O O V S O

Mission	Primary goal	Mag range	Cadence+ Duration	Filter	Notes
Kepler/ K2	Exopl.	10 <kp<16< th=""><th>30/1 min 4yr/1month</th><th>4,300 – 9,000 Å</th><th>Stamps, specific fields Mission completed</th></kp<16<>	30/1 min 4yr/1month	4,300 – 9,000 Å	Stamps, specific fields Mission completed
BRITE	Bright stars	Brighter than 6	1sec (20 sec readout) 1 star/month	Blue + red	No comp/ no calibration
TESS	Exopl.	8 and 13	20/2 min 29 days/field	V band	23" pixels 2-year mission
KELT	Exopl.	8 and 13	10-30 min	very broad Johnson R	23" pixels Specific fields
PTF/ZTF	transients	Reaching r~20	public survey: 3-d cadence 30 sec exposures	g+r	Northern hemisphere
LSST		16 and 20	1 point/15 days	u, g, r, i, z, y	Southern hemisphere

OOVSO

Mission	Caveats:
Kepler/ K2	 Limited Duration + cadence One filter
BRITE	 NO follow-up of interesting targets
TESS	 Automated data reduction pipelines + stellar classification (no data quality control or data validation)
KELT	• Large pixel sizes (ASAS-SN=8"; KELT and TESS = $32"$) \rightarrow
PTF/ZTF	source confusion
	• 1 telescope/1 site \rightarrow Weather, instruments, moonlight,
LSST	not all sky coverage, calibrations?
	 Databases/web pages not curated past the duration of the
	mission/project

CICIVSO

Mission	Caveats:
Kepler/ K2	 Limited Duration + cadence One filter
BRITE	NO follow-up of interesting targets
TESS	 Automated data reduction pipelines + stellar classification (no data quality control or data validation)
	We need your help

The AAVSO in the era of large surveys – a resource for research

O O V S

- COLLABORATION Connecting professional and non-professional astronomers for impactful science + projects
- DATA AAVSO maintaining and curating databases (AAVSO International Database, AAVSO exoplanet Database, AAVSO International Spectroscopic Database)
- **COMMUNITY** Broader Impact/Active Community Engagement
- **COMMUNICATION** JAAVSO





AAVSO – a resource for research



Become a member

Contact us: aavso@aavso.org

