The AAVSO
An Interface for PRO-AM in Astronomy

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day job: Scientific Software Engineer @ MPI f. Gravitationsphysik, Hannover, Germany (AEI)

Overview

- Some Facts and Figures
- Hands-on demo of the ecosystem: resources and services
- Plans for the future (say...next couple of years)
- How can we best serve you?

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AAVSO: some facts and figures

- AAVSO: **A**merican **A**ssociation of **V**ariable **S**tar **O**bservers (est. 1911, HQ in Boston, Mass., USA)

- **Mission Statement:**

  *The AAVSO is an **international** non-profit organization of variable star observers whose mission is to **enable anyone, anywhere, to participate in scientific discovery through variable star astronomy**.*

AAVSO: some facts and figures

AAVSO: **A**merican **A**ssociation of **V**ariable **S**tar **O**bservers

- As of Fall Meeting 2023:
  - ca 1200 members
  - 800 active observers,
  - US$ 1M/year budget
  - 6 staff + 2 contractors
  - Database of 55M observations
  - Curated variable star index VSX (2.2M entries)
  - 10k Spectroscopy observations
  - 1.5k Exoplanet transits
  - Solar Observation database (sunspots and SIDs)
  - Webinars reached 5.5k people

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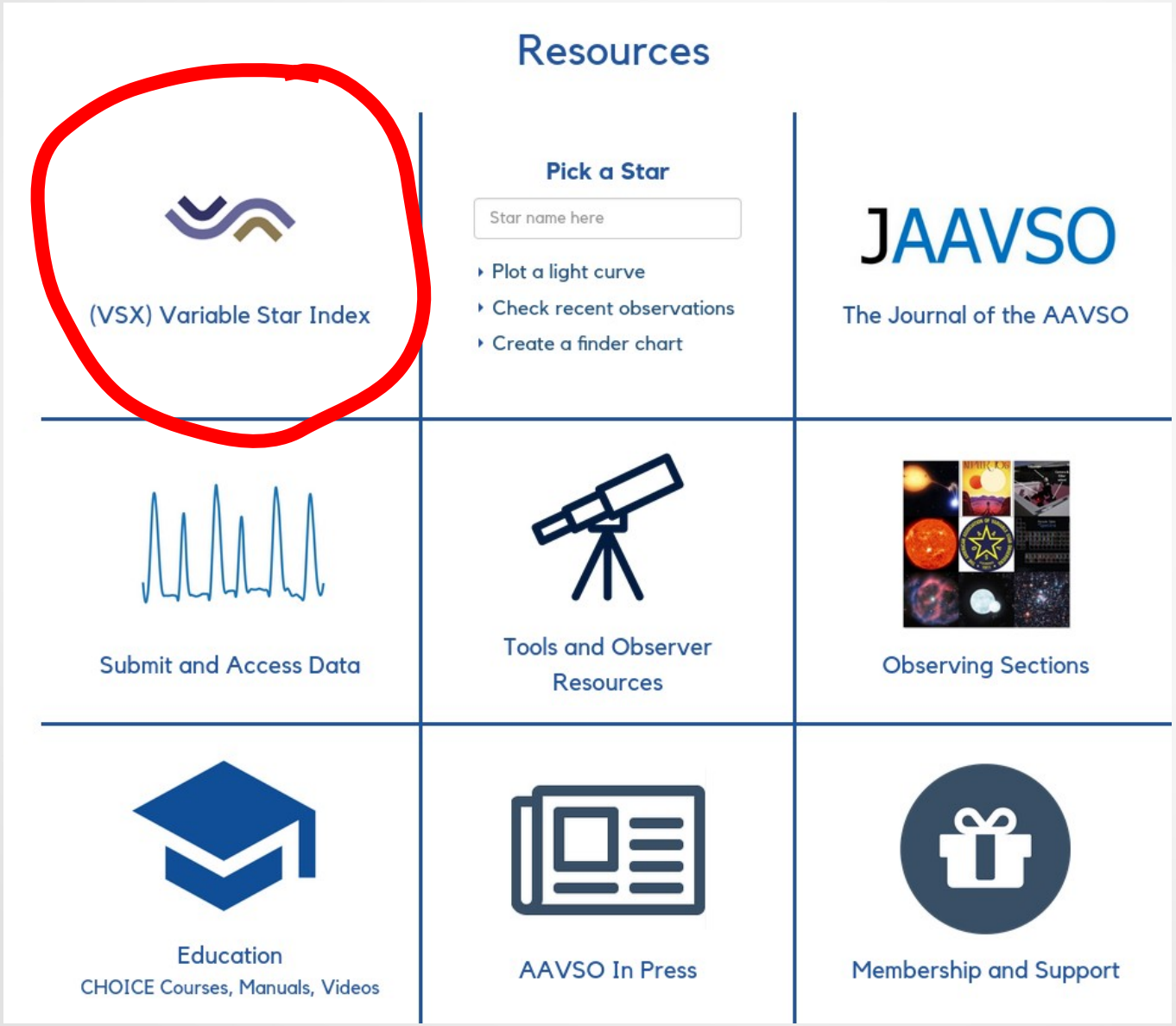
Hands-on demo of the ecosystem: resources and services

Hands-On Demo Examples for a concrete target: T CrB

- Cataclysmic Variable, D < 1kpc
- **Recurring** Nova: ca every 78ish years
- Eruption mag 10ish ==> mag 2ish (V) (!)
- Last outbreak 1946 … woohoo ... !!!!
- Pre-outbreak dimming observed **now**: get ready for an outbreak in ~2024:

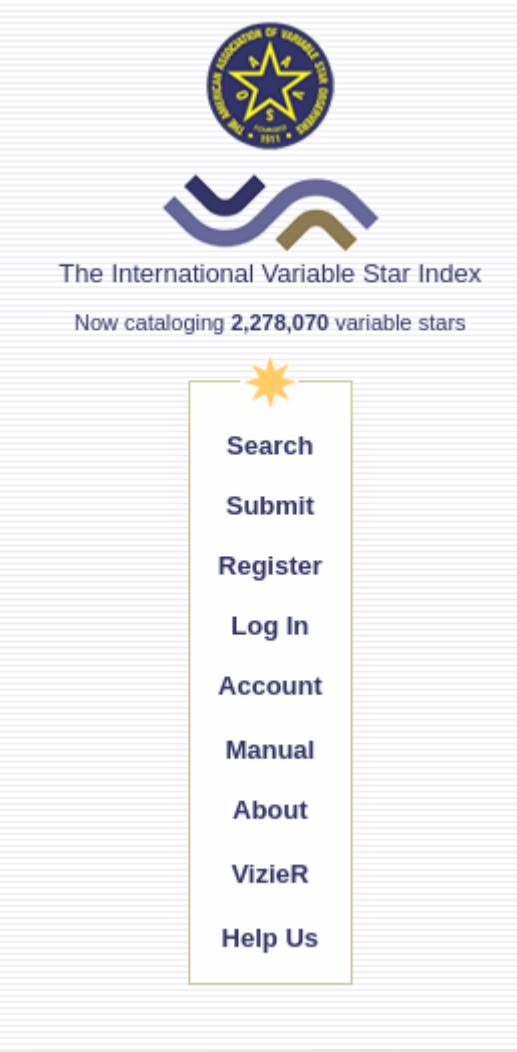
AAVSO resources



VSX: Variable Star indeX

VSX is key (pun intended)

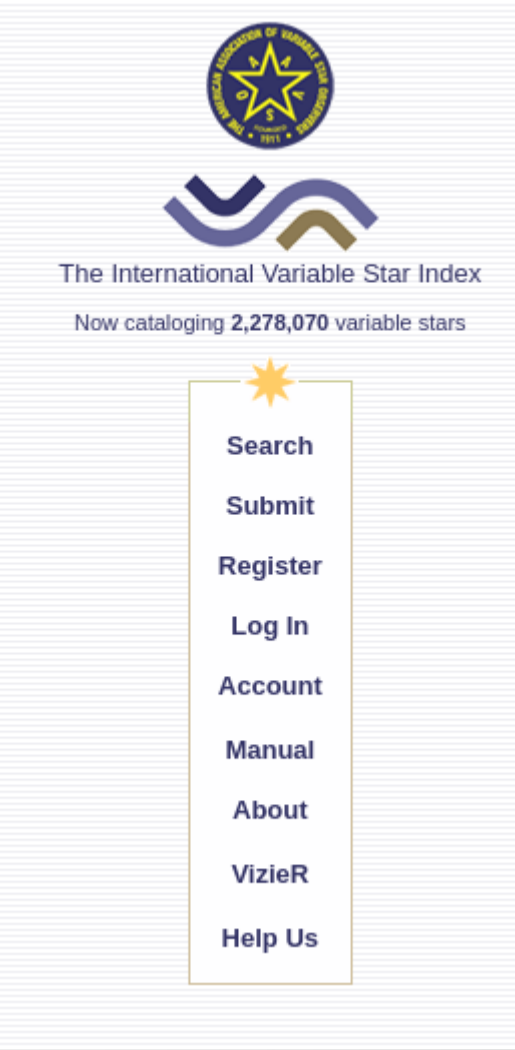
- Mission: Catalog of all known (+ suspected) variable stars within reach by amateurs (e.g. > 1 milli mag variation)
- Combines data from surveys with reviewed additions/updates from registered VSX users.
- **Without VSX entry, no obs submission to AAVSO**
  ==> no obs requests, no light curves, …
- Web GUI at https://www.aavso.org/vsx/
- Exported to CDS **~every month**: catalog B/vsx



VSX: Variable Star indeX

VSX is key (pun intended)

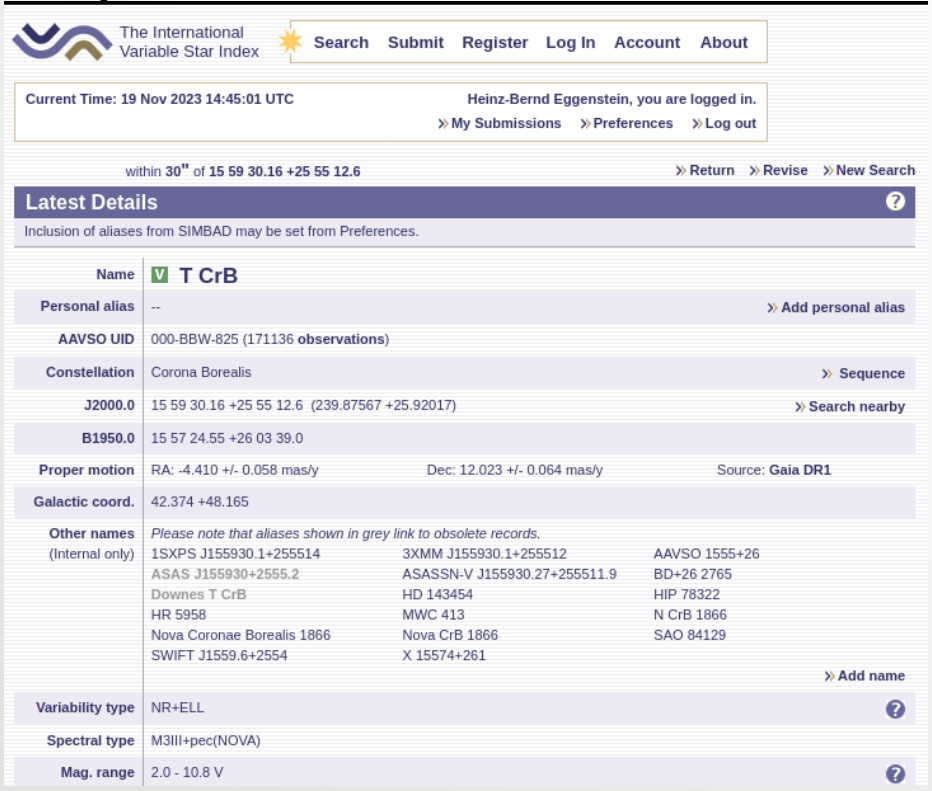
- Live demo

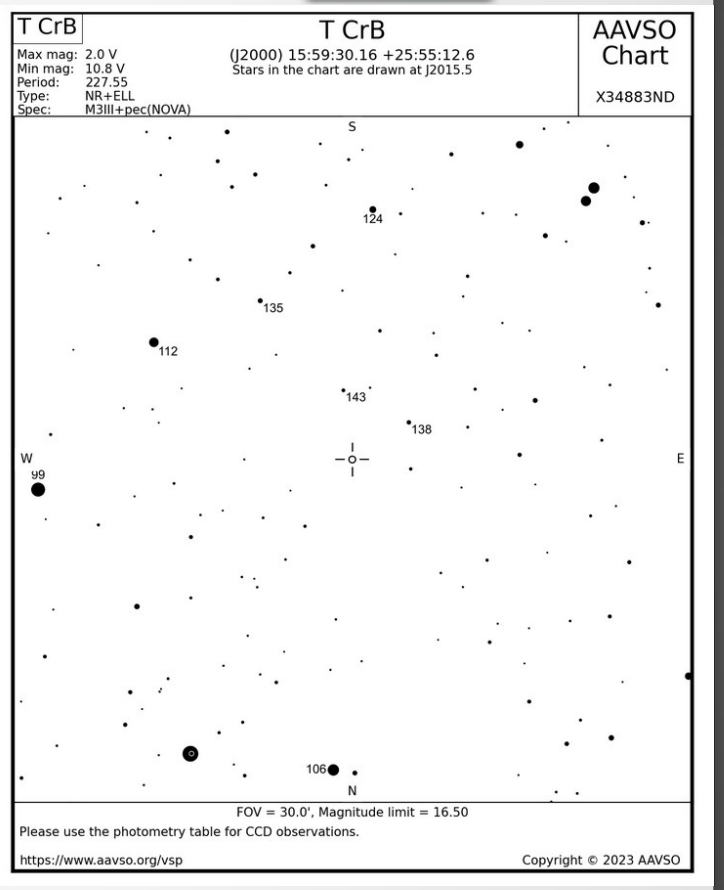


VSX: Variable Star indeX

VSX is key (pun intended)

- Summary: starting point to access AAVSO resources on known variable objects:





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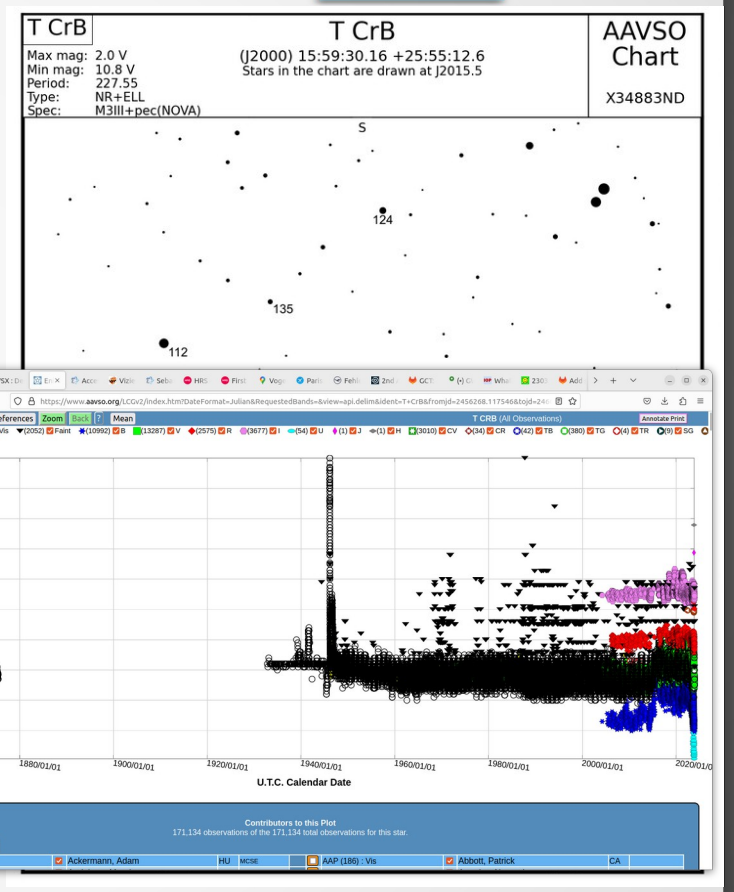

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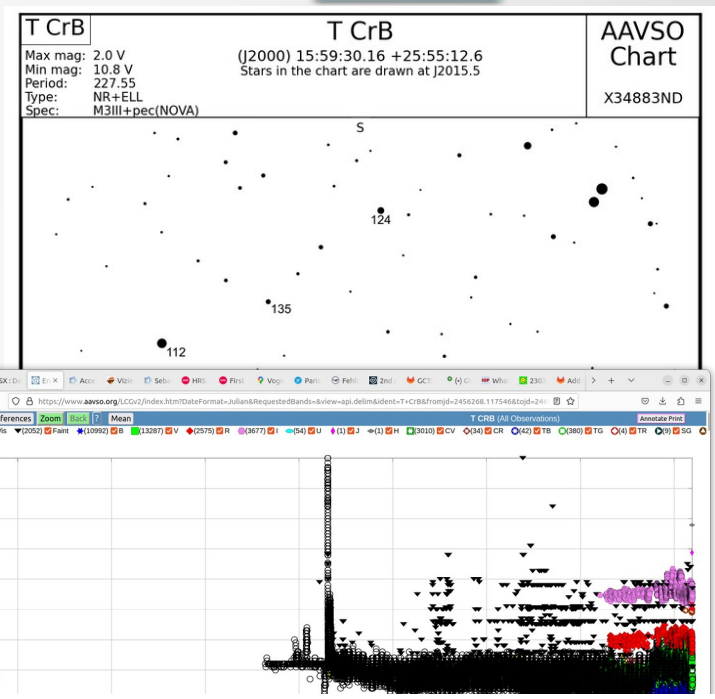


The International Variable Star Index

Search Submit Register Log In Account About

Current Time: 19 Nov 2023 14:45:01 UTC

Heinz-Bernd Eggenstein, you are logged in.

» My Submissions » Preferences » Log out

within 30" of 15 59 30.16 +25 55 12.6 » Return » Revise » New Search

Latest Details

Inclusion of aliases from SIMBAD may be set from Preferences.

Name	V T CrB		
Personal alias	--		» Add personal alias
AAVSO UID	000-BBW-825 (171136 **observations**)		
Constellation	Corona Borealis		» Sequence
J2000.0	15 59 30.16 +25 55 12.6 (239.87567 +25.92017)		» Search nearby
B1950.0	15 57 24.55 +26 03 39.0		
Proper motion	RA: -4.410 +/- 0.058 mas/y	Dec: 12.023 +/- 0.064 mas/y	Source: **Gaia DR1**
Galactic coord.	42.374 +48.165		
Other names (Internal only)	*Please note that aliases shown in grey link to obsolete records.*		
	1SXPS J155930.1+255514	3XMM J155930.1+255512	AAVSO 1555+26
	ASAS J155930+2555.2	ASASSN-V J155930.27+255511.9	BD+26 2765
	Downes T CrB	HD 143454	HIP 78322
	HR 5958	MWC 413	N CrB 1866
	Nova Coronae Borealis 1866	Nova CrB 1866	SAO 84129
	SWIFT J1559.6+2554	X 15574+261	
			» Add name
Variability type	NR+ELL		
Spectral type	M3III+pec(NOVA)		
Mag. range	2.0 - 10.8 V		

aavso

Home / WebObs / Search / Results

WebObs Search Results

Showing *171,136* observations for *T CrB* from *1694* observers

Plot a Chart | Generate a Light Curve | Search VSX

Star	JD	Calendar Date	Magnitude	Error	Filter	Observer	Collapse All Expand All
T CRB	2460266.7194	2023 Nov. 18.21940	<7.3	—	Vis.	HGUA	Details...
T CrB	2460266.00438	2023 Nov. 17.50438	10.5	—	Vis.	SBRE	Details...
T Crb	2460265.28333	2023 Nov. 16.78333	10.3	—	Vis.	GKI	Details...
T Crb	2460264.26389	2023 Nov. 15.76389	10.3	—	Vis.	GKI	Details...
T CRB	2460264.24344	2023 Nov. 15.74344	10.432	0.0060	V	OFA	Details...

VSX: Variable Star indeX

VSX is key (pun intended)

- XML API available. Cone search around a coordinate:
  https://www.aavso.org/vsx/index.php?view=api.list&ra=239.87567&dec=25.92017&radius=0.25&tomag=20&format=xml

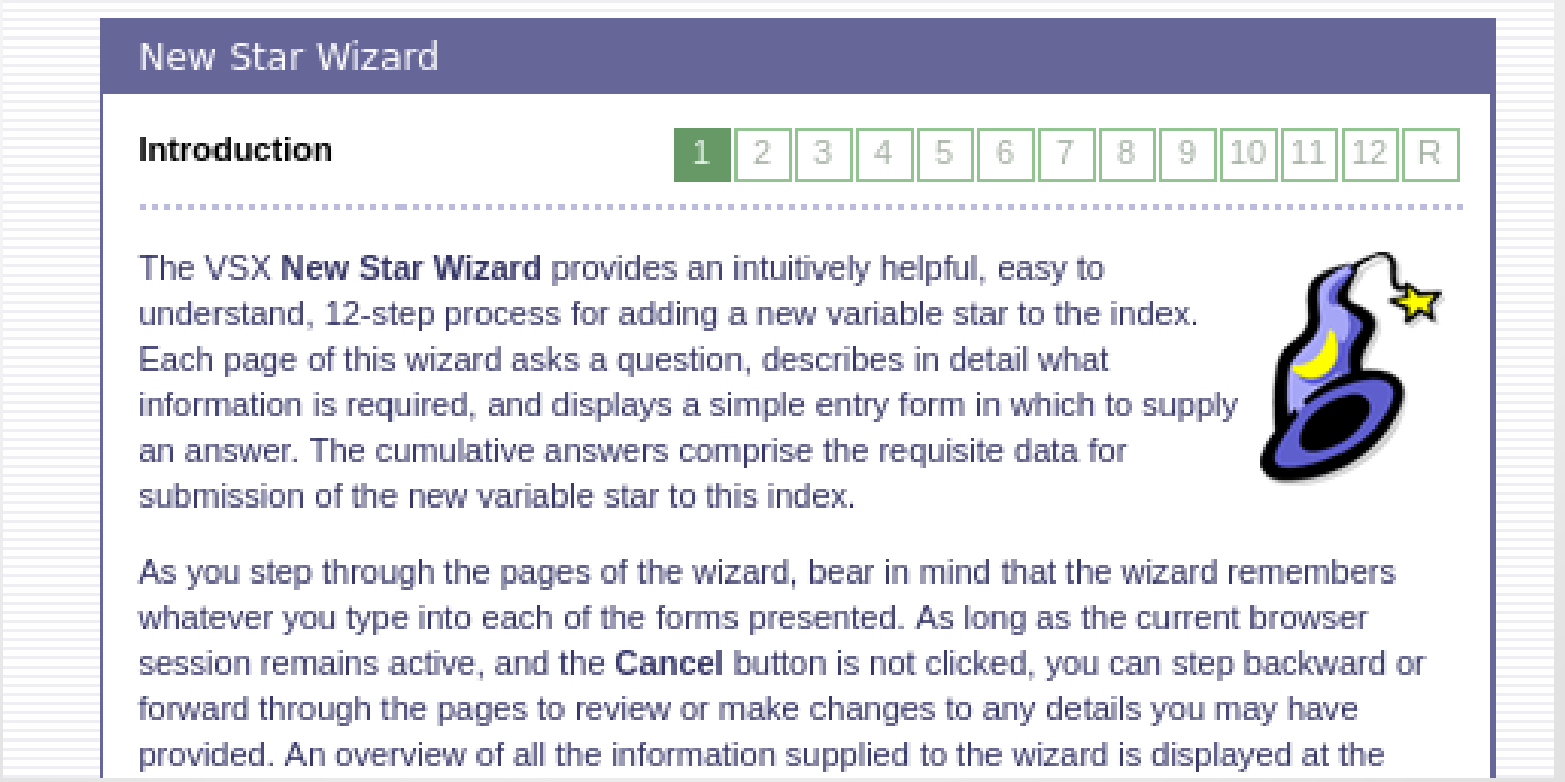

```
-<VSXObjects>
 -<VSXObject>
    <Name>T CrB</Name>
    <AUID>000-BBW-825</AUID>
    <RA2000>239.87567</RA2000>
    <Declination2000>25.92017</Declination2000>
    <ProperMotionRA>-4.4100</ProperMotionRA>
    <ProperMotionDec>12.0230</ProperMotionDec>
    <VariabilityType>NR+ELL</VariabilityType>
    <Period>227.55</Period>
    <Epoch>2455828.9</Epoch>
    <MaxMag>2.0 V</MaxMag>
    <MinMag>10.8 V</MinMag>
    <SpectralType>M3III+pec(NOVA)</SpectralType>
    <Discoverer>John Birmingham</Discoverer>
    <Category>Variable</Category>
    <OID>10602</OID>
    <Constellation>CrB</Constellation>
  </VSXObject>
 -<VSXObject>
    <Name>NSV 7378</Name>
    <AUID>000-BBW-808</AUID>
    <RA2000>239.74279</RA2000>
    <Declination2000>26.13461</Declination2000>
```

VSX: Variable Star indeX

VSX is key (pun intended)

- Adding new variable stars to VSX:

Submitting a new variable: The New Star Wizard Dialog



VSX: Variable Star indeX

VSX is key (pun intended)

- Adding new variable stars to VSX:
- You need to register with VSX first to make submissions

  Manual here:
  https://www.aavso.org/vsx/_images/Manual.pdf

- If you need to add many objects: talk to us!
  vsx@aavso.org

The AAVSO International Database (AID)

- Many ways to access data:
  - Bulk download for specific targets
  - Web based query by object name
  - VStar software

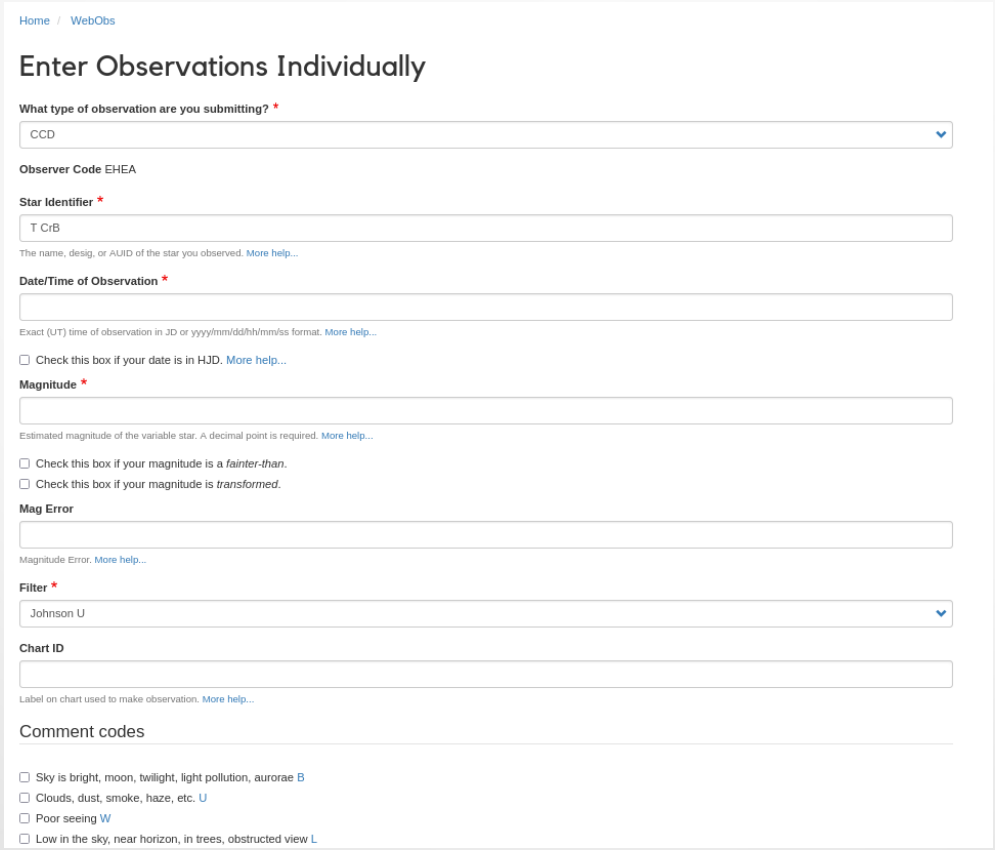
  Live Demo

The AAVSO International Database (AID)

- Show time for AAVSO observers:
  - Observe (& spread the news)
    using your own telescope, or iTelescope, or AAVSOnet assets,...
  - Reduce data
  - Report observation to AID
    - Repeat :-)

The AAVSO International Database (AID)

- Submitting photometry:
  - The pedestrian way: by webform https://www.aavso.org/webobs/individual



Home / WebObs

Enter Observations Individually

What type of observation are you submitting? *

CCD

Observer Code EHEA

Star Identifier *

T CrB

The name, desig, or AUID of the star you observed. More help...

Date/Time of Observation *

Exact (UT) time of observation in JD or yyyy/mm/dd/hh/mm/ss format. More help...

Check this box if your date is in HJD. More help...

Magnitude *

Estimated magnitude of the variable star. A decimal point is required. More help...

Check this box if your magnitude is a *fainter-than*.

Check this box if your magnitude is *transformed*.

Mag Error

Magnitude Error. More help...

Filter *

Johnson U

Chart ID

Label on chart used to make observation. More help...

Comment codes

Sky is bright, moon, twilight, light pollution, aurorae B

Clouds, dust, smoke, haze, etc. U

Poor seeing W

Low in the sky, near horizon, in trees, obstructed view L

The AAVSO International Database (AID)

- Submitting photometry:
  - Bulk submission by CSV file upload, format supported by many photometry tools popular with amateurs

```
#TYPE=EXTENDED
#OBSCODE=TST01
#SOFTWARE=GCX 2.0
#DELIM=,
#DATE=JD
#NAME,DATE,MAG,MERR,FILT,TRANS,MTYPE,CNAME,CMAG,KNAME,KMAG,AMASS,GROUP,CHART,NOTES
SS CYG,2450702.1234,11.235,0.003,B,NO,STD,ENSEMBLE,na,105,10.593,1.561,1,X16382L,na
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SS CYG,2450702.2234,11.244,0.003,B,NO,STD,ENSEMBLE,na,105,10.590,1.661,2,X16382L,na
SS CYG,2450702.2254,11.166,0.003,V,NO,STD,ENSEMBLE,na,105,10.497,1.663,2,X16382L,na
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```
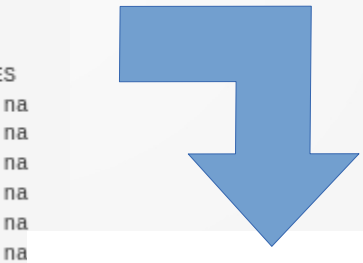



Hands-on demo of the ecosystem: resources and services

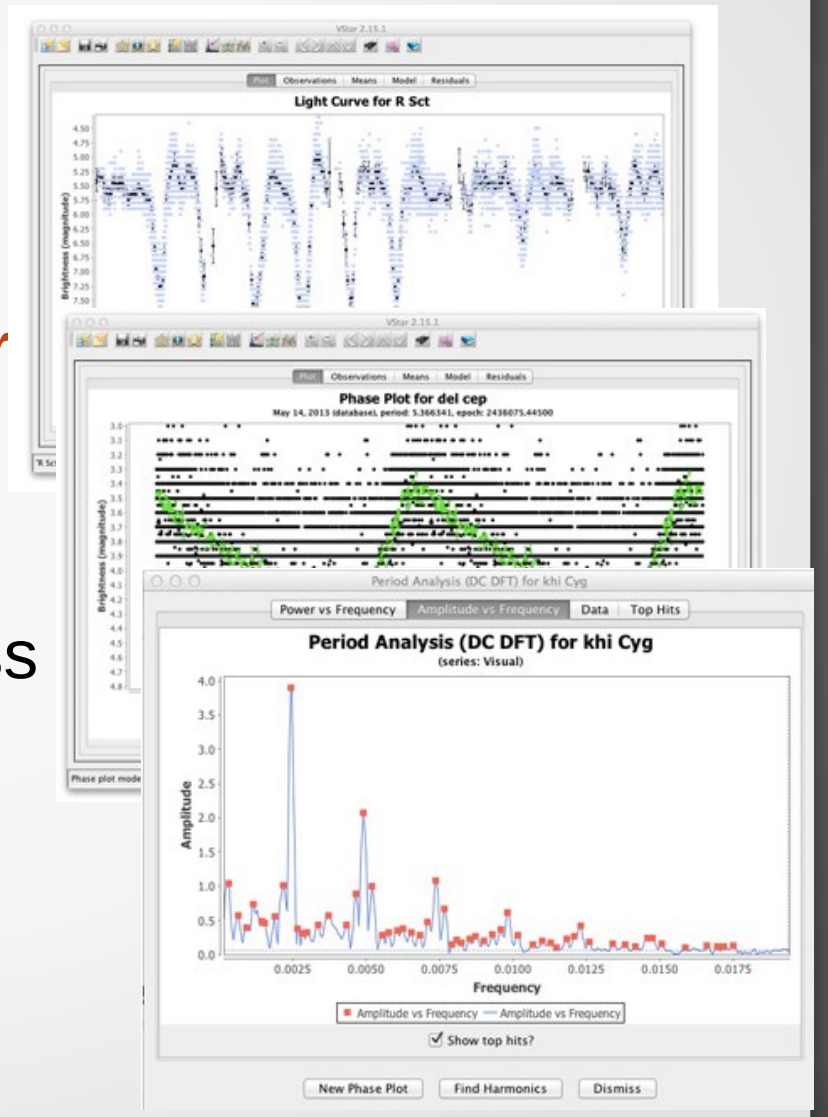
- **Hint for Astro-Colibri Sciathon:**
- API documentation is scattered in several places, but:
- See this forum message
- **https://www.aavso.org/apis-aavso-resources**

Hands-on demo of the ecosystem: resources and services

Hint for Astro-Colibri Sciathon:

- Open source VSTAR software (AGPL license (!))
- **https://github.com/AAVSO/VStar**
- Written in JAVA, but source code can be informative in general
- Explains programmatic web-access to all relevant AAVSO databases

(and much more)



AAVSO: PRO-AM communication hub

- Many different communication modes:
  - **Broadcast**
    Speak to entire AAVSO community, e.g. Alerts/Campaigns
  - **Targeted** specific observer groups
    Use ***observing sections***
  - **Individual**
    Most observers allow to be contacted via their Observer Code w/ contact form https://app.aavso.org/member/search/

AAVSO: example campaigns/alerts

- Example: optical amateur observation in sync with other messenger observations

Alert Notice 750: T CrB photometry and spectroscopy requested for HST and XMM-Newton observations

”Dr. Koji Mukai (NASA-GSFC, University of Maryland) and colleagues have requested AAVSO observers' assistance in monitoring the symbiotic recurrent nova T CrB in support of multiwavelength observations currently scheduled with HST (August 26) and XMM-Newton (to be determined) in August and September.

-
- **Dr. Mukai writes: "[Our] HST and XMM-Newton observations of the symbiotic recurrent nova, T CrB ... are part of our ongoing campaign to the current active state that started in 2016, and perhaps leading to its next nova eruption that might happen within the next 5 years or so. ...”**

AAVSO: example campaigns/alerts

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Home / News and Announcements

Announcing T CrB pre-eruption dip

Recurrent nova T CrB has just started its Pre-eruption Dip in March/April 2023, so the eruption should occur around 2024.4±0.3

Authors: B. E. Schaefer (Louisiana State Univ.), B. Kloppenborg (AAVSO), E. O. Waagen (AAVSO), and the AAVSO observers

T Coronae Borealis (T CrB) is a famous recurrent nova with known eruptions in the years 1217, 1787, 1866, and 1946. Many workers have realized that the rise in brightness from its low state (1954.5 to 2015.0) to its high state (2015.0 to the present) is a precursor and harbinger for an upcoming eruption around 2025.5±1.3 or so (Munari et al. 2016; Schaefer 2023). A distinct and under-appreciated close-up harbinger is the unique and mysterious Pre-eruption Dip (Schaefer 2023). The Dip in 1945-1946 started around 1945.0 (1.1±0.3 years before the 1946 eruption), with the B-band magnitude fading from near 10.5 to 12.0 mag, while the V-band magnitude faded from around 9.8 to 12.3 mag. This fading ended abruptly with the nova eruption.

In anticipation of the start of this Pre-eruption Dip, we have been frequently monitoring the up-to-date light curve as collected into the AAVSO International Database. The AAVSO B and V band light curves from 2021.0 to present, with 2-day binning, for 4330 B-band mags and 12734 V-band mags, all with CCD photometry, are linked below. The normal light curve since 2016 shows the usual ellipsoidal modulation, with a full amplitude of ~0.4 mag for a sinewave at half the orbital period. The light curve shows variations about this average curve on all time scales, with larger variations in the B-band than in the V-band, all arising from ordinary flickering always present since 1867. Starting around 2023.25, T CrB shows a systematic fade from its long-time ellipsoidal variations. This fading is far outside of any historic variations since 2016. The fading in the blue was 0.4 mag in 2023.3 to 0.8 mag in 2023.5. The fading in the V-band was 0.25 mag in 2023.3, and 0.35 mag in 2023.5. The fading in the R and I bands are substantially smaller. This color dependency in the fading is consistent with increasing dust absorption, for a scenario featuring a recently discrete mass ejection in which dust formation occurs (much like for R CrB stars)

AAVSO webinar

"Recurrent Nova T CrB Coming Soon to a Sky Near You!"

AAVSO: example campaigns/alerts

Alert Notice 826: Supernova in M101 - SN 2023ixf in NGC 5457

May 22, 2023

AAVSO Forum threads (scroll to the bottom of a thread for latest posts):
- *Time Sensitive Alerts: https://www.aavso.org/sn-2023ixf-m101*
- *Cataclysmic Variables: https://www.aavso.org/sn-2023ixf-m101-01*

Please subscribe to these threads if you are observing this supernova so you can be updated as to its behavior and any observing campaigns on it. Join in the discussion or ask questions there!

Event: Supernova in M101 - SN 2023ixf in NGC 5457 (UMa)

Discovered by: Koichi Itagaki (Yamagata, Japan)

Discovery magnitude: 14.9 unfiltered CCD

Discovery date: 2023 May 19.7272569 UT

Coordinates (2000.0): R.A. 14 03 38.58 Decl. +54 18 42.1 (from VSX page for SN 2023ixf)
(located 227.7" east and 134.1" south of the center of M101)

Spectra: Spectroscopy indicating the object to be a Type II supernova was obtained on 2023 May 19.93316 UT with the SPRAT (SPectrograph for the Rapid Acquisition of Transients) instrument on the Liverpool Telescope by D. Perley et al. (AstroNote 2023-119).

General observing recommendations: Please observe SN 2023ixf as it continues to evolve, with observations of all types (visual, CCD/CMOS, DSLR, spectroscopy) and multiple bands as instrumentation permits. Frequency of observation depends on the rate of decline; a minimum of one observation per night per band is recommended.

Observations reported to the AAVSO: (selected from over 450 observations at time of Alert Notice preparation)
2023 May 18.33 UT, <20-21 clear filter (pre-discovery, D. Kennedy, reported in K. Zhang et al., AstroNote 125);
18.4286458, <20.5 ATLAS orange (pre-discovery, ATLAS, reported by M. Fulton et al., AstroNote 2023-124);
19.02292, 17.3: BVR (pre-discovery, B. Ostermeyer, reported in K. Zhang et al., AstroNote 2023-125);
19.1625, 15.5 clear filter +/-0.5 (pre-discovery, S. Limeburner, AstroNote 2023-128);

AAVSO Forums for Alert Notice 826

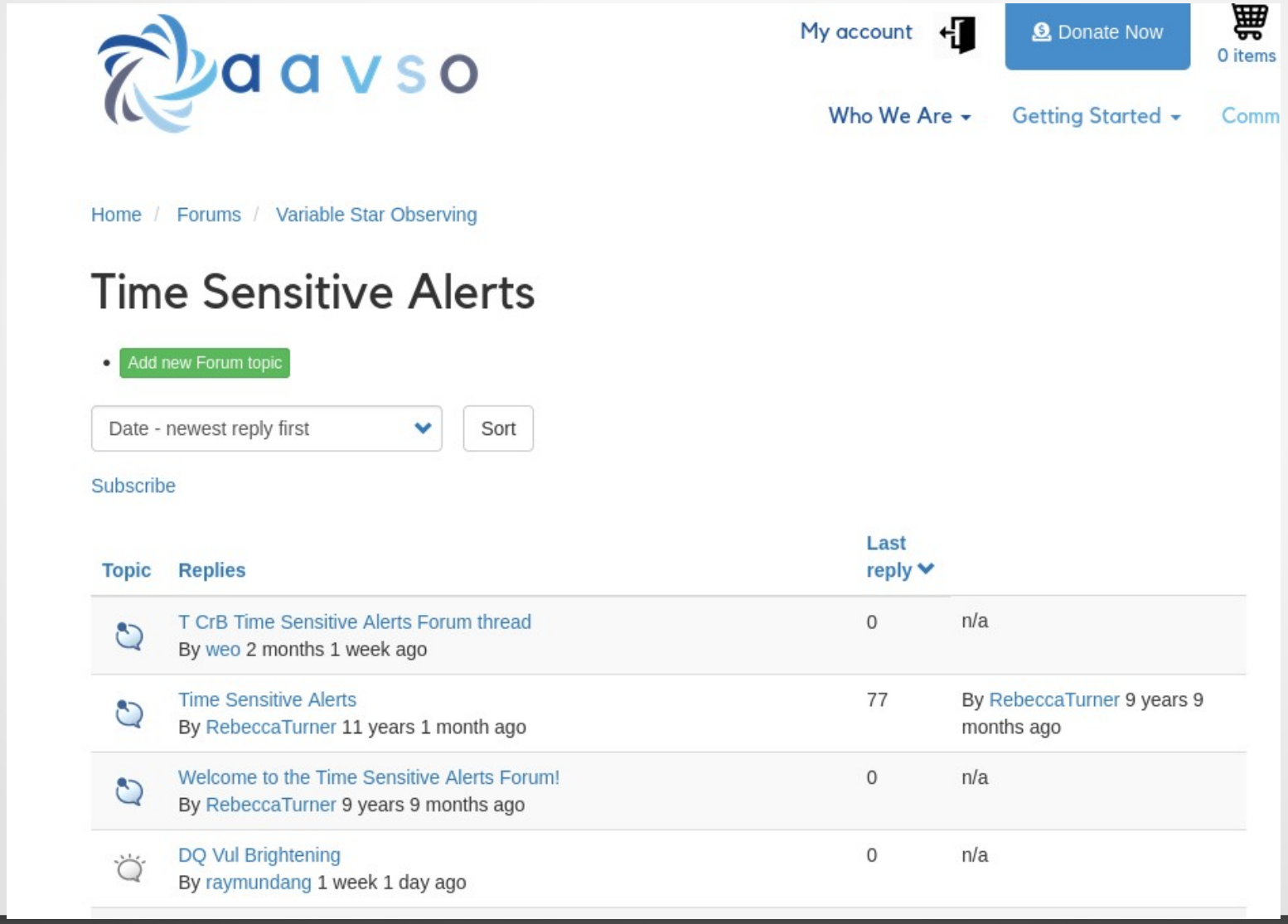
- *Time Sensitive Alerts: https://www.aavso.org/sn-2023ixf-m101*
- *Cataclysmic Variables: https://www.aavso.org/sn-2023ixf-m101-01*

Submitting an alert/obs campaign

- See info on https://www.aavso.org/observing-campaigns
  - Contact the campaign coordinator, currently eowaagen@aavso.org
  - Required information is outlined in document linked on the page above
    https://www.aavso.org/sites/default/files/AAVSOCampaignRequestInfo.docx
  - Elizabeth O. Waagen will help you complete all the required information, you can take existing alerts as template : https://www.aavso.org/aavso-alert-notices-for-observing-campaigns-and-discoveries
  - Alerts will be cross-posted in the Campaign Forum and the Forum of the matching Observer Section
  - Observers who subscribe to these forums will be notified instantly about the new campaign

Get in touch with observers

Time Sensitive Alerts forum: Ad hoc observation requests possible



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Future project: Smart telescope support

- **Smart telescope**: one stop, ready-to-use solution that combines in a single product
  - Telescope optics
  - Filter(s)
  - Focusing solution
  - Thermal control (mostly just dew control, no sensor cooling)
  - Digital Camera
  - Image Acquisition software
  - Tracking mount solution (Alt/Az for most popular products)
    - with Plate-Solving component
  - (Battery) Power Supply solution
  - Telescope control software
  - Digital Image processing & “Enhancement” software
    - Image calibration , co-adding, “pretty picture” image manipulations
  - Planetarium software for target selection/Sky Atlas
  - Social media integration

Future project: Smart telescope support

- AAVSO goals:
  - **Engange with** AAVSO observers who are **early adopter users** of smart telescopes
  - **Establish useful applications** in variable star science
  - Probably **adapt our own tools** and services for better use with smart telescopes
    - e.g. idea: allow upload of instrumental magnitudes and do differential photometry part on AAVSO side

Future project: Smart telescope support

- Fast evolving market
- 4 notable vendors so far
  - UNISTELLAR (see talk in this session)
  - vaonis
  - Seestar / ZWO
  - DWARF LAB
- Aperture rage for popular models:
  114 mm (Unistellar eVscope), 80mm (Vaonis Stellina), 50 mm (Vaonis Vespera), (Seestar S50), 24 mm (Dwarf II)
- Price range : ca 4000 EUR… 340 EUR

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  - **Please let us know.**

Thank you!

Questions, please :-)

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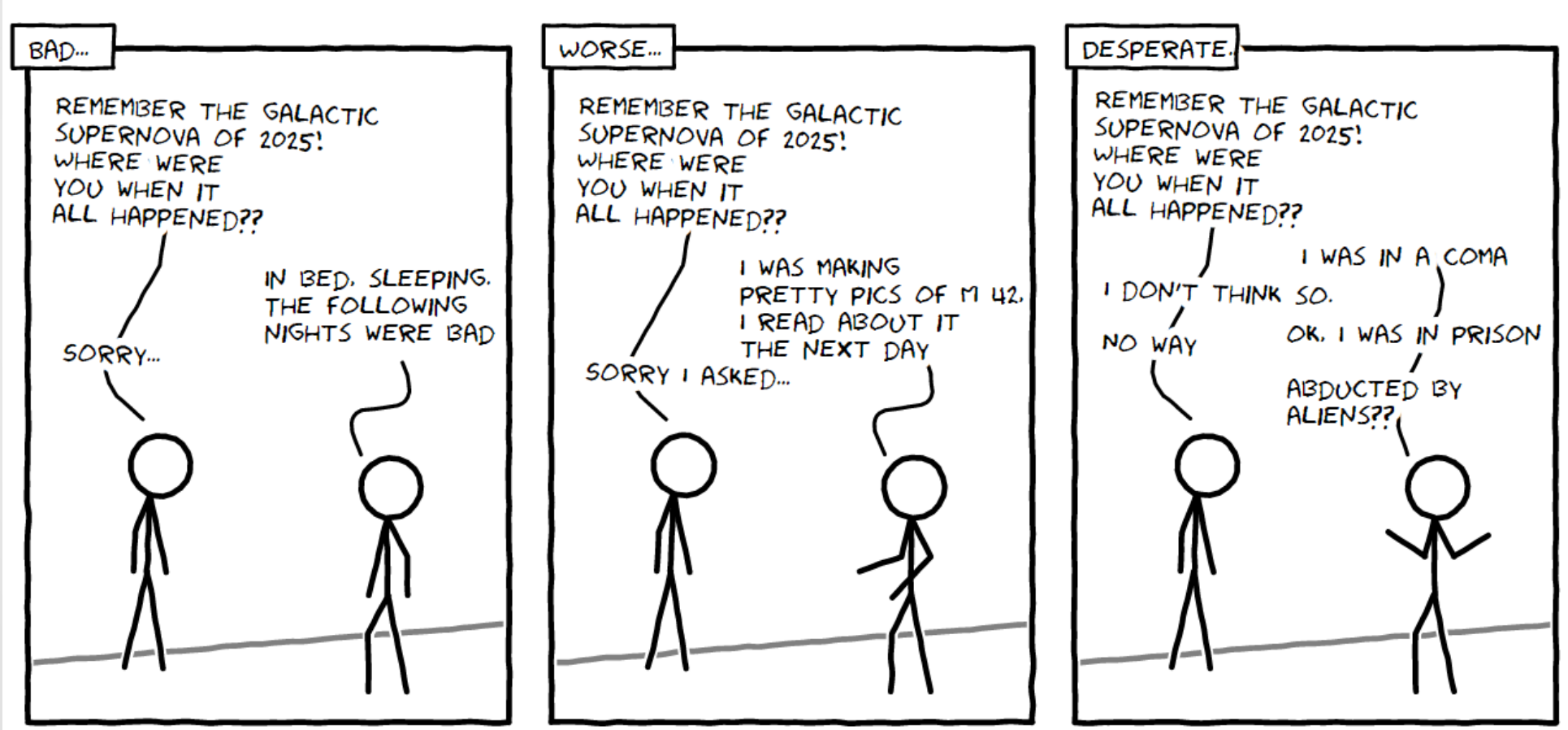
Heinz-Bernd Eggenstein
AAVSO - High Energy Network (HEN) Observer Section Co-Lead
day job: Scientific Software Engineer @ MPI f. Gravitationsphysik, Hannover, Germany (AEI)



Done with cmx.io . For the real XKCD stuff, go to xkcd.com