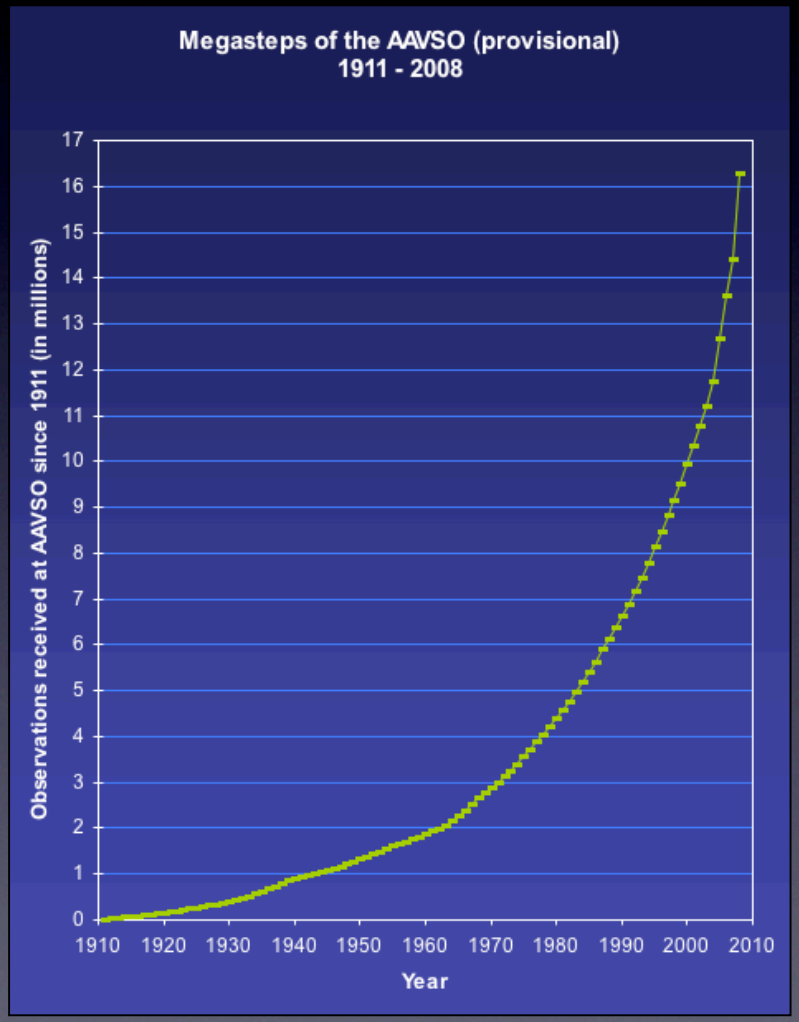
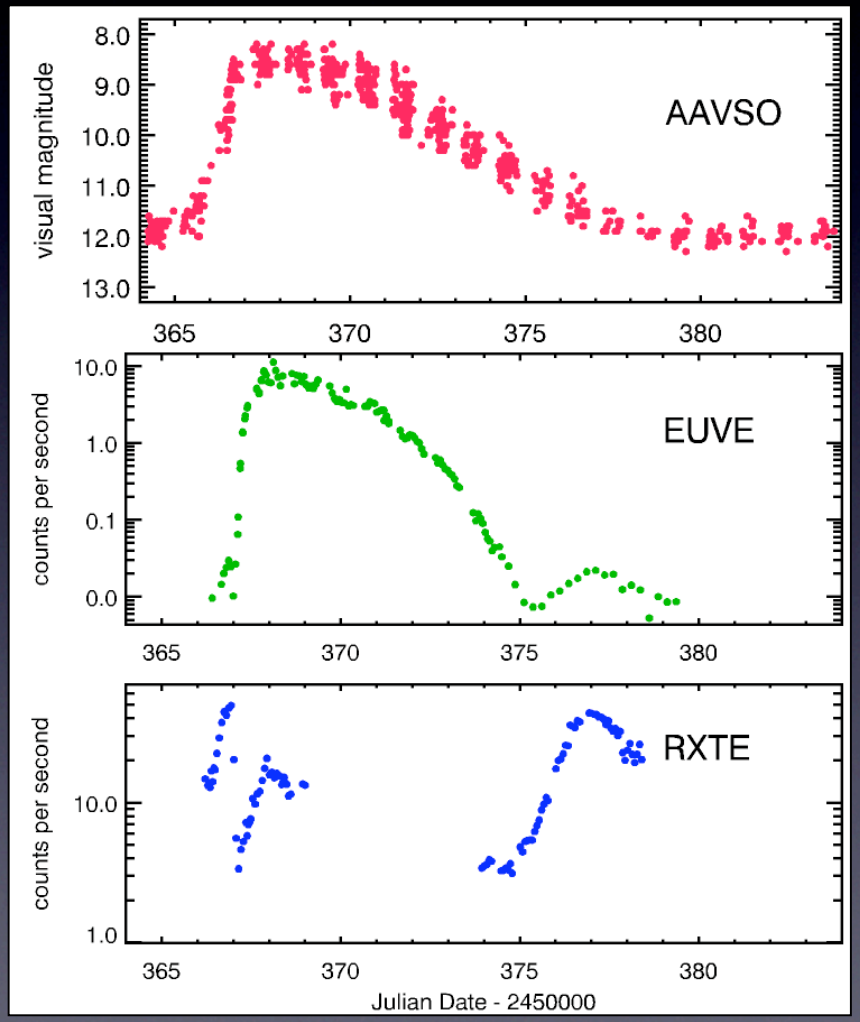
Using the AAVSO International Database

A. Henden The 98th Spring Meeting of the AAVSO
With the Society for Astronomical Sciences
May 19-21 2009, Big Bear, CA



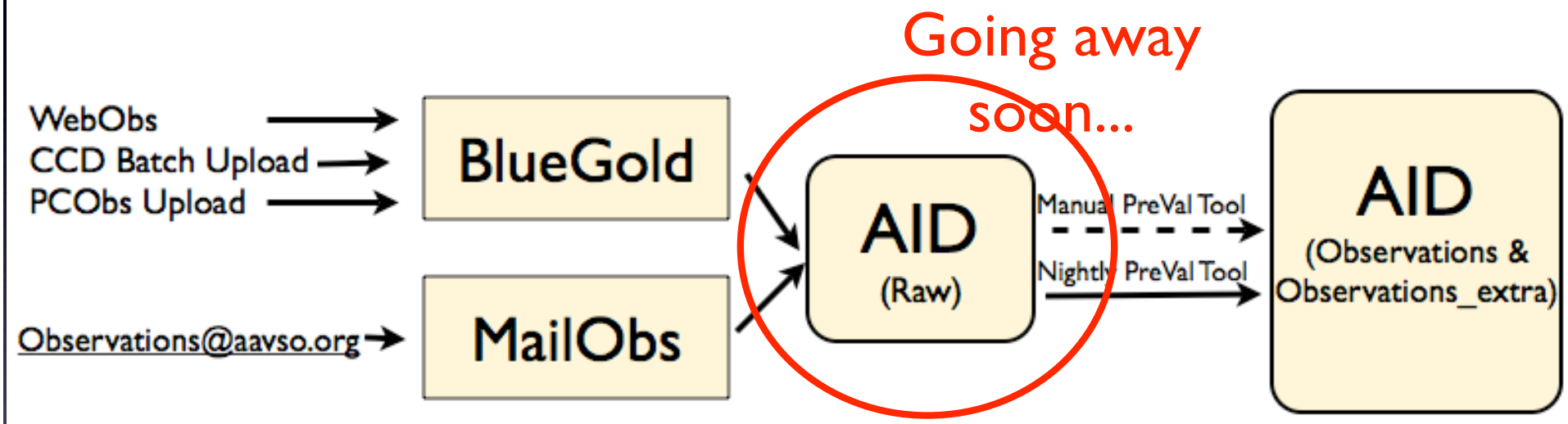


Vital Statistics

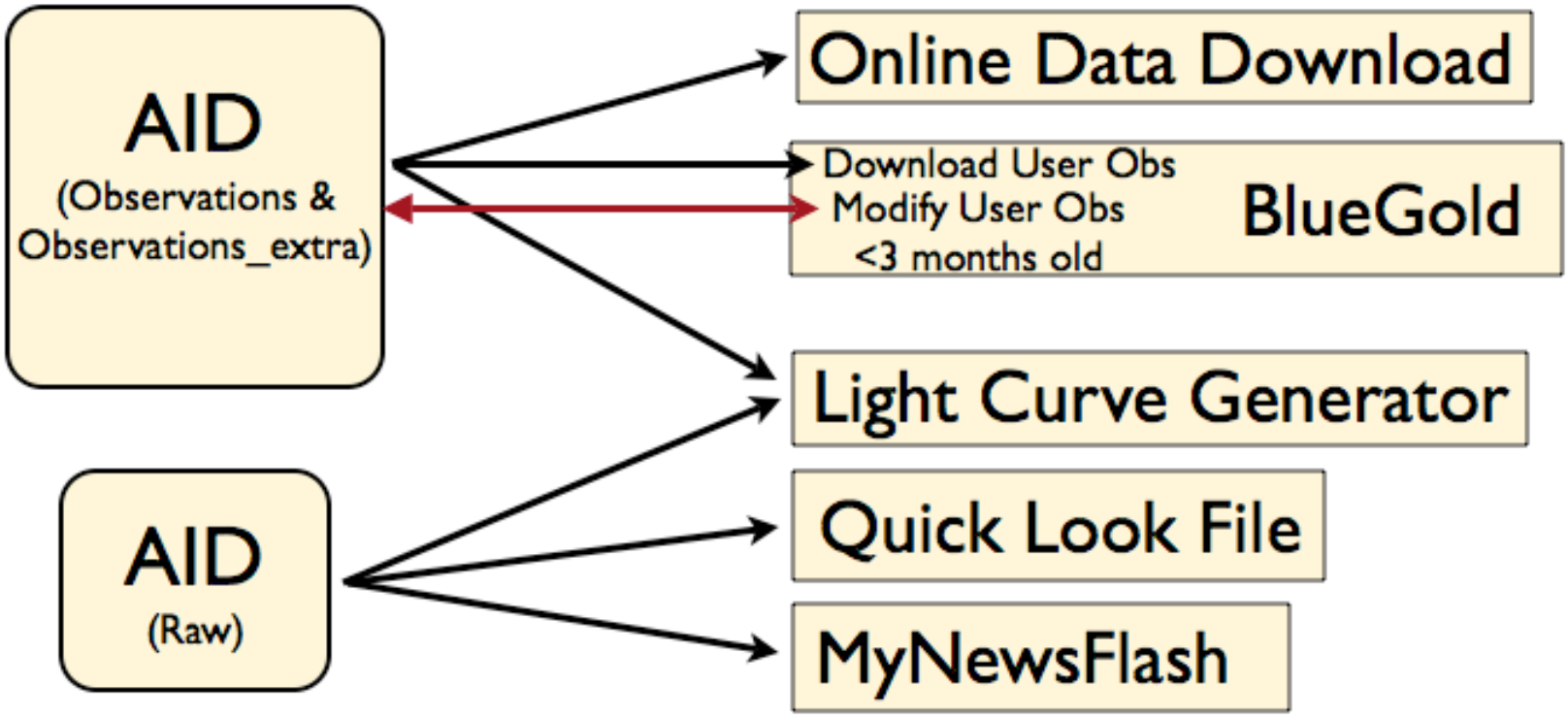
- 17,157,186 obs as of May 12, 2009 at 20:13UT
- Oldest obs: July 19, 1894 at 18:18 UT
- 77% visual, 23% CCD, .003% other
- MySQL 5.0.77
- 3.8 GB
- Backups: 1 mirror*, 7 daily snapshots, off-site weekly, archived monthly, far-off site annually
- BAA has archived copy as part of mutual archive agreement
- Paper ledgers to IBM punch cards in 1967
- Migration from punch cards to magnetic tape began in 1973 and ended in 1981
- In-house CPM system for data entry onto 8" disks began in 1981 (some in-house processing begins)
- Conversion from CPM 8" to IBM 5.25" disks in 1987
- Transfer for 4.5 million obs database from CfA storage to AAVSO HQ in 1989-1990
- ASCII tables replaced with relational database in 2006

* Details in JAAVSO papers in 1970's (Hill) and 1980's (Waagen)

Incoming Data Pipeline



Outgoing Data Pipeline



Light curve generator

SBIG Light Curve Generator

Object* V630 CAS
Name, Designation or AUID

Time Range* Plot last 400 days
or
Start End 2454967.3600
JD or mm/dd/yyyy JD or mm/dd/yyyy

Highlight Your Own Observations
Observer Initials

Which data would you like to display?

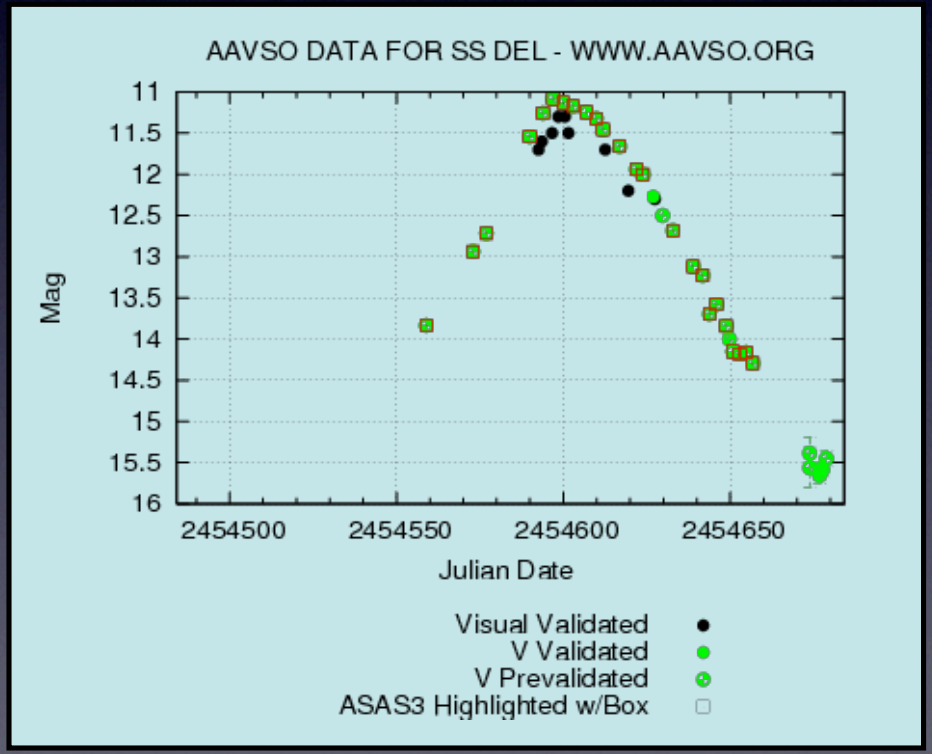
- Visual
- R
- Unknown/Unfiltered
- U
- I
- Fainter Than
- B
- J
- Discrepant
- V
- H
- Unvalidated
- Differential

Show List of Observers
Enable Background Grid
Point Size 1
Width 600 pixels Height 450 pixels
Force Vertical Axis to Magnitude
Draw V-band mean curve with day bins

Reset Fields to Defaults Plot Data

* Required

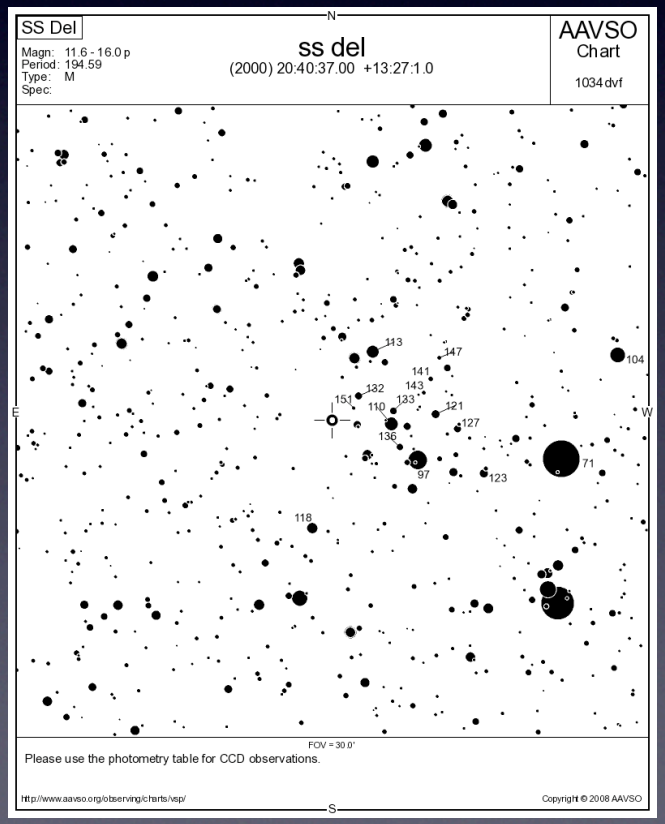
"V is V is V...."

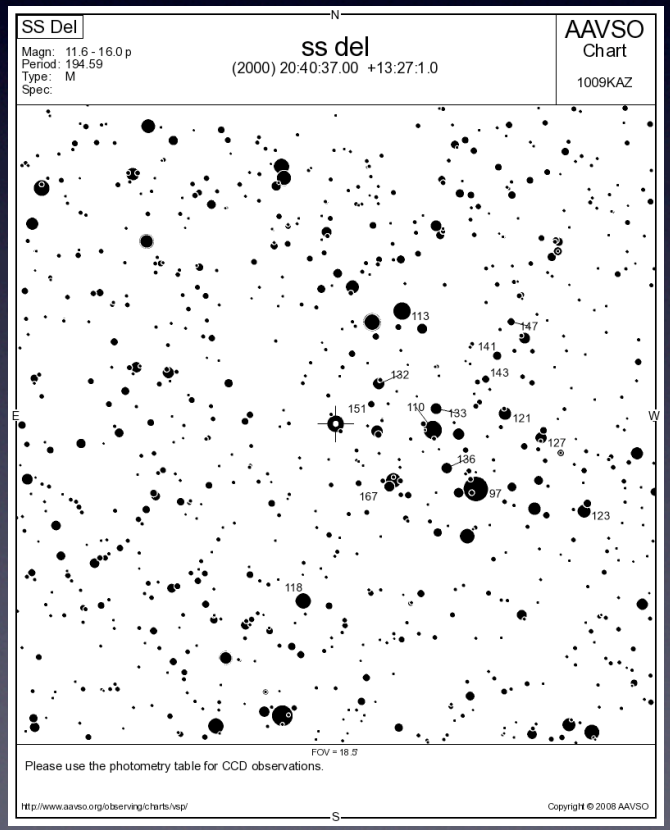


Quick Look (File)

Displaying 40 observations received since 2453870 from 11 observer(s). (New Search)

Name	JD	Calendar Date	Mag.	Band	Comment Codes	Observer	Comparison Star 1 (CName)	Comparison Star 2 (KName)	Chart(s)	Uncertainty	Trans-formed	Comments
SS DEL	2454749.00774	OCT 09.5077	15.3	V		NLX	110		1034dvf	0.13	N	
SS DEL	2454746.655676	OCT 07.1557	15.214	V		SRIC	151	136	1034DMP	0.023	N	
SS DEL	2454746.652094	OCT 07.1521	15.256	V		SRIC	151	136	1034DMP	0.026	N	
SS DEL	2454746.648512	OCT 07.1485	15.215	V		SRIC	151	136	1034DMP	0.028	N	
SS DEL	2454745.1774	OCT 05.6774	15.57	V	BU	HMH	000-BCS-657	000-BCS-648	08010	0.02	N	Limits of detection with this set-up
SS DEL	2454743.39028	OCT 03.8903	<14.3	Vis.		ACO	143		AAVSO		N	chart questioned
SS DEL	2454739.29097	SEP 29.7910	15.913	V	BU	HMH	000-BCS-652	000-BCS-648	080101	0.024	Y	limits of detection with this CCD setup
SS DEL	2454738.3958	SEP 28.8958	10.8	Vis.		TSTO1	102-6		AAVSO 080110		N	beyond sequence

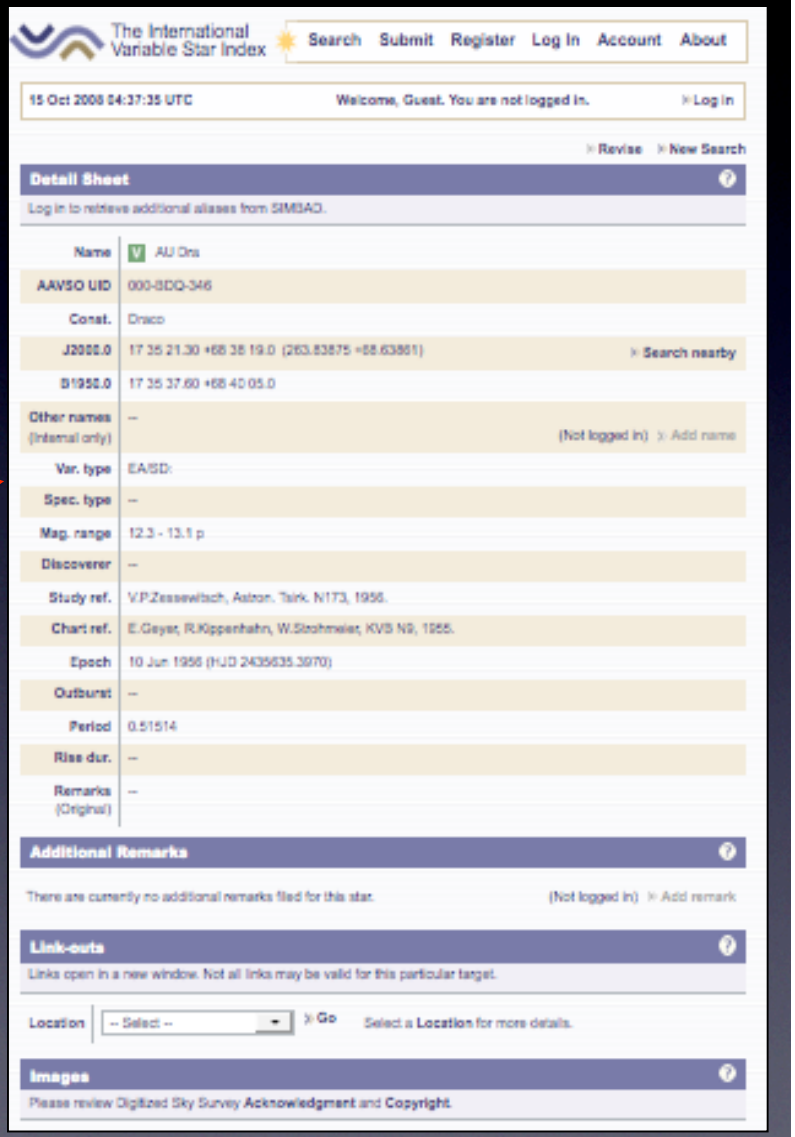




Validation List

- AUID, Designation, "Name", Aliases
- 44,351 stars & 1,669 aliases as of May 12 at 20:39UT
- Greek and nonstandard name consolidation projects
- Properties kept in VSX
- Add stars through VSX and then submitting an obs (preferred), WebObs or e-mail aavso@aavso.org
- Any proven variable accepted
- Exceptions can be made for good cause

000-BDM-465	AU CrA	-	light curve
000-BDB-509	AU CRB	1609+32	light curve
000-BDN-230	AU Cru	-	light curve
000-BCV-013	AU CVN	1305+32	light curve
000-BCL-291	AU CYG	2014+34	light curve
000-BDQ-081	AU Del	-	light curve
000-BDQ-320	AU Dor	-	light curve
000-BDQ-346	AU Dra	-	light curve
000-BBG-760	AU ERI	0412-25	light curve
000-BCV-933	AU GEM	0739+31	light curve
000-BDR-031	AU Gru	-	light curve
000-BCV-995	AU HER	1753+29	light curve
000-BDR-976	AU Hya	-	light curve
000-BDS-313	AU Hyi	-	light curve
000-BDS-415	AU Ind	-	light curve
000-BDS-487	AU Lac	-	light curve
000-BDS-814	AU Leo	-	light curve
000-BBW-005	AU LIB	1512-24	light curve



Data Download

Name, designation or AUID

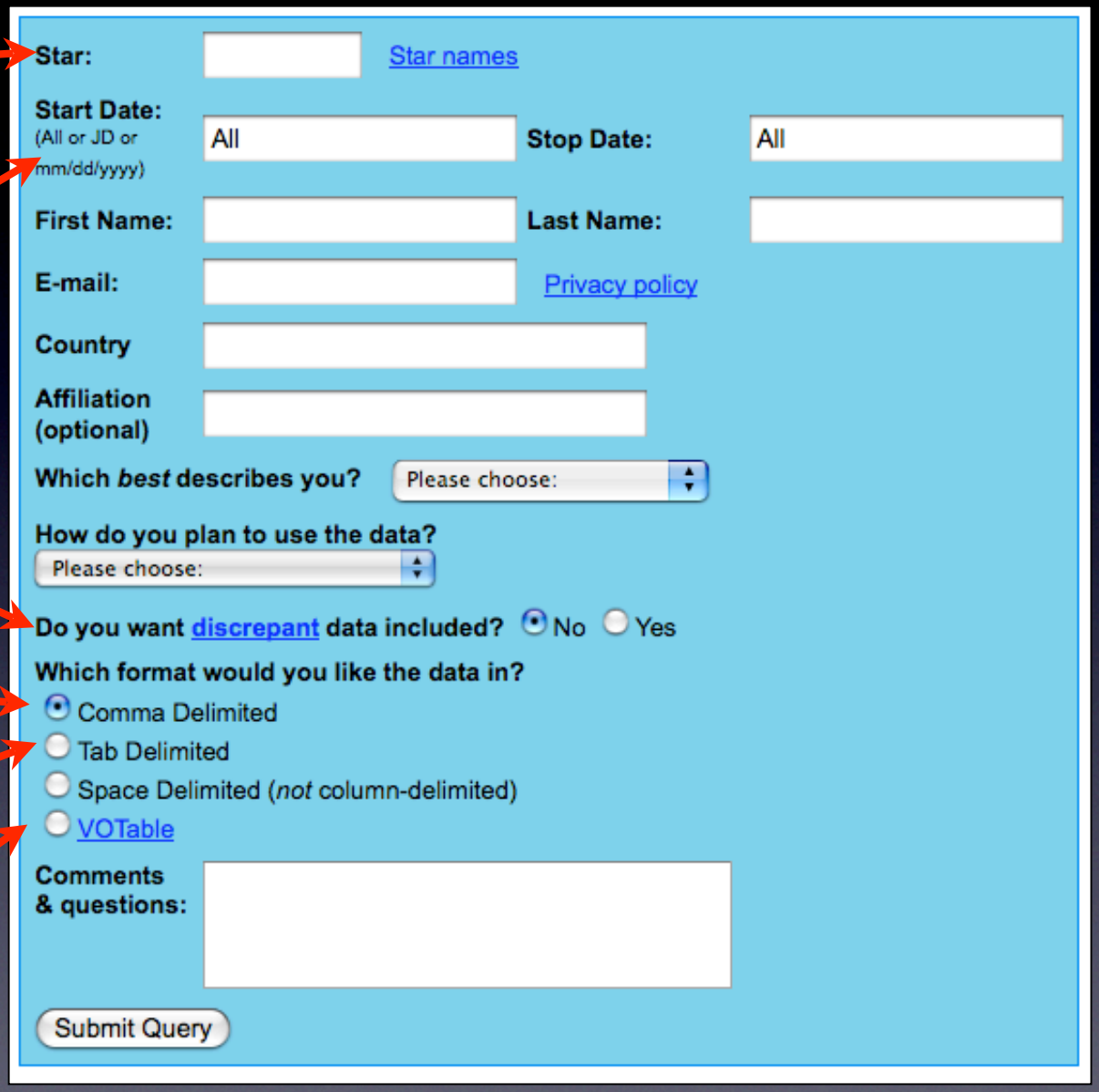
All, JD or mm/dd/yyyy

Danger, Will Robinson!

Beware rogue commas...

Recommended

NVO XML Format



More fields were added over time as we expanded the database

```
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2439766.7,<14.3,,,Visual,FD,,,,,,No,,G,,,,ss del
2439778.5,<13.2,,,Visual,LS,,,,,,No,,G,,,,ss del
2439786.5,14.8,,,Visual,LS,,,,,,No,,G,,,,ss del
```

```
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2452455.4118,11.5,,,Visual,DPA,,11.3  11.8,,PE0597,,No,,G,,,,ss del
2452460.4479,11.6,,,Visual,KKI,,113W,118,PD1997,,No,,G,118,,,ss del
2452461.481,11.7,,,Visual,SJZ,,113S,118,PE1997,,No,,G,118,,,ss del
```

```
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2454652.84554,14.183,0.043,,V,ASAS3,,000-BCS-651,000-BCS-655,1009QAL,SUBMITTED BY DKS,No,,P,000-BCS-655,,11.282,ss del
2454654.77611,14.161,0.057,,V,ASAS3,,000-BCS-651,000-BCS-655,1009QAL,SUBMITTED BY DKS,No,,P,000-BCS-655,,11.269,ss del
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2454662.7188,<14.2,,,Visual,SXN,,142,,030712,,No,,P,,,,ss del
```
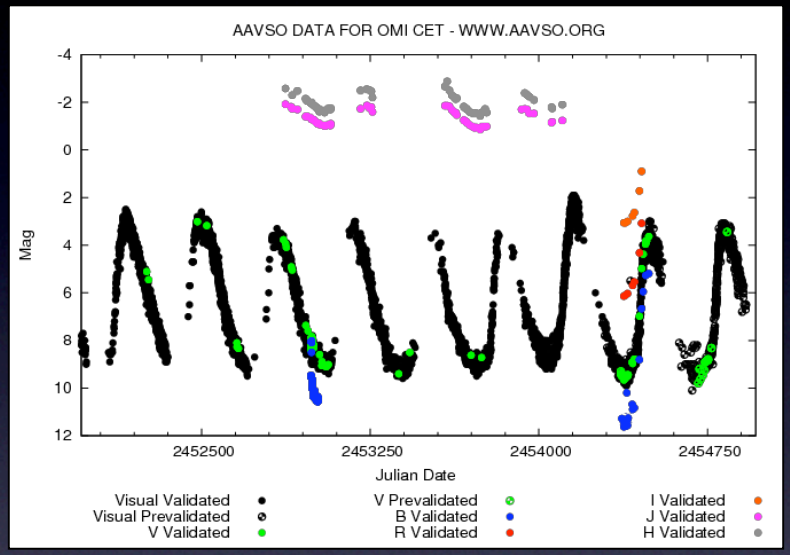

Format

1. **JD:** The Julian Date of the observation.
2. **Magnitude:** The magnitude estimate of the observation. A **<** sign means it was a null observation "fainter than" the magnitude given. A **:** (colon) means the observer was uncertain about the estimate.
3. **Uncertainty:** Uncertainty (error) of the observation as submitted by the observer
4. **HQ Uncertainty:** Uncertainty (error) of the observation as determined by AAVSO HQ
5. **Band:** Bandpass of the observation
6. **Observer Code:** This is a unique ID assigned to each observer.
7. **Comment Code:** Comment codes submitted by the observer. A list of codes is here.
8. **Comp Star 1:** The comparison star(s) used to make the visual estimate. If photometric, this is the comparison (C) star ID.
9. **Comp Star 2:** The comparison star(s) used to make the visual estimate. If photometric, this is the check (K) star ID.
10. **Charts:** The charts used to find the field and locate the comparison stars and their values. As of July, 2008 new charts were issued with a Chart ID format of XXXXY where XXXX is a number and Y can be any combination of letters. You can visit our Variable Star Plotter and type in that Chart ID to see the exact chart the observer used to make that observation. For Chart IDs that are not in that format, contact AAVSO HQ and we can e-mail you a copy of the chart used in the observation.
11. **Comments:** Comments on the observation, usually from the observer
12. **Transform:** If transformation coefficients were applied to the observation then this will be "Yes".
13. **Airmass:** The airmass of the observation.
14. **Validation Flag:** This flag describes the level of validation of the observation. **G** means the observation has passed our validation tests. **D** means that during the validation phase it was flagged discrepant and should be used with extreme caution. **P** means it has only undergone pre-validation, meaning it was checked for typos and data input errors only. No flag means it has not been validated at all and should be used with caution.
15. **Cmag:** Supplied magnitude of the comparison star
16. **Kmag:** Measured magnitude of the check star
17. **HJD:** Heliocentric Julian Date
18. **Name:** Name of the star

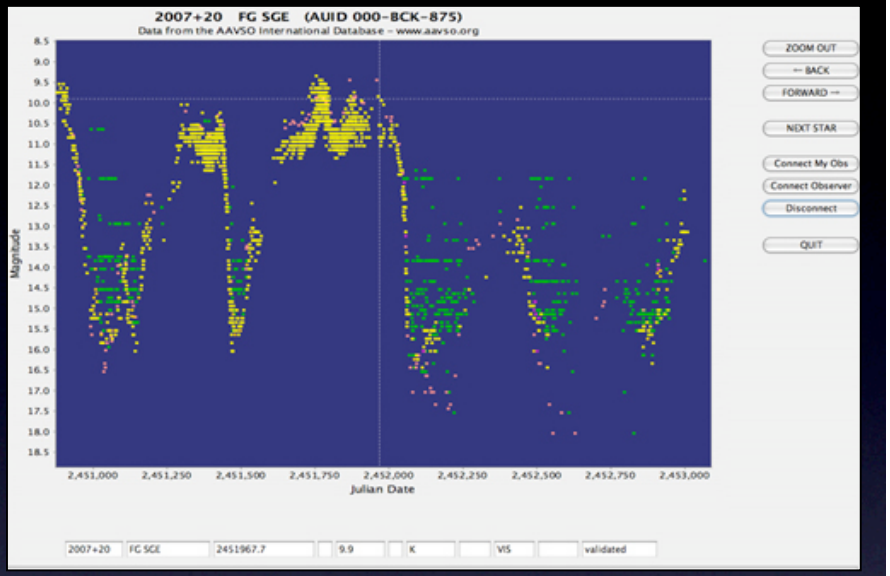
Bandpasses

- Vis.: Visual observations
- U: Johnson U band
- V: Johnson V band (a.k.a. "photometric V")
- B: Johnson B band
- R: R band, usually Cousins R (Rc)
- I: I band, usually Cousins I (Ic)
- Sloan Z: Z band from SDSS set (Iz)
- CV: Unfiltered with a V zeropoint
- CR: Unfiltered with a Red zeropoint
- J: J band (NIR 1.2micron)
- H: H band (NIR 1.6micron)
- K: K band (NIR 2.2micron)
- N/A: Unknown
- Rare/old filters:
- RGB-Blue: Blue filter from the RGB set (144 obs)
- RGB-Green: Green filter from the RGB set (3,801 obs)
- RGB-Red: Red filter from the RGB set (522 obs)
- Orange: Orange color filter (1,359 obs)
- Yellow: Yellow color filter (482 obs)
- Always expanding...



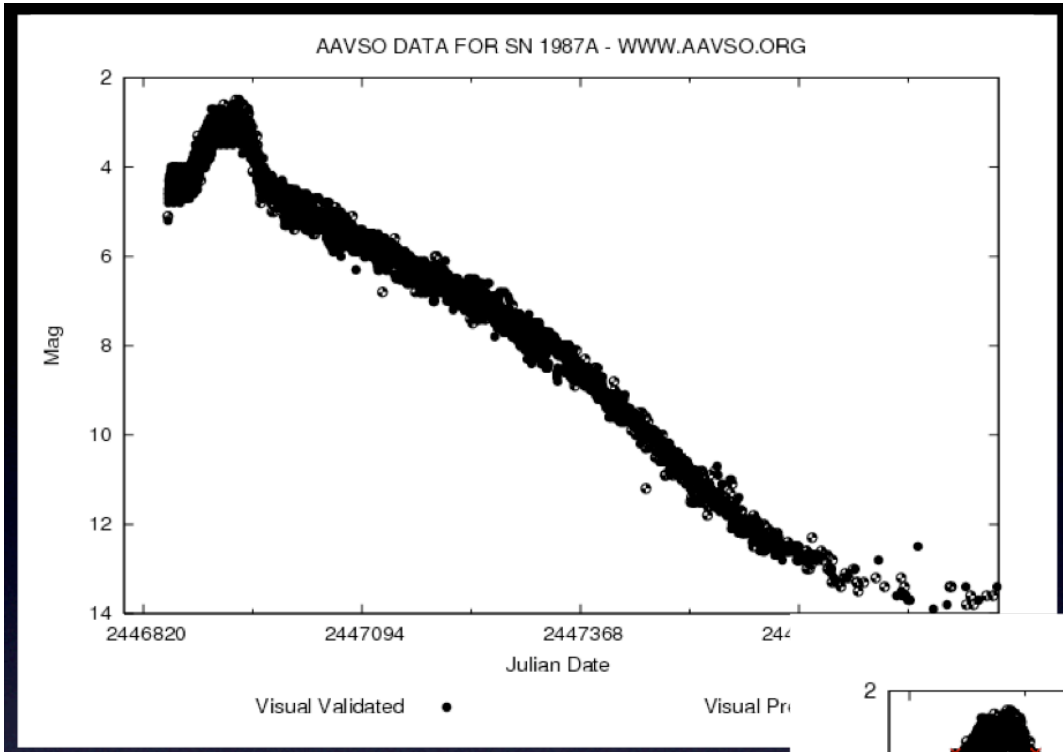
Validation Flag

- Two types of validation: *full* and *pre*
- G means the observation has passed our validation tests.
- D means that during the validation phase it was flagged discrepant and should be used with extreme caution.
- P means it has only undergone pre-validation, meaning it was checked for typos and data input errors only.
- No flag means it has not been validated at all and should be used with caution.
- Details in Malatesta et al., (2005) JAAVSO ,Volume 34, 1.
- Supervalidation

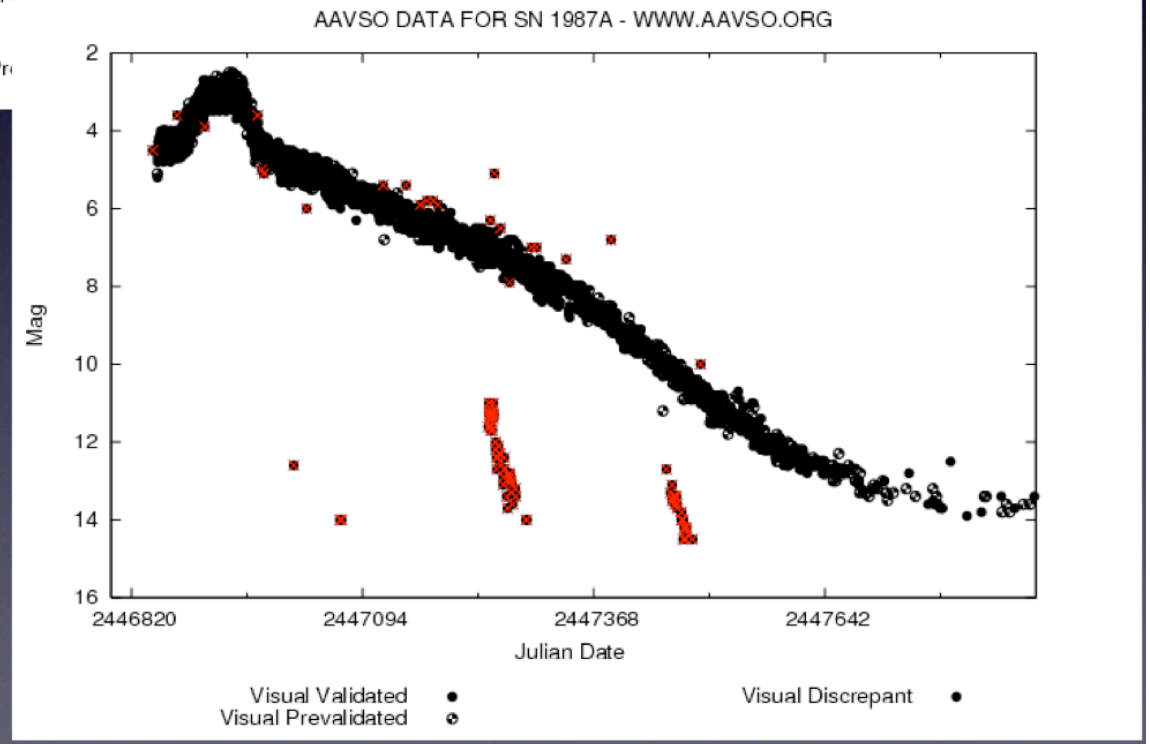


Help us w/Zapper!

Validated & Prevalidated



Unvalidated



Dear Colleague

Dear Colleague,

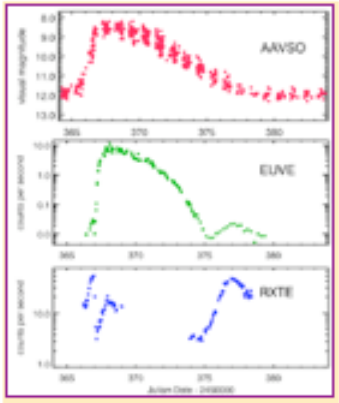
The AAVSO International Database is a precious resource for the science of variable star astronomy, and we hope your research will benefit greatly from the use of these data. The amateur and professional astronomers who have contributed data to the AAVSO over the last century did so hoping to make a positive contribution to variable star research, and it is our goal to facilitate the use of these data by the astronomical community. AAVSO data are and always will be provided **free of charge** upon request, as a service to the scientific community.

AAVSO Director Arne Henden with the AstroCam at USNO Flagstaff, AZ

Our only requirements for the use of AAVSO data are simple:

First, please acknowledge the use of any and all AAVSO data used in publications with the appropriate acknowledgements we have provided on our webpage. If the data form the basis of your research, we ask that a representative of the AAVSO be included as an author; in exchange we will assist you in the analysis and interpretation of these data at a level appropriate for a coauthor.

Second, if you use our data in a publication, please let us know! We are thrilled to see the work of our observer community in print, and our observers are equally thrilled to see their work put to good use. The AAVSO has created the AAVSO In Print page for just this purpose. It shows the observers that their work is paying off, it showcases *your* hard work in using and analyzing AAVSO data, and it proves to the astronomical research community that the AAVSO continues to be a relevant and valuable resource for variable star astronomy. If your paper is accepted, in press, or published in a magazine, journal, or conference proceedings, please email us at aavso@aavso.org with the paper title, the authors, the year of publication, and the journal and reference information. If the paper appears on the arXiv.org preprint server, please include the URL for the abstract page.



Click image to see complete figure. The October 1996 narrow outburst of SS Cyg captured in three wavelengths. For more information about the SS Cyg collaboration, visit RXTE's Greatest Hits and EUVE Science Highlights. Figure adapted from Wheatley et al. (2003).

We are very pleased to provide you with whatever data we have of interest to you. If our data prove valuable to your research, please let us know!

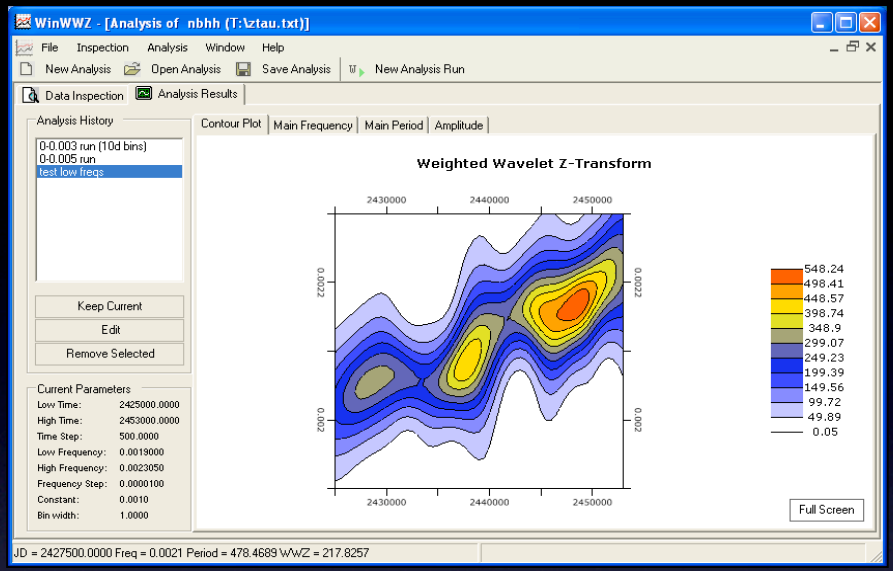
Sincerely,

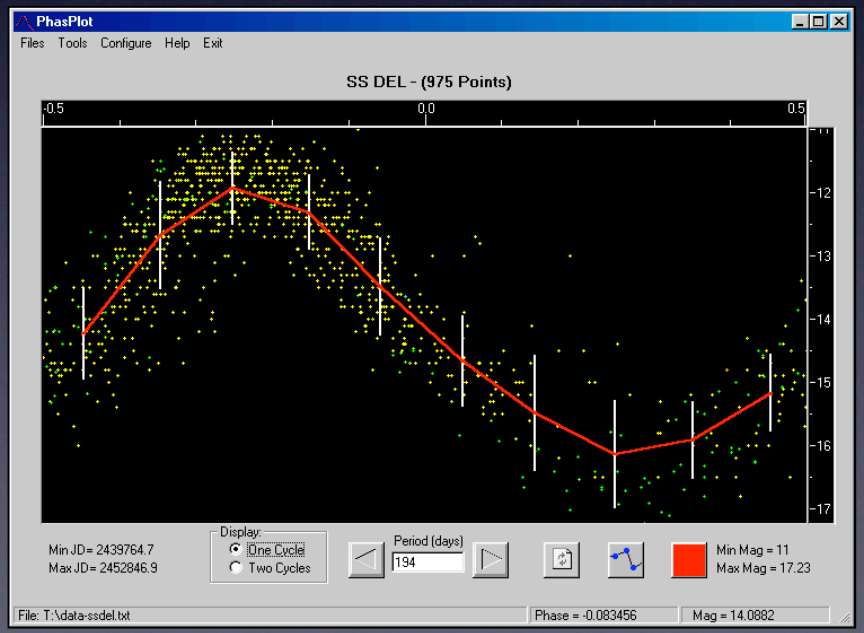
Dr. Arne A. Henden, Director
American Association of Variable Star Observers

Authorship guidelines
Let us know so we can promote your project and inform our members
Not included, but important: *If you have some, please toss some MONEY our way!*

Analysis Software

- WWZ by Foster/Klingenberg
- MagPlot by Abbey
- PhasPlot by Abbey
- TS by Foster
- VStar* by Foster/HOA team
  - New version: Aug. 5, 2009
- Peranso, commercial by Vanmunster
- Volunteers needed





Analysis Tutorials

Time-Series Analysis of Astronomical Data
by Dr. Matthew Templeton, AAVSO

You may download the PowerPoint file of this presentation by clicking here.

The full version of this paper appears in the Journal of the AAVSO, volume 32, number 1, page 41.

SLIDE 1 -TITLE

In this short paper, I'll give a very brief overview of time series ar
time-series analysis is performed on astronomical data, and wha
also suggest different kinds of analysis for different kinds of obje
resources that you might find useful in your own work.

Templeton, JAAVSO Volume 32, 2004

Time-Series Analysis of Variable Star Data

Matthew Templeton
AAVSO, 25 Birch Street, Cambridge, MA 02138

Based on a workshop session at the 92nd Spring Meeting of the AAVSO, April 25, 2003; revised August 2004

Abstract **Time**-**series** analysis is a rich field of mathematical and statistical analysis, in which physical understanding of a **time**-varying system can be gained through the analysis of **time**-**series** measurements. There are several different techniques of **time**-**series** analysis that can be usefully applied to variable star data sets. Some of these techniques are particularly useful for data found in the AAVSO International Database. In this paper, I give a broad overview of **time**-**series** analysis techniques useful for variable star data, along with some practical suggestions for the application of different techniques to different types of variables. Included are elementary discussions of traditional Fourier methods, along with wavelet and autocorrelation analysis.

Our web site is full of them!

AAVSO: Grant **Foster** Online Chat Transcript

My favorite is "TS" -- it's a **time series** analysis program. It does very sophisticated Fourier analysis (the CLEANEST method), and also does polynomial ...

www.aavso.org/aavso/**foster**.html

Grant Foster *30 minutes*

"Long-Term Light Curves of Cepheid Variables" (video, ppt)

We have analyzed the light curves of 65 Cepheid variables, using visual data from the American Association of Variable Star Observers (AAVSO). We find that Cepheid pulsations are not nearly so constant as is often believed; half of our well-observed sample show episodes of period change, in addition to long-term period evolution. We derive the Fourier decomposition coefficients for the sample, and present mean light curves for the best-observed stars. We also find that the light curve shape is usually well approximated by a "bent sawtooth" wave, which can account for the coefficients of the Fourier series.

Wednesday, March 23

Workshop: Intro to Using AAVSO Data Analysis Tools Grant Foster
Talk: The Sun in High Energy Mitzi Adams
Talk: Polars Steve Howell
Talk: VERITAS & AGN Light Curves Geza Gyuk
Workshop: Intro to Using X-ray Data Analysis Tools Sandeep Patel
Town Hall Style Discussion all speakers as panelists

Method #1: world's best

- Eye + Brain: Look at the data!
- Plot x as a function of t: Explore!
- Scientific name:

  Visual Inspection
- World's best – but not infallible

2005 HEA Data Analysis Workshop

Time Series Analysis of AmateurObservations: Various Methods and Some Results

Ivan L. Andronov
Astronomical Observatory, Odessa State University, Ukraine (now Astronomical Observatory, Odessa National University, T. G. Shevchenko Park, Odessa 65014 Ukraine)

Present affiliation: Odessa National Maritime University, Mechnikova St. 34, Odessa 65029 Ukraine

Abstract Algorithms and programs are described which allow time series analysis of periodic, multi-periodic, quasi-periodic, and aperiodic signals of an arbitrary nature with equidistant and non-equidistant arguments. The methods are applied to the observations of semiregular, dwarf nova, eclipsing, and Mira-type stars.

WAVELET ANALYSIS OF SMALL-AMPLITUDE PULSATING RED GIANTS

John R. Percy
Ryan Kastrukoff
Erindale Campus, and
Department of Astronomy
University of Toronto
Mississauga, ON L5L 1C6
Canada

Presented at the 90th Spring Meeting of the AAVSO, May 5, 2001

Abstract

We have investigated the usefulness of wavelet analysis for studying the changing period and amplitude of small-amplitude pulsating red giants. Specifically, we have applied it to EU Del, W Boo, and SX UMi. With care, this method can provide useful information about variables with amplitudes between 0.2 and one magnitude, especially if used in conjunction with light curves, Fourier analysis, and autocorrelation analysis.

DATA REDUCTION BY AVERAGING

Grant Foster
AAVSO
25 Birch Street
Cambridge, MA 02138

Presented at the AAVSO Annual Meeting, October 28, 1995

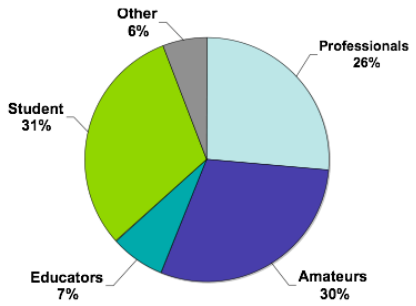
Abstract

In many cases, a time series with very many observations can, by averaging over an appropriate time span, be reduced to a manageable number of data points with very little loss of information. I investigate the errors inherent in this process.

Enjoy your data... everyone else is!

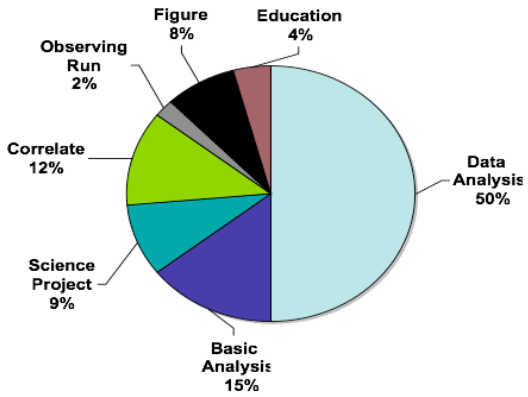
4,248 Online Data Requests

Who is downloading the data?



4,248 Online Data Requests

How is the data being used?



2008

- J. Shears, C. Lloyd, D. Boyd, S. Brady, I. Miller, R. Pickard, 2008, Outburst characteristics of the dwarf nova V452 Cassiopeiae, *Accepted for publication in the Journal of the British Astronomical Association.*
- A. Golovin, Y. Kuznyetsova, M. Andreev, 2008, High-Resolution Spectroscopy of Long-Periodic Eclipsing Binary Epsilon Aurigae, *Odessa Astronomical Publications*, vol. 20, p. 55.
- M. Zhao, D. Gies, J.D. Monnier et al., 2008, First Resolved Images of the Eclipsing and Interacting Binary Beta Lyrae, Accepted by ApJL.
- C. Papadaki, H.M.J. Boffin and D. Steeghs, 2008, IP Pegasi in outburst: Echelle spectroscopy & Modulation Doppler Tomography, *Journal of Astronomical Data* (submitted)
- Izumi Hachisu ,Mariko Kato, and Angelo Cassatella, 2008, A Universal Decline Law of Classical Novae. III. GQ Mus 1983, accepted to *The Astrophysical Journal*
- A.V.Halevin and A.A.Henden, 2008, Eclipse mapping of RW Tri in the low luminosity state, MNRAS (submitted)
- A. Olech, M. Wisniewski, K. Zloczewski et al., 2008, Curious Variables Experiment (CURVE). RZ LMi - the most active SU UMa star, accepted to *Acta Astronomica*
- C. Papadaki, H.M.J. Boffin, V. Stanishev et al., 2008, Photometric study of selected cataclysmic variables II. Time-series photometry of nine systems, *Journal of Astronomical Data* (submitted)
- Akira Imada, Rod Stubbings, Taichi Kato et al., 2008, The 2006 November outburst of EG Aquarii: the SU UMa nature revealed, accepted to *Publications of the Astronomical Society of Japan*
- Shunsaku Okada, Ryoko Nakamura, and Manabu Ishida, 2008, Chandra HETG line spectroscopy of the Non-magnetic Cataclysmic Variable SS Cyg, accepted to *The Astrophysical Journal*
- Mariko Kato, Izumi Hachisu, Seiichiro Kiyota et al., 2008, Helium Nova on a Very Massive White Dwarf -- A Light Curve Model of V445 Puppis, accepted to *The Astrophysical Journal*
- P. Pietrukowicz, J. Kaluzny, A. Schwarzenberg-Czerny et al., 2008, Cluster AgeS Experiment (CASE): Deficiency of observed dwarf novae in globular clusters, accepted to *MNRAS*
- F. Senziani, G.K. Skinner, P. Jean, M. Hernanz, 2008, Detectability of gamma-ray emission from classical novae with Swift/BAT, *accepted for publication in Astronomy & Astrophysics*

Save the Dates!

1st AAVSO Eps Aur Workshop
August 5-7, 2009
Adler Planetarium, Chicago

Focus on observing bright stars but with a session on basic analysis

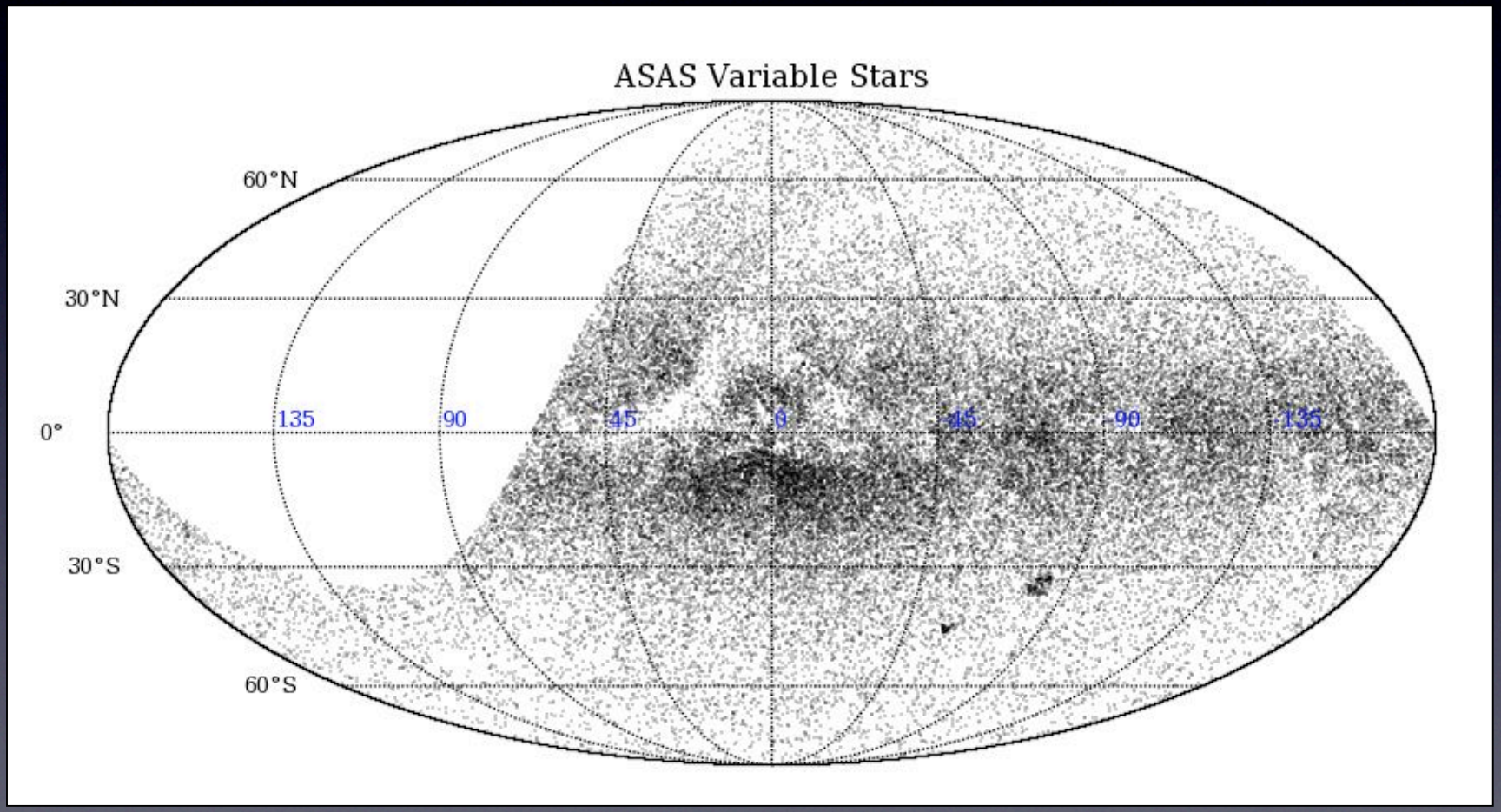
2nd AAVSO Eps Aur Workshop
Spring, 2010
California Academies of Science, San Francisco

Special focus on data analysis

(some travel funds likely available)

Using the ASAS-3 Database

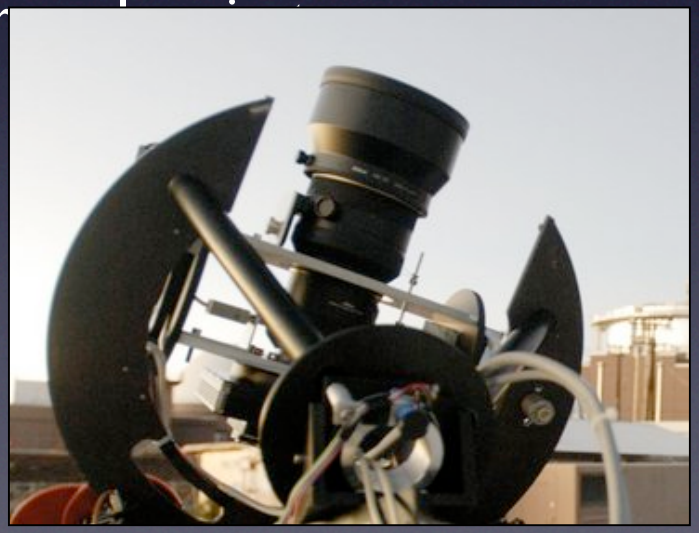
Special thanks to Aaron Price, Sebastian Otero and Mike Simonsen



ASAS

- All Sky Automated Survey
- Prof. Bohdan Paczynski & Dr. Grzegorz Pojmański
- Inexpensive all sky cameras for every amateur's backyard
- Public data
- AAVSO has permission to include ASAS data in the database
- Use for finding comparison stars
- Or per

Prof. Paczynski (Yale)

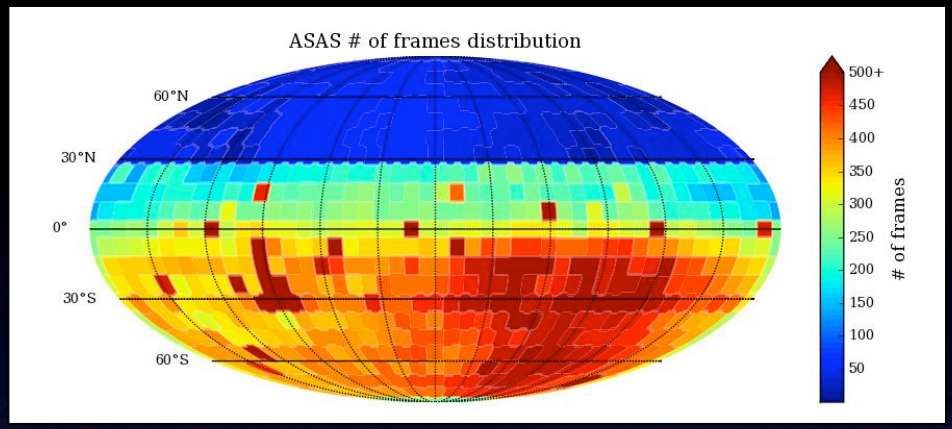


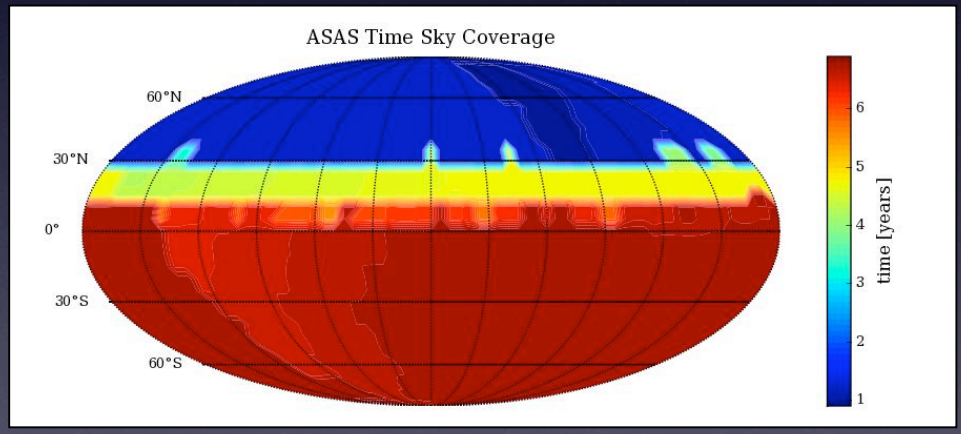
ASAS-3N (Hawaii)

ASAS-3 (Chile)

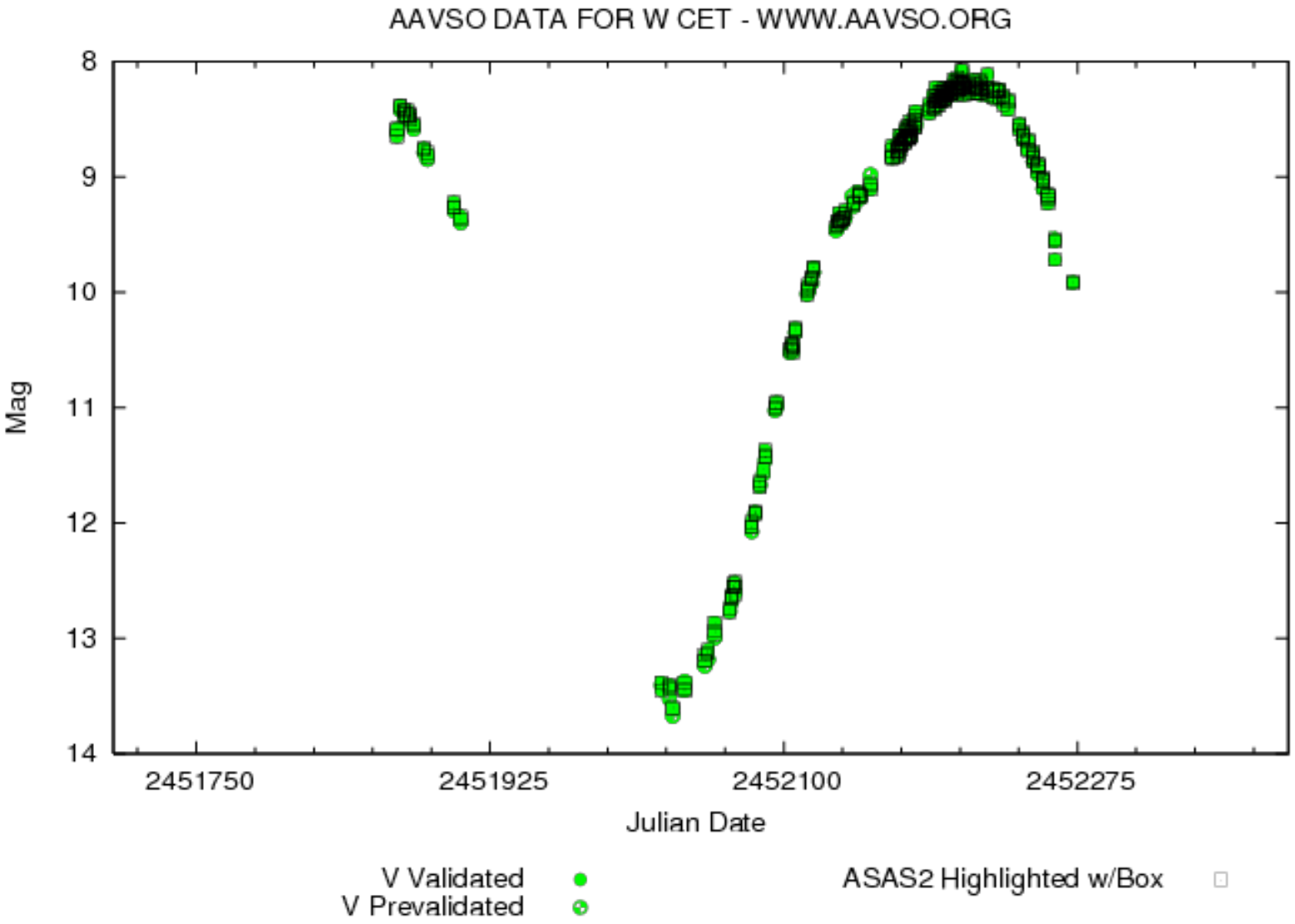
ASAS-3

- 20,000,000 stars
- Mag 8-14
- South of +28°
- All sky since June, 2006
- Cadence: 1-3 days
- 36,858 ASAS-2 V Data
- 16,230 ASAS-2 Ic Data
- 105,028 ASAS-3 V Data loaded by Sean Dvorak (DKS)
- 5,896 comp stars based on ASAS-3 data

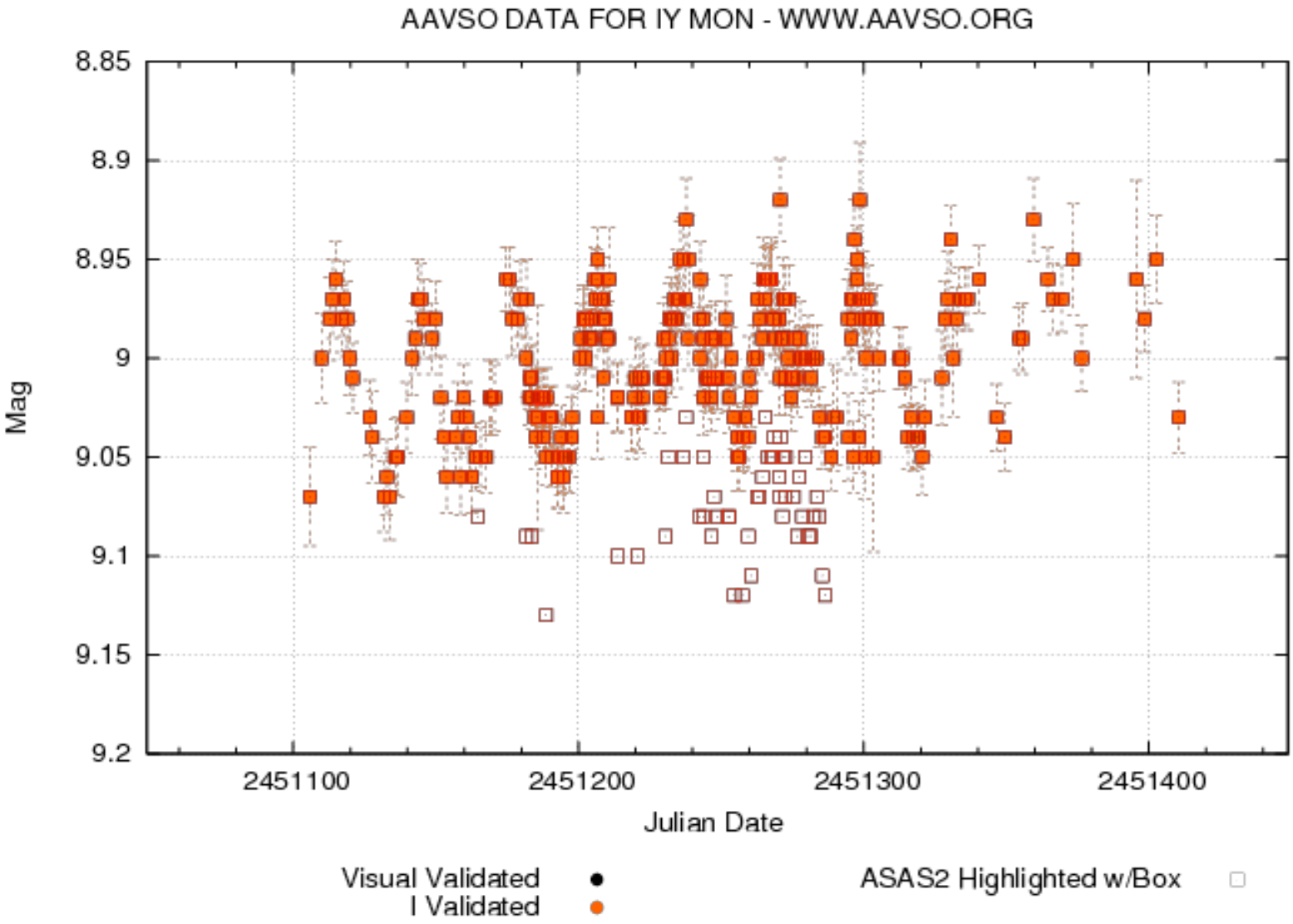




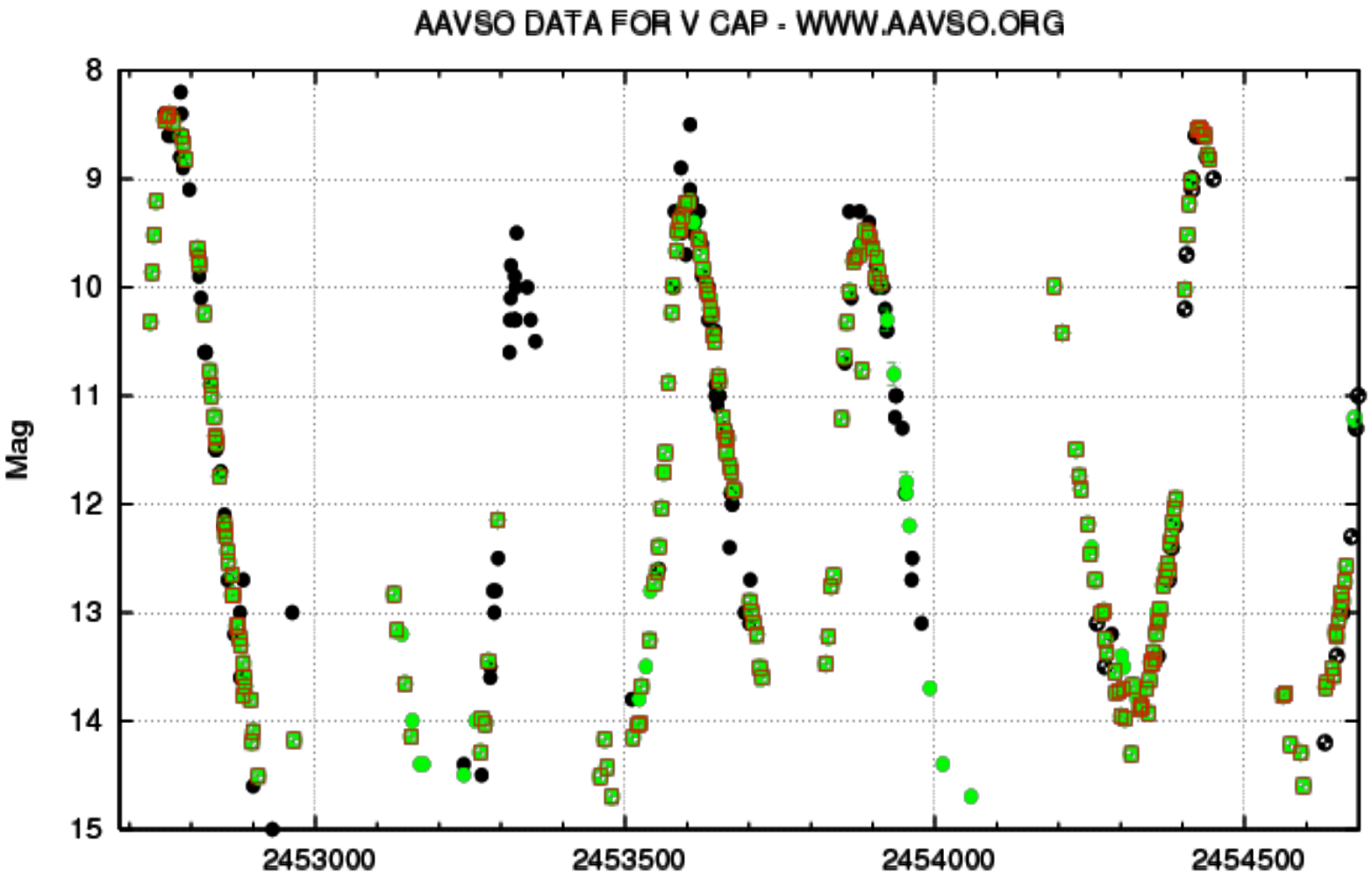
ASAS-2 (V)


AAVSO DATA FOR W CET - WWW.AAVSO.ORG
Mag
8
9
10
11
12
13
14
2451750
2451925
2452100
2452275
Julian Date
V Validated
V Prevalidated
ASAS2 Highlighted w/Box

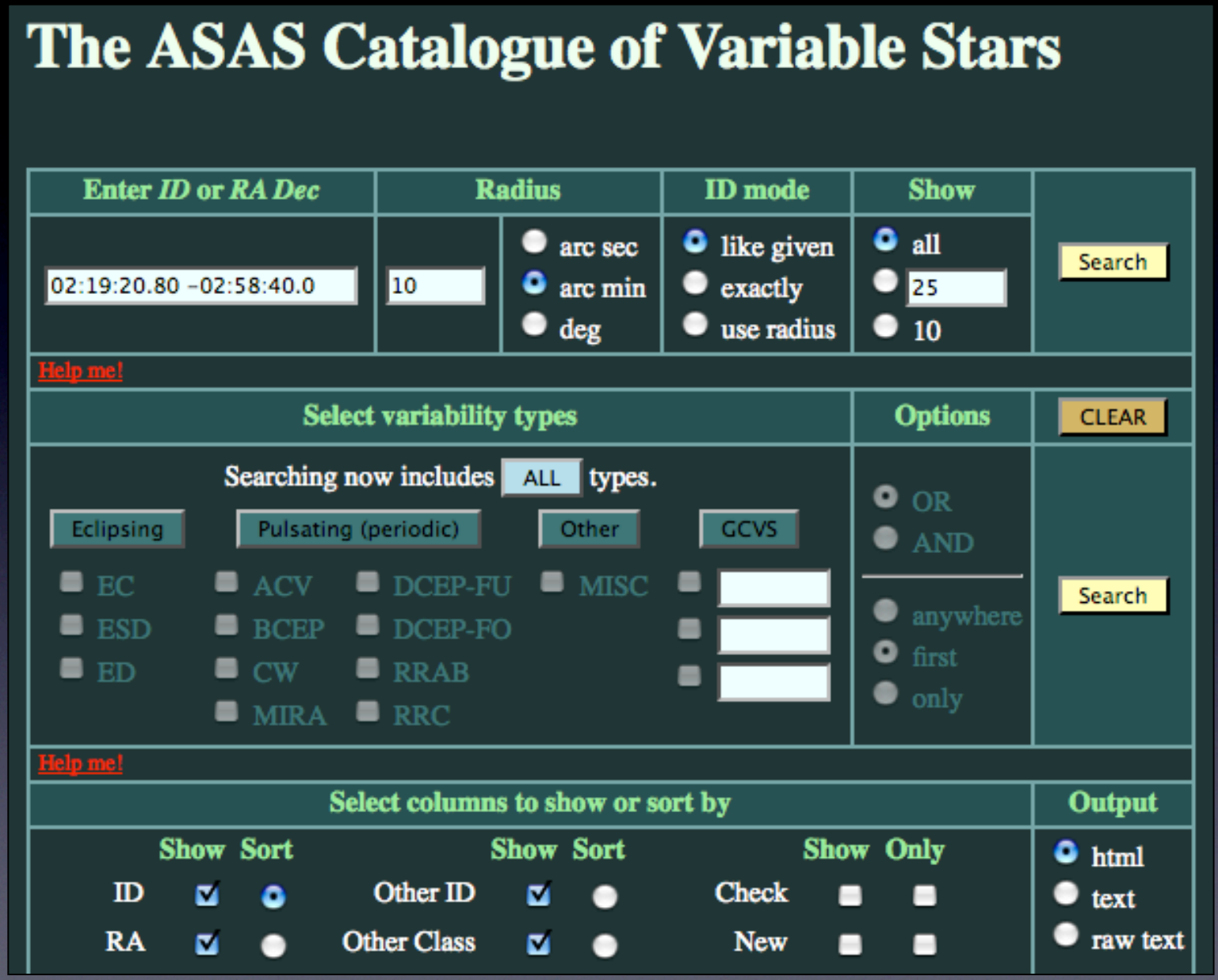
ASAS-2 (Ic)


AAVSO DATA FOR IY MON - WWW.AAVSO.ORG
Mag
8.85
8.9
8.95
9
9.05
9.1
9.15
9.2
2451100
2451200
2451300
2451400
Julian Date
Visual Validated
I Validated
ASAS2 Highlighted w/Box

ASAS-3 (V)

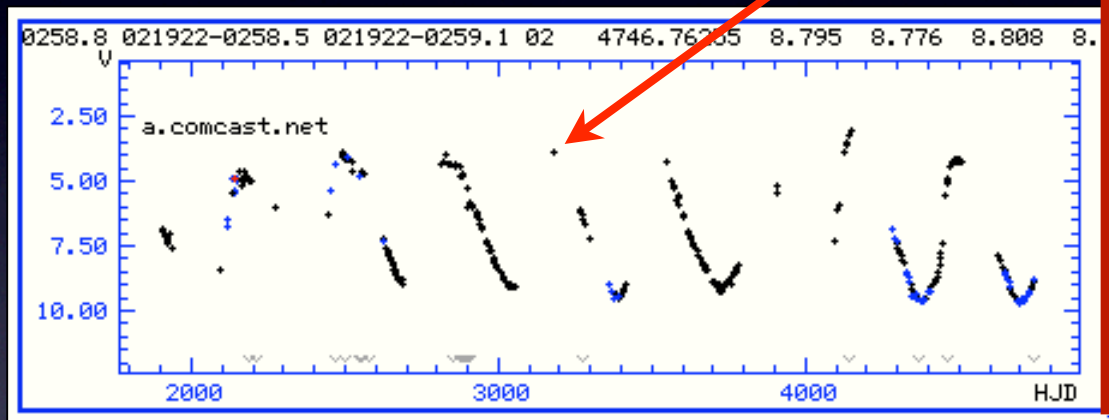

AAVSO DATA FOR V CAP - WWW.AAVSO.ORG
Mag
8
9
10
11
12
13
14
15
2453000
2453500
2454000
2454500

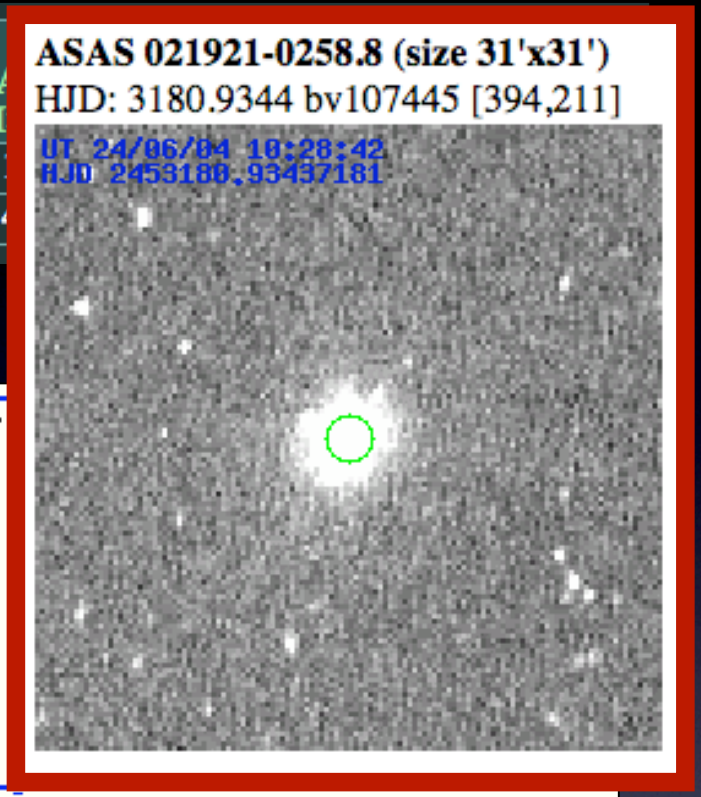
First, find the object...



ID ↓	RA (2000)	DEC (2000)	Period [days]	T_0	V [mag]
021914-0256.5	02:19:14	-02:56:30	344	2502.1	12.68
021921-0258.8	02:19:21	-02:58:48	335	3023.8	4.89

Click for the image frame





GetData | Map | Image | DSS | USNO | 2MASS | SIMBAD | ROSAT | Try period: 335

Now, find the data...

Multiple datasets

```
# ########## LIGHT CURVE BEGINS NEXT LINE ############
#ndata= 9
#dataset= 1 ; 1 F0208-08_292
#desig= 021921-0258.7
#cra=    2.322378  02:19:20.6
#cdec=  -2.978169 -2:58:41.4
#class= 0
#cmag_0=  6.151
#cmer_0=  0.425
#nskip_0= 1
#cmag_1=  5.969
#cmer_1=  0.512
#nskip_1= 1
#cmag_2=  5.753
#cmer_2=  0.678
#nskip_2= 1
#cmag_3=  5.628
#cmer_3=  0.739
#nskip_3= 1
#cmag_4=  5.574
#cmer_4=  0.773
#nskip_4= 1
#ra=    2.322378  02:19:20.6
#dec=  -2.978169 -2:58:41.4
#      HJD       MAG_4  MAG_0  MAG_1  MAG_2  MAG_3    MER_4 MER_0 MER_1 MER_2 MER_3 GRADE FRAME
   2115.87330  6.523  6.674  6.596  6.584  6.535    0.027 0.032 0.024 0.021 0.024   A 26968
   2117.83457  6.764  7.011  6.863  6.820  6.771    0.030 0.054 0.025 0.023 0.025   A 27391
   2135.83252  4.877  5.198  4.989  4.940  4.895    0.043 0.049 0.032 0.032 0.038   A 29512
   2144.80822  4.943  5.806  5.552  5.201  5.025    0.028 0.054 0.026 0.023 0.025   A 31076
   3382.55780  9.319  9.285  9.333  9.333  9.319    0.037 0.054 0.033 0.029 0.031   A 125599
#dataset= 1 ; 2 F0208-08_292
#desig= 021922-0258.8
#cra=    2.322694  02:19:21.7
#cdec=  -2.979891 -2:58:47.6
#class= 0
#cmag_0=  5.981
#cmer_0=  0.242
#nskip_0= 0
#cmag_1=  5.729
#cmer_1=  0.217
#nskip_1= 0
#cmag_2=  5.432
#cmer_2=  0.278
#nskip_2= 0
#cmag_3=  5.265
#cmer_3=  0.294
#nskip_3= 0
#cmag_4=  5.185
#cmer_4=  0.317
#nskip_4= 0
#ra=    2.322694  02:19:21.7
#dec=  -2.979891 -2:58:47.6
#      HJD       MAG_4  MAG_0  MAG_1  MAG_2  MAG_3    MER_4 MER_0 MER_1 MER_2 MER_3 GRADE FRAME
   2140.80576  5.408  6.151  5.882  5.628  5.472    0.037 0.061 0.037 0.033 0.034   A 30256
   2144.80822  4.963  5.812  5.577  5.236  5.059    0.028 0.054 0.026 0.023 0.025   A 31076
#dataset= 1 ; 3 F0208-08_292
```

With data, size matters

```
#dataset= 4 ; 2 F0208+00_337
#desig= 021921-0258.7
#cra=    2.322448  02:19:20.8
#cdec=  -2.977593 -2:58:39.3
#class= 0
#cmag_0=  7.461
#cmer_0=  1.681
#nskip_0= 1
#cmag_1=  7.428
#cmer_1=  1.747
#nskip_1= 0
#cmag_2=  7.397
#cmer_2=  1.782
#nskip_2= 0
#cmag_3=  7.380
#cmer_3=  1.805
#nskip_3= 0
#cmag_4=  7.375
#cmer_4=  1.812
#nskip_4= 0
#ra=    2.322448  02:19:20.8
#dec=  -2.977593 -2:58:39.3
#      HJD        MAG_4   MAG_0   MAG_1   MAG_2   MAG_3     MER_4 MER_0 MER_1 MER_2 MER_3 GRADE FRAME
   1903.58667   6.849   7.269   7.002   6.916   6.858     0.025 0.049 0.022 0.019 0.021   A 3645
   1908.58456   6.987   7.257   7.111   7.058   7.004     0.025 0.040 0.027 0.021 0.023   A 4449
   1915.53393   7.089   7.554   7.272   7.165   7.103     0.033 0.046 0.027 0.025 0.029   A 4884
   1919.59243   7.226   7.608   7.382   7.293   7.240     0.033 0.049 0.032 0.026 0.029   A 5283
   1922.55938   7.362   7.780   7.553   7.449   7.375     0.023 0.038 0.028 0.020 0.021   A 5740
   1925.56129   7.431   7.803   7.572   7.493   7.439     0.026 0.047 0.029 0.022 0.024   A 6245
   1930.52692   7.042   7.172   7.088   7.053   7.052     0.058 0.055 0.044 0.044 0.050   A 7046
   1934.52542   7.571   7.911   7.673   7.620   7.579     0.030 0.041 0.030 0.024 0.026   A 7707
   2094.86387   8.469   8.509   8.494   8.484   8.471     0.046 0.075 0.039 0.036 0.041   A 25099
   2129.77396   5.463   6.016   5.645   5.537   5.478     0.068 0.093 0.064 0.062 0.065   B 28214
   2156.73986   4.656   5.131   4.774   4.649   4.597     0.053 0.057 0.047 0.048 0.052   B 31693
   2167.74685   4.925   6.033   5.686   5.284   5.033     0.032 0.053 0.030 0.027 0.028   A 32145
   2168.75749   4.925   6.012   5.683   5.293   5.040     0.032 0.055 0.032 0.027 0.029   A 32315
   2172.71089   4.787   5.362   5.000   4.851   4.773     0.034 0.046 0.032 0.030 0.032   A 32821
   2173.74103   4.916   5.883   5.572   5.179   5.001     0.029 0.051 0.028 0.024 0.027   A 33023
   2174.73650   4.643   5.414   5.249   4.936   4.728     0.043 0.064 0.045 0.034 0.038   A 33196
   2177.70711   4.873   5.731   5.500   5.142   4.963     0.033 0.055 0.033 0.027 0.030   A 33456
   2183.67780   4.951   5.722   5.541   5.218   5.042     0.036 0.054 0.034 0.029 0.032   A 33904
   2188.82268   4.893   5.496   5.264   5.067   4.948     0.033 0.049 0.038 0.030 0.032   A 34714
   2190.65865 29.999 29.999 29.999 29.999 29.999     0.033 0.044 0.030 0.027 0.030   C 34947
   2194.69396   5.018   5.620   5.489   5.203   5.090     0.031 0.040 0.031 0.025 0.028   A 35674
   2211.58713 29.999 29.999 29.999 29.999 29.999     0.036 0.042 0.033 0.030 0.033   C 37829
```

Aperture Criteria

- cmag_0 = >12.0
- cmag_1 = 11 - 12
- cmag_2 = 10 - 11
- cmag_3 = 9 – 10
- cmag_4 = <9

# HJD	MAG_1	MAG_0	MAG_2	MAG_3	MAG_4	MER_1	MER_0	MER_2	MER_3	MER_4	GRADE	FRAME
1981.89917	11.314	11.333	11.298	11.287	11.290	0.042	0.044	0.037	0.041	0.042	A	12671
1983.91106	11.363	11.359	11.327	11.237	11.246	0.056	0.061	0.053	0.060	0.060	B	12889
1985.88935	11.258	11.264	11.260	11.269	11.232	0.042	0.046	0.036	0.040	0.039	A	13265
1994.90607	11.158	11.168	11.140	11.164	11.148	0.052	0.060	0.047	0.053	0.052	B	13562

Beware of Saturation!

Differences between aperture magnitudes is too large

# HJD	MAG_4	MAG_0	MAG_1	MAG_2	MAG_3	M
1903.58667	6.849	7.269	7.002	6.916	6.858	0
1908.58456	6.987	7.257	7.111	7.058	7.004	0
1915.53393	7.089	7.554	7.272	7.165	7.103	0
1919.59243	7.226	7.608	7.382	7.293	7.240	0
1922.55938	7.362	7.780	7.553	7.449	7.375	0
1925.56129	7.431	7.803	7.572	7.493	7.439	0
1930.52692	7.042	7.172	7.088	7.053	7.052	0
1934.52542	7.571	7.911	7.673	7.620	7.579	0
2094.86387	8.469	8.509	8.494	8.484	8.471	0

Better.

..

Beware of Crowding!

# HJD	MAG_1	MAG_0	MAG_2	MAG_3	MAG_4	MER_1
2628.82965	12.131	12.299	11.840	11.591	11.500	0.034
2679.78280	11.997	12.281	11.819	11.671	11.614	0.034

Check the field and other apertures

Beware of mean mags!

HD 109993

```
#ndata= 411
#dataset= 3 ; 1 F1200-64_048
#desig= 123950-6702.4
#cra=    12.663945  12:39:50.2
#cdec= -67.039741 -67:02:23.1
#class= 0
#cmag_0=   7.952
#cmer_0=   0.025
#nskip_0= 3
#cmag_1=   7.978
#cmer_1=   0.021
#nskip_1= 2
#cmag_2=   7.997
#cmer_2=   0.010
#nskip_2= 9
#cmag_3=   8.009
#cmer_3=   0.013
#nskip_3= 7
#cmag_4=   8.024
#cmer_4=   0.015
#nskip_4= 5
#ra=    12.663945  12:39:50.2
#dec= -67.039741 -67:02:23.1
```

- Saturation causes artificially low means (DIY)
- Zero point calibration issues (calibrate using external sources or use old ASAS catalog)

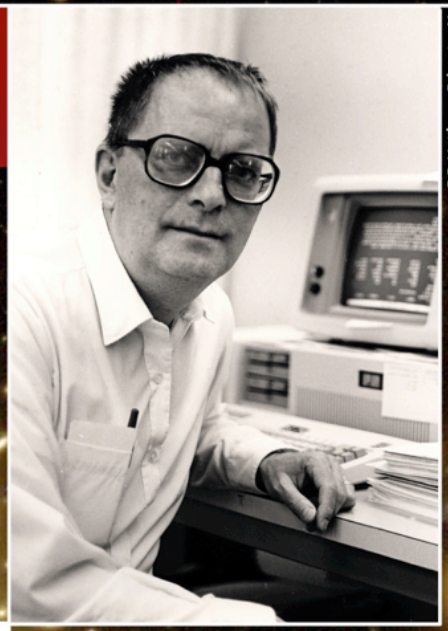
```
#ndata= 555
#dataset= 4 ; 1 F1300-64_049
#desig= 123951-6702.4
#cra=    12.664160  12:39:51.0
#cdec= -67.040732 -67:02:26.6
#class= 0
#cmag_0=   8.182
#cmer_0=   0.033
#nskip_0= 19
#cmag_1=   8.185
#cmer_1=   0.024
#nskip_1= 17
#cmag_2=   8.190
#cmer_2=   0.014
#nskip_2= 25
#cmag_3=   8.198
#cmer_3=   0.016
#nskip_3= 27
#cmag_4=   8.208
#cmer_4=   0.019
#nskip_4= 24
#ra=    12.664160  12:39:51.0
#dec= -67.040732 -67:02:26.6
```

Using the Data

- Ignore data sets with <10 obs (star may be on edge)
- Reported accuracy is based on night-to-night variation
- Add 0.05 in quadrature to the ASAS uncertainty and report *that* number (for now)
- Submit via *Extended Format*
- Use ASAS3 as the observer code
- Put "Submitted by X" in the Remarks where X is *your* observer code
- Put ASAS in the Chart, Cmag and KMag fields
- Send an e-mail to aavso@aavso.org so we can credit your observer totals
- Database is alive and always changing
- When using ASAS data in a publication, describe how you chose which aperture and data set to use.
- Also, include a citation to:
- Pojmanski, G. 2002, Acta Astronomica, 52, 397

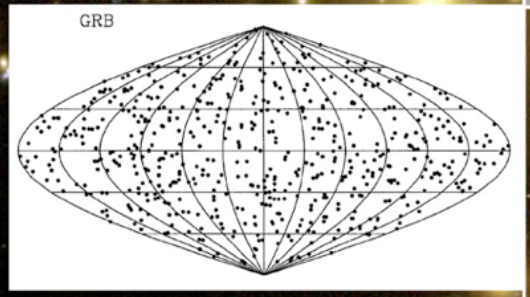
THE VARIABLE UNIVERSE
A CELEBRATION OF BOHDAN PACZYŃSKI

MEMORIAL SERVICE - 9.28.07 - 3PM
SYMPOSIUM - 9.29.07 & 9.30.07
PRINCETON UNIVERSITY



R.P. Matthews, Princeton U.

stellar evolution
variable stars
accretion disks
gamma ray bursts
micro-lensing



INVITED SPEAKERS

MAREK ABRAMOWICZ
CHARLES ALCOCK
ANDREW GOULD
CHRYSSA KOUVELIOTOU
TSVI PIRAN
GRZEGORZ POJMAŃSKI
GEORGE PRESTON
VIRGINIA TRIMBLE
ANDRZEJ UDALSKI

Conference Registration - Deadline 8.15.07 - www.astro.princeton.edu/paczynski
Contact - schaos@astro.princeton.edu

Imaging Data

- Isaac Newton Group (IAC80, INT, WHT):
- http://casu.ast.cam.ac.uk/casuadc/archives/ingarch/@@query.html
- Canadian Data Center (HST, Gemini, CFHT):
- http://www1.cadc-ccda.hia-iha.nrc-cnrc.gc.ca/cadc/
- Near Earth Asteroid Tracking
- http://skyview.gsfc.nasa.gov/skymorph/
- MACHO:
- http://wwwmacho.anu.edu.au/Data/MachoData.html

Other Photometric Data

- Tycho Epoch Photometry (morePhoto link):
- http://vizier.u-strasbg.fr/viz-bin/VizieR-3?-to=2&-meta=1u&-source=I%2F239%2Ftyc_main
- IPHAS:
- http://casu.ast.cam.ac.uk/surveys-projects/iphas
- MACHO:
- http://wwwmacho.anu.edu.au/Data/MachoData.html
- Northern Sky Variability Survey:
- http://skydot.lanl.gov/nsvs/nsvs.php

Final Words

- More images than epoch photometry available on web
- Simple queries can be performed using the supplied GUIs
- More detailed queries require SQL
- Check VizieR first!
- APASS coming soon, will be another datamining source
- Amazing what is already available on the Web
- NVO will be a big player for the big projects
- PanSTARRS, LSST, CSS, PTF will be important on the faint end
- Have fun!