Using the AAVSO International Database

A. Price 97th AAVSO Annual Meeting
October 16-19, Nantucket, MA
Vital Statistics

- Oldest obs: July 19, 1894 at 18:18 UT
- 77% visual, 23% CCD, .003% other
- MySQL 5.0.27
- 3.6 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

* Details in JAAVSOpapers in 1970’s (Hill) and 1980’s (Waager)
Going away soon...
Outgoing Data Pipeline

AID
(Observations & Observations_extra)

Online Data Download
- Download User Obs
- Modify User Obs <3 months old
- BlueGold

Light Curve Generator

Quick Look File

MyNewsFlash
The Near Future

Incoming

Occam

Outgoing

Harmonia

The Near Future

Incoming

Occam

Outgoing

Harmonia
Light curve generator

Arne sez “V is V is V....”
Quick Look (File)

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

<table>
<thead>
<tr>
<th>Name</th>
<th>JD</th>
<th>Calendar Date</th>
<th>Mag.</th>
<th>Band</th>
<th>Comment Codes</th>
<th>Observer</th>
<th>Comparison Star 1 (CName)</th>
<th>Comparison Star 2 (KName)</th>
<th>Chart(s)</th>
<th>Uncertainty</th>
<th>Transformed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS DEL 2454749.00774</td>
<td>OCT 09.5077</td>
<td>15.3</td>
<td>V</td>
<td></td>
<td></td>
<td>NLX</td>
<td>110</td>
<td></td>
<td>1034dyf</td>
<td>0.13</td>
<td>N</td>
<td>Limits of detection with t</td>
</tr>
<tr>
<td>SS DEL 2454746.655676</td>
<td>OCT 07.1557</td>
<td>15.214</td>
<td>V</td>
<td></td>
<td></td>
<td>SRIC</td>
<td>136</td>
<td></td>
<td>1034DMP</td>
<td>0.023</td>
<td>N</td>
<td></td>
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<td>OCT 07.1521</td>
<td>15.256</td>
<td>V</td>
<td></td>
<td></td>
<td>SRIC</td>
<td>136</td>
<td></td>
<td>1034DMP</td>
<td>0.026</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>SS DEL 2454746.648512</td>
<td>OCT 07.1485</td>
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<td>V</td>
<td></td>
<td></td>
<td>SRIC</td>
<td>136</td>
<td></td>
<td>1034DMP</td>
<td>0.028</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>SS DEL 2454745.1774</td>
<td>OCT 05.6774</td>
<td>15.57</td>
<td>V</td>
<td>BU</td>
<td></td>
<td>HMH</td>
<td>000-BCS-652</td>
<td>000-BCS-648</td>
<td>08010</td>
<td>0.02</td>
<td>N</td>
<td>Limits of detection with t</td>
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<tr>
<td>SS DEL 2454743.39028</td>
<td>OCT 03.8903</td>
<td>&lt;14.3</td>
<td>Vis.</td>
<td></td>
<td></td>
<td>ACO</td>
<td>145</td>
<td></td>
<td>AAVSO</td>
<td>N</td>
<td>chart questioned</td>
<td></td>
</tr>
<tr>
<td>SS DEL 2454739.29097</td>
<td>SEP 29.7910</td>
<td>15.913</td>
<td>V</td>
<td>BU</td>
<td></td>
<td>HMH</td>
<td>000-BCS-652</td>
<td>000-BCS-648</td>
<td>0801010</td>
<td>0.024</td>
<td>Y</td>
<td>limits of detection with t</td>
</tr>
<tr>
<td>SS DEL 2454738.3958</td>
<td>SEP 28.8958</td>
<td>10.8</td>
<td>Vis.</td>
<td></td>
<td></td>
<td>TST01</td>
<td>102-6</td>
<td></td>
<td>AAVSO 08010</td>
<td>N</td>
<td>beyond sequence</td>
<td></td>
</tr>
</tbody>
</table>

![SS Del Chart](http://www.aavso.org/irb/region/maps/red_map/)

![ss del Chart](http://www.aavso.org/irb/region/maps/red_map/)
Validation List

- AUID, Designation, “Name”, Aliases
- 44,146 stars & 1,499 aliases as of Oct. 14 at 5:39UT
- 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
Data Download

Name, designation or AUID

All, JD or mm/dd/yyyy

Danger, Will Robinson!

Beware rogue commas...

Recommended

NVO XML Format

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
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 (lZ)
- **CV**: Unfiltered with a V zeropoint Block
- **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
- Supervalidation

Help us!
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.

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.

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 Labbey
- PhasPlot by Labbey
- TS by Foster
- VStar* by Foster/HOA team
- Peranso*, commercial by Vanmunster
- Volunteers needed
Analysis Tutorials

Time-Series Analysis of Astronomical Data
by Dr. Matthew Templeton, AAVSO
(Copyright 2003, AAVSO. All rights reserved.)

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.

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

Our web site is full of them!
Grant Foster

"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 the 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 in the Fourier series.

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 Amateur Observations: 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.

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.

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 At with care, this method can provide useful information about variations with amplitudes between 0.2 and one magnitude, especially if used in conjunction with light curves, Fourier analysis, and autocorrel analysis.
Enjoy your data... everyone else is!

4,248 Online Data Requests
Who is downloading the data?

- Students: 31%
- Professionals: 26%
- Educators: 7%
- Amateurs: 30%
- Other: 6%

4,248 Online Data Requests
How is the data being used?

- Data Analysis: 60%
- Basic Analysis: 15%
- Science Project: 9%
- Correlate: 12%
- Observing Run: 2%
- Figure: 8%
- Education: 4%

2008
- M. Zhao, D. Gies, J.D. Monnier et al., 2008, First Resolved Images of the Eclectic Interacting Binary Beta Lyrae, Accepted by ApJL.
- A. Olech, M. Wisniewski, K. Zloczewski et al., 2008, Curious Variables Experience (CURVE). RZ LMi - the most active SU UMa star, accepted to Acta Astronomica.
- P. Pietrukowicz, J. Kaluzny, A. Schwarzenberg-Czerny et al., 2008, Cluster Age Experiment (CASE): Deficiency of observed dwarf novae in globular clusters, accepted to MNRAS.
fin