

VSS Workshop

Edinburgh

18th October 2008

Roger Pickard, Director BAA VSS
and
President, BAA

CCD Observing

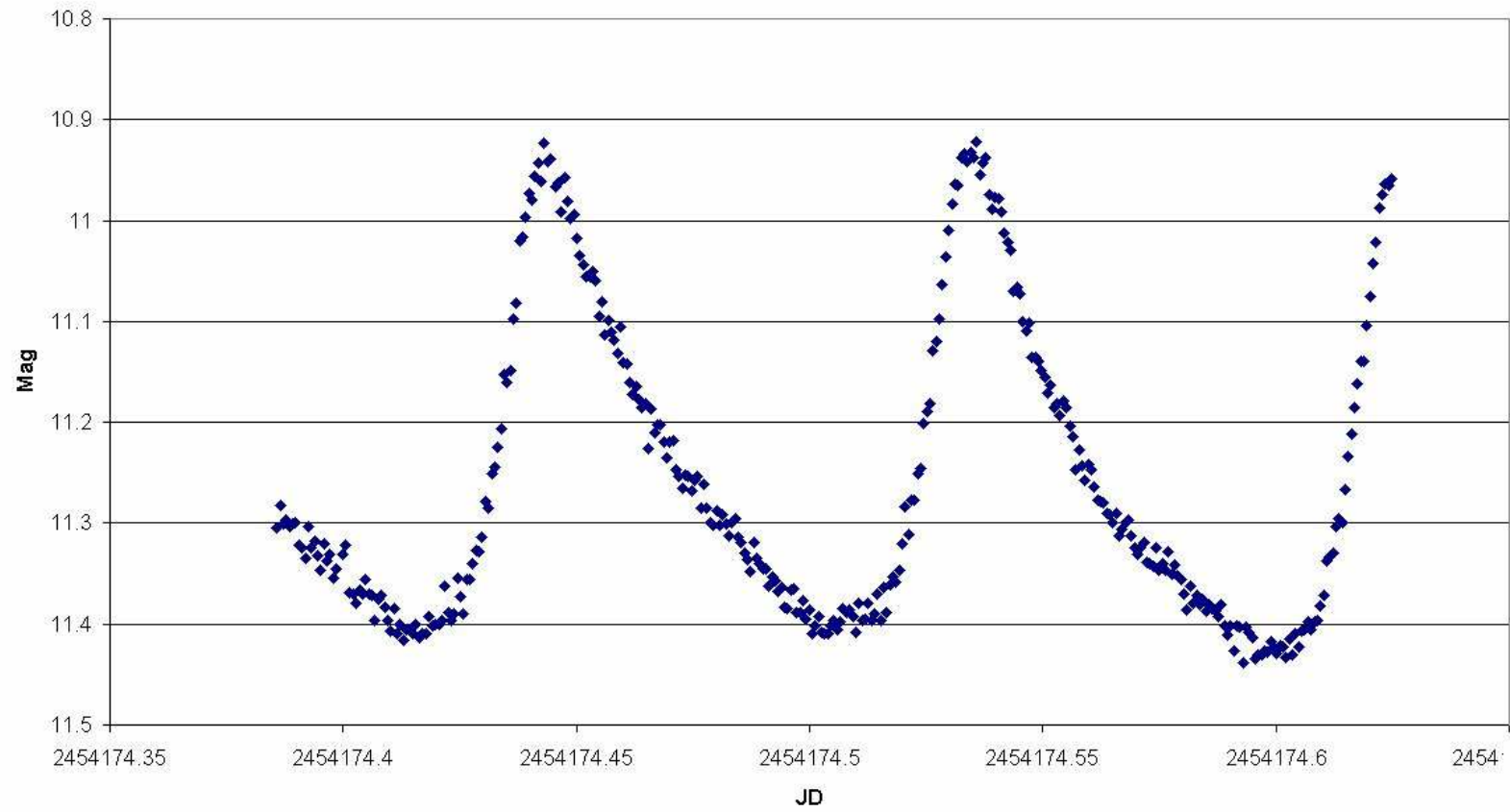
CCD Observing



CCD Observing

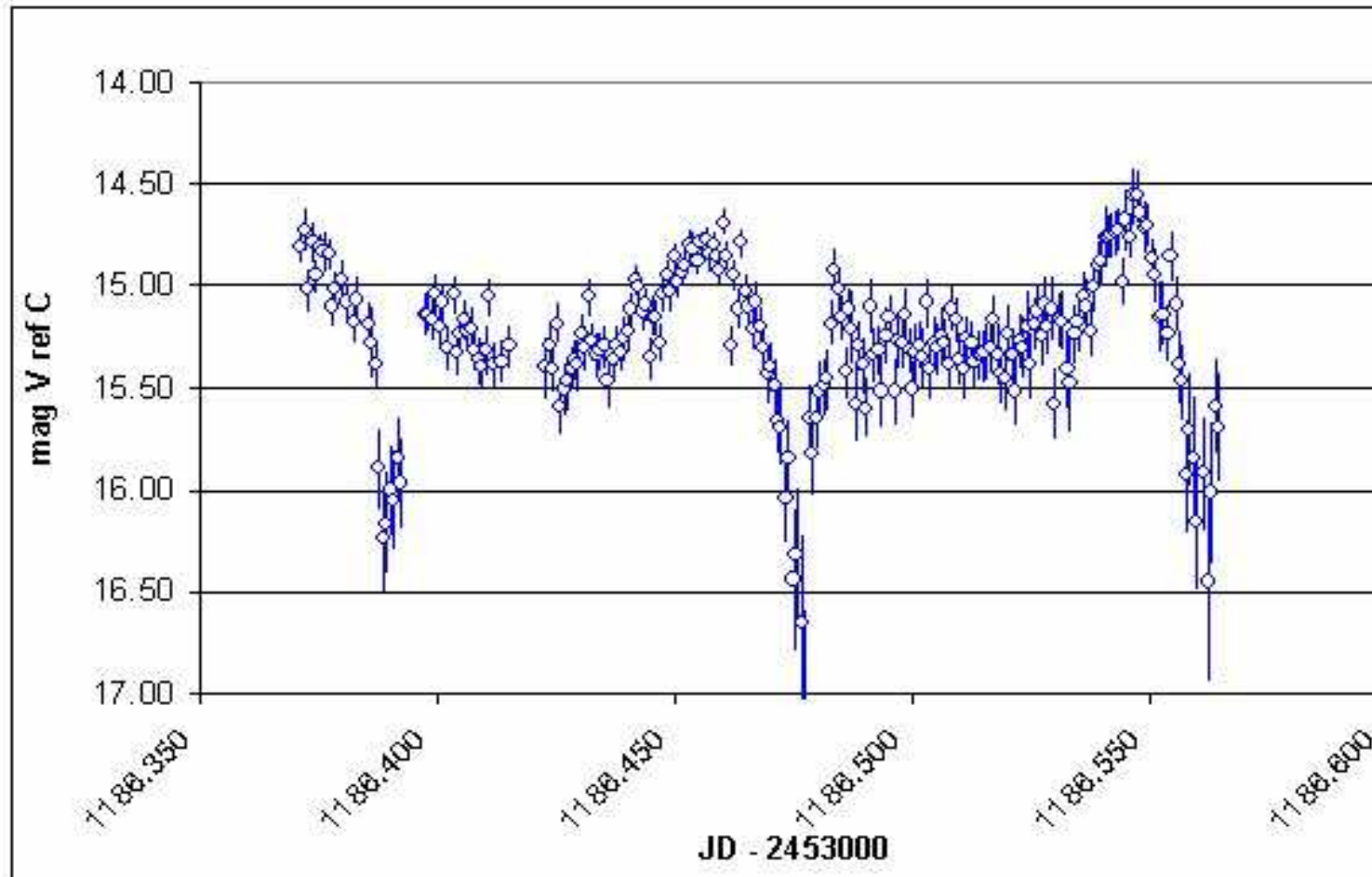


GSC 3832-0152 UMa (HADS)
2007 March 14/15



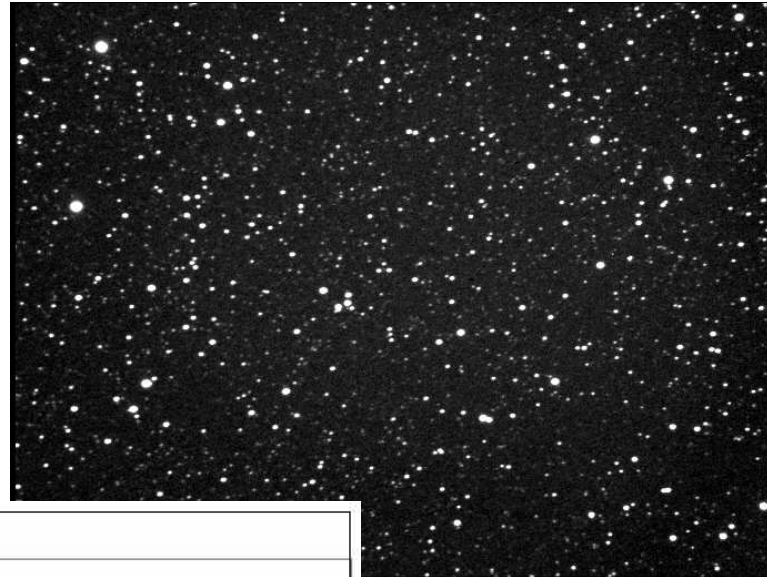
CCD Observing

DV UMa 070326

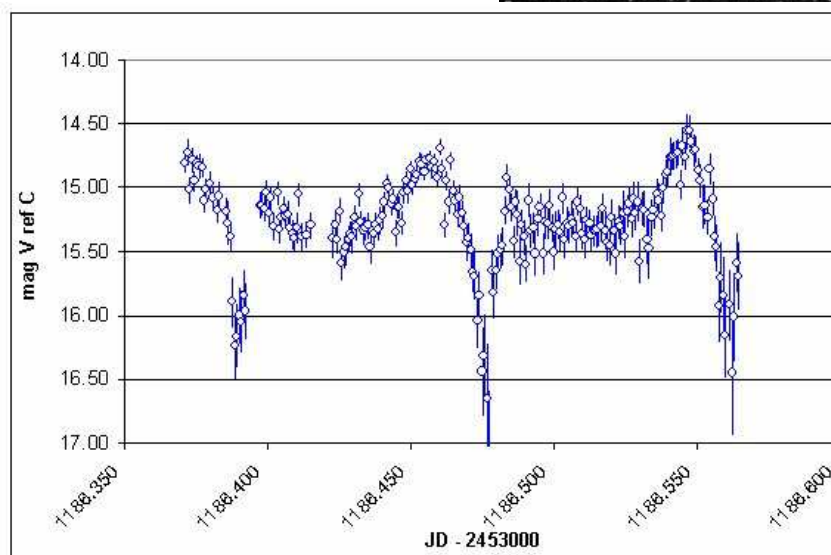


CCD Observing

But how do you get from -

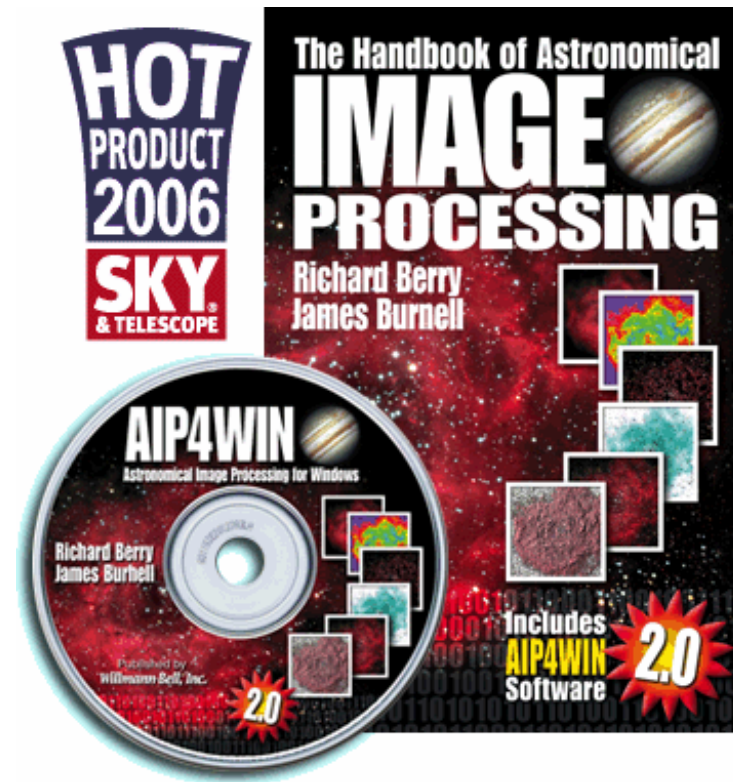


To -



CCD Observing

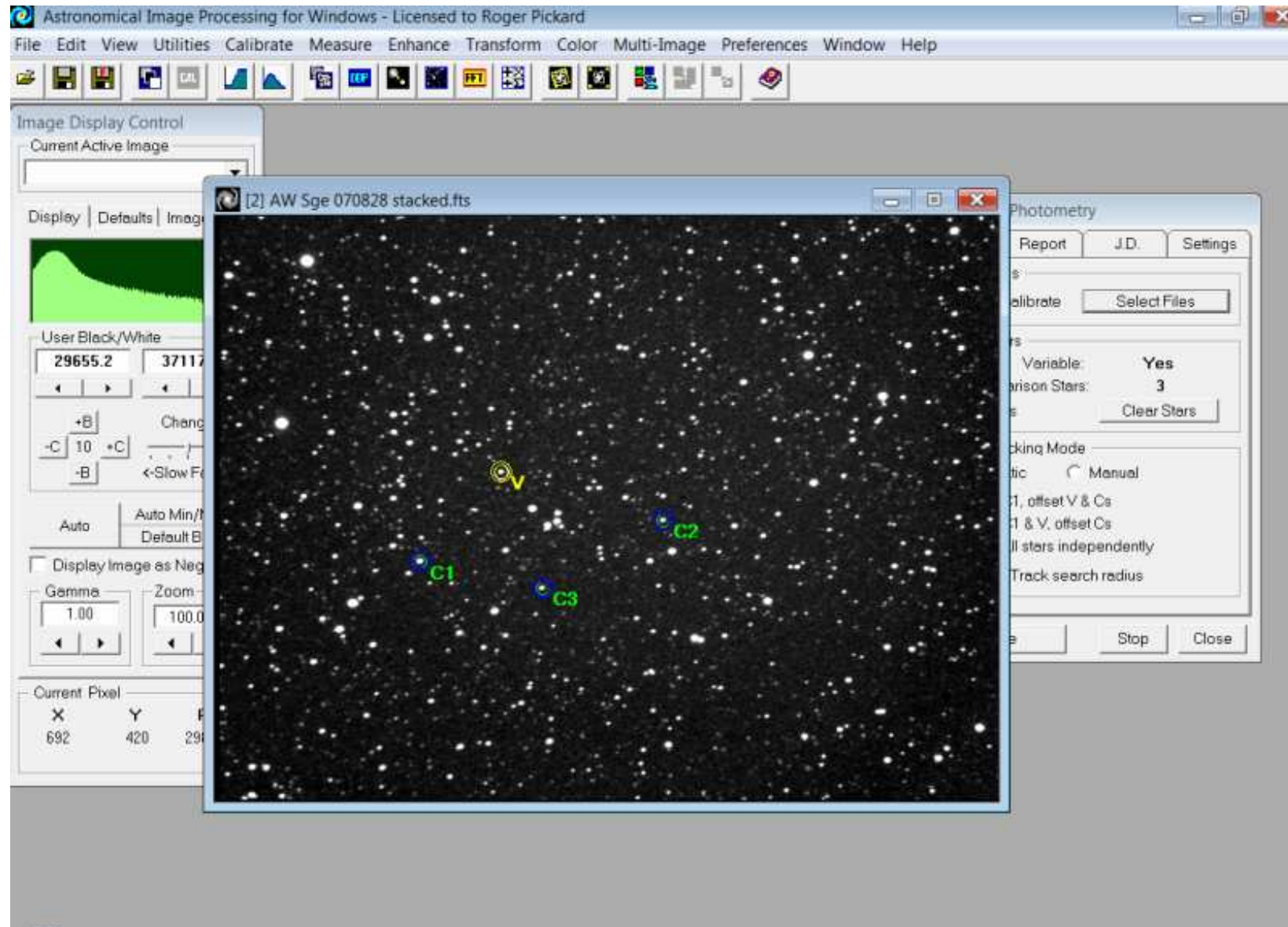
One example is AIP4WIN



The VS Section has developed an Excel program
Takes output from AIP4WIN
Does all the hard work for you

CCD Observing

AIP4WIN in use



CCD Observing

AIP4WIN in use – A small part of the output file

AIP4Win Multiple-Image Photometry Tool

Ensemble Photometry Report

AIP4Win Licensed to: Roger Pickard

AIP4Win v. 2.1.10

Folder containing files: C:\Astronomy\~Imaging\2007 SXV\08\AW Sge

Filename of first image: IMG3491.FIT

Number of files selected: 44

Star aperture radius: 5

Sky annulus inner radius: 7

Sky annulus outer radius: 10

Star aperture pixels: 77

Sky annulus pixels: 94

Default integration time: 60.0

First Mid-exposure Date: 2007-08-26

First Mid-exposure Time: 20:19:11.000

CCD Observing

The VSS Excel file – opening page

Microsoft Excel - AW Sge 070826.xls

File Edit View Insert Format Tools Data Window Help

Arial 10

G19

Select Photometry Import File

Directory: C:\Astronomy\Imaging\2007 SXV\08\26\AW Sge

File name: AW Sge 070826.txt

Type: AIP4Win v2 - Ensemble Photometry

Select Export Directory

Export directory: C:\Astronomy\Imaging\2007 SXV\08\26\AW Sge

BAA VSS report file name: AW Sge 070826 BAAVSS

AAVSO report file name: AW Sge 070826 AAVSO

Select Equipment/Object Settings File or Old Version of Spreadsheet

Directory:

File name: Optional

Import Photometry File

Create BAA VSS Report File

Create AAVSO Report File

Load Equipment/Object Settings

Save Equipment/Object Settings

Instructions

Files must be processed using AIP4Winv2 'Ensemble Photometry', with Tab as the 'Column Separation Character' and the file must be saved with a .txt extension. (See below screen print of AIP4WinV2 settings)

Use the Select buttons to pick the files and directories. The Select buttons do not work in some older versions of Excel, in which case the file names and paths must be typed/copied into the above boxes. The path must include the drive letter. Eg C:\My Documents

Buttons ObsvEqmt Results Calculation Data charts BAAVSS AAVSO Image Data Version Log

Ready

CCD Observing

The VSS Excel file – results page

Microsoft Excel - AW Sge 070826.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10

F16

Observation Summary		Red - Required, Blue - Optional, Green - Calculated/Automated					
Chart	Guide8 + Henden	Star Aperture	5.0				
Filter	V	Sky Annulus Inner Radius	7.0	Observations per Block Average	5	Red Warn Max Calc - Q	
Photometry Time Stamp	Middle Exposure	Sky Annulus Outer Radius	10.0	Julian Date Offset	2453000		
Timing Error	5.00					Regenerate Data sheet and	

Star Data & Summary Calculations (Individual Variable Measurements to Right)

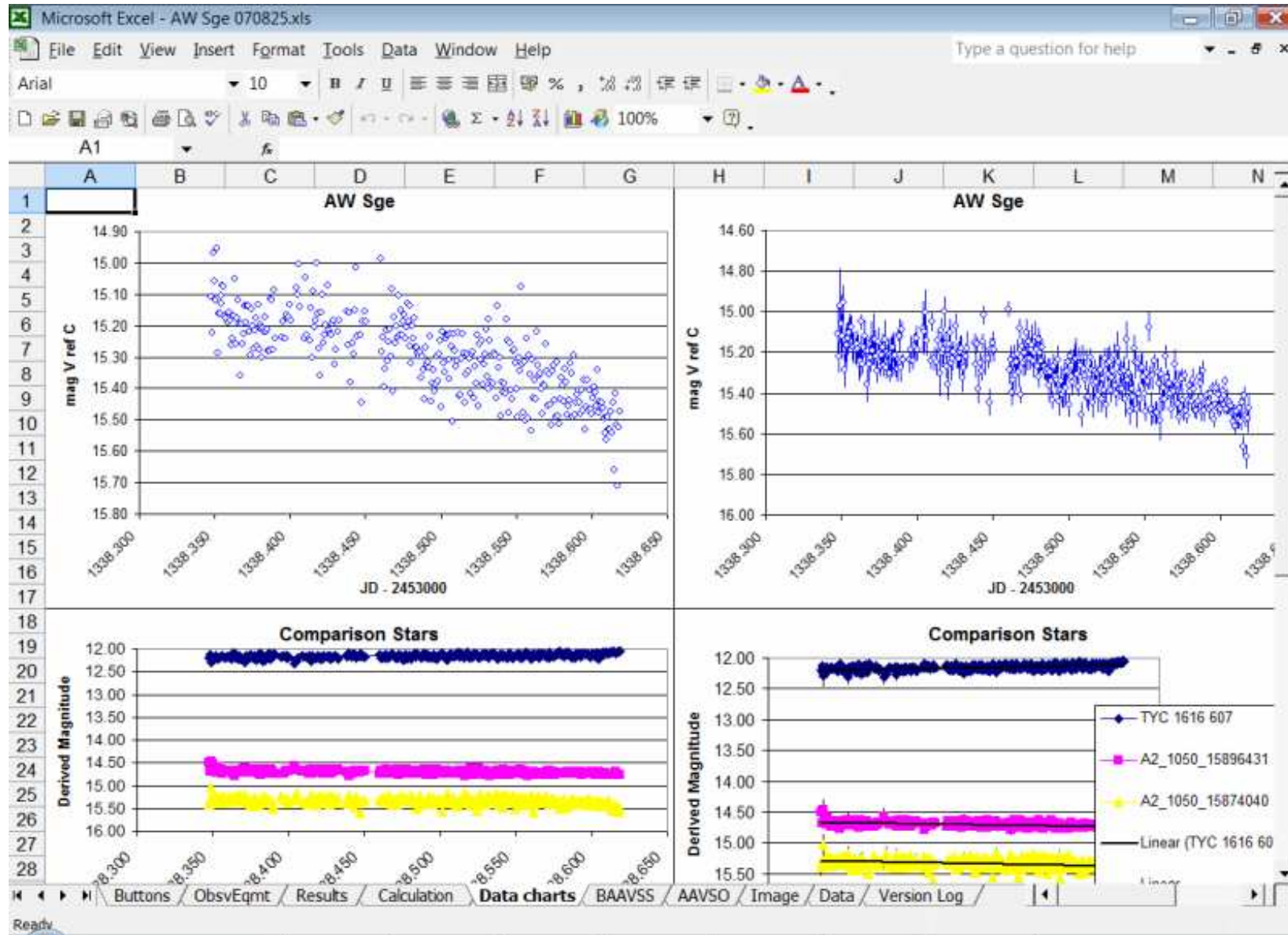
	User Input				Results				Date	
Type	Star Designation	AIP4WIN	Include in Analysis	Reference Magnitude	Error	Average Magnitude	Average Error	Std Dev	Average Weight	Calc Diff
Variable	AW Sge	Var				16.240	0.140	0.230		
Comparison	TYC 1616 607	C1	Yes	12.100	0.028	12.101	0.032	0.036	0.535	
Comparison	A2_1050_15896431	C2	Yes	14.600	0.018	14.599	0.045	0.053	0.353	
Comparison	A2_1050_15874040	C3	Yes	15.250	0.030	15.261	0.065	0.103	0.112	
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Buttons / ObsvEqmt / Results / Calculation / Data charts / BAAVSS / AAVSO / Image / Data / Version Log /

Ready

CCD Observing

The VSS Excel file – data charts page



CCD Observing

Filters!

CCD allows much smaller magnitude variations to be detected than by NE

If you use **Photometric** filters CCD also allows much more information to be obtained from your data.

Photometric systems

- A **Photometric system** is a set of well-defined passbands.
- The first known standardized photometric system is the Johnson-Morgan or [UBV photometric system](#) (1953). At present, there are more than 200 photometric systems!
- Photometric systems are usually characterized according to the widths of their passbands:
- broadband (passbands wider than 30 nm (the most widely used is Johnson-Morgan [UBV system](#))),
- intermediate band (passbands widths between 10 and 30 nm),
- narrow band (passbands widths less than 10 nm).

CCD Observing

Color Indices

Color index is defined by taking the difference in magnitudes at two different wavelengths.

Using the U, B, V colour filters, there are three independent possible such differences.

The B-V colour index is defined by taking the difference between the magnitudes in the blue and visual regions of the spectrum;

The U-B colour index is that between the ultra-violet and blue regions.

CCD Observing

Color Index Examples

Spica has apparent magnitudes $U = -0.24$, $B = 0.7$, and $V = 0.9$

The corresponding color indices are:-

$$B - V = 0.7 - 0.9 = - 0.2$$

$$U - B = -0.24 - 0.7 = - 0.94$$

Generally, negative values indicate that a star is hot (most radiation coming at shorter wavelengths).

Antares $B = 2.7$ and $V=0.9$, and the $B - V$ color index is

$$B - V = 2.7 - 0.9 = 1.8$$

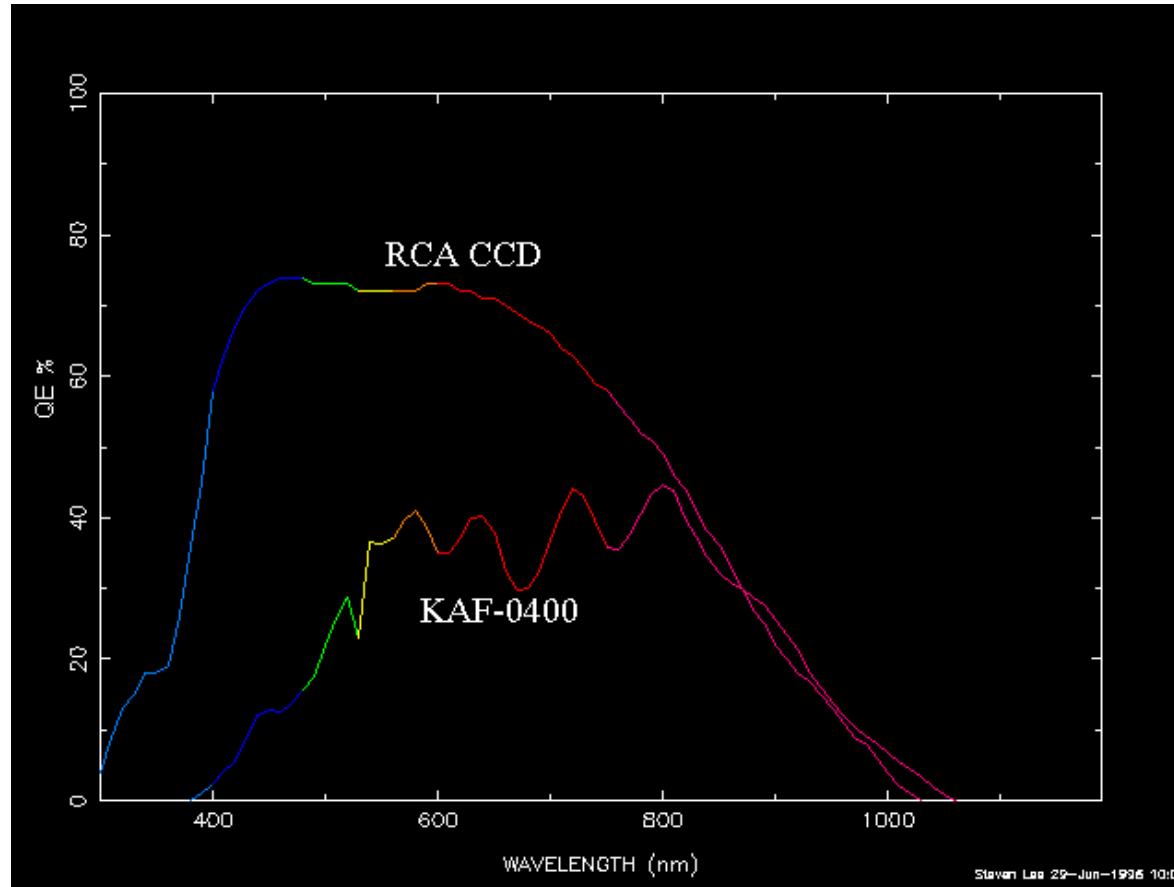
The positive value of $B - V$ in this case is an indication that Antares is a cool star, with most of its radiation coming at longer wavelengths.

CCD Observing

Table of example B - V and U - B mags

Star	Type	B-V	U-B
Y CVn	N	2.54	6.62
μ Cep	M	2.26	2.45
α Ori (Betelgeuse)	M	1.89	2.07
α Tau (Aldebaran)	K	1.54	1.92
α 1 Cen	G	0.71	0.33
α CMi (Procyon)	F	0.42	0.03
40 Eri B	DA	0.04	-0.68
α CMa (Sirius)	A	0.00	-0.04
α Eri (Achernar)	B	-0.16	-0.66
ζ Pup	O	-0.27	-1.09

CCD Observing



Note: Unfiltered CCDs are usually red sensitive and so see red stars much brighter than visual observers do.

CCD Observing

Easy

AD And
OO Aql
AC Boo
EG Cep
TZ Lyr
ER Ori

Basic

V452 Cas
GO Com
KV Dra
V478 Her
DV Dra
HR Lyr
V1363 Cyg
V1316 Cyg
TY Vul
V630 Cas

Time series

SV CMi
ES Dra
HR Lyr
CG Dra
V1363 Cyg

CCD Observing

Basic CCD Data – observe once per night reporting any changes

Star	RA (2000)	Dec (2000)	Type	Range
V452 Cas	00 52 19	+53 52	UGSU	14-17.5
GO Com	12 56 37	+26 37	UGSU	13.1-18.5V
KV Dra	15 50 38	+64 03	UGSU	13.4-17.7V
V478 Her	17 21 05	+23 39	UGSU	15.5-17.1p
DV Dra	18 17 25	+50 48	UGSU/UGWZ	15.0-<21p
HR Lyr	18 53 25	+29 14	N (or NR)	6.5-15.8v
V1363 Cyg	20 06 12	+33 43	?	13.0-<17.6p
V1316 Cyg	20 12 13	+42 45	UGSU	14.5 – 17.8C
TY Vul	20 41 44	+25 35	UG	14.0-19.0p
V630 Cas	23 48 53	+51 28	UG	12.3-17.1p

CCD Observing

Time resolved photometry – observe one star all night long, if possible.

Star	RA (2000)	Dec (2000)	Type	Range
SV CMi	07 31 08	+05 59	UGZ	12.6-17.1V
ES Dra	15 25 32	+62 01	UGSU?	13.9-16.3p
HR Lyr	18 53 25	+29 14	N (or NR)	6.5-15.8v
CG Dra	19 07 33	+52 58	UG	15.0-17.5p
V1363 Cyg	20 06 12	+33 43	?	13.0-<17.6p

Easy – instant results (well, a couple of hours)

Star	RA -2000	Dec -2000	Type	Max	Min I	Min II	Orbital Period	Comp V mag	Comp GSC
AD And	23 36.7	+48 40	EB	10.9	11.6	11.6	0.99 d	10.93	3641 0339
OO Aql	11.19.8	+09 18	EW	9.2	9.9	9.8	0.51 d	10.25	1058 409
AC Boo	14 56.5	+46 22	EW	10	10.6	10.6	0.35 d	9.39	3474 966
EG Cep	20 16.0	+76 49	EB	9.3	10.2	9.6	0.54 d	9.6	4585 413
TZ Lyr	18 15.8	+41 07	EB	10.6	11.3	10.8	0.53 d	10.06	3107 2554
ER Ori	05 11.2	-08 33	EW	9.3	10	10	0.42 d	9.25	5330 364

SUMMARY

- CCD observations are easy to make.
- Reducing the observations is made easier by the use of the VSS Excel spreadsheet.
- Filtered observations are something to work up to – if you wish.
- Professionals need your observations

Thank You