

# *Danie Overbeek Memorial Lecture*

## **Contributions of South African Amateur Astronomers to Variable Star Research**

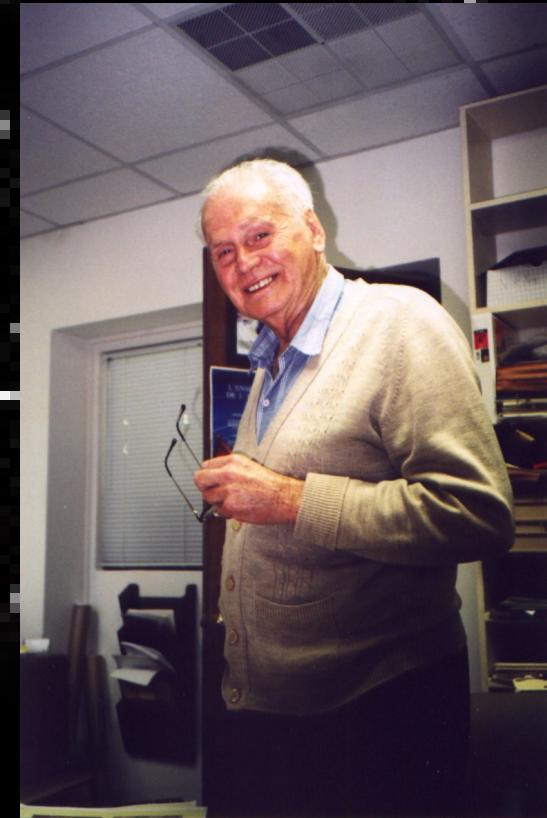
Janet Akyüz Mattei

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(AAVSO)

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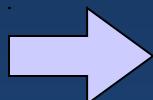
[www.aavso.org](http://www.aavso.org)



*Danie Overbeek at  
AAVSO Headquarters*

Presented at the Fifth Symposium of the Astronomical Society of South Africa (ASSA), November 29, 2002

# Associations Contributing Variable Star Observations to the AAVSO



- Agrupacion Astronomica de Sabadell (Spain)
- Asociacion de Variabilistas de Espana (Spain)
- Association of Variable Star Observers "Pleione" (Russia)
- Association Francaise des Observateurs d'Étoiles Variables (France)
- Astronomical Society of Southern Africa, Variable Star Section
- Astronomischer Jugendclub (Austria)
- Astronomisk Selskab (Scandinavia)
- Brazilian Observational Network REA
- British Astronomical Association, Variable Star Section
- Bundesdeutsche Arbeitsgemeinschaft für Veränderliche Sterne e.V. (BAV)  
(Germany)
- Grupo Astronomico Silos (Zaragoza, Spain)
- Israeli Astronomical Association, Variable Star Section
- Liga Ibero-Americana de Astronomia (South America)
- Madrid Astronomical Association M1 (Spain)
- Magyar Csillagászati Egyesület, Valtozócsillag Szakcsoport (Hungary)
- Nederlandse Vereniging Voor Weer-en Sterrenkunde, Werkgroep  
Veranderlijke Sterren (Netherlands)
- Norwegian Astronomical Society, Variable Star Section
- Red de Observadores (Montevideo, Uruguay)
- Royal Astronomical Society of Canada
- Royal Astronomical Society of New Zealand, Variable Star Section
- Sociedad Astronomica 'Syrma' (Valladolid, Spain)
- Svensk Amator Astronomisk Förening, variabelsektionen (Sweden)
- Ukraine Astronomical Group, Variable Star Section
- Unione Astrofili Italiani (Italy)
- URSA Astronomical Association, Variable Star Section (Finland)
- Variable Star Observers League in Japan
- Vereniging Voor Sterrenkunde, Werkgroep Veranderlijke Sterren (Belgium)

# South African Variable Star Observers in the AAVSO International Database (1915-2002)

AF	ARCHER, SIMON	CAPE TOWN	1952	1956	717	KOP	KOPINSKY, MERVYN	JOHANNESBURG	1977	1978	37
BPY	BAILLEY, PAUL	GRAHAMSTOWN	1995	1995	1	KRN	KRIEK, NICO	BRITSTOWN	1991	1995	311
BAY	BARSBY, JOHN	JOHANNESBURG	1977	1977	64	KM	KRUMM, HAROLD E.	CAPETOWN	1943	1948	476
BAF	BATEMAN, F.	JOHANNESBURG	1975	1976	103	LEE	LEE, P.		1988	1988	16
B7	BEEVOR, MISS J.	TRANSVAAL	1954	1954	2	LTE	LLOYD EVANS, TOM	SAAO	1999	1999	87
BNJ	BENNETT, JOHN	PRETORIA	1977	1977	2	LKN	LOBB, KEVIN ALAN		1993	1993	3
BLD	BLANE, DAVID L.	HENLEY-ON-KLIP	1978	1998	4748	LOA	LONG, ARTHUR W.	ROSEBANK	1917	1927	3500
BOJ	BODENSTEIN, J. J.	PETIT	1981	1981	31	LHU	LUND, HUGH	JOHANNESBURG	1995	1999	413
BPT	BOSMAN, PETER		2002	2002	0	MAF	MARSHALL, G. R.	JOHANNESBURG	1975	1980	235
BJH	BOTHAM, JOHN H.	JOHANNESBURG	1953	1954	456	MCX	MCCRAE, ANDREW R.		1986	2001	460
BBY	BURDIS, BARRY	GRAHAMSTOWN	1995	1995	1	MPY	MEYERS, PAUL	CAPETOWN	1983	1989	940
BKT	BURDIS, KEITH	GRAHAMSTOWN	1995	1995	1	MLF	MONARD, LIBERT A.G. (BERTO) PRETORIA		1992	2001	27483
CJA	CAMPOS, JOSE ALBERTO S.		1976	1994	2259	MMP	MOSTERT, J.P.L. (MOSSIE)	NIEKERKSHOOP	2001	2001	20
C17	CHURMS, J.	JOHANNESBURG	1953	1953	30	MLQ	MUNTON, LYNNIE K.	GRAHAMSTOWN	1995	1995	2
CJC	COOK, J. C.		1987	1987	5	NKE	NAYLOR, KIRSTEN		1992	1992	3
COM	COOPER, TIM	KEMPTON PARK	1976	2001	15347	NXO	NOCANDA, XOLANI	GRAHAMSTOWN	1995	1995	1
CSH	COUSINS, A. H.	DURBAN	1922	1924	63	OB	OVERBEEK, M. DANIEL	EDENVALE	1952	2001	287150
CS	COUSINS, A. W. J.	DURBAN	1937	1947	9130	PDB	PARASKEVOPOULOS, JOHN S.	BLOEMFONTEIN	1922	1923	548
CSC	COUSINS, C. A.	DURBAN	1924	1924	34	PA	PARASKEVOPOULOS, JOHN	BLOEMFONTEIN	1922	1943	664
CRA	CRAMB, MRS. PETA	DURBAN	1977	1977	14	PAX	PAXTON, G.		1975	1976	104
CDJ	CRONJE, D. L.	STELLENBOSCH	1985	1985	14	PLZ	PAZZI, LUIGI		1981	1991	2487
DMX	DATT, MICHAEL	GRAHAMSTOWN	1995	1995	1	PHC	PIETERS, H. CORNELIA		1994	1994	14
DK	DE KOCK, REGINALD P.	OBSERV.	1934	1973	160777	PJP	PLOMP, JAN		2001	2001	30
DVI	DE VILLIERS, FANIE (S.N.)	CAPETOWN	1992	2001	1081	PMO	POLL, MICHAEL		2001	2001	32
DVN	DE VILLIERS, W. JOHAN (DVI's son)		2000	2000	35	PNL	POTGIETER, NEIL	GRAHAMSTOWN	1997	1999	1
DBE	DEBEER, GERRIT		1991	1992	73	PRG	PROSSER, GEOFF		1977	1986	1076
DVC	DEVILLIERS, CHRIS	VANRHYNSDORP	1998	1999	115	RMT	RITCHIE, MIKE		1995	1995	1
DWR	DOUGLAS, W. R.	PINELANDS	1979	1979	15	RNB	ROBINSON, NEVILLE B.	PRETORIA N.	1992	1995	712
DMW	DOWDESWELL, MARK ROBERT	RUSTENBURG	2002	2002	0	SIR	SCHILLER, D.		1987	1988	30
DHE	DOYLE, HEATHER	WELKOM	2000	2000	1	SCP	SCULLY, P.	VANDERBYL PK.	1979	1982	70
DAG	DREDGE, A.		1981	1988	722	SPF	SHILLINGTON, P.H. & F.A.	GRAHAMSTOWN	1963	1963	34
DRN	DREYER, N. J. G.		1993	1994	8	SKQ	SKJELLERUP, J. F.	CAPETOWN	1915	1948	6733
DPT	DU PLOOY, THINUS	GARSFONTEIN	2001	2001	0	SAE	SLOTEGRAAF, AUKE	STELLENBOSCH	1983	1983	38
DTH	DU TOIT, HENRICH		1994	1994	19	SJX	SMIT, JAN A.	PRETORIA	1987	2001	15289
EKP	ENGELBRECHT, KEVIN P.	KROONDAL	1978	1978	11	SMW	SMITH, W. H.	PLUMSTEAD	1924	1931	4785
EN	ENSOR, G. E.	PRETORIA	1926	1940	14952	SMP	SMITS, PETER	PINELAND	1953	1960	893
FIR	FIELD, RAY K. <ex FIE>	BELLAIR	1975	1977	157	SKC	SMYTHE, KERI ANN	CAPETOWN	1994	1994	1
FGA	FOURIE, G. A.		1993	1993	2	SOS	SOS, ROBERT		1976	1976	16
FBN	FRASER, BRIAN	KENSINGTON	1985	2000	947	SKF	STAKESBY-LEWIS, JENNIFER	GRAHAMSTOWN	1994	1994	1
FJX	FRASER, J.		1987	1987	8	SDT	STRYDOM, D.	JOHANNESBURG	1976	1979	68
GMJ	GEYSER, M.		1987	1992	189	TRJ	THOMSON, ROBERT	JOHANNESBURG	1981	1987	417
GJM	GREAVES, JAMES D.	GRAHAMSTOWN	1994	1994	1	TUC	TURK, CLIFFORD		1974	2001	1523
GDJ	GRIFFITH, D. J.	E. LONDON	1980	1980	14	VAW	VAN ASWEGEN, DANIEL H.	REITZ	1994	1995	8
HKT	HARRISON, KEITH		1995	1995	1	VZ	VAN ZYL, L. L.	BOKSBURG	1959	1962	3036
HJN	HERS, JAN	SEDGEFIELD	1977	2001	14264	VZP	VAN ZYL, PHILIP P.	REITZ	1994	1994	3
HUU	HERTLING, URSULA		1997	1999	2	VBP	VANBLOMMESTEIN, PETER		1991	1994	7
HDD	HOUDARD, G.	FRENCH ARMY	1917	1919	274	VDN	VANDERNEUT, C. A.	PRETORIA	1966	1967	8
HT	HOUGHTON, H. E.	CAPETOWN	1926	1942	25589	VR	VENTER, S. C.	PRETORIA	1948	1964	7786
JKM	JACKSON, MERLIN G.	MERRIVALE	1978	1980	2895	WKD	WAKEFIELD, N.		1987	1987	36
JEN	JENKINS, CHARLES	VEREENIGING	1972	1975	1080	WBL	WALWYN, BELINDA	GRAHAMSTOWN	1997	1999	1
JRW	JONES, RAYMOND W.	CAPETOWN	1989	2001	17602	WF	WATERFIELD, WILLIAM	BLOEMFONTEIN	1921	1929	8519
JJE	JOOSTE, JEROME	MELVILLE	2001	2001	0	WPT	WEDEPOHL, PETER	SOMERSET W.	1999	2001	808
JJL	JOOSTE, JOHANNES L.	REITZ OFS	1987	1997	228	WEG	WILLIAMS, E. G.	PRETORIA	1938	1940	540
KBY	KILIAN, BRYAN	GRAHAMSTOWN	1994	1994	1	YNV	YOUNG, NEVILLE	LYTTELTON	1999	1999	2
KLI	KINGHORN, LIESL		1995	1995	3						
KF	KIRCHHOFF, PETER	JOHANNESBURG	1947	1952	2551						
KPD	KLEINSMITH, PIETER DANIEL		1994	1994	2						

# **South African Observers in the AAVSO**

## **1915-2002**

**111 OBSERVERS**

**TOTAL OBSERVATIONS = 654,100**

# AAVSO

## *Observers...*

Fiscal 2000-2001 (received 10/2000-9/2001)

		#Obs	#IS
COM	Tim Cooper	533	8
DVI	Fanie DeVilliers	25	PEP
HJN	Jan Hers	297	17
JRW	Win Jones	526	PEP
MLF	Berto Monard	4,620	2,995
MMP	J. (Mossie) Mostert	20	
OB	Danie Overbeek	1,629	1
PJP	Jan Plomp	30	
PMO	Michael Poll	32	
SJX	Jan Smit	1,626	
TUC	Cliff Turk	92	
WPT	Peter Wedepohl	318	

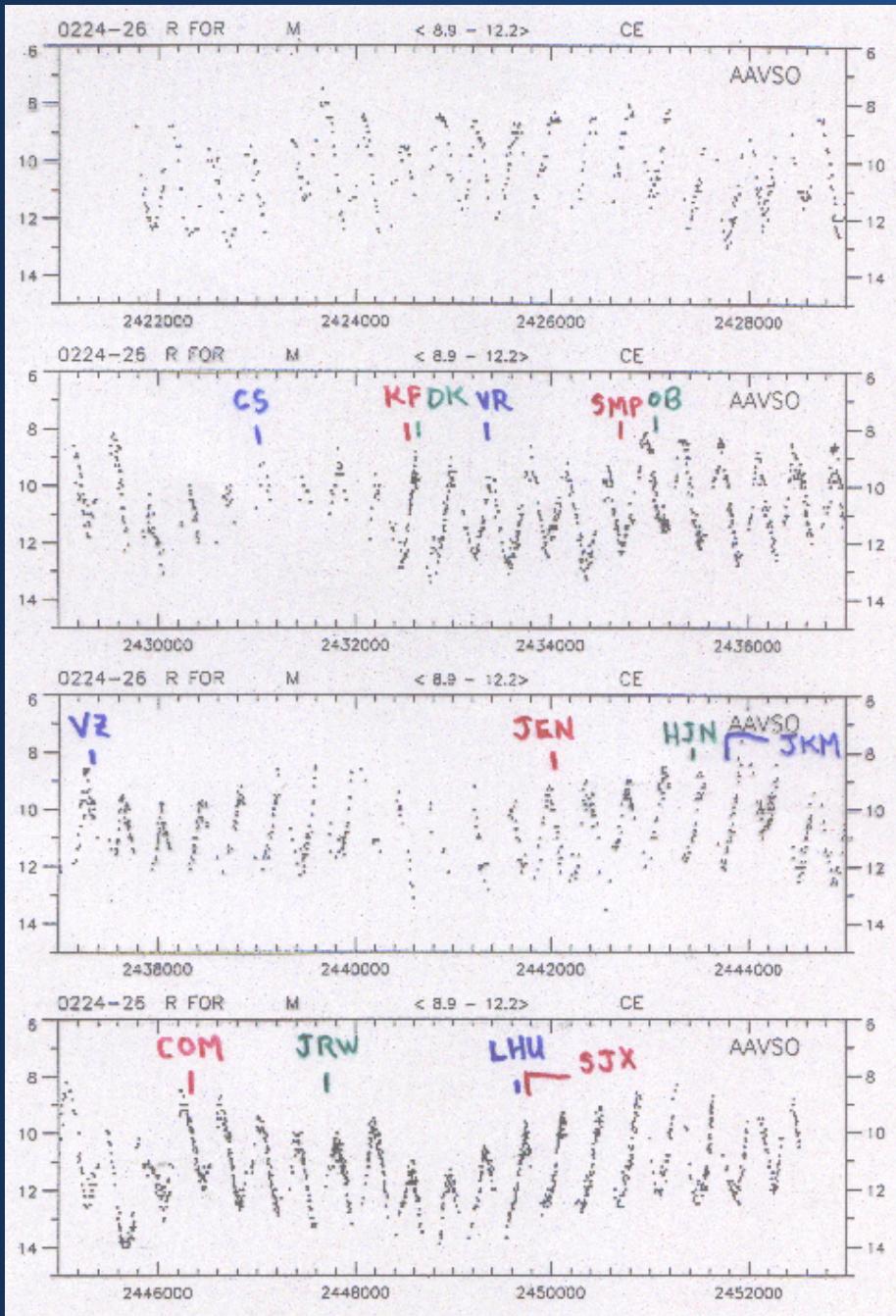
*Totals* 12 observers 9,748 observations 3,021 inner sanctums

Fiscal 2001-2002 (received 10/2001-9/2002)

COM	Tim Cooper	109	10	
DVI	Fanie DeVilliers	20	PEP	
DMW	Mark Dowdeswell	32		
HJN	Jan Hers	166	30	
JRW	Win Jones	633	PEP	
LHU	Hugh Lund	38	11	CCD
MLF	Berto Monard	1,997	1,139	
MMP	J. (Mossie) Mostert	21		
PJP	Jan Plomp	85		
PMO	Michael Poll	115		
SJX	Jan Smit	1,615		
TUC	Cliff Turk	94		
WPT	Peter Wedepohl	385		

*Totals* 13 observers 5,310 observations 1,190 inner sanctums

*in South Africa*



Contributions of South African observers as seen through the light curve for R For. The start date for each observer is shown.

**COM** = Cooper, T.

**CS** = Cousins, A.W.J.

**DK** = de Kock, R.

**HJN** = Hers, J.

**JEN** = Jenkins, C.

**JKM** = Jackson, M.

**JRW** = Jones, R.

**KF** = Kirchhoff, P.

**LHU** = Lund, H.

**OB** = Overbeek, D.

**SJX** = Smit, J.

**SMP** = Smits, P.

**VR** = Venter, S.C.

**VZ** = Van Zyl, L.

Royal Observatory  
Observatory Cape  
3/12/51

JAN 4

Jan 31 1952

1952

Dear Mrs Mayall

I enclose my list  
for November as you will notice the observations  
are rather scattered, the reason being the  
weather which has been rather bad.

You may be receiving some observations from  
Mr Overbeek of Lemiston Transvaal.  
Like all beginners he seems very keen.  
Thank you for your card and congratulations  
which I have just received. I hope  
Ternald's relaps from grace is just  
temporary, and once he has settled down  
he will go back to his old form.

Kind regards

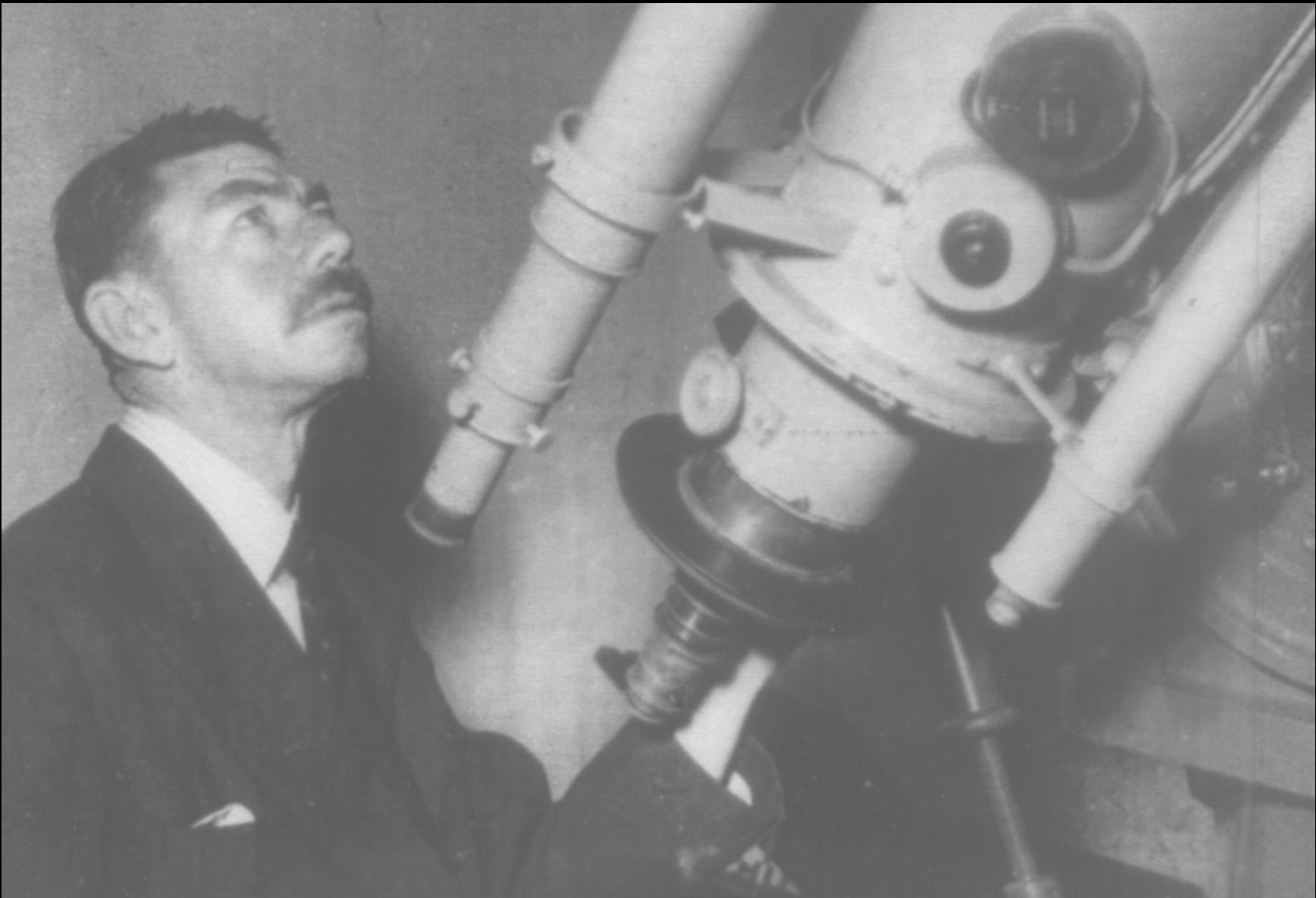
yours sincerely

R.P. de Kock

1951 letter to the then AAVSO  
Director, Margaret Mayall,  
from Reginald de Kock

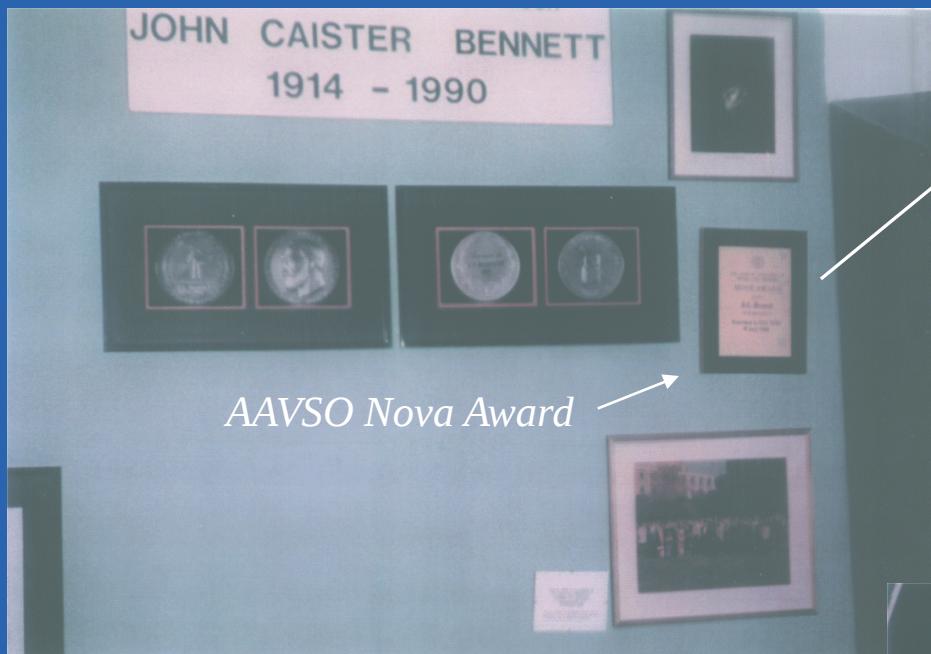
“You may be  
receiving some  
observations  
from Mr.  
Overbeek...

Like all  
beginners he  
seems to be  
very keen.”



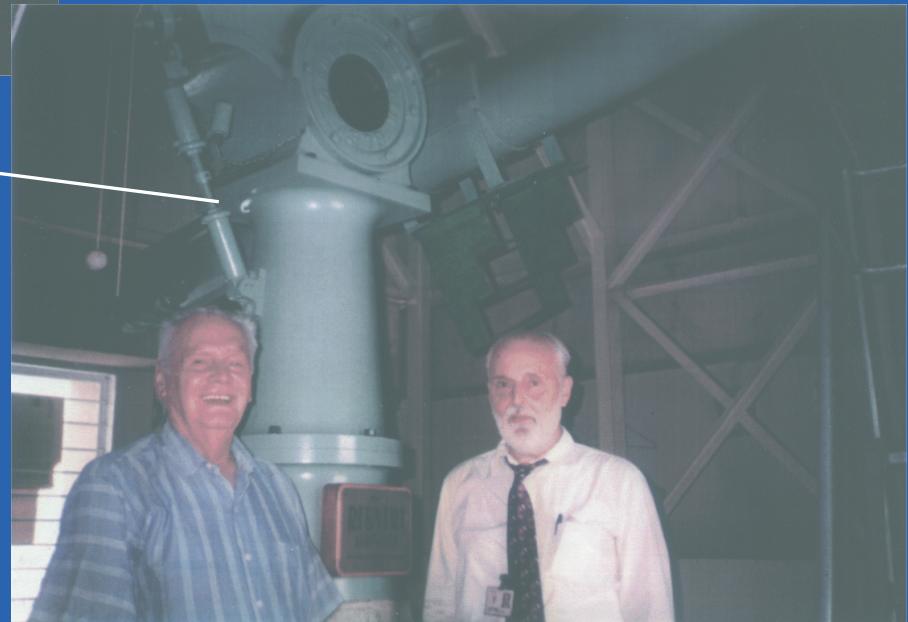
Reginald de Kock, mentor to Danie Overbeek

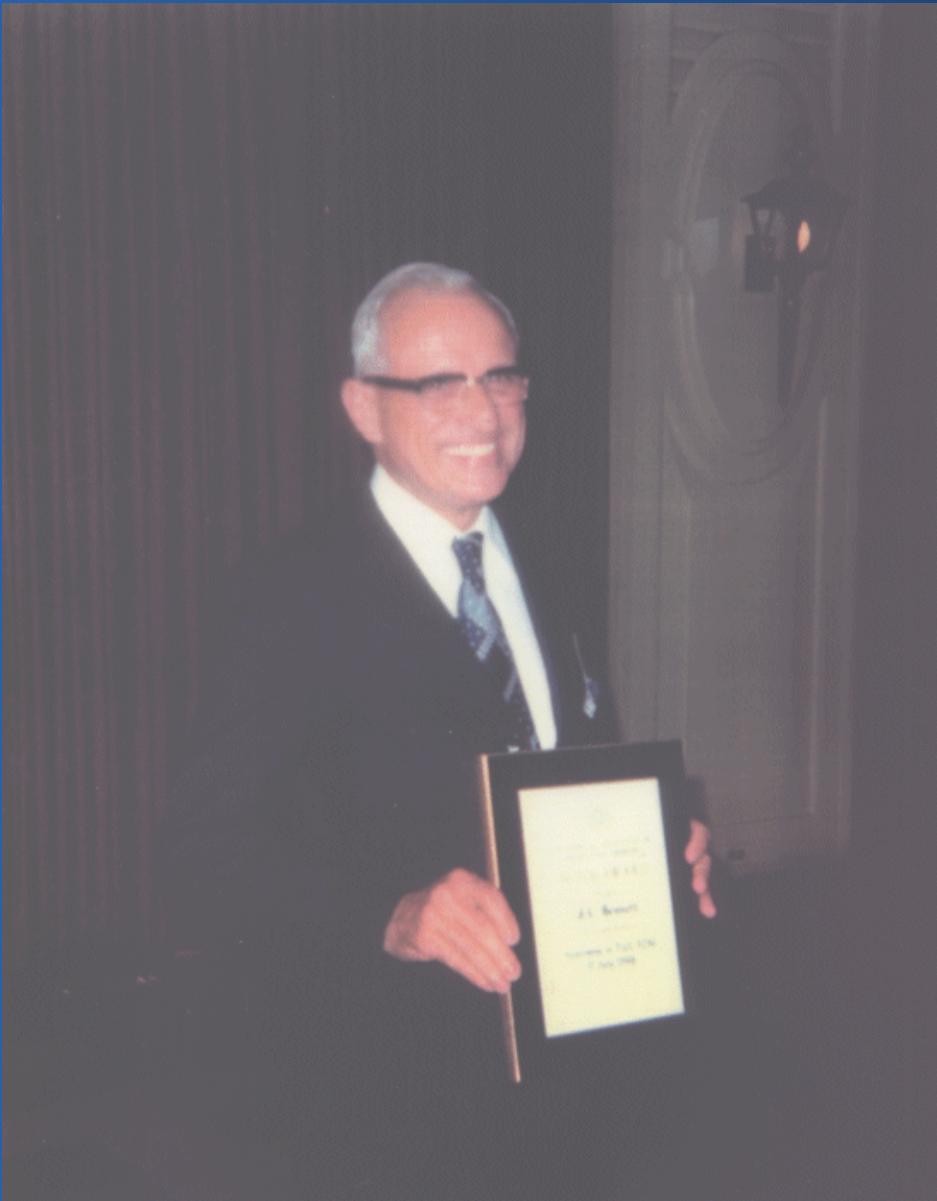
# At the University of South Africa (UNISA)



A corner at the UNISA, dedicated to John Bennett. Along with other memorabilia, mounted on this wall is Bennett's AAVSO Nova Award.

Memorable 9" refractor once housed at the Johannesburg Observatory. In 1951, at the pier of this telescope active variable star observer and sculptor, Peter Kirchhoff, encouraged Danie to go after variable stars.

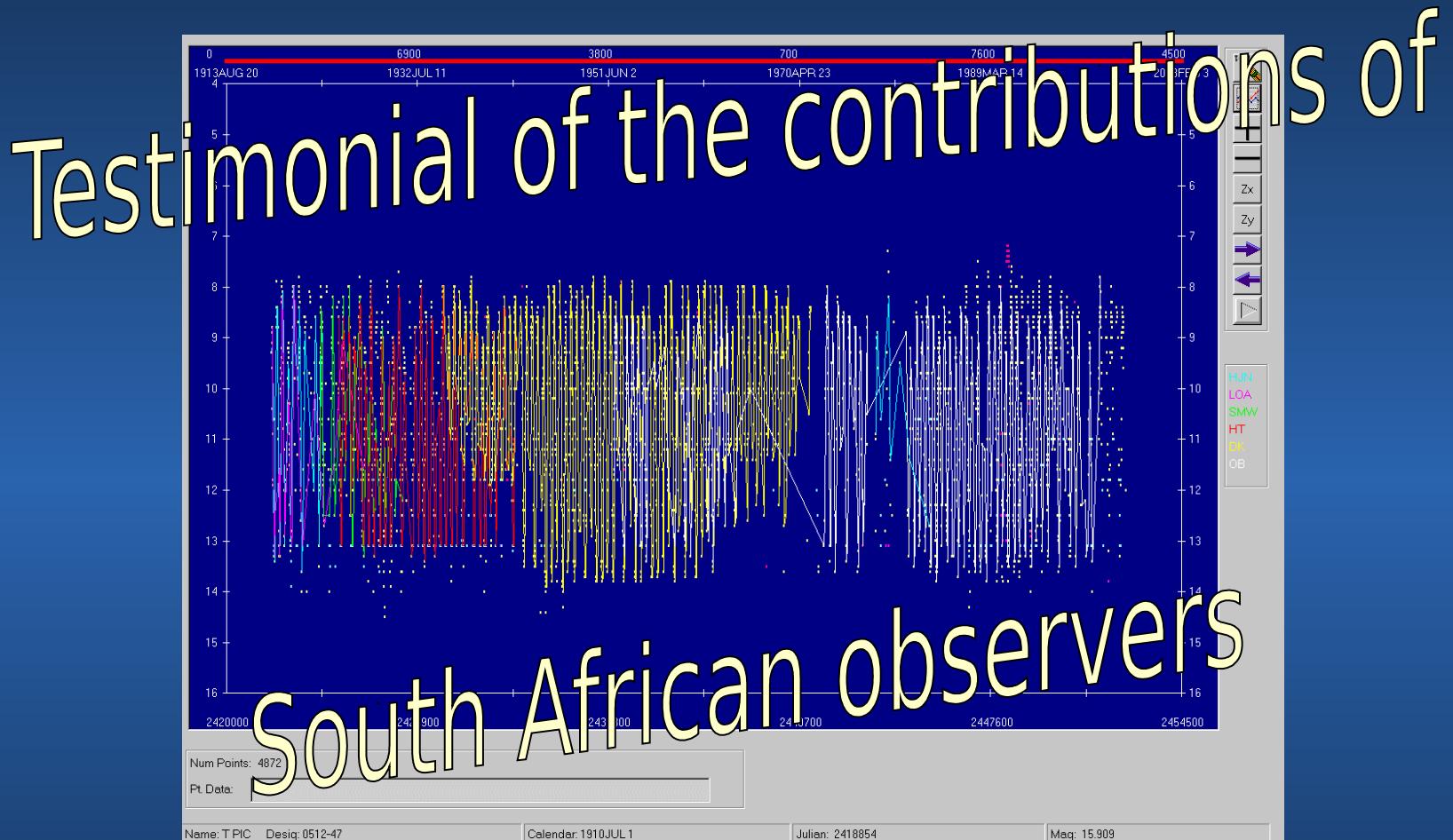




John (Jack) Bennett with his AAVSO Nova Award, presented at the 1976 AAVSO Annual Meeting in Northampton, Massachusetts, USA. John was awarded with this honor for his visual discovery of a supernova in NGC 5236 on July 16, 1976.

# AAVSO Data for 0512-47 T Pic

JD 2421647-2452525 (Feb 1918-Sep 2002)

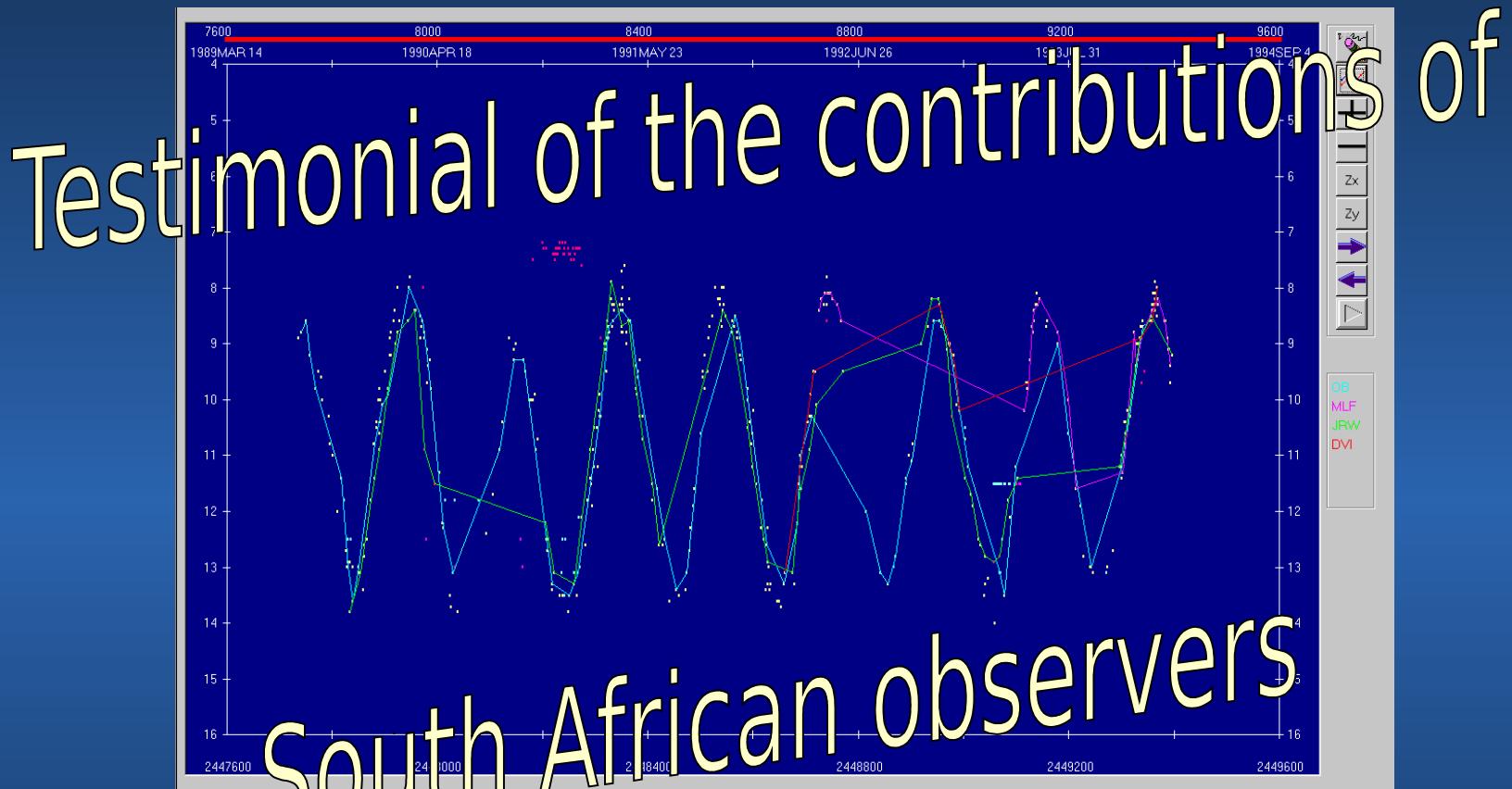


Blue (at left) = SKQ, J. Skjellerup (1915-1948)  
Purple = LOA, A. Long (1917-1927)  
Green = SMW, W. Smith (1924-1931)  
Red = HT, H. Houghton (1926-1942)

Yellow = DK, R. De Kock (1934-1973)  
White = OB, D. Overbeek (1952-2001)  
Blue (towards right) = HJN, J. Hers (1977- )

# AAVSO Data for 0512-47 T Pic

JD 2421647-2452525 (Feb 1918-Sep 2002)



Blue = OB, D. Overbeek (1952-2001)

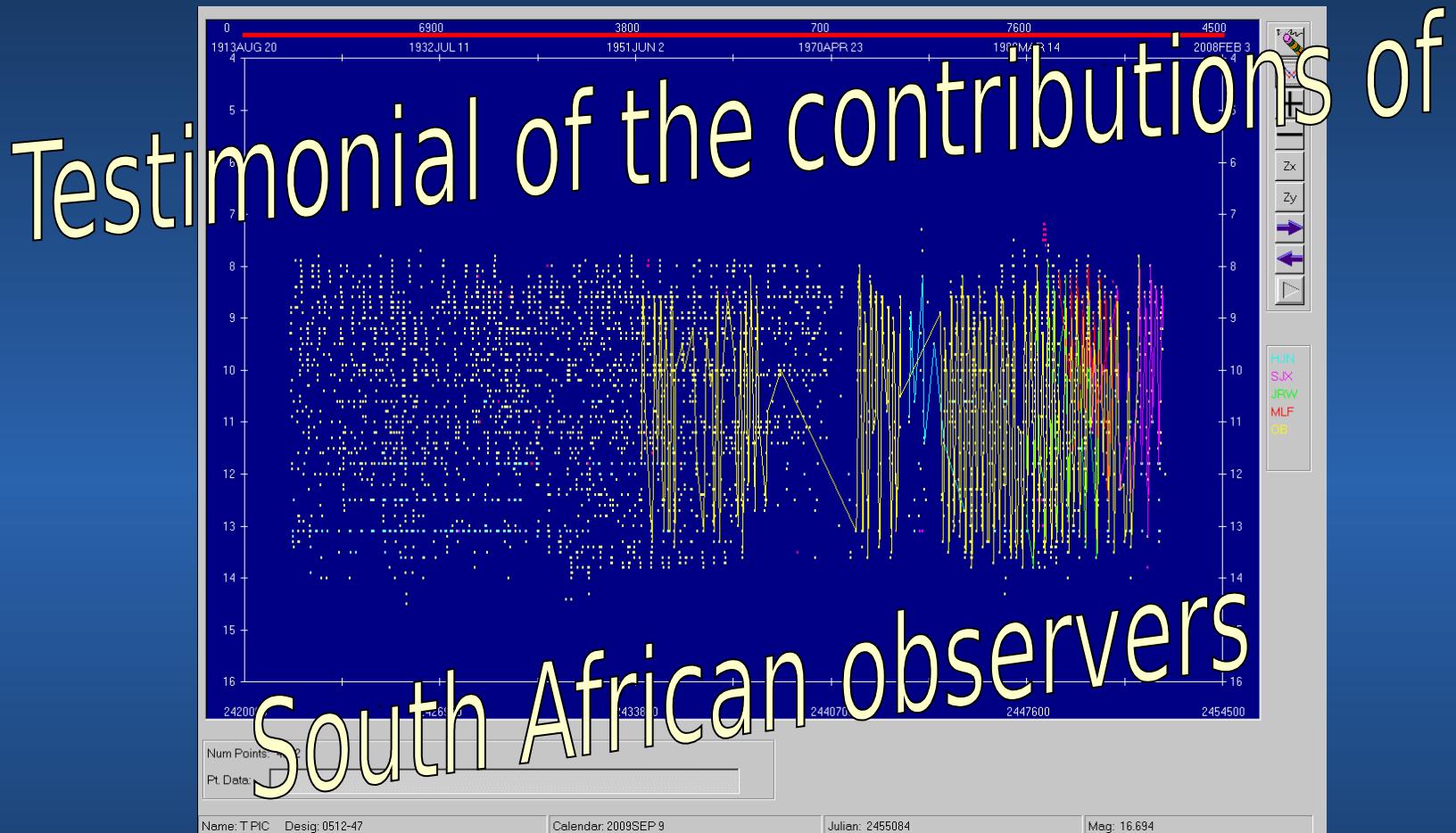
Purple = MLF, B. Monard (1992- )

Green = JRW, W. Jones (1989- )

Red = DVI, F. De Villers (1992- )

# AAVSO Data for 0512-47 T Pic

JD 2421647-2452525 (Feb 1918-Sep 2002)



Blue = HJN, J. Hers (1977- )

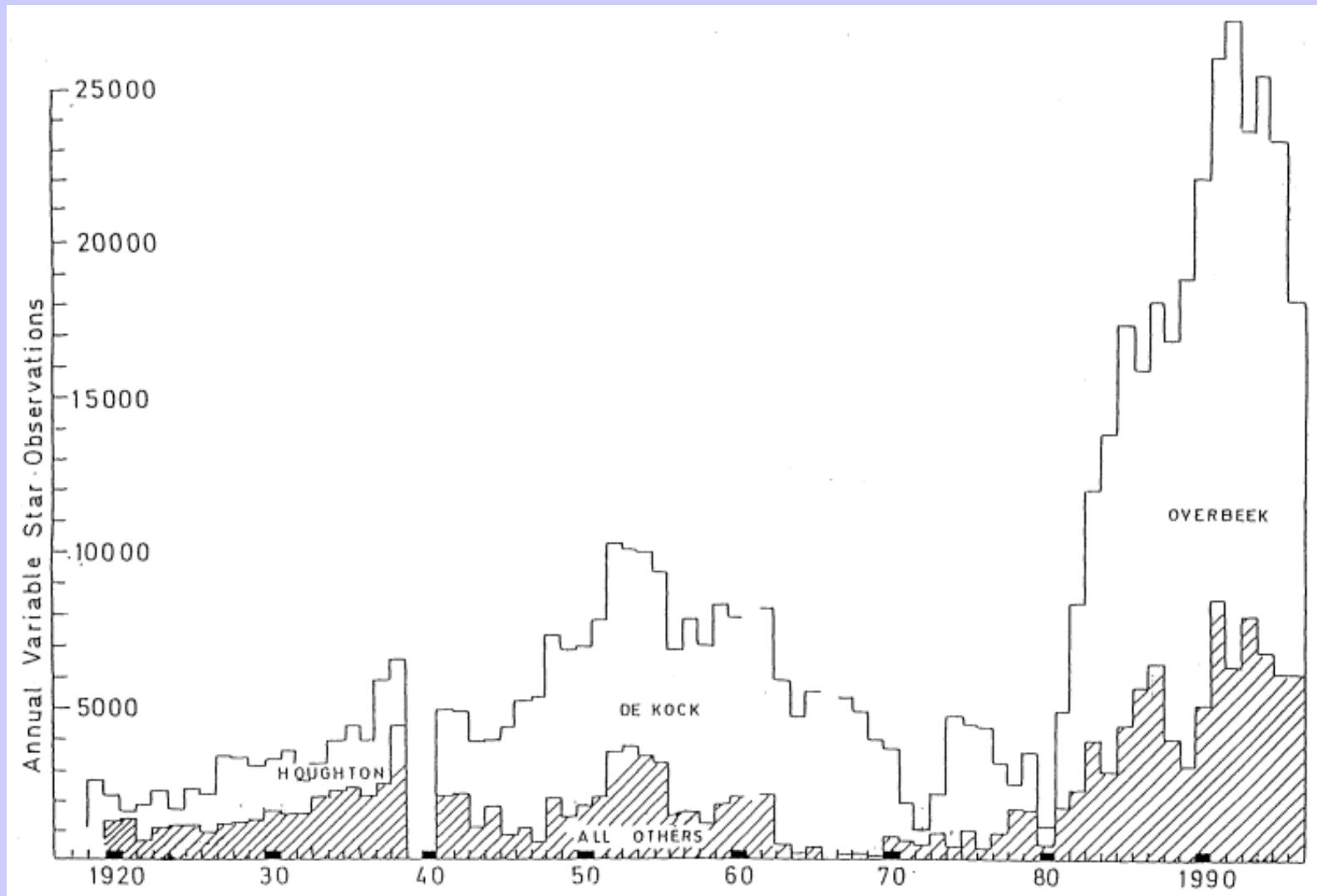
Purple = SJX, J. Smit (1987- )

Green = JRW, W. Jones (1989- )

Red = MLF, B. Monard (1992- )

Yellow = OB, D. Overbeek (1952-2001)

# Annual Variable Star Observations of South African Observers

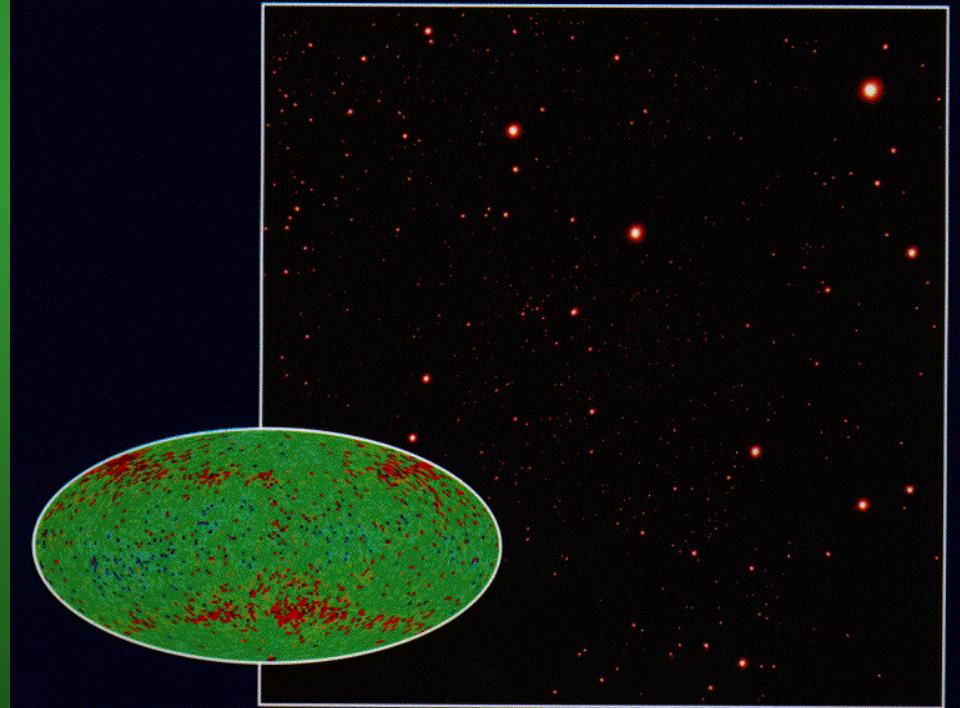


Presented by J. Hers at the 1997 AAVSO Spring Meeting; Sion, Switzerland

## The Hipparcos and Tycho Catalogues

Observations submitted to the AAVSO by variable star observers worldwide were used to predict the behavior of about 300 large-amplitude long-period variable stars. This information was used in allocating the correct observing time for those stars with the HIPPARCOS satellite.

### Hipparcos Variability Annex: Light Curves



Desig 1409-59 Name R CEN

Max 5.9

Min 10.7

Per 515

Type M

Spec M4E-M8IIE

2447800

2447900

2448100

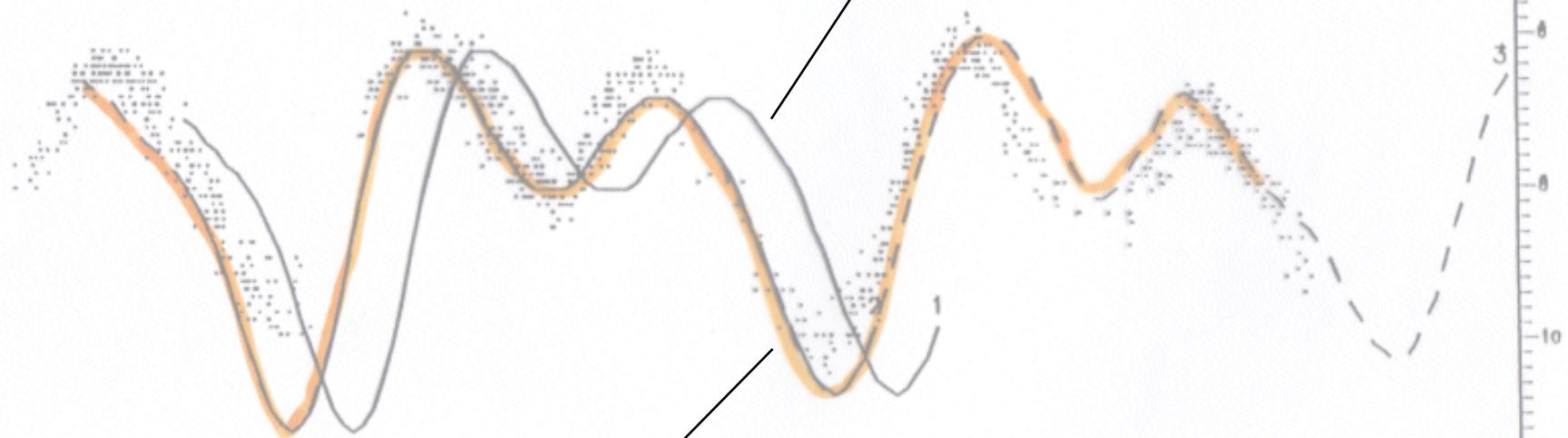
2448400

2448700

2449000

A A V S O

Preliminary  
predictions for the  
HIPPARCOS satellite



Revised predictions  
using up-to-date  
observations from South  
African observers.

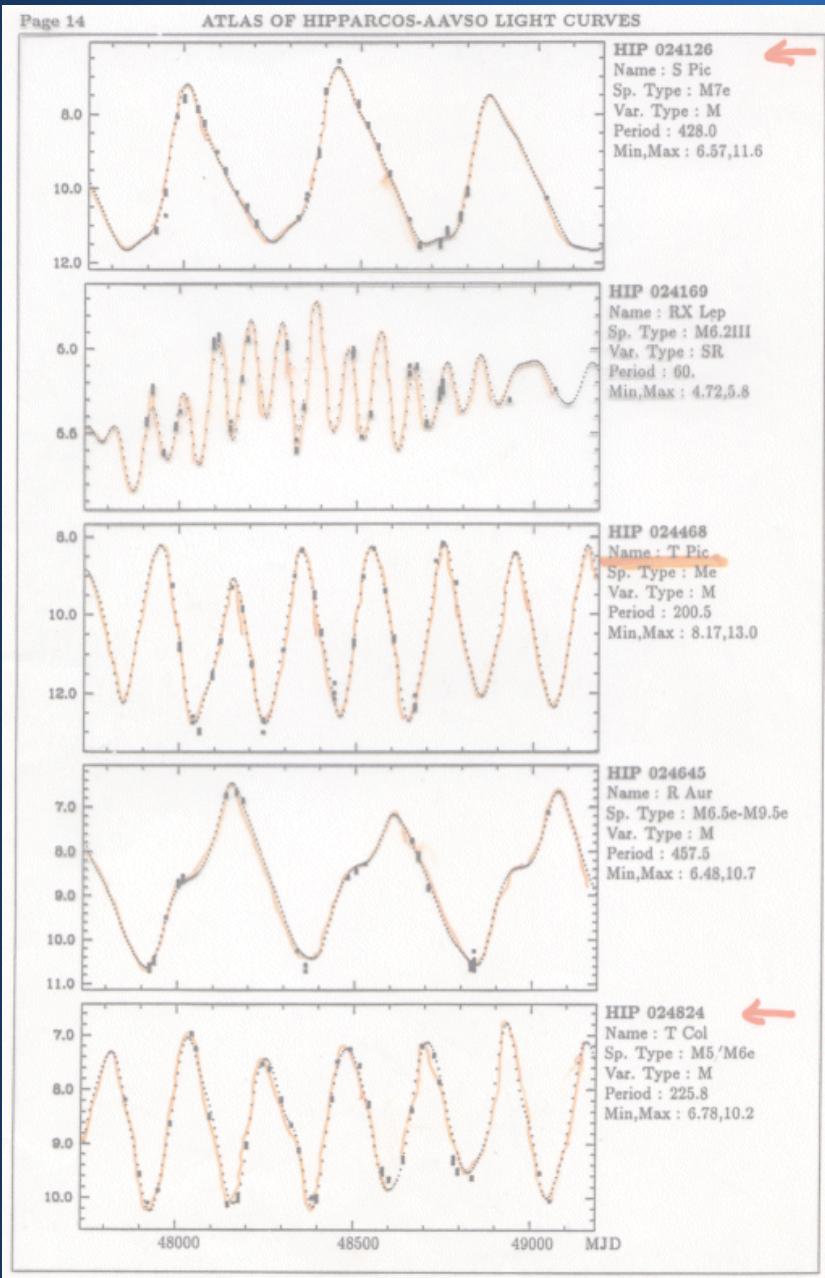
1989.0

1990.0

1991.0

1992.0

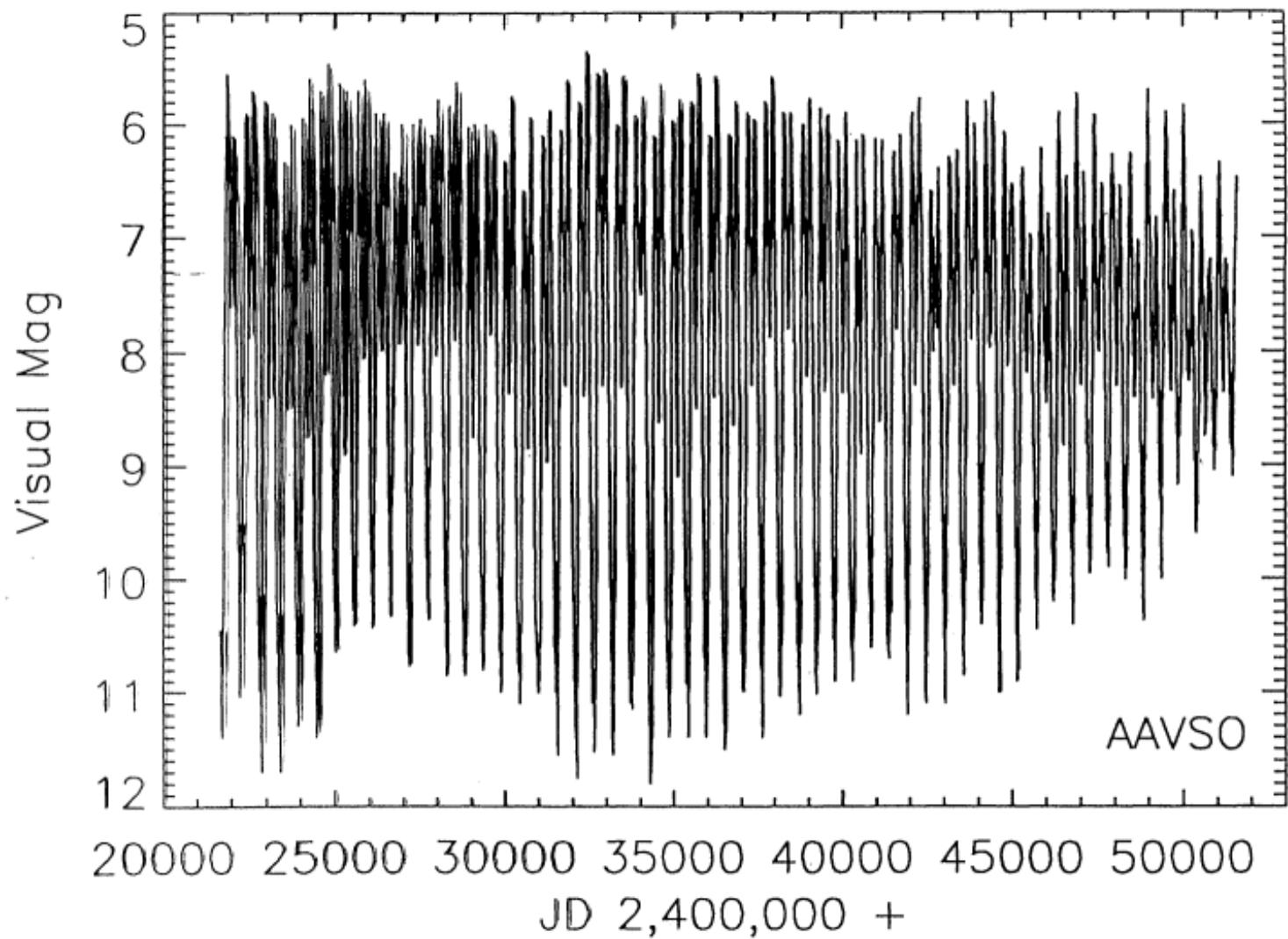
1993.0



HIPPARCOS photometry was superimposed on statistically fitted light curves to AAVSO observations. Data on southern stars came mostly from South African observers.

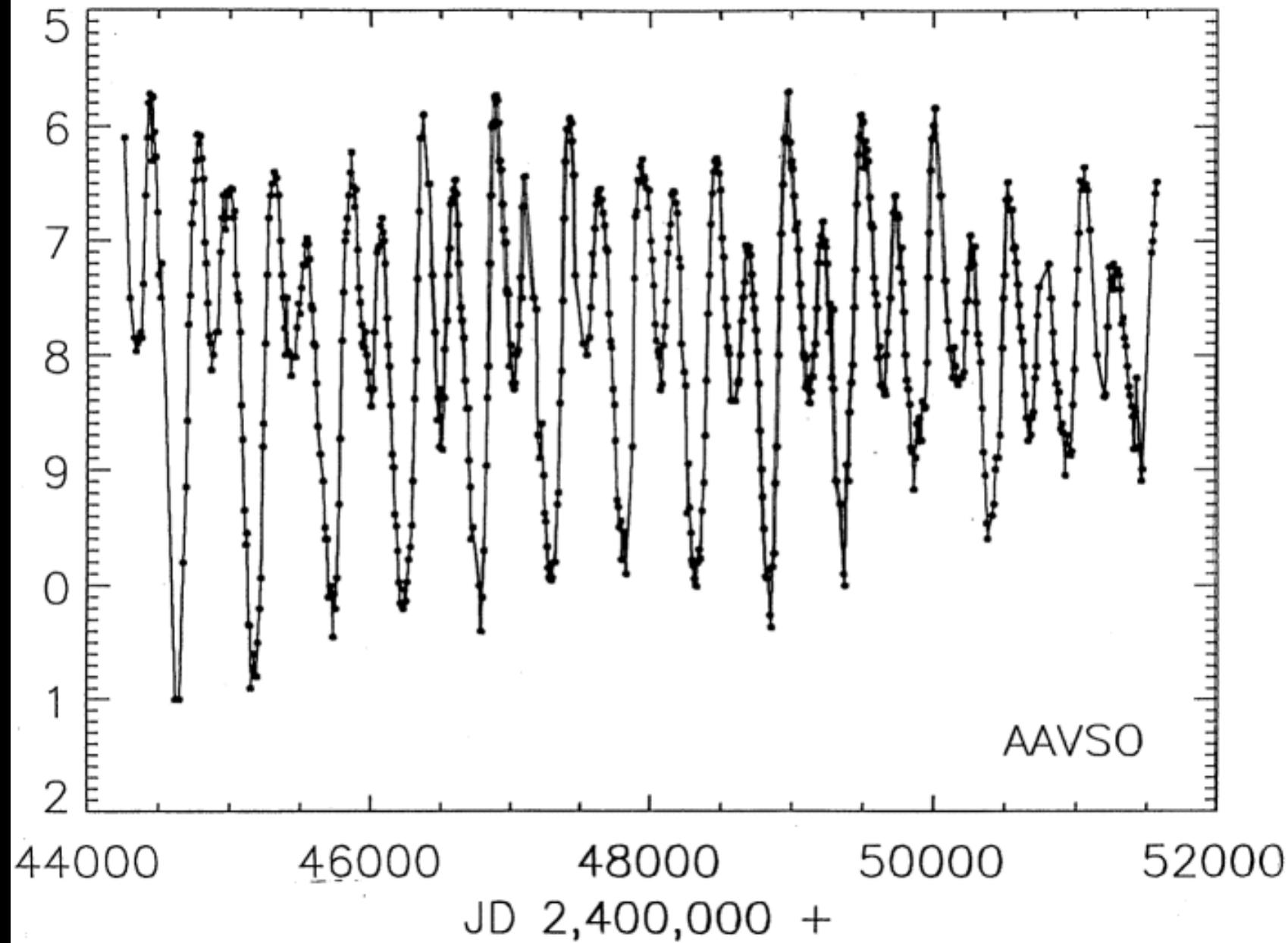
There is excellent agreement between AAVSO light curves (in red) and HIPPARCOS photometry. The light curves were published in Volume 11, Part B of the *Hipparcos and Tycho Catalogues*.

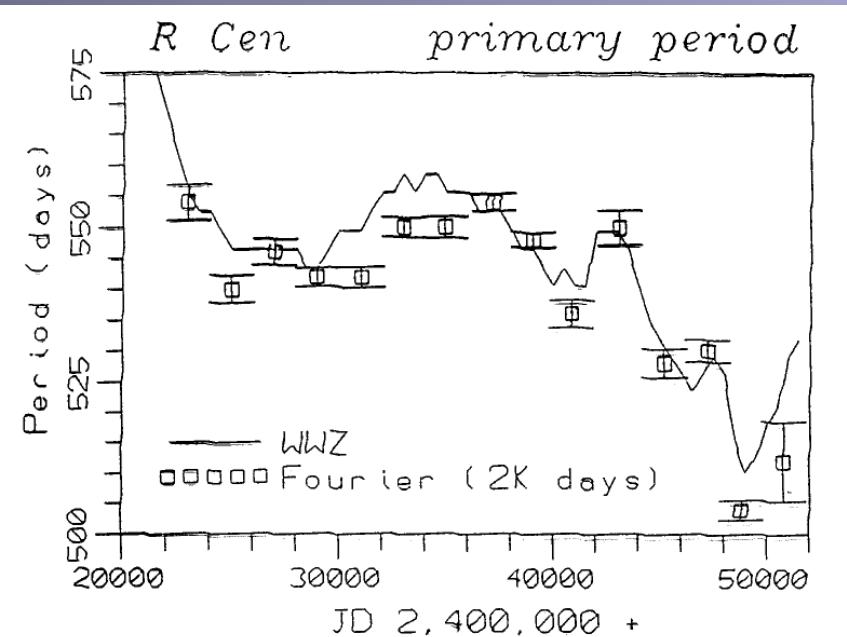
# R Cen 1918–2000



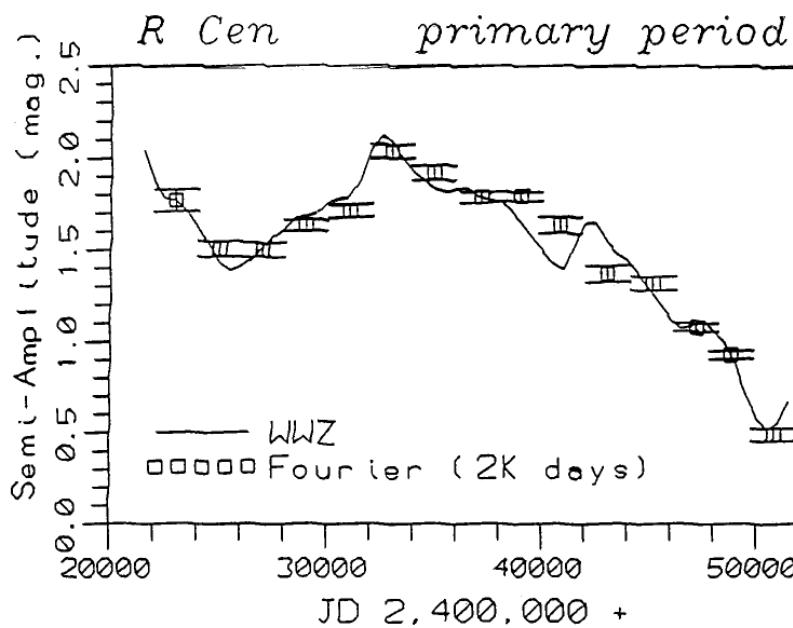
Long-term data (mostly from South African observers) on R Centauri show evolutionary change - major decrease in period and amplitude

# R Cen 1980–2000



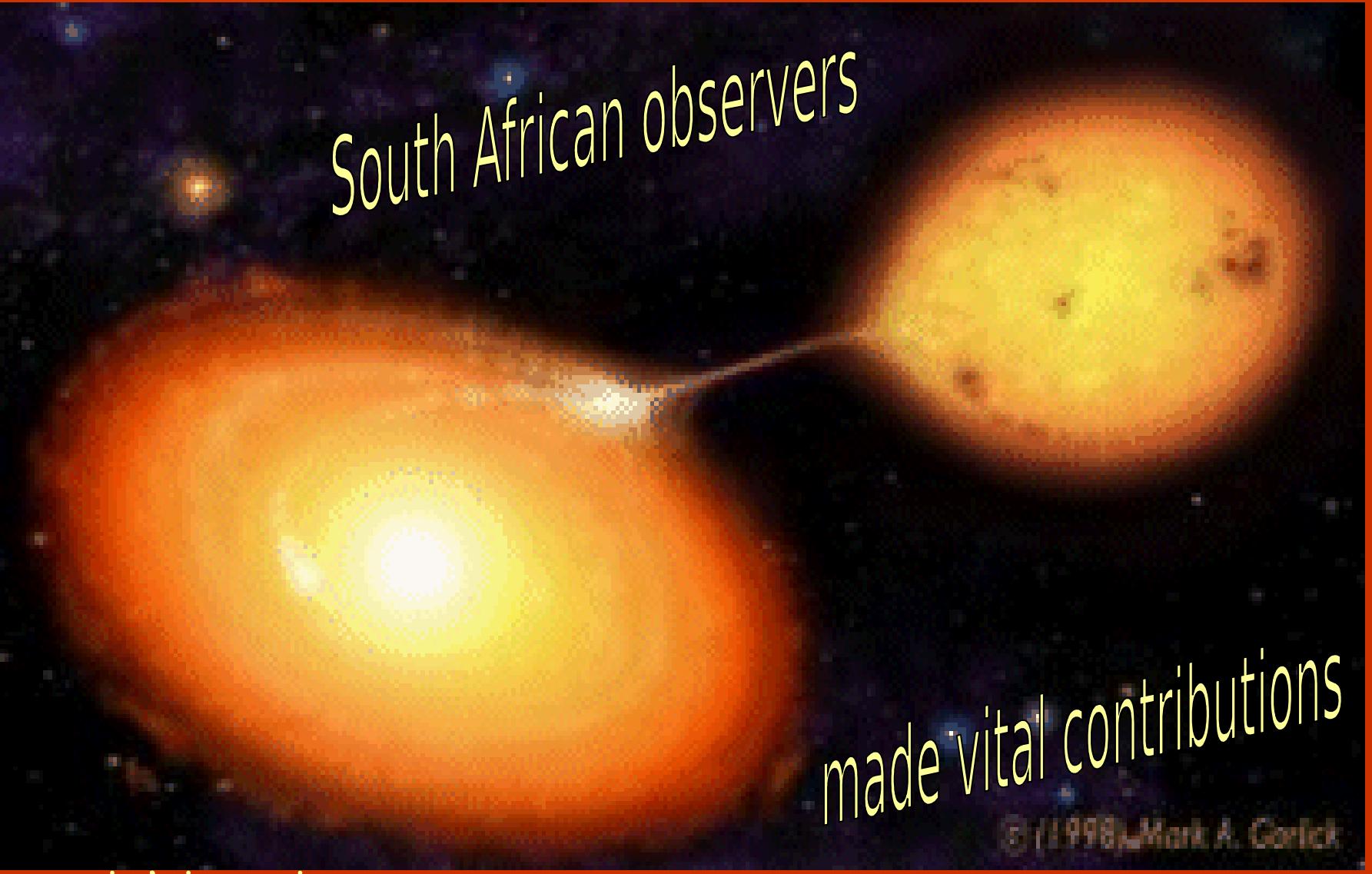


Period decrease



Amplitude decrease

# Cataclysmic Variable Star

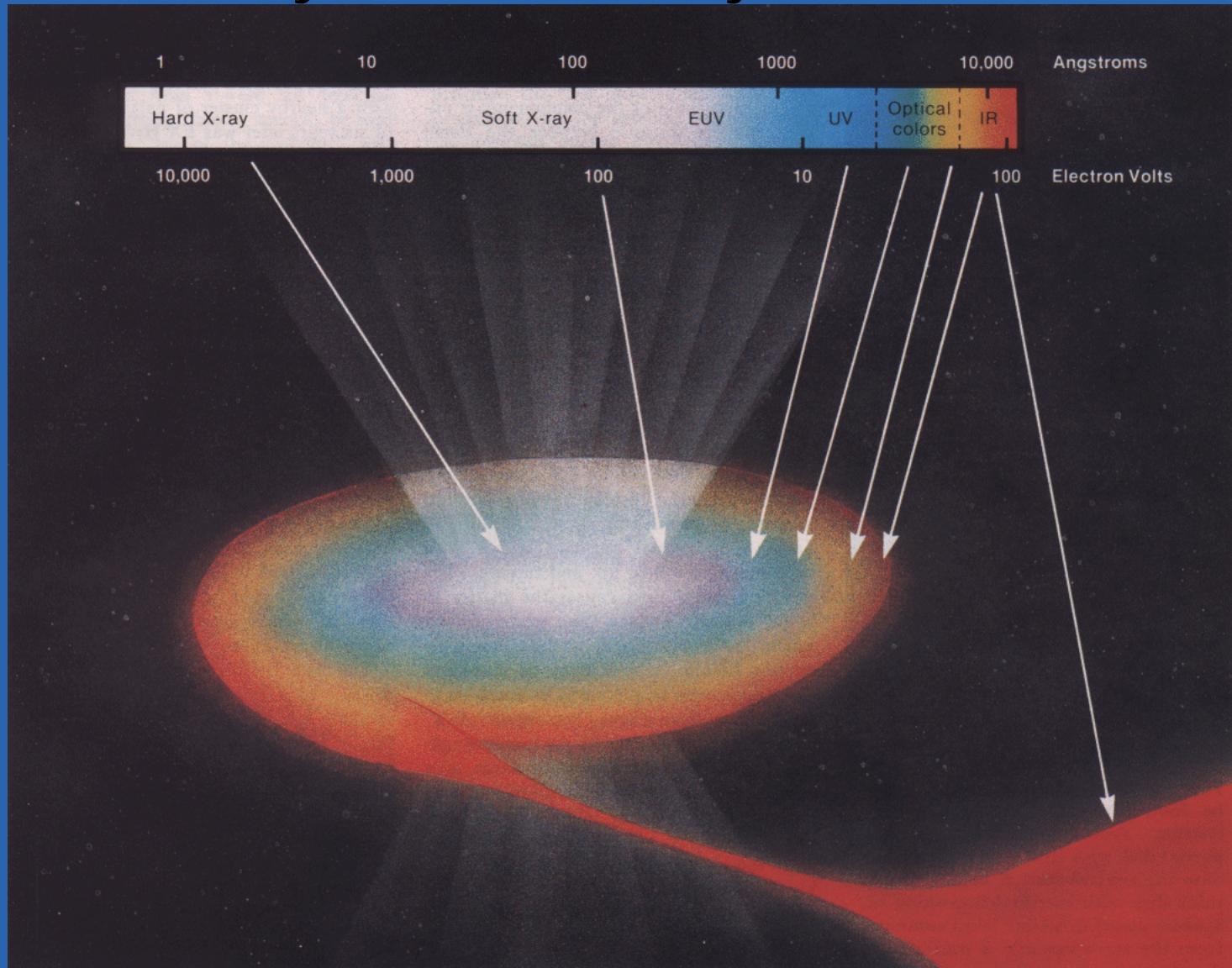


South African observers

made vital contributions

© 1998, Mark A. Garlick

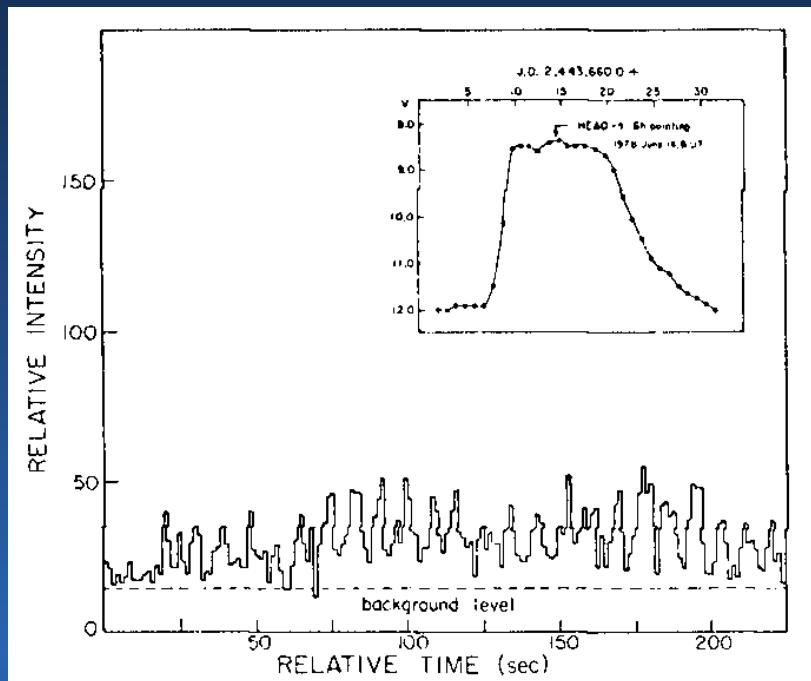
# Anatomy of a Cataclysmic Variable



Mason, K.O., & Cordova, F.A. July 1982, *Sky & Telescope*

# **Amateur Astronomers contribute to High-Energy Astrophysics (HEA) in:**

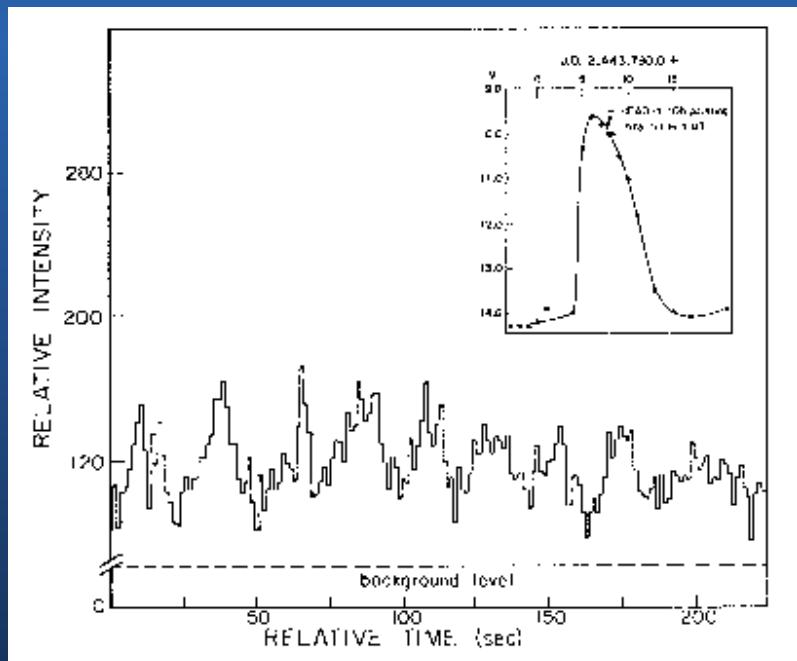
- ★ Scheduling observations for instruments aboard HE satellites
- ★ Providing simultaneous monitoring of targets during these scheduled observing runs
- ★ Correlating multi-wavelength observations obtained with HE satellites

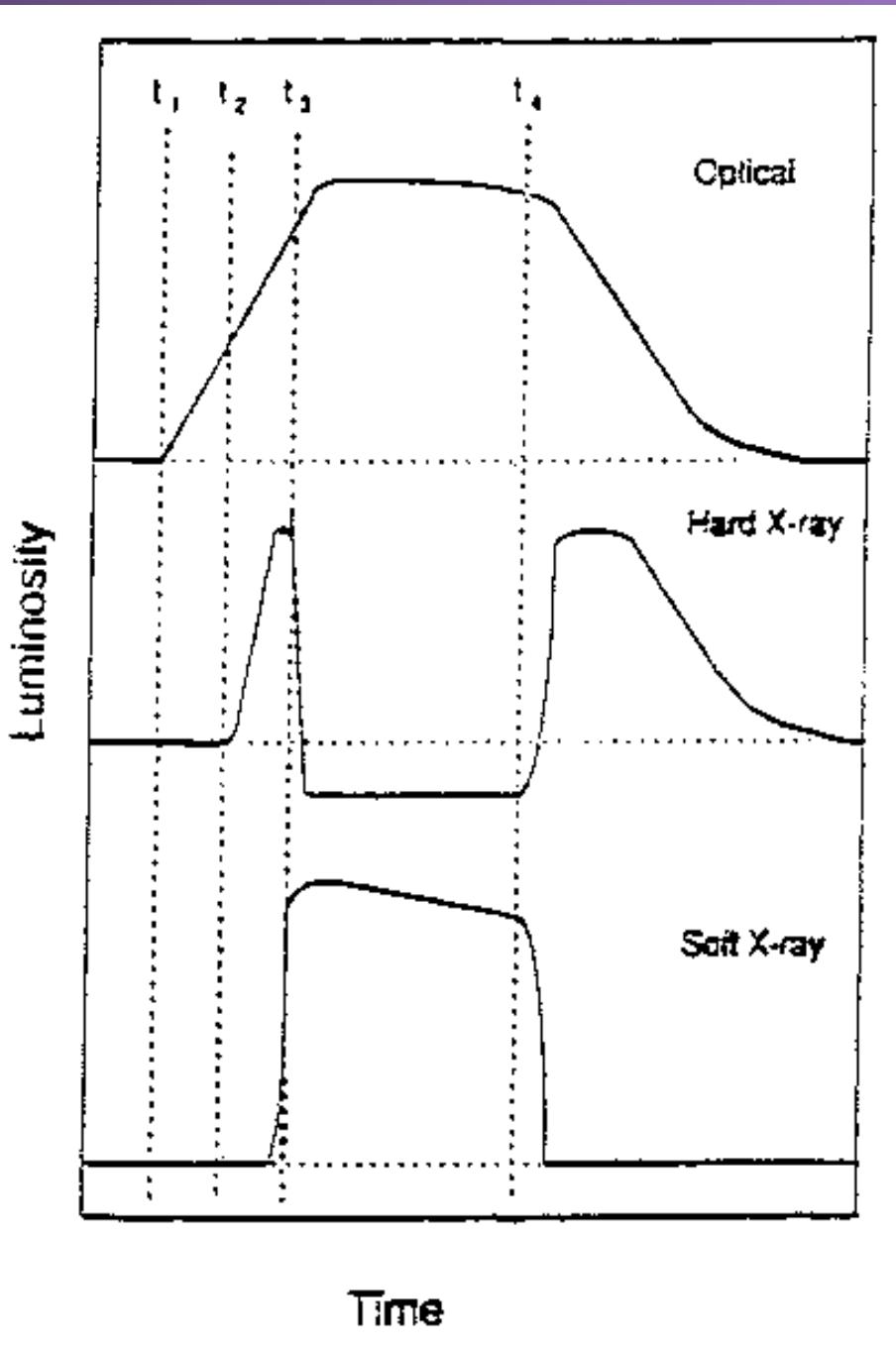


Above: soft x-ray emission detected during the outburst of SS Cygni on June 1978 by High Energy Astronomical Observatory – 1 (HEAO-1) . HEAO-1 observations were triggered by variable star observers. The inset shows the AAVSO light curve of this .

## First X-ray observations during outburst

Below: quasi-periodic nature of the soft x-ray emission detected by HEAO-1 during the Oct. 1978 outburst of U Gem. The inset is the AAVSO light curve of this outburst.





A schematic of the behavior of the optical, soft x-ray ( $<0.5$  keV) and hard x-ray ( $>1$  keV) intensity of SS Cygni through and outburst.

Jones, M.H., & Watson, M.G.  
1992, *MNRAS*, 257, 633

# Amateur-Professional Collaboration

## *and Accolades to South African Observers*

From: haas@ait.physik.uni-tuebingen.de  
To: aavso@cfa0.HARVARD.EDU  
Subject: Thanks for VW HYI data

Dear Dr. Mattei,

Thank you very much for sending me electronically the observations of VW HYI  
>from AAVSO International Database.

As I can see so far from your data we got one spectrum nearby the maximum of  
the september outburst and the other during the decline to quiescence. The  
observations of the members of the AAVSO will be very helpful for analyzing  
our data.

Please tell all the members of the AAVSO who contribute to the observations  
during our Mission, especially Mr. Jan Hers and Mr. Danie Overbeck, that we  
are very grateful to them for providing the data of VW HYI.

It will be a pleasure for me to inform Dr. Robert Stachnik about the support  
we got from you and your organization.

Thank you once again and I will let you know, what happens to your data.

Best regards,

Christoph Haas

# Amateur-Professional Collaboration

to: emsion@ucis.vill.edu  
from: aavso@cfa0.harvard.edu

19 November 1993

"Ed Sion"  
"Janet Mattei, AAVSO"

⑤

Dear Ed,

Below are our data on VW Hyi covering the periods of your two HST runs in September 25 and Nov. 13. The September data are complete, however the November data have only those that have been Faxed to us - I would say probably 80% complete. I am VERY happy that VW Hyi waited two more days to go into its recent outburst.

Below are also observations on AM Her which very regrettably continues to be in its bright state.

Have a nice weekend and a happy Thanksgiving!  
Janet

\*\*\*\*\*  
Symbols: < = fainter than : = uncertain

Star Name	Date/Time UT	Julian Date	Magn	Observer
VW HYI	SEP 2.0	2449232.5	<12.6	OB
VW HYI	SEP 4.470	2449234.970	10.5	CR
VW HYI	SEP 5.7	2449236.2	<12.9	JRW
VW HYI	SEP 7.8	2449238.3	<12.9	JRW
VW HYI	SEP 8.8	2449239.3	<12.6	OB
VW HYI	SEP 9.4	2449239.6	<13.0	SJX
VW HYI	SEP 10.1	2449240.6	<12.6	OB
VW HYI	SEP 10.1	2449240.6	<13.0	SJX
VW HYI	SEP 10.641	2449241.141	13.6	CR
VW HYI	SEP 11.0	2449241.5	13.2	OB
VW HYI	SEP 11.1	2449241.6	<13.0	SJX
VW HYI	SEP 12.0	2449242.5	<11.6	MLF
VW HYI	SEP 12.1	2449242.6	<12.6	OB
VW HYI	SEP 12.1	2449242.6	<13.0	SJX
VW HYI	SEP 12.606	2449243.106	13.7	CR
VW HYI	SEP 13.0	2449243.5	<12.6	OB
VW HYI	SEP 13.9	2449244.4	13.2	OB
VW HYI	SEP 14.1	2449244.6	13.7	HJN
VW HYI	SEP 14.1	2449244.6	<13.0	SJX
VW HYI	SEP 14.8	2449245.3	<12.9	JRW
VW HYI	SEP 15.1	2449245.6	13.2	HJN
VW HYI	SEP 15.1	2449245.6	<12.6	OB
VW HYI	SEP 15.1	2449245.6	<13.0	SJX
VW HYI	SEP 15.8	2449246.3	13.7	HJN
VW HYI	SEP 16.1	2449246.6	<13.0	SJX
VW HYI	SEP 17.078	2449247.578	12.4	OB
VW HYI	SEP 17.096	2449247.596	12.3	OB
VW HYI	SEP 17.125	2449247.625	12.1	OB
VW HYI	SEP 17.125	2449247.625	12.0	SJX
VW HYI	SEP 17.855	2449248.355	9.5	OB
VW HYI	SEP 18.122	2449248.622	9.7	OB
VW HYI	SEP 18.128	2449248.628	9.8	SJX

CR = T. Cragg, Australia

HJN = J. Hers, SA

JRW = R. Jones, SA

MLF = L.A.G. Monard, SA

OB = D. Overbeek, SA

SJX = J. Smit, SA

# Amateur-Professional Collaboration

Dear Janet:

I am writing to convey my deepest gratitude for the indispensable observational ground-support and archival photometric data your organization has provided and will continue to provide for my Hubble Space Telescope project entitled "Spectroscopic Observations of the Exposed White Dwarfs in the Dwarf Novae U Geminorum, WZ Sagittae and VW Hyi". While I have received both valuable data from your observers and archival photometric information about selected cataclysmic variables from AAVSO before, the recent information on the detailed outburst histories of VW Hyi and U Gem were absolutely essential to scheduling and carrying out my time-critical HST experiments successfully. Moreover the information AAVSO provided was also critical to insuring that the Hubble telescope instrumentation would remain within safe brightness limits during the observations. The fear was that an outburst or superoutburst during acquisition would send the spacecraft into a "deep safe mode".

In summary, without your data support and continued monitoring by your ground-based observers, scientific progress in understanding cataclysmic variables would be well-nigh impossible.

Thank you again for the continued support of AAVSO.

Sincerely,

Edward M. Sion

# AAVSO Goes Extreme (UV) with EUVE

**Survey phase** - Optical brightness of variable source when observed by satellite?

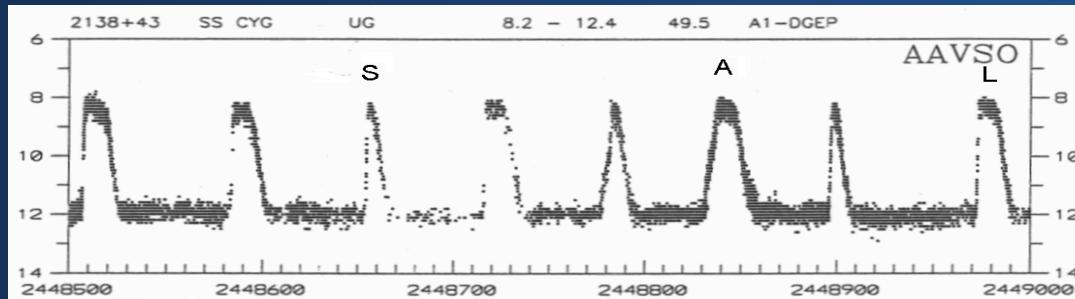
- AAVSO Observers monitored 81 variables bright enough to be EUV sources: cataclysmic variables, flare stars, RS CVn stars, bright active galactic nuclei
- Observations sent weekly to Center for EUV Astrophysics to correlate w/ EUVE data
- 29,500+ observations from 309 observers provided over 6 months

**Spectroscopy (pointed) phase** - Satellite observes target in response to alert of activity

- Astronomer informs AAVSO of target-of-opportunity (TOO) star and activity state needed
- AAVSO HQ informs observers and observers monitor
- Observers inform HQ when activity seen
- HQ compiles and assesses observations, informs astronomer
- Astronomer triggers TOO observations

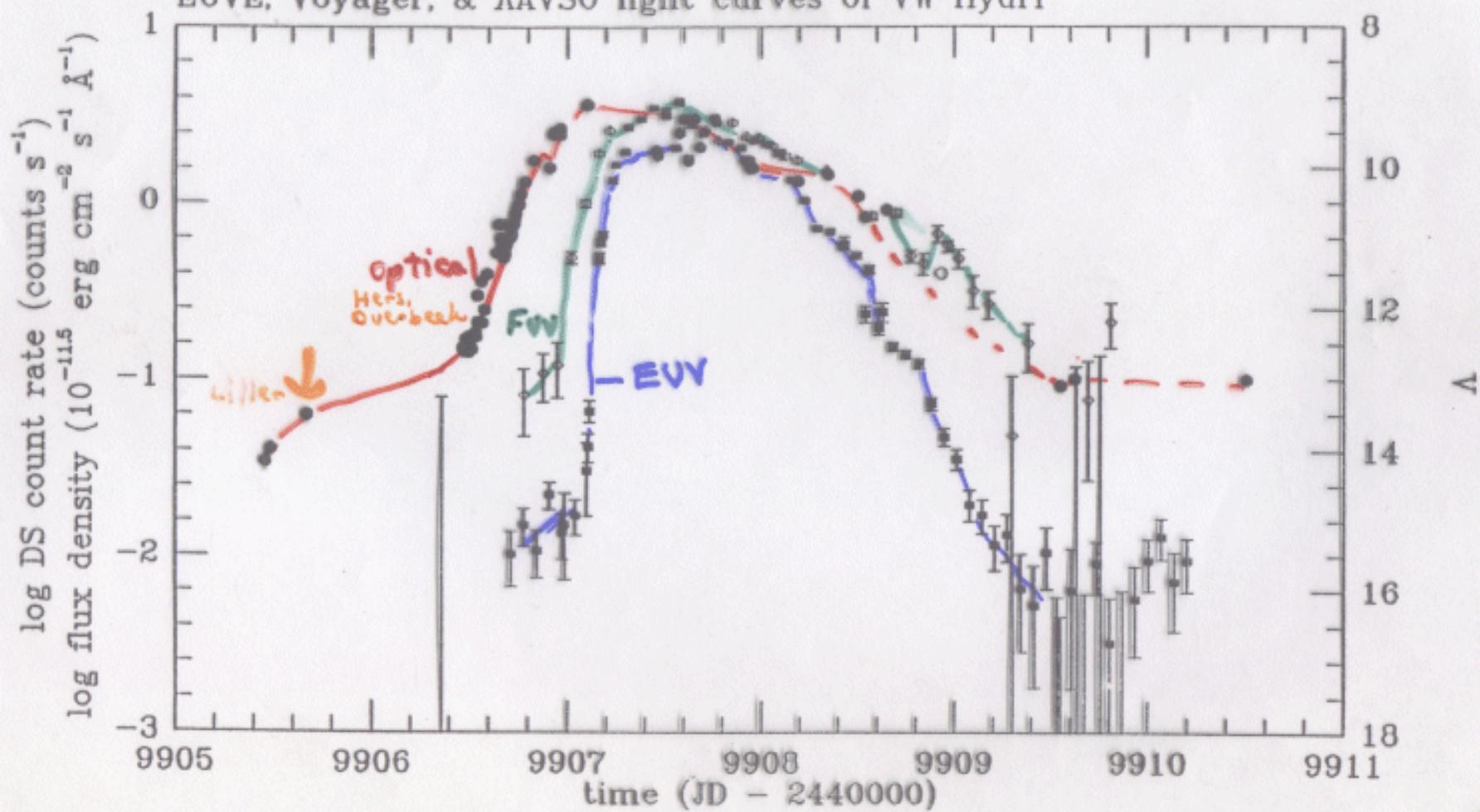
**Accomplishments to date** (TOO research is ongoing)

- Observations of 4 CV systems:
  - SS Cyg** – in short, long, and anomalous outbursts
  - U Gem** – in outburst
  - VW Hyi** – in normal and superoutbursts
  - OY Car** – in superoutburst
- → studies of boundary layer physics
- → measurement of time delay between optical and EUV, and significance
- → first detection of transition from x-ray to EUV emission during (SS Cyg)

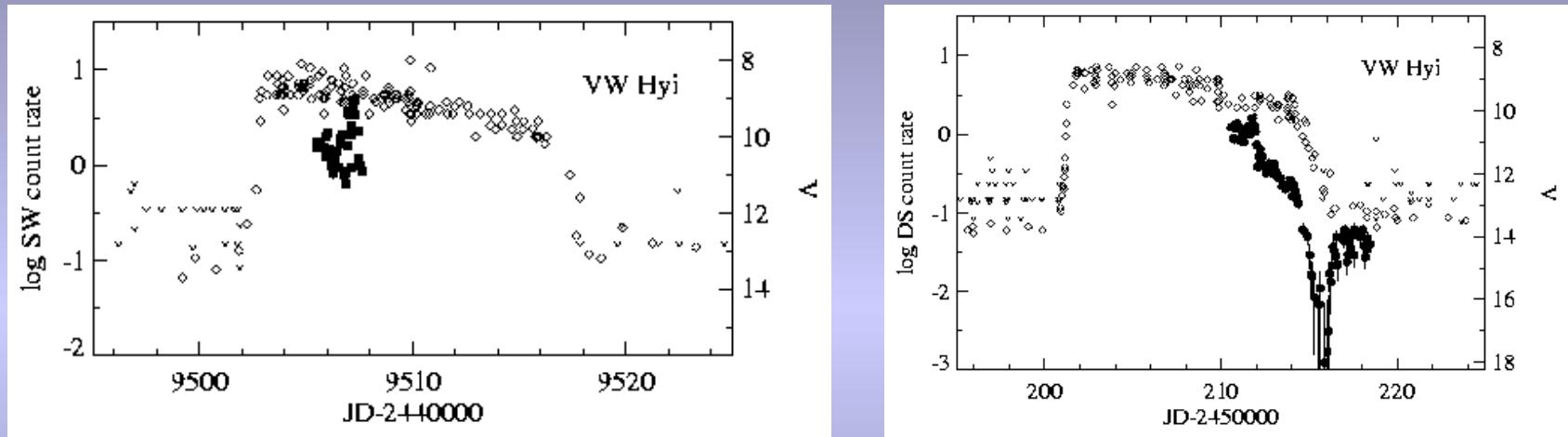


AAVSO light curve of SS Cyg (1991-1993), showing short (S), long (L), and anomalous (A) outbursts

Mauche, Raymond, Holberg, & Mattei 8/95  
EUVE, Voyager, & AAVSO light curves of VW Hydri



# VW Hyi: Superoutbursts



There is a dramatic decline in the EUV flux of VW Hyi just before the optical flux returns to quiescent value (left). The subsequent rebound of the EUV flux coincides with the return of hard “thermal brems” component of the boundary layer spectrum (right).

# EUVE Observations of CVs – all triggered by variable star observers

Star	Date (M/Y)	Interval (JD–2400000)	Exp. (ks)	Type of Outburst	Comment
SS Cyg	08/93	49216.58–222.86	179.4	Anom. Wide	
U Gem	12/93	49350.00–361.15	249.0	Normal	
VW Hyi	06/94	49505.46–507.66	89.4	Super	
SS Cyg	06/94	49526.67–536.69	147.8	Normal Wide	
VW Hyi	07/95	49906.70–917.29	183.8	Normal	+ <i>Voyager</i>
VW Hyi	05/96	50210.58–218.47	55.4	Super	+ <i>RXTE</i>
SS Cyg	10/96	50366.40–379.45	208.1	Normal Narrow	+ <i>RXTE</i>
OY Car	03/97	50534.46–537.64	94.8	Super	
U Gem	11/97	50760.27–766.85	150.0	Normal	+ <i>RXTE</i>
SS Cyg	06/99	51336.84–349.67	274.0	Anom. Narrow	+ <i>RXTE</i>
OY Car	02/00	51597.66–601.26	69.1	Super	& <i>HST</i>

Mauche, C.W., Mattei, J.A., & Bateson, F. 2001, in *Evolution of Binary and Multiple Star Systems*

## EUV Observations of Nonmagnetic Cataclysmic Variables<sup>1</sup>

Christopher W. Mauche

Lawrence Livermore National Laboratory, L-43, 7000 East Avenue,  
Livermore, CA 94550

**Abstract.** We summarize *EUVE*'s contribution to the study of the boundary layer emission of high accretion-rate nonmagnetic cataclysmic variables, especially the dwarf novae SS Cyg, U Gem, VW Hyi, and OY Car in outburst. We discuss the optical and EUV light curves of dwarf nova outbursts, the quasi-coherent oscillations of the EUV flux of SS Cyg, the EUV spectra of dwarf novae, and the future of EUV observations of cataclysmic variables.

### 1. Introduction

Cataclysmic variables (CVs) are a diverse class of semidetached binaries composed of a low-mass main-sequence star and an accreting white dwarf. In nonmagnetic CVs conservation of angular momentum dictates that accretion onto the white dwarf is mediated by a disk. While the white dwarf and disk are the dominant sources of optical through FUV light, the boundary layer between the disk and the surface of the white dwarf is the dominant source of higher-energy emission. Simple theory predicts that the accretion disk and boundary layer luminosities should be comparable, with  $L_{\text{disk}} \approx L_{\text{bl}} \approx GM_{\text{wd}}\dot{M}/2R_{\text{wd}} \sim 3 \times 10^{34} (\dot{M}/10^{-8} M_{\odot} \text{ yr}^{-1}) \text{ erg s}^{-1}$ , where  $\dot{M}$  is the accretion rate and  $M_{\text{wd}}$  and  $R_{\text{wd}}$  are respectively the mass and radius of the white dwarf. When  $\dot{M}$  is low ( $\dot{M} \sim 10^{-11} M_{\odot} \text{ yr}^{-1}$ , as in dwarf novae in quiescence), the boundary layer is optically thin and quite hot (of order the virial temperature  $T_{\text{vir}} = GM_{\text{wd}}m_{\text{H}}/3kR_{\text{wd}} \sim 10 \text{ keV}$ ); when  $\dot{M}$  is high ( $\dot{M} \sim 10^{-8} M_{\odot} \text{ yr}^{-1}$ , as in novalike variables and dwarf novae in outburst), the boundary layer is optically thick and quite cool (of order the blackbody temperature  $T_{\text{bb}} = [GM_{\text{wd}}\dot{M}/8\pi\sigma R_{\text{wd}}^3]^{1/4} \sim 10 \text{ eV}$ ). Hence, the boundary layer emission of high- $\dot{M}$  CVs is radiated primarily in the EUV, where it is easily hidden from us by the interstellar medium.

In addition to the severe effect of photoelectric absorption in the EUV, progress in our understanding of the EUV/soft X-ray emission of high- $\dot{M}$  CVs has been hampered by the poor energy resolution of X-ray detectors, the target-of-opportunity (TOO) scheduling required to observe dwarf novae in outburst,

<sup>1</sup>Dedicated to the memory and accomplishments of Danie Overbeek, a charming man and dedicated “amateur” observer, who, over a period of nearly 50 years, contributed over 287,000 observations of variable stars to the AAVSO International Database.

<sup>1</sup>Dedicated to the memory and accomplishments of Danie Overbeek, a charming man and dedicated “amateur” observer, who, over a period of nearly 50 years, contributed over 287,000 observations of variable stars to the AAVSO International Database.

# Amateur Astronomers Contributed Data for the Following Satellites

(• denotes satellites that have observed CVs)  
(satellites in chronological order)

• Apollo-Soyuz	*	Extreme UV	Hipparcos	*	Astrometry
• ANS	*	X-ray	ISO	*	IR
• Ariel V	*	X-ray	• GINGA	*	X-ray
• HEAO-1/2	*	X-ray	• EUVE	*	Extreme UV
IRAS	*	IR	• ORFEUS	*	UV
• IUE	*	UV	• BeppoSAX	*	X-ray
• Voyager	*	Far UV	• ASCA	*	X-ray
• ASTRO-1	*	UV	CGRO	*	Gamma ray
• ASTRO-2	*	UV	• RXTE	*	X-ray
• EXOSAT	*	X-ray	• FUSE	*	Far UV
• ROSAT	*	X-ray	• Chandra	*	X-ray
• HST	*	Multiwavelength	• XMM-Newton	*	X-ray

# Danie Overbeek's Observatory

Edenvale, Johannesburg, SA

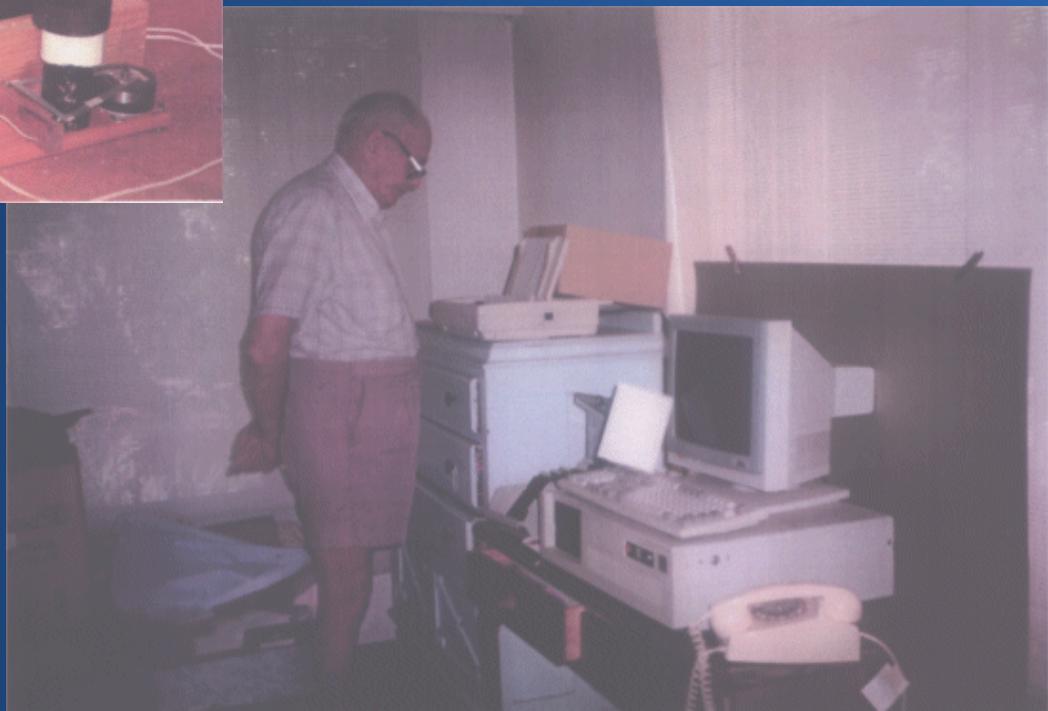


# Danie Overbeek's Observatory

## Edenvale, Johannesburg, SA



# Danie Overbeek: at Work and Play





# Sudden Ionospheric Disturbances Supplement

[Home](#)

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[Variable Stars](#)

[Membership](#)

[Meetings](#)

[Publications](#)

[Star Charts](#)

[Contributing Data](#)

[Accessing Data](#)

[Observing Programs](#)

[Hands-On Astrophysics](#)

*From February 2001 Solar Bulletin*

Casper H.  
Hossfield, SID  
Sup. Editor  
PO Box 23  
New Milford, NY  
10959, USA

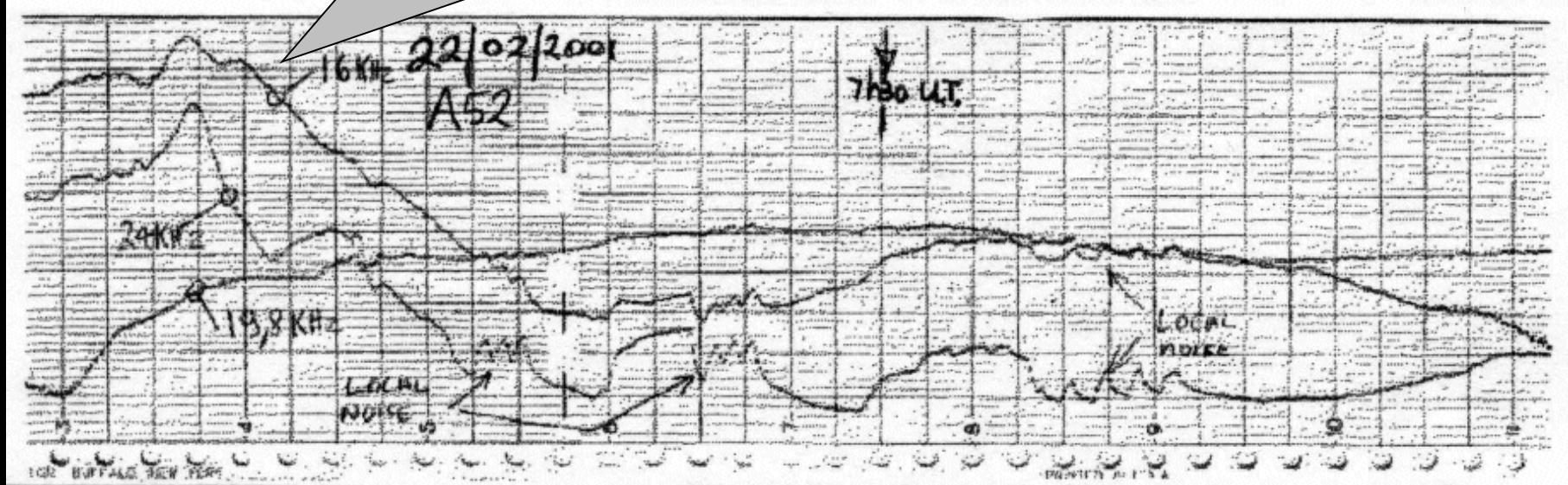
**SUDDEN  
IONOSPHERIC  
DISTURBANCES  
RECORDED DURING  
February, 2001**

[capaavso@aol.com](mailto:capaavso@aol.com)  
Fax 973 853 2588

A very strong gamma ray burst, GRB, was detected by the Italian GRB satellite, Beppo SAX on 22 February at 0723.5 UT. It was described as being the strongest GRB Beppo SAX had ever detected. When I saw this notice on the AAVSO's GRB network as a GCN Circular I immediately emailed five of our SID observers to see if any of them recorded anything unusual at that time. All USA observers were in darkness at 0723 UT and none of them reported seeing anything unusual in their nighttime traces that might be the GRB. A few days later I did receive a daytime chart from Danie Overbeek and Domenic Toldo, A-52, that showed a very clear sudden ionospheric disturbance, SID, at that time on all three multiplexed signals that they record, 24 kHz, NAA, in Cutler, Maine, USA; 16 kHz, GBR in Rugby, England, UK and 19.8 kHz, NWC, at Northwest Cape, West Australia. This seemed like a definite recording of an SID at the time of GRB010222 so I sent it to Arne Hendon at the US Naval Observatory in Flagstaff, Arizona, USA. Arne posted it on the GRB network where it came to the attention of professional astronomers interested in GRBs who asked many questions about the SID. You can see this Rustrak strip-chart recording at <ftp://ftp.aavso.org/grb/sid010222.jpg> I was able to present enough data to convince them it was an SID caused

"A few days later I did receive a daytime chart from Danie Overbeek and Domenic Toldo, A-52, that showed a very clear sudden ionospheric disturbance, SID, at that time on all three multiplexed signals that they record, 24 kHz, NAA, in Cutler, Maine, USA; 16 kHz, GBR in Rugby, England, UK and 19.8 kHz, NWC, at Northwest Cape,

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*February 2001 Solar Bulletin, Sudden Ionospheric Disturbances Supplement*

Photo taken on March 27, 2001 at 14:40 UT by AAVSO  
observer A. Gonzalo Vargas, Cochamamba, Bolivia.

# Janet Mattei's Observations from Danie Overbeek's Observatory

Observations by J.A. mattei at sdu-sd, 1995 Feb 1/2

52	9750-467	1207-43	MCG Cen	13.2
	9750-5	0634-62	RRC P-L	11.5
"		0659-11	Z Cen	10.3
"		0304-00	V657 Mon	11.0
"		1216-18	R Crv	7.9

# AAVSO Annual Observation Totals and Top Three Observers

*Note: Year given is beginning of fiscal year, e.g., 1910 = fiscal 1910-11.*

Year	Total	1st Top Observer	2nd Top Observer	3rd Top Observer
....				
1933	43172	E. Jones 4778	L. Peltier 2801	H. Houghton 2214
....				
1939	45646	E. Lorta 4200	R. de Kock 3018	W. Holt 2670
1940	37443	C. Fernald 3133	R. de Kock 2611	W. Holt 2452
1941	33090	C. Fernald 4206	W. Holt 2364	R. de Kock 2264
1942	31205	C. Fernald 4536	R. de Kock 3054	F. Hartmann 2353
1943	32767	C. Fernald 5316	R. de Kock 2878	L. Peltier 2215
1944	34244	C. Fernald 7216	R. de Kock 3844	W. Holt 1657
1945	44272	C. Fernald 5016	R. de Kock 4272	C. Chassapis 2425
1946	50222	C. Fernald 6649	R. de Kock 4616	C. Chassapis 4082
1947	54370	C. Fernald 7504	R. de Kock 4729	C. Chassapis 3642
1948	50006	C. Fernald 7654	R. de Kock 5210	P. Ahnert 3713
1949	51777	C. Fernald 6537	R. de Kock 5350	L. Peltier 2504
1950	48291	R. de Kock 5963	C. Fernald 3774	L. Peltier 1950
1951	60396	R. de Kock 6692	C. Fernald 3056	E. Oravec 2536
1952	62223	D. Elias 8363	R. de Kock 6467	C. Fernald 3808
1953	52028	R. de Kock 6549	E. Oravec 4112	C. Fernald 3571
1954	64990	R. de Kock 5977	E. Oravec 4843	G. Hein 4516
1955	49579	R. de Kock 5699	E. Oravec 5019	C. Fernald 3397
1956	46238	R. de Kock 6257	E. Oravec 5712	C. Fernald 4710
1957	51317	R. de Kock 5983	E. Oravec 4686	C. Fernald 4374
1958	52589	R. de Kock 6582	C. Fernald 4758	E. Oravec 4174
1959	58791	R. de Kock 5824	C. Fernald 4721	R. de la Vega 4096
1960	57510	R. de Kock 5858	C. Fernald 3605	R. de la Vega 3415
1961	67459	R. de la Vega 6064	R. de Kock 5937	E. Oravec 3467
1962	69830	R. de la Vega 5793	R. de Kock 5343	E. Oravec 3477
1963	83599	C. Fernald 6068	R. de Kock 4492	C. Anderson 4423
....				

*Continued...*

# AAVSO Annual Observation Totals and Top Three Observers

*Note: Year given is beginning of fiscal year, e.g., 1910 = fiscal 1910-11.*

Year	Total	1st Top Observer	2nd Top Observer	3rd Top Observer
1981	188679	W. Lowder 7640	D. Overbeek 6493	M. Heifner 4751
1982	194580	D. Overbeek 8080	W. Lowder 6602	M. Verdenet 6362
1983	214468	D. Overbeek 11622	M. Verdenet 7774	C. Mezosi 7095
1984	233753	D. Overbeek 12160	W. Lowder 8198	H. Grzelczyk 7210
1985	222245	D. Overbeek 10707	G. Dyck 8572	A. Perez-Revilla 5805
1986	264566	D. Overbeek 13682	G. Dyck 12399	M. Baldwin 7926
1987	229167	D. Overbeek 11713	G. Dyck 9179	W. Lowder 7381
1988	232442	D. Overbeek 16239	G. Dyck 11204	M. Baldwin 6754
1989	260318	D. Overbeek 17290	G. Dyck 10108	W. Lowder 8740
1990	250954	D. Overbeek 16551	G. Dyck 12204	W. Albrecht 8269
1991	276226	D. Overbeek 22472	G. Dyck 10068	P. Vedrenne 6574
1992	305691	O. Gabzo 20420	D. York 16741	D. Overbeek 16617
1993	330699	D. York 19876	D. Overbeek 16917	O. Gabzo 11405
1994	340169	D. Overbeek 18601	A. Diepvens 13208	G. Dyck 9380
1995	335669	S. Dominguez 16695	D. Overbeek 12797	G. Poyner 12333
1996	366335	L. Jensen 21607	D. Overbeek 16095	G. Poyner 15097
1997	323061	D. Overbeek 14858	G. Poyner 13810	G. Hanson 11285
1998	340604	D. Overbeek 12525	G. Comello 11523	G. Poyner 10839

**TOTAL OBSERVATIONS Oct. 1911 through Sep. 2002 10,770,314**

**Lifetime totals for South African AAVSO tip-top observers:**

H. Houghton: 25,589

Reginald P. De Kock: 160,777 (fourth highest total in the AAVSO)

M. Daniel (Danie) Overbeek: 287,150 (highest total in the AAVSO)

# AAVSO Nova Awards presented to South African observers



## 8<sup>th</sup> Nova Award:

To *Jack Bennett* of Pretoria, South Africa, for his discovery of a Supernova in NGC 5236 on July 16, 1976. The award was presented to him by Janet Mattei at the 1976 Annual Meeting in Northampton, MA, USA.

## 64<sup>th</sup> Nova Award:

To *Libert A.G. (Berto) Monard* of Die Wilders (near Pretoria), South Africa, for his discovery of Supernova 2001el in NGC 1448 on September 17.064 UT. The award was announced at the 90<sup>th</sup> Annual Meeting, November 3, 2001, in Somerville, MA, USA.

# **AAVSO Merit Awards presented to South African observers**

## **15<sup>th</sup> Merit Award, awarded in 1961:**

“To Reginald P. de Kock, whose constant vigilance of the morning and evening sky resulted in an invaluable contribution of over 100,000 observations of variable stars in the southern sky.

## **26<sup>th</sup> Merit Award, awarded in 1986:**

“To Michiel Daniel Overbeek, in recognition of his dedicated devotion to observing variable stars in the southern sky since 1951, resulting in over 70,000 observations of variable stars, his excellent guidance of many variable star observers in Southern Africa, and his valuable service on the AAVSO Council.”

# AAVSO Awards presented to Danie Overbeek

## 26<sup>th</sup> AAVSO Merit Award:

“To Michiel Daniel Overbeek, in recognition of his dedicated devotion to observing variable stars in the southern sky since 1951, resulting in over 70,000 observations of variable stars, his excellent guidance of many variable star observers in Southern Africa, and his valuable service on the AAVSO Council.”

*Presented at the 75<sup>th</sup> Annual Meeting, Cambridge, MA, USA, August 1986*



## 1<sup>st</sup> Director's Award:

“For his valuable contributions to special AAVSO observing programs, particularly those using such telescopes as HST, IUE, EUVE, ORFEUS, Hipparcos, and ROSAT.”

*Presented at the 83<sup>rd</sup> Spring Meeting, Houston, TX, USA, May 1994*

# AAVSO Awards presented to Danie Overbeek

## AAVSO Observer Awards:

- For making over 100,000 visual observations

*Presented at the 83<sup>rd</sup> Spring Meeting, Houston, TX, USA, May 1994*

- For making over 200,000 visual observations

*Presented at the 86<sup>th</sup> Spring Meeting, Sion & St. Luc, Switzerland, May 1997*

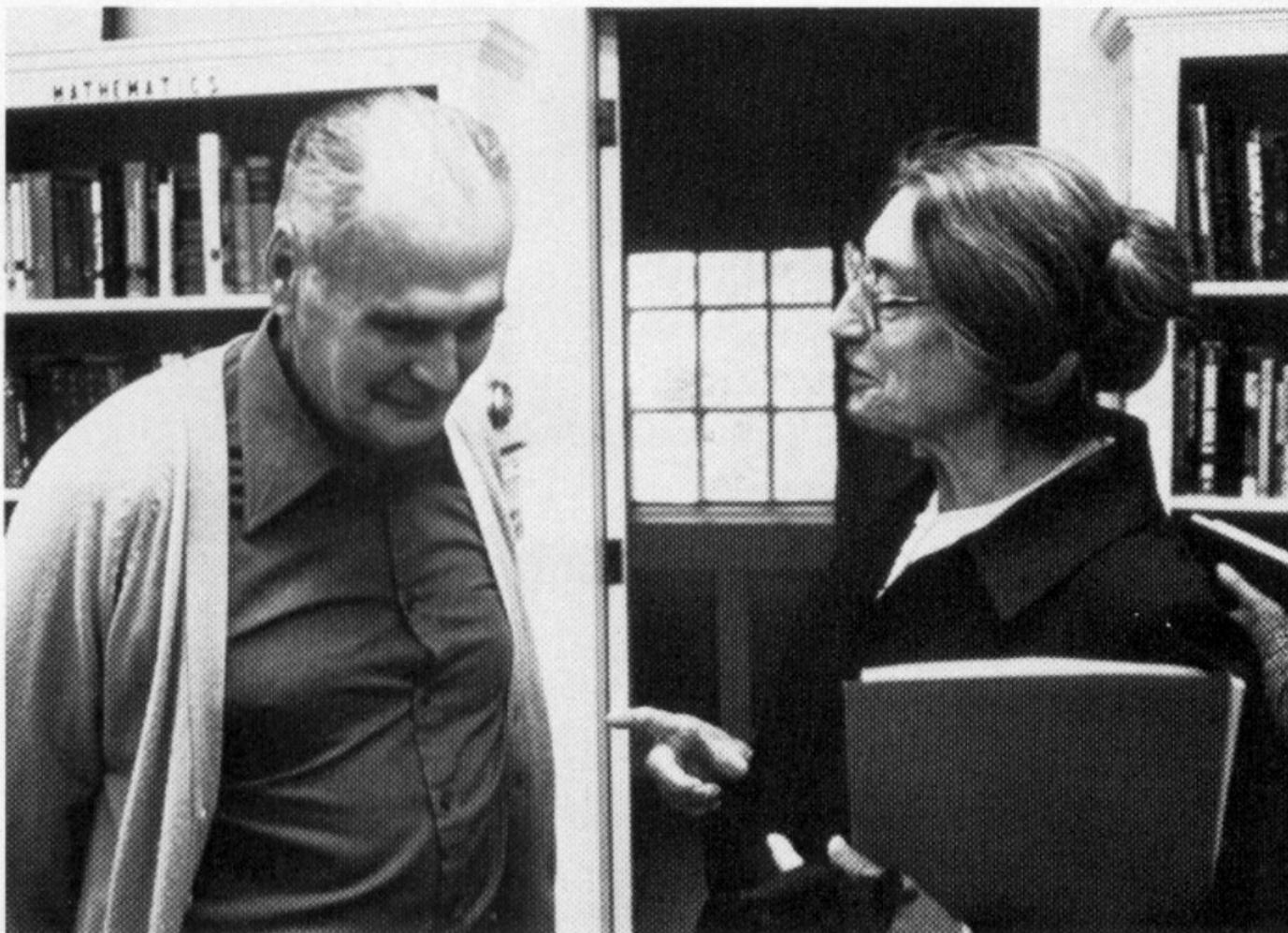
- For making over 250,000 visual observations

*Presented at the 87<sup>th</sup> Spring Meeting, Boulder, CO, USA, June 1998*

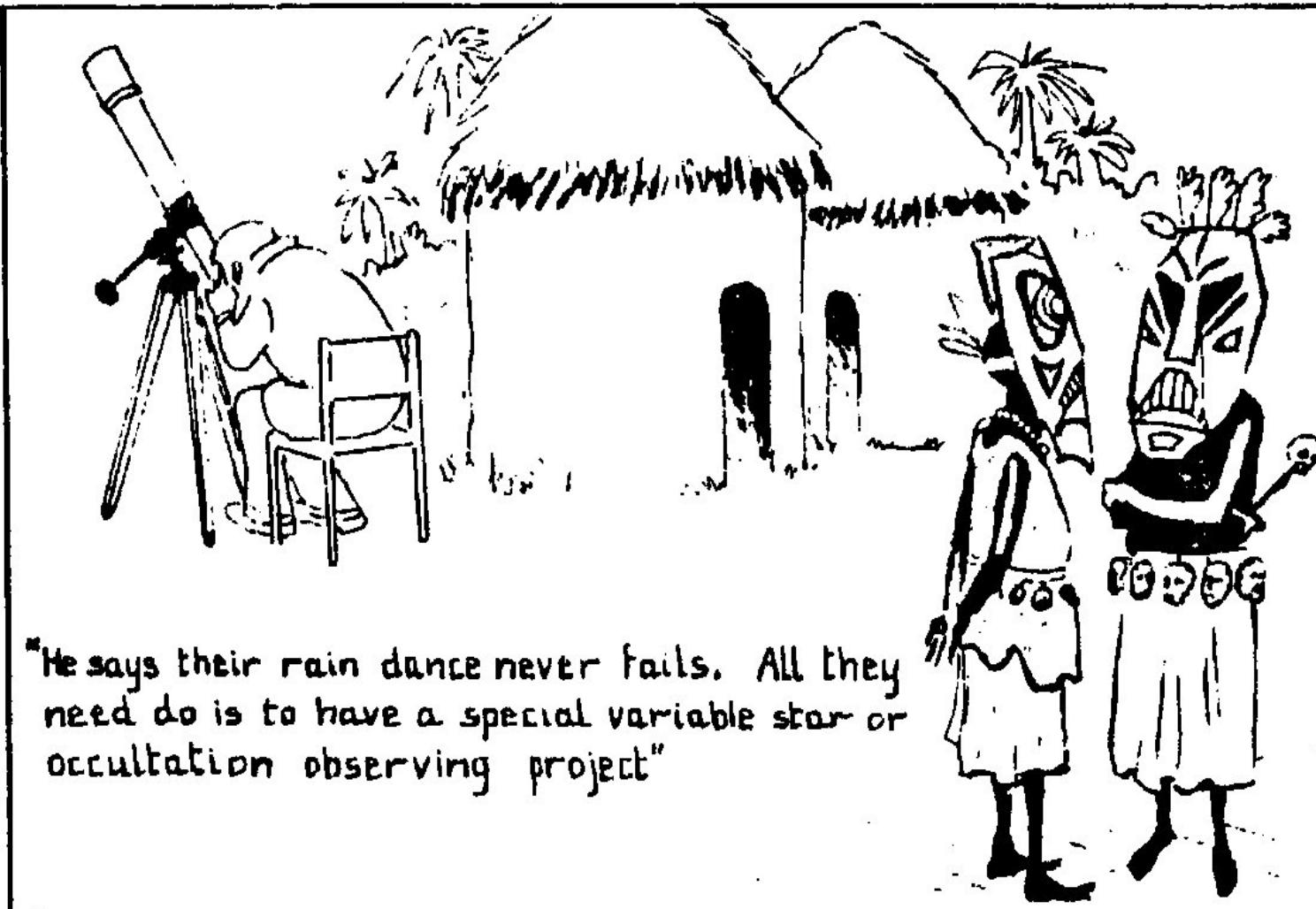
# Visit from Danie and Jennifer at AAVSO HQ



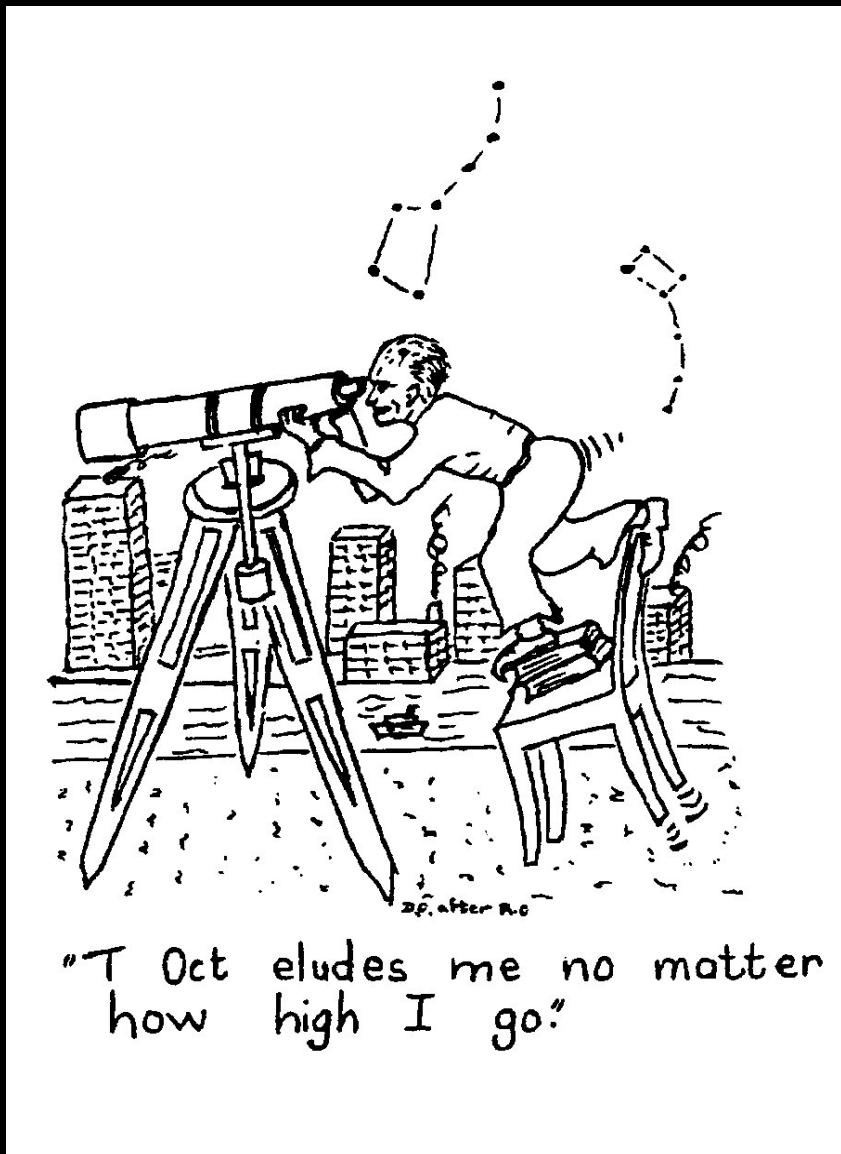
# Danie Overbeek and Dorrit Hoffleit discussing Danie's cartoons



# Some of Danie's Astronomcial Humor



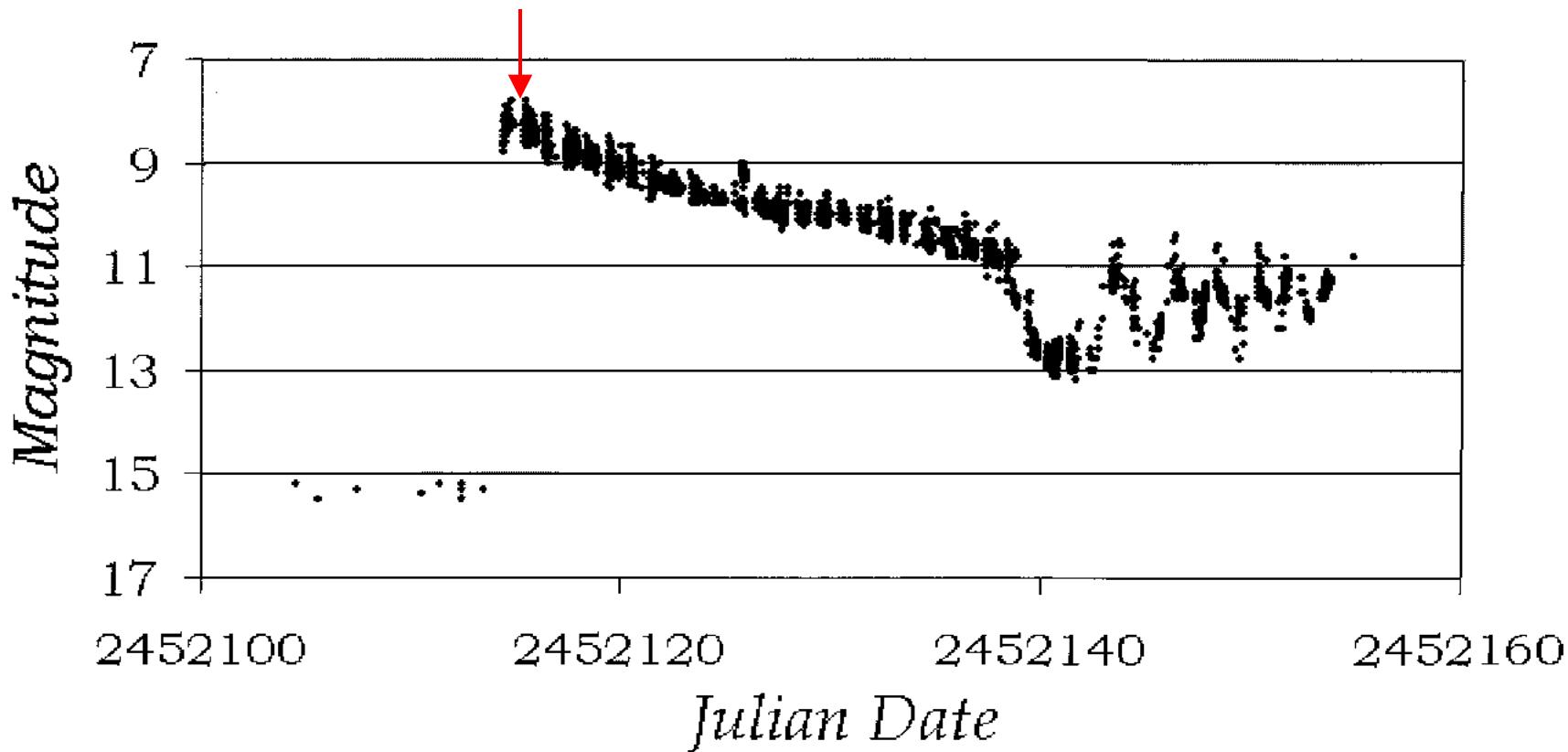
# Some of Danie's Astronomcial Humor



"T Oct eludes me no matter  
how high I go."

# *WZ Sagittae*

## Outburst of July 2001



WZ Sge went into a rare outburst exactly on Danie's funeral



Danie Overbeek  
1920-2001