British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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Contents

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Office: Burlington House, Piccadilly, London, W1V 9AG

NEW CHARTS

JOHN TOONE

036·02

5° FIELD INVERTED

U BOOTIS

14h 54m 20·0s +17°41′44″ (2000)

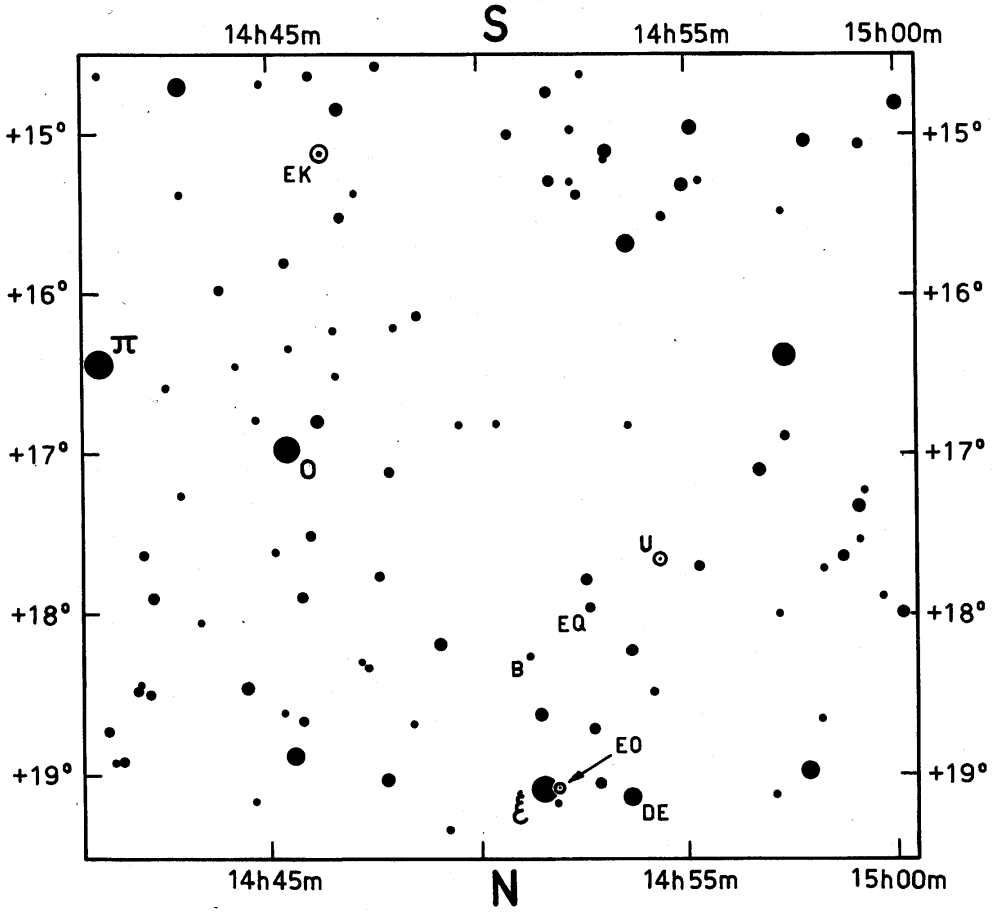


CHART: B 9·1
ATLAS ECLIPTICALIS

SEQUENCE:
RLL 1981 FEB

BAA VSS
EPOCH: 2000
DRAWN: JT 23-02-03
APPROVED: RDP

FROM THE DIRECTOR

ROGER PICKARD

Director's New Address

After 33 years at the same address, the Director has finally moved to the quiet of a village in Herefordshire, close to the Welsh border; see the back cover of this circular for details. Note though, the e-mail address remains unchanged. Sadly, this has meant that, at the time of writing, I'm without a telescope. Hopefully, this will be rectified before you read the next Circular.

Web Master

Following the announcement in the last Circular that Peter Moreton wished to resign from this post, I'm pleased to advise that Dave Grover has agreed to take over. Dave is not specifically a VS man (yet!), but he is a professional web page designer and currently looks after the Crayford Manor House AS web page. I'm hopeful that a new front page will be in place by the time you read this, and invite any comments.

LX Cyg and Members E-addresses

At the end of March following email exchanges with James Bryan in the US regarding amateur spectroscopy, Dr Albert Zijlstra of the University of Manchester Institute of Science and Technology asked to be kept advised of the state of this Mira variable. This was because he wanted a spectrum, and he was unlikely to get one with professional equipment on such a (relatively) bright star. Maurice Gavin in this country was also kept informed. This star is not on the VSS programme, and it was too late to ask but a handful of observers to keep an eye on LX Cyg, and this threw up a problem. Many observers must now have e-mail addresses, but the Director has only a few, mostly of Section Officers. Could I therefore ask all Section members who are unsure whether I have their e-addresses to email me at the address on the back cover.

Observer Profiles

Karen Holland asked for Section Officers to provide these for occasional publication in the Circulars and as Director I felt I should have been first. However, I'm delighted that Mike Simonsen has done that, especially as he's an "unofficial officer" helping out John Toone with the production of new charts, mostly of stars on the Recurrent Objects Programme. Thank you Mike - on both counts.

BAA Observer Workshops and Exhibition Meeting

I'm pleased to advise that the Section has had a prominent profile at these workshops with new observers taking advantage of the Mentor Scheme. The second Workshop formed part of the BAA Winchester Weekend and gave the opportunity to display some of our work over a longer period and to a larger audience. Sadly, apart from the material which had been displayed at the first workshop and some new material from Gary Poyner (who always supports these occasions with new material) there was little that was new. Could I therefore ask all

Section Members to send me any material, be it visual observations or CCD, in time for the Exhibition Meeting at the end of June.

Section Meeting

It is almost two years since the last Section Meeting which was a two-day meeting at Alston Hall near Preston in October 2000, and it is high time for another. I'm therefore organising a one-day meeting on Saturday 8th November at the Humfrey Rooms, in Northampton. This will be of a similar format to other Section Meetings, although there will be more time left for informal discussion. I hope to be able to announce full details in the September Circular but in the meantime, please think about those poster papers or any other presentation you may care to give.

CHART NEWS

JOHN TOONE

The following new charts are now available from the Chart Secretary:

Main Programme - Telescopic Stars

030.02 R Aql
Formally 030.01. New 9 degree and 1 degree field charts have been drawn. The original sequence that dates from Hagen has been extensively revised to incorporate Tycho 2 photometry.

003.03 SS Aur
Formally 003.02. New 3 degree and 20 minute charts have been drawn. The previous mv sequence has been replaced and extended by a V sequence sourced from Tycho 2, Henden and West. SS Aur in March 2003 was seen to fade below magnitude 16, so observers should take care to identify the variable correctly when it is in quiescence.

036.02 U Boo (see inside cover of this circular for a copy of one of these new charts)
Formally 036.01. New 5 degree and 1 degree field charts have been drawn. The sequence remains unchanged.

004.03 Z Cam
Formally 004.02. New 3 degree and 30 minute field charts have been drawn. The previous mv sequence has been replaced and extended by a V sequence sourced from Zissell, Lenouvel and Daguillon.

005.03 SS Cyg (see page 5 of this circular for a copy of one of these charts)
Formally 005.02. New 5 degree and 1 degree field charts have been drawn. The previous mv sequence has been replaced and extended by a V sequence sourced from Tycho 2, Henden, Lenouvel and Daguillon.

007.04 AB Dra (see back inside cover of this circular for a copy of one of these charts)
Formally 007.03. New 3 degree and 20 minute field charts have been drawn. The previous mv sequence has been replaced and extended by a V sequence sourced from Bailey, Misselt and Zissell.

018·03 3° FIELD INVERTED

SU URSAE MAJORIS 08h 12m 28·3s +62° 36′ 23″ (2000)

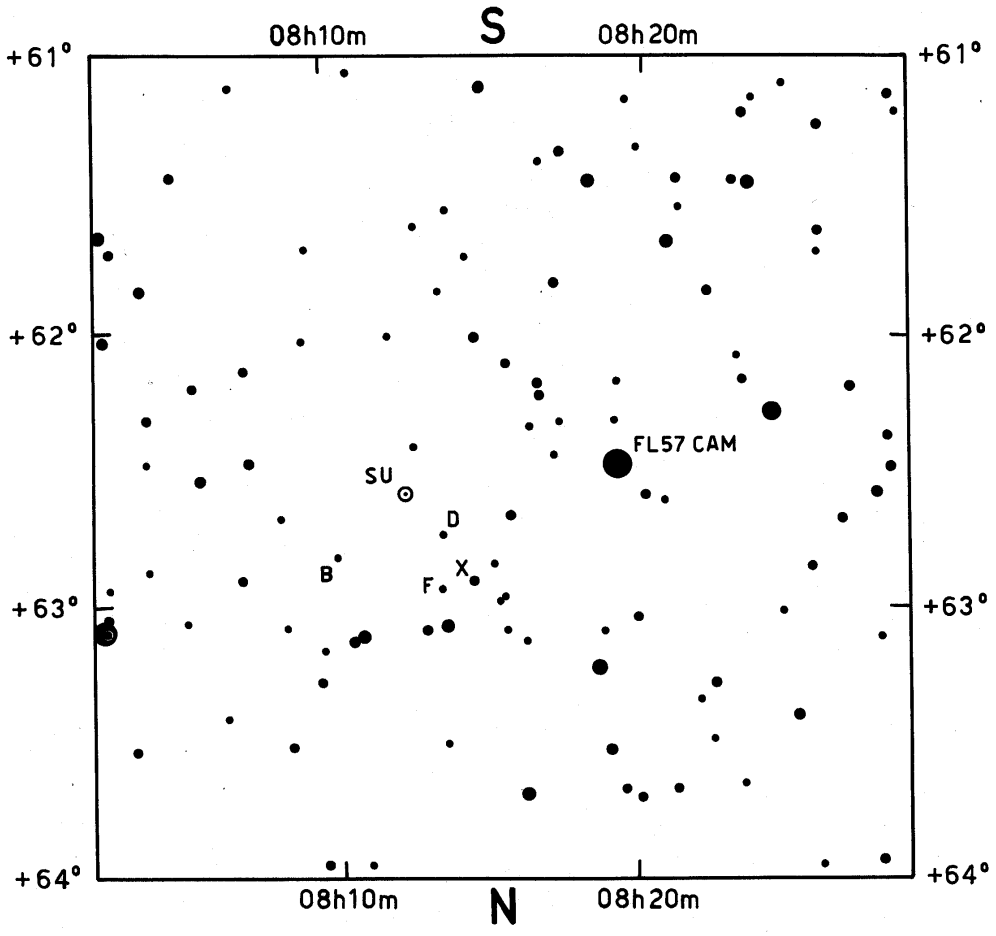


CHART: MILLENNIUM SA

SEQUENCE: TYCHO 2 VJ

X 9·3 D10·7
B 10·4 F11·3

BAA VSS
EPOCH: 2000
DRAWN: JT 02-03-03
APPROVED: RDP

018.03 SU UMa (see page 3 of this circular for a copy of one of these new charts)
Formally 018.02. New 3 degree and 20 minute field charts have been drawn. The previous sequence (used by both the BAA VSS and AAVSO for many years) was known to be poorly calibrated at the faint end, and has now been replaced with a V sequence sourced from Tycho 2 and Henden.

Recurrent Object Programme Stars

116.02 LS And
Formally TA chart GMH 880219, no previous BAA VSS chart existed. A 15 minute field chart has been drawn with a V sequence by Henden introduced.

185.02 V630 Cas
Formally TA chart GMH 880219, no previous BAA VSS chart existed. A 15 minute field chart has been drawn with a V sequence by Henden introduced.

262.01 CG Dra
No previous BAA VSS chart existed for this star which was added to the ROP in September 2001. A 15 minute field chart has been drawn complete with a V sequence by Henden.

264.01 KV Dra
Formally known as RXJ 1450+6403 and added to the ROP in September 2001. A 15 minute field chart is drawn for the first time complete with a V sequence by Henden.

265.01 CI Gem
No previous BAA VSS chart existed for this star. A 15 minute field chart has been drawn complete with a V sequence by Henden.

266.01 V589 Her
No previous BAA VSS chart existed for this star. A 15 minute field chart has been drawn complete with a V sequence by Henden.

267.01 V336 Per
No previous BAA VSS chart existed for this star which was added to the ROP in September 2001. A 15 minute field chart has been drawn complete with a V sequence by Henden.

Thanks are due to Mike Simonsen who prepared all of the Recurrent Objects Programme charts.

005·03

5° FIELD INVERTED

SS CYGNI

21h 42m 42·8s +43°35′10″ (2000)

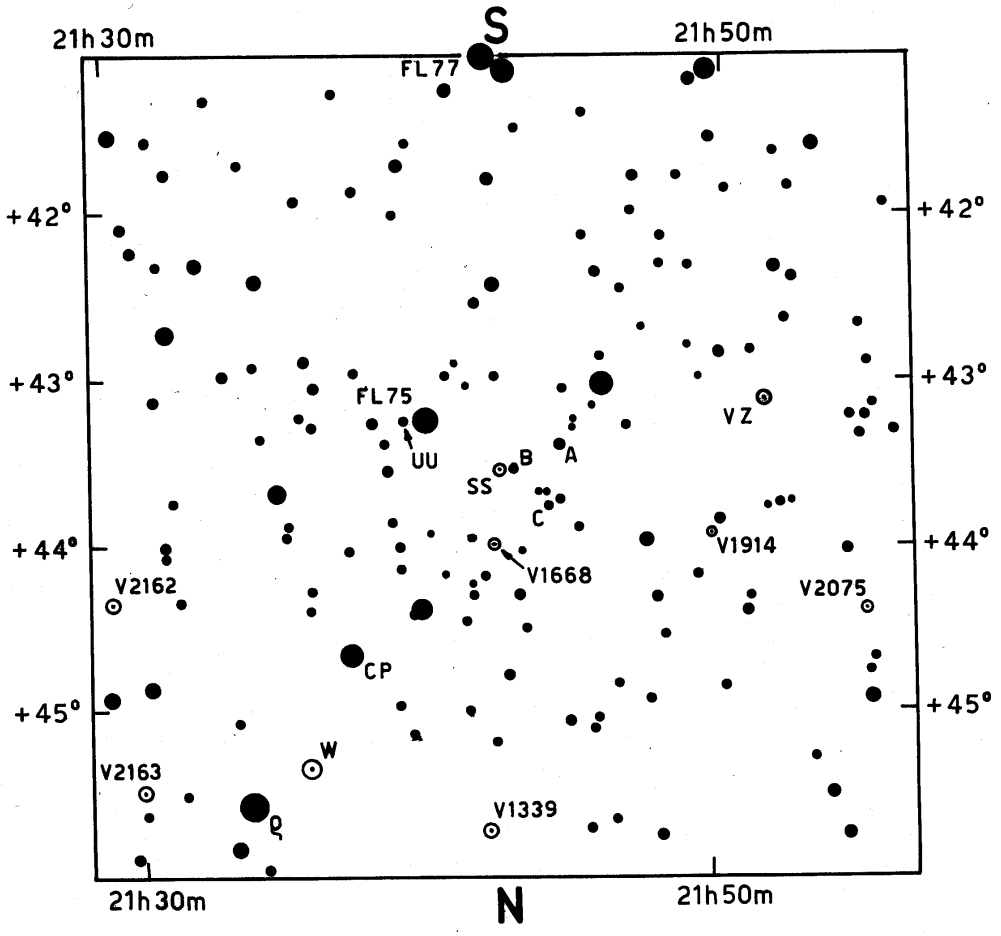


CHART:
ATLAS BOREALIS

BAA VSS
EPOCH: 2000
DRAWN: JT16-02-03
APPROVED: RDP

THE LONG AND WINDING ROAD

MIKE SIMONSEN

Driving to the observatory through the Michigan countryside gives me plenty of time to reflect on the long and winding road that has brought me to this point in my life. Leaving my urban neighborhood of closely packed homes, I pause at the main road and gaze west into the sunset. I remember the kid who raced home to get to dinner on time, after spending hours in the library reading every astronomy book and periodical I could lay my hands on. I usually read the magazines from cover to cover first, because we weren't allowed to take them home. Then I'd hop on my bicycle with another Patrick Moore book in my bag and race to make it home before the streetlights came on.

It was instilled in me early on, that to take notes and record everything I saw carefully and accurately was the only way to be a good observer. Those magical popular astronomy books by Moore and James Muirden were probably the biggest influence in my life as an amateur astronomer. A couple of years ago I discovered my notebooks from this time, whilst rummaging through boxes I had in storage. I was surprised at how faithfully I had recorded sunspots, lunar craters and the positions of the Galilean satellites from night to night with my 70mm refractor.

I head east for a mile or so and come to the road that leads north towards the countryside. The sharp left turn I make here is analogous to the sharp left turn I took in life entering college. After spending my high school years focused on mathematics, physics and music I came to a crossroad in life. Weeks before leaving home to study electrical engineering at Michigan Tech, I decided to turn down financial assistance and a relatively certain future to study music at another university.

I was already playing in a band professionally, and my decision was no doubt influenced by the fact that young girls found musicians much more exciting than engineers! Playing saxophone and keyboards in nightclubs until the wee hours of the morning five nights a week, left little time for astronomy. My *observing* was soon limited to pointing out constellations and planets to girls I was trying to impress. I spent the next twenty years playing jazz, rock and roll, blues and country music, and thought little about my astronomical interests.

I follow this road north out of the city for quite a while, until I come to a small town typical of the villages in this part of the country. At the north end of town I make another left turn, and head west through farm fields. Similarly, life took another turn in the late 80's for me.

Through an unexpected chain of events, I found myself turning my passion for gardening into a profession. Eventually, I retired from the music business and started my own landscape design/build firm. I now had the time and money to purchase a *big* telescope and pursue my long dormant interests in astronomy.

I wasted no time in reviving my hibernating enthusiasm for astronomy, and observing variable stars. I joined the AAVSO, and my local astronomical society, and soon after, started a variable star sub-group. The sub-group eventually evolved into an independent group of observers we call Sirius Astronomy. We have our own website at **http://sirius-astronomy.com/** and an observing site with three domed observatories, and a collection of telescopes. We

Mike in his observatory with his telescope

don't bother with meetings very often. The main focus of the group is observing astronomical objects, rather than talking about them.

Another quick turn to the north, past an apple orchard, and I find myself under a dark enough sky to see the evening's first bright stars through the windows of my car. I'm getting closer to my destination.

The single most important factor in my rapid development as a variable star observer has been the Internet. I was fortunate to be mentored through email by two of the world's leading observers, Gary Poyner and Gene Hanson. They graciously shared the wealth of their experience and knowledge, and saved me countless hours, learning things the hard way.

Our informative, lively, and quite often humorous discussions, led to the creation of an informal email discussion group that includes many of the world's leading visual observers of cataclysmic variables. I have friends all over the planet now, who share similar interests. Many of them I have never met face to face. It was a great thrill for me to finally meet Hazel McGee and Rod Stubbings in Hawaii, after having known them through email only. One of the main topics of discussion has always been the inadequate, or non-existent, charts for many of the CVs we were observing. This eventually led to my other astronomical passion, the creation of accurate sequences and charts for variables.

I turn left onto the road that is the last leg of my dark sky journey. There is an old schoolhouse at the corner that has been converted into a home. Decades ago these little one-room schoolhouses were the centres of learning for kids in the country.

I soon learned that making variable star charts with accurate sequences was not as easy as it looks to the uninformed amateur observer. I was fortunate enough to get in touch with Arne Henden and Bruce Sumner a few years ago. They took me under their wings and taught me more than I ever wanted to know about photometry and sequences.

It still tickles me to be consulting with Arne, an astronomer at the US Naval Observatory in Flagstaff, regarding observing targets for a metre class telescope, with a state of the art CCD and the world's leading photometrist at the controls.

I now have hundreds of charts and sequences published on our website based on Henden photometry, and am currently working with John Toone, Roger Pickard and Gary Poyner to utilize this information to create BAAVSS charts for ROP stars.

I turn in the driveway that leads to the observatory. The dome is located on the homestead of my friends Dawna and Dennis. At star parties and gatherings, I am often introduced as *Mike, the guy who lives in our back yard,* by them.

I park the car and step out into the night air. Most nights, all the stars in the Little Dipper are plainly visible and the dark rift in the Milky Way is quite obvious before eyes have become dark-adapted. M31 is often an easy naked eye object.

The observatory is a seven-foot diameter fibreglass cylinder, with a manually rotated fibreglass dome. It houses an equatorially mounted 12" LX200. I make no apologies for using a go-to telescope and punching in coordinates to locate the fields of my programme stars. I have done plenty of star-hopping in my time, and not having to handle a metal telescope at

The 12" LX 200 in Mike's Observatory

ambient winter temperatures that can exceed -30C is a distinct advantage in my opinion.

On average nights my limiting magnitude is 15.5V or better. I have seen 16th magnitude and fainter on exceptional nights. My primary programme stars are CVs that outburst at 15V or brighter. I also observe about 500 LPVs with faint minima more or less regularly.

My favorite objects are CVs that I can follow through most, or all of their cycle, and which are fairly active. These would include **KT Per, TZ Per, Z Cam, YZ Cnc, AT Cnc, SY Cnc, SU UMa, ER UMa** and **AB Dra**. Some stars I like to visit because of the field: **CY Lyr** is in the midst of a nice cluster, and the Mira **RX Lyr** has the ghostly smoke ring of M57 in the same low-power field of view.

Observing sessions are usually two to eight hours long, depending on the weather and the seasonal variation in the length of night. Driving half an hour each way, my goal is always to observe as long as I can. I've averaged about 130 nights per year for the last three years. Needless to say, I have a very understanding and supportive wife.

It's not unusual for me to watch dawn turn to sunrise as I drive home, sometimes faster than I should, anxious to report outbursts observed during the night.

In many ways I have come full circle, only now I feel like a kid trying to get home in time for breakfast.

CEPHEID VARIABLE STARS IN M13: V2 AND V6

FRANCISCO A. VIOLAT BORDONAU AND TONI BENNASARANDREU
Asociacion de Variabilistas de Espana, Asesores Astronomicos Cacerenos

During a period of 129 days (June 15 to October 21, 2001: JD 2076 - JD 2204), Toni Bennasar Andreu, in Palma, Mallorca, and Francisco Violat Bordonau, in Caceres, Spain, studied the globular cluster M13 in Hercules. They used telescopes of 305 mm and 203mm aperture, together with Starlight Xpress MX 916 and MX5 CCD cameras respectively. The periods, amplitudes (V magnitude), and light curves for two Cepheid variable stars, V2 and V6 were determined, and the results are presented here.

In order to process the CCD images that were obtained, the IRIS software package, written by engineer and French amateur, Christian Buil, was used. This software is easy to use, powerful, and gives reliable results. For the generation of periodograms and light curves, and for the determination of oscillation amplitude, we used the AVE software (Analysis of Stellar Variability), which is produced by the *Grupo de Estudios Astronomicos* (Astronomy Group). The AVE software has also proved itself to be easy to use, powerful and reliable, and it has a long history of use in the discovery and study of variable stars of all types.

A total of 32 stars of the M13 cluster were measured, night to night; two non-variable stars were used as comparison stars, for the photometric calibration of the images. The remaining 30 stars were variable stars or suspect variable stars; of these, two were the very well-known Cepheid variable stars V2 and V6.

V2

Professional publications indicate that V2 is a W Virginis type (of subtype BL Herculis) Cepheid of Population II origin.

It varies with a period of 5.110939 days (Osborn, 1969; Pike and Meston, 1976), or more recently 5.11070 days (Wehlau and Bohlender, 1982). The variation has an amplitude of 1.26 magnitudes in blue light (Osborn, 1977), but only 0.99 magnitudes in the visual (Demers, 1970).

We analysed the two data sets independently, since the telescopes and CCD cameras were very different. It was possible to determine the light curves for each author, and from these to extract the period and amplitude of oscillation. The curves are essentially identical, showing the characteristic asymmetry between the ascent and descent of the light curve. The amplitude of oscillation was measured as 0.923 magnitudes for Toni's dataset, and 1.052 for Francisco's dataset; this difference of barely 0.129 magnitudes was typical of the kind of values that professional work achieves (Demers, Meston, Welty, Osborn).

Using both data sets separately, it was possible to determine the period and the range as shown:

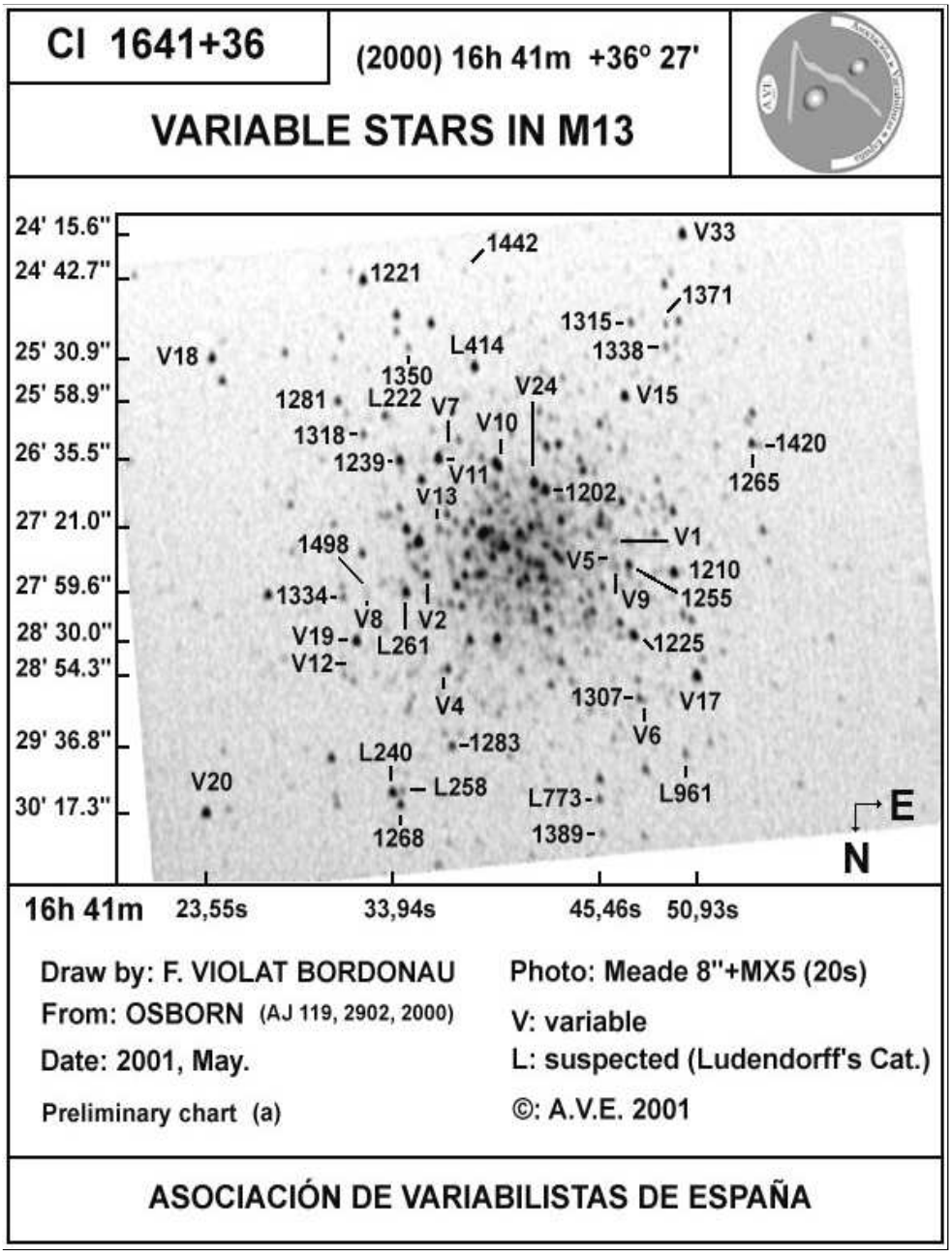


Chart produced and used by author showing CCD(V) values for stars in M13 ; the decimal point is omitted from the magnitude values.

	Amplitude	Period
Bennasar	0.923	5.0436
Violat	1.052	5.1332
Both	1.052	5.1097

The error in the period (compared with Osborn's value of 5.110939 days), was 0.0673 days for Toni, and 0.0222 days for Francisco, but was only 0.0012 days if the combined dataset was used; a complete success! Let us compare this with the data of professional work:

	Year	Amplitude	Period
Barnard	1900	1.000	5.10
Arp	1955	1.23 (V)	5.10
Osborn	1969		5.110939
Demers	1970	0.990	5.110939
Pike-Meston	1977	0.76 (V)	5.110939
Osborn	1977	1.26 (B)	5.112
Wehlau-Bohlender	1982	1.08 (B)	5.11070
Us	2001	1.052 (V)	5.1097

Why, when we measure from night to night do we not obtain the same magnitudes? Instead, we actually measure slightly different values. The answer to this is determined by a consideration of the cycle: this system takes 5.110939 days to complete one cycle. However, we are forced to observe at roughly 24 hour intervals during the night. So after 5 nights of observing, the star will be 0.110939 days (2.66 hours) into its next cycle. Because of the fact that the period is not an exact multiple of a day, we see a different magnitude each night. So how many days are needed, until the light curve begins to repeat itself? This is given by:

$$1 : 0.110939 \text{ d} = 9.013962628 \text{ cycles}$$

$$9.013962628 \text{ cycles} \times 5.110939 \text{ d} = \mathbf{46.0698 \text{ days}}$$

So after 9 cycles we will return, almost exactly, to observe the same light curve that we studied on the first day. This indicates that although 5 days observing are necessary in order to cover one complete light curve, 46 days or more of observing are required to obtain complete information about this system.

In view of these excellent results, and encouraged by an e-mail from Dr. Osborn, we felt happy to move on to study V6 with the same enthusiasm.

V6

This is a relatively bright Cepheid star (13.71 to 14.33 V magnitude), and has a short period (only 2.112867 days); it is also a W Virginis type Cepheid, of subtype BL Herculis. A star of this magnitude and period should have been an easy target for our team. Regrettably, it was very close to a star of magnitude 13.07. It was easy to identify as it appeared near to the bright red variable V17, which is immediately to the north of a reddish star of magnitude 12.25 (slightly variable according to a private communication from Dr. Osborn).

It turned out that the amplitude of variation in this case, was so small, that we decided to stop observing it. It would have required a focal length of 3 to 4 metres to obtain useful results! However, an e-mail conversation encouraged us to measure our images with the maximum of care; in this way we obtained the combined magnitude of both stars, and determined the light curve of the Cepheid that was superimposed on the brighter star's light curve.

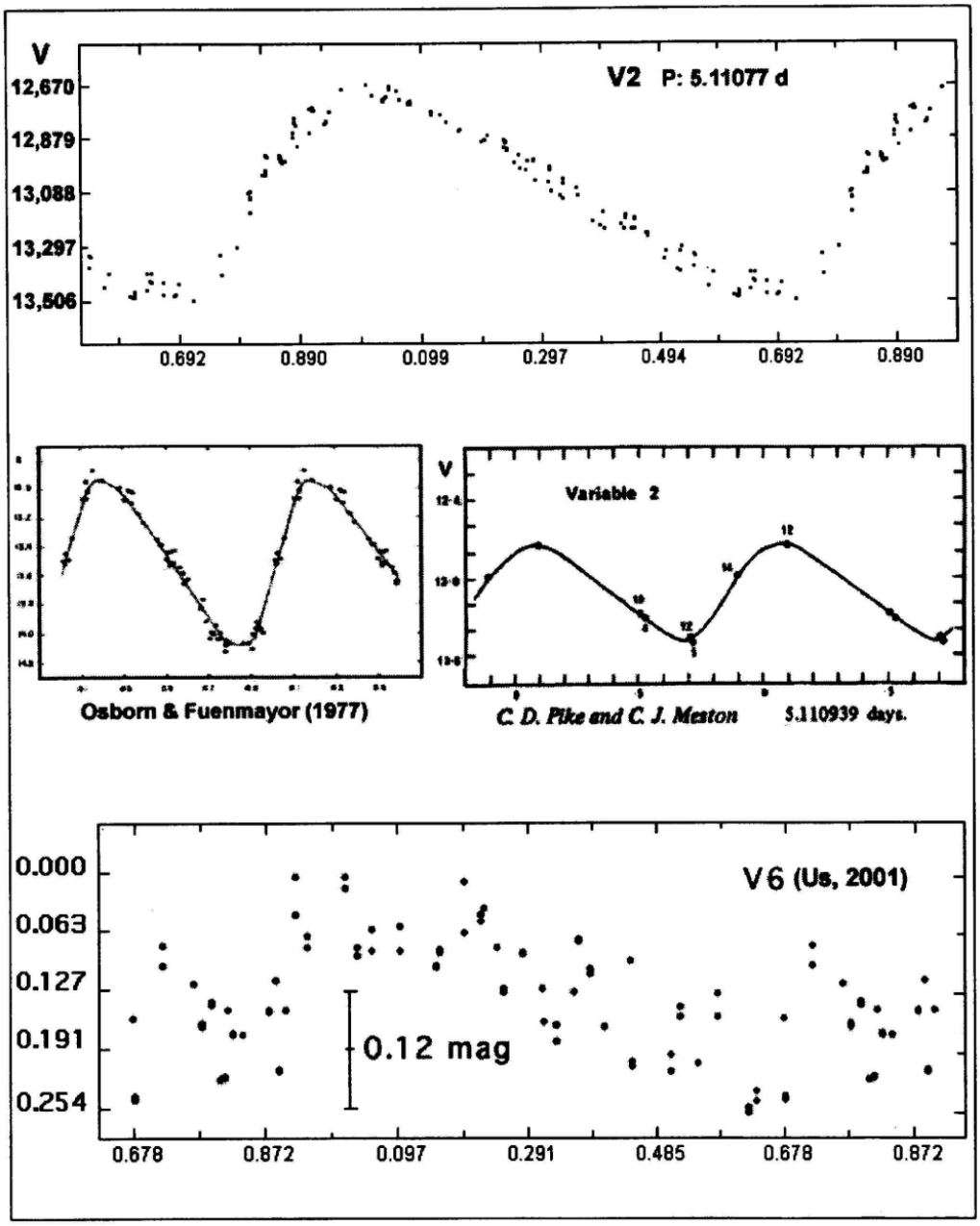
In total, we gathered a total of 75 brightness measurements (58 from Toni and 23 from Francisco). We kept in mind that it was a difficult star, not so much because of its amplitude range, but more because of its proximity to a much brighter star. Let us see the professional data on V6

	Year	Amplitude	Period
Arp	1955	0.83 (V)	2.1
Osborn	1969		2.112867
Demers	1970	0.59	2.112867
Pike-Meston	1977	0.46 (V)	2.112867
Wehlau-Bohlender	1982	1.000 (B)	2.112867
Osborn	2000		2.11
Us	2001	0.254 (V)	2.0787

Using both data sets separately (since our apertures and CCD cameras were different) we determined the period and the amplitude of magnitude variation:

	Amplitude	Period
Bennasar:	0.254	2.0784 d
Violat:	0.213	2.0762 d
Both:	0.254	2.0787 d

Here, contrary to the V2 results, my measurements are of lower quality, which is due to the fact that my focal length is shorter than Toni's instrument, so that I cannot measure the Cepheid light curve variations quite as well. In spite of everything, a light curve is obtained that indicates a period of 2.0787 days, as opposed to the 2.112867 days predicted. This gives



Top: Authors' folded light curve for V2; centre: equivalent professional data; bottom: authors' folded light curve for V6

an error of 0.034167 days (49 minutes 12 seconds), which is indicative of the difficulty with which the measurement was made. I have inserted an error bar of 0.12 magnitudes, which is the standard deviation of the measurements. It is clear that, in general, the measurements show the light curve cycle quite well, with the exception of those measurements taken on poor nights.

We hope to continue to measure the last M13 Cepheid star, V1, which varies between magnitude 13.62 and 14.53, with a period of 1.459252 days; this makes this star the cepheid of shortest period in this globular cluster.

Acknowledgements

The author expresses his gratitude to Dr. Wayne Osborn (Central Michigan University), for the advice and assistance that he gave me, and Josep M. Gomez (Grupo de Estudios Astronomicos), for his helpful comments. I thank my collaborator and friend Tony Bennasar Andreu ('Ca Nostra' Observatory), thanks to whose images (all them excellent!) I have been able to improve and refine my measurements. The photometric reduction has been carried out using IRIS software, developed by engineer and French amateur Christian Buil. The analysis of the data has been carried out with Rafael's Barbera software A.V.E, of the G.E.A. (Grupo de Estudios Astronomicos).

Availability of the data: Upon request from fviolat@yahoo.es

References

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Asesores Astronomicos Cacerenos

BINOCULAR PRIORITY LIST

MELVYN TAYLOR

Variable	Range	Type	Period	Chart	Variable	Range	Type	Period	Chart
AQ And	8.0-8.9	SRC	346d	82/08/16	***AH Dra***	7.1-7.9	SRB	158d?	106.01
EG And	7.1-7.8	ZA		072.01	***NQ Gem***	7.4-8.0	SR+ZA	70d?	077.01
V Aql	6.6-8.4	SRB	353d	026.03	***X Her***	6.3-7.4	SRB	95d?	223.01
UU Aur	5.1-6.8	SRB	234d	230.01.	***SX Her***	8.0-9.2	SRD	103d	113.01
AB Aur	7.2-8.4	INA		83/10/01	***UW Her***	7.8-8.7	SRB	104d	107.01
V Boo	7-12	SRA	258d	037.01	***AC Her***	6.8-9.0	RVA	75d	048.03
RW Boo	6.4-7.9	SRB	209d	104.01	***IQ Her***	7.0-7.5	SRB	75d	048.03
RX Boo	6.9-9.1	SRB	160d	219.01	***OP Her***	5.9-6.7	SRB	120d	84/04/12
ST Cam	6.0-8.0	SRB	300d?	111.01	***R Hya***	3.5-10.9	M	389d	049.01
XX Cam	7.3-9.7?	RCB?		068.01	***RX Lep***	5.0-7.4	SRB	60d?	110.01
X Cnc	5.6-7.5	SRB	195d	231.01	***SS Lep***	4.8-5.1	ZA		075.01
RS Cnc	5.1-7.0	SRC	120d?	84/04/12	***Y Lyn***	6.9-8.0	SRC	110d	229.01
V CVn	6.5-8.6	SRA	192d	214.01	***SV Lyn***	6.6-7.5	SRB	70d?	108.01
WZ Cas	6.9-8.5	SRB	186d	82/08/16	***U Mon***	5.9-7.8	RVB	91d	029.03
V465 Cas	6.2-7.2	SRB	60d	233.01	***X Oph***	5.9-9.2	M	328d	099.01
γ Cas	1.6-3.0	GC		064.01	***BQ Ori***	6.9-8.9	SR	110d	84/04/12
rho Cas	4.1-6.2	SRD	320d	064.01	***AG Peg***	6.0-9.4	NC		094.01.
W Cep	7.0-9.2	SRC		83/10/01	***X Per***	6.0-7.0	GC+XP		84/04/08
AR Cep	7.0-7.9	SRB		85/05/06	***R Sct***	4.2-8.6	RVA	146d	026.03
mu Cep	3.4-5.1	SRC	730d	112.01	***Y Tau***	6.5-9.2	SRB	242d	84/04/12
O Cet	2.0-10.1	M	332d	039.02	***W Tri***	7.5-8.8	SRC	108d	114.01
R CrB	5.7-14.8	RCB		041.02	***Z UMa***	6.2-9.4	SRB	196d	217.01
W Cyg	5.0-7.6	SRB	131d	062.1	***ST UMa***	6.0-7.6	SRB	110d?	102.01
AF Cyg	6.4-8.4	SRB	92d	232.01	***VY UMa***	5.9-7.0	LB		226.01
CH Cyg	5.6-10.0	ZA+SR		089.02	***V UMi***	7.2-9.1	SRB	72d	101.01
U Del	5.6-7.5	SRB	110d?	228.01	***SS Vir***	6.9-9.6	SRA	364d	097.01
EU Del	5.8-6.9	SRB	60d?	228.01	***SW Vir***	6.4-7.9	SRB	150d?	098.01
TX Dra	6.8-8.3	SRB	78d?	106.01					

ECLIPSING BINARY PREDICTIONS

TONY MARKHAM

The following predictions, based on the latest Krakow elements, should be usable for observers throughout the British Isles. The times of mid-eclipse appear in parantheses, with the start and end times of visibility on either side. The times are hours UT, with a value greater than 24 indicating a time after midnight. D indicates that the eclipse starts/end in daylight, L indicates low altitude at the start/end of the visibility and << indicates that mid eclipse occurred on an earlier date.

Thus, for example, on Aug 30, TV Cas D20(21)25 indicates that an eclipse of TV Cas starts in daylight, but can be observed between approx 20h on Aug 30 and 01h UT on Aug 31, with mid eclipse occurring at approx 21h UT on Aug 30. Please contact the EB secretary if you require any further explanation of the format.

The variables covered by these predictions are :

TV Cas	7.2-8.2V	**S Equ**	8.0-10.08V	**U Sge**	6.45-9.28V
U Cep	6.75-9.24V	**delta Lib**	4.9-5.9V	**RW Tau**	7.98-11.59V
SS Cet	9.4-13.0v	**V640 Ori**	11.2-13.5V	**HU Tau**	5.92-6.70V
SW Cyg	9.24-11.83V	**Z Per**	9.7-12.4p	**X Tri**	8.88-11.27V
Z Dra	10.8-14.1p	**ST Per**	9.52-11.40V	**TX UMa**	7.06-8.80V
TW Dra	8.0-10.5v	**Y Psc**	9.44-12.23V	**Z Vul**	7.25-8.90V

Note that predictions for RZ Cas, Beta Per and Lambda Tau can be found in the BAA Handbook.

2003 Jul 1 Tue
TV Cas D22(26)26D
S Equ 22(28)26D
Z Dra 24(26)26D
2003 Jul 2 Wed
TW Dra D22(24)26D
U Cep 22(27)26D
Z Vul 23(28)26D
ST Per L23(23)26D
2003 Jul 3 Thu
TV Cas D22(21)25
2003 Jul 5 Sat
TW Dra D22(20)25
U Sge D22(20)26D
del Lib D22(22)24L
2003 Jul 7 Mon
RW Tau L01(03)02D
Z Vul D22(26)26D
U Cep 22(27)26D
del Lib 23(29)24L
2003 Jul 8 Tue
Z Dra D22(21)23
SW Cyg D22(22)26D
S Equ D22(24)26D
U Sge 24(29)26D
2003 Jul 10 Thu
RW Tau L01(<<)02
Y Psc L23(27)26D
ST Per L23(21)26
TV Cas 23(27)26D
2003 Jul 11 Fri
Z Per D22(18)23
2003 Jul 12 Sat
del Lib D22(21)24L
TV Cas D22(23)26D
Z Dra D22(23)25
Z Vul D22(24)26D
U Cep D22(27)26D
2003 Jul 14 Mon
TW Dra 01(06)02D
Z Per D22(19)24
Y Psc L22(21)26
del Lib 23(29)23L
2003 Jul 15 Tue
S Equ D22(21)26D
U Sge D22(24)26D
2003 Jul 16 Wed
ST Per 00(05)02D
TW Dra D22(25)26D
Z Dra 22(25)26D
2003 Jul 17 Thu
Z Per D22(21)25
Z Vul D22(22)26D
SW Cyg D22(25)26D
U Cep D22(26)26D
2003 Jul 18 Fri
RW Tau L01(05)02D
ST Per L22(20)24
2003 Jul 19 Sat
TX UMa D22(18)23
TW Dra D22(21)26
del Lib D22(21)23L
2003 Jul 20 Sun
TV Cas 01(05)02D
Z Per D22(22)26D
Z Dra 24(26)26D
2003 Jul 21 Mon
RW Tau L01(<<)02D

TV Cas D22(24)26D
del Lib 22(29)23L
2003 Jul 22 Tue
U Sge D21(18)24
S Equ D21(18)24
TX UMa D21(19)24
Z Vul D21(19)25
U Cep D21(26)26D
2003 Jul 23 Wed
Z Dra D21(19)22
TV Cas D21(20)24
Z Per D21(23)26D
ST Per 23(27)26D
2003 Jul 24 Thu
X Tri 02(04)02D
2003 Jul 25 Fri
X Tri 01(03)03D
Z Vul 01(06)03D
Z Dra 02(04)03D
TX UMa D21(21)25L
U Sge 21(27)27D
S Equ 23(29)27D
Y Psc 24(28)27D
2003 Jul 26 Sat
X Tri 00(03)03D
del Lib D21(20)23L
Z Per D21(25)27D
ST Per L22(19)23
SW Cyg 23(29)27D
X Tri 23(26)27D
2003 Jul 27 Sun
Z Vul D21(17)23
Z Dra D21(21)24
U Cep D21(26)27D
X Tri 23(25)27D
2003 Jul 28 Mon
TW Dra 02(07)03D
TX UMa D21(22)25L
del Lib 22(28)23L
X Tri 22(25)27D
2003 Jul 29 Tue
RW Tau 02(06)03D
TV Cas 02(06)03D
Z Per D21(26)27D
Y Psc L21(23)27D
X Tri L22(24)26
Z Vul 23(28)27D
2003 Jul 30 Wed
TW Dra D21(26)27D
TV Cas 22(26)27D
X Tri L22(23)26
2003 Jul 31 Thu
SW Cyg D21(18)24
Z Dra D21(23)25
TX UMa D21(24)25L
X Tri L22(23)25
ST Per 22(26)27D
RW Tau L24(25)27D
2003 Aug 1 Fri
TV Cas D21(21)25
U Sge D21(21)27D
U Cep D21(25)27D
S Equ D21(26)27D
X Tri L22(22)24
Z Per 23(27)27D
2003 Aug 2 Sat
del Lib D21(20)22L
TW Dra D21(21)26
Y Psc L21(17)21
X Tri L22(21)24
2003 Aug 3 Sun
TX UMa D21(25)25L
Z Vul D21(26)27D
ST Per L21(17)22
X Tri L22(21)23
2003 Aug 4 Mon
del Lib 21(28)22L
X Tri L22(20)22
Z Dra 22(25)27D
Z Per 24(29)27D
2003 Aug 5 Tue
HU Tau L01(<<)02
U Sge 01(07)03D
SW Cyg 02(08)03D
TW Dra D21(17)22
X Tri L21(19)22
2003 Aug 6 Wed
U Cep D21(25)27D
TX UMa 22(27)24L
2003 Aug 7 Thu
HU Tau L01(<<)03D
2003 Aug 8 Fri
Z Per 01(06)03D
S Equ D21(23)27D
Z Vul D21(24)27D
ST Per D21(25)27D
TV Cas 23(27)27D
2003 Aug 9 Sat
Z Dra 00(02)03D
HU Tau L01(01)03D
del Lib D21(19)22L
SW Cyg D21(22)27D
TX UMa 24(28)24L
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TX UMa L03(04)03D
TV Cas D21(23)27
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HU Tau L01(02)03D
TW Dra 02(07)03D
Z Per 03(07)03D
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U Cep D21(25)27D
U Sge D21(25)27D
del Lib 21(27)22L
RW Tau L23(27)27D
2003 Aug 12 Tue
TV Cas D21(18)22
2003 Aug 13 Wed
HU Tau L00(03)03D
Z Dra 02(04)03D
TX UMa L02(06)03D
Z Vul D21(22)27
Y Psc D21(24)27D
TW Dra 22(27)27D
2003 Aug 14 Thu
RW Tau L23(21)26
2003 Aug 15 Fri
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2003 Aug 16 Sat
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ST Per D20(23)27D
U Cep D20(24)27D
2003 Aug 17 Sun
HU Tau 02(06)03D
Y Psc D20(18)23
2003 Aug 18 Mon
TV Cas 01(05)03D
U Sge D20(19)25
Z Vul D20(19)25
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del Lib 20(27)21L
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TW Dra D20(18)23
TV Cas D20(24)28D
Z Dra 21(23)25
2003 Aug 21 Thu
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TV Cas D20(20)24
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Z Vul D20(17)23
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2003 Aug 24 Sun
ST Per D20(22)26
2003 Aug 25 Mon
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TW Dra 03(08)04D
del Lib D20(26)21L
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RW Tau L22(23)28
Z Vul 23(28)28D
2003 Aug 26 Tue
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U Cep D20(24)28D
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TV Cas 02(06)04D
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2003 Aug 28 Thu
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TV Cas 22(26)28D
2003 Aug 29 Fri
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X Tri 24(26)28D
2003 Aug 30 Sat
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TV Cas D20(21)25
TW Dra D20(23)28D

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X Tri 23(25)28
2003 Aug 31 Sun
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X Tri 22(25)27
2003 Sep 1 Mon
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SW Cyg D20(19)25
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ST Per D20(21)25
S Equ D20(24)27L
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X Tri 22(24)27
2003 Sep 2 Tue
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X Tri 21(23)26
2003 Sep 3 Wed
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2003 Sep 4 Thu
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Z Per D20(18)23
X Tri D20(22)24
Z Vul D20(24)28L
2003 Sep 5 Fri
X Tri D20(21)24
U Cep D20(23)28
RW Tau L21(25)28D
2003 Sep 6 Sat
SW Cyg 02(08)04D
TX UMa D20(18)22L
X Tri D20(21)23
HU Tau L23(20)23
TV Cas 23(27)28D
ST Per 24(28)28D
2003 Sep 7 Sun
Z Per D19(20)24
X Tri D19(20)22
U Sge 20(26)27L
Z Dra 21(23)26
2003 Sep 8 Mon
X Tri D19(19)22
S Equ D19(21)26
TV Cas D19(23)27
del Lib D19(26)20L
RW Tau L21(19)24
HU Tau L23(21)25
2003 Sep 9 Tue
X Tri D19(19)21
ST Per D19(19)23
TX UMa D19(20)22L
Z Vul D19(22)27
2003 Sep 10 Wed
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TV Cas D19(18)22
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U Cep D19(23)27
HU Tau L22(22)26
TW Dra 23(29)28D
2003 Sep 11 Thu
X Tri D19(17)20
Z Dra 22(25)27
2003 Sep 12 Fri
S Equ 02(07)03L
TX UMa D19(21)22L
HU Tau L22(24)27
Y Psc 23(27)28D
2003 Sep 13 Sat
TX UMa L00(<<)02
V640 Ori L02(01)04
SS Cet 03(08)04D
del Lib D19(17)19L
Z Per D19(22)27
TW Dra D19(24)28D
2003 Sep 14 Sun
RW Tau 03(08)04D
Z Dra D19(18)20
Z Vul D19(20)25
U Sge D19(20)26
HU Tau L22(25)28D
ST Per 22(26)28D
2003 Sep 15 Mon
V640 Ori L02(02)04
S Equ D19(18)23
U Cep D19(22)27
TX UMa D19(23)22L
del Lib D19(25)19L
2003 Sep 16 Tue
Z Dra 00(03)04D
TX UMa L00(<<)03
TV Cas 01(05)04D
SS Cet 02(07)04D
TW Dra D19(19)24
Y Psc D19(21)26
Z Per D19(24)28
RW Tau 22(27)28D
HU Tau 22(26)28D
2003 Sep 17 Wed
Z Vul 01(07)03L
V640 Ori L02(02)04D
ST Per D19(18)22
TV Cas 20(24)28D
U Sge 24(29)26L
2003 Sep 18 Thu
Z Dra D19(20)22
TX UMa 19(24)22L
S Equ 23(28)26L
HU Tau 24(28)29D
2003 Sep 19 Fri
TX UMa L00(00)05D
SS Cet 02(06)05D
V640 Ori L02(03)05D
TW Dra D19(15)20
Z Vul D19(17)23
TV Cas D19(20)24
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Z Per 20(25)29D
RW Tau L21(21)26
2003 Sep 20 Sat
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Y Psc D19(16)20
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U Cep D19(22)27
2003 Sep 21 Sun
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V640 Ori L02(03)05D
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TV Cas D19(15)19
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Z Vul 23(28)26L
TX UMa L24(26)29D
2003 Sep 22 Mon
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S Equ D19(15)20
Z Dra 19(21)24
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Z Per 21(26)29D
2003 Sep 23 Tue
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HU Tau 03(06)05D
2003 Sep 24 Wed
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Z Vul D19(15)21
SW Cyg D19(15)21
U Sge D19(24)26L
TX UMa L24(27)29D
2003 Sep 25 Thu
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SS Cet 00(05)05D
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TV Cas 02(06)05D
HU Tau 04(08)05D
ST Per D19(17)21
U Cep D19(22)26
S Equ 20(25)26L
Z Per 23(28)29D
2003 Sep 26 Fri
X Tri 04(07)05D
Z Dra 21(23)26
Z Vul 21(26)26L
TV Cas 22(26)29D
2003 Sep 27 Sat
V640 Ori 02(05)05D
X Tri 04(06)05D
TW Dra 20(25)29D
RW Tau 24(28)29D
SS Cet 24(28)29D
2003 Sep 28 Sun
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Y Psc 00(05)05L
X Tri 03(06)05D
ST Per 04(08)05D
TV Cas D19(21)26
SW Cyg 23(29)29D
2003 Sep 29 Mon
Z Per 00(05)05D
X Tri 02(05)05D
V640 Ori 02(05)05D
2003 Sep 30 Tue
X Tri 02(04)05D
TV Cas D19(17)21
TW Dra D19(20)25
U Cep D19(21)26
ST Per 20(24)28
RW Tau L20(23)27
Z Dra 23(25)27
SS Cet 23(28)29D

007·04 3° FIELD INVERTED

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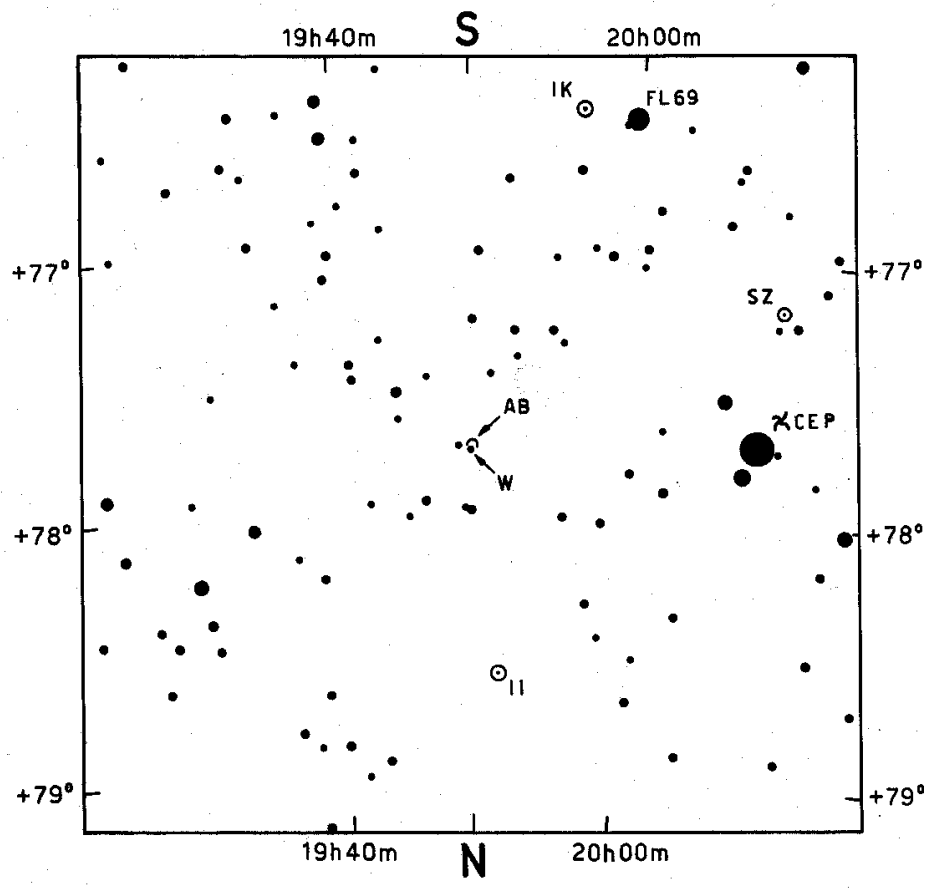

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EPOCH: 2000
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APPROVED: RDP

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