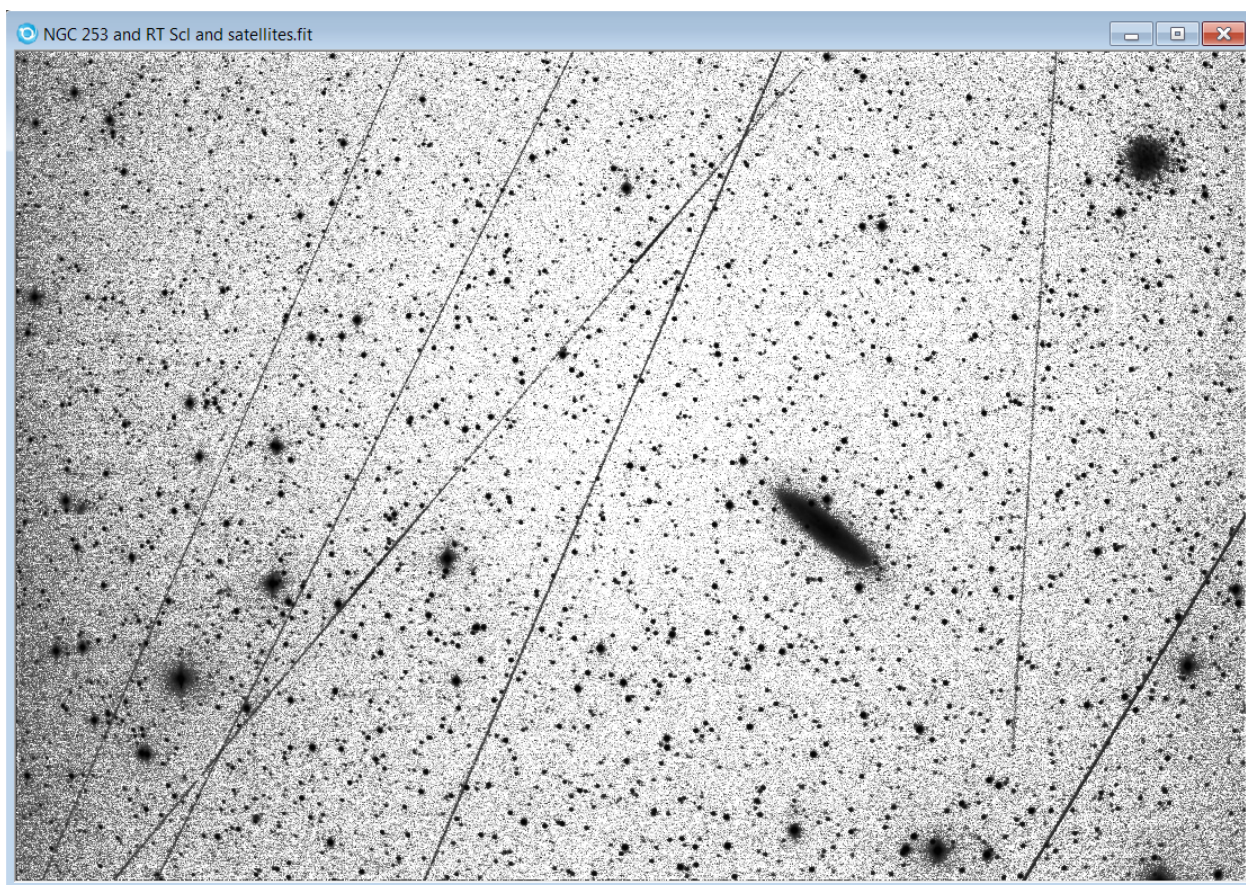




The danger to our skies from the ever increasing number of orbiting satellites is amply illustrated in this montage of 13 frames from wide-field photometry of RT Scl by Mark Blackford. As of the end of October Elon Musk's Starlink project has launched 835 satellites but plans to launch at least 12,000. Other companies also plan to launch several tens of thousands of satellites to provide global internet coverage.

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From the Director – *Mark Blackford*

Welcome to the final, slightly delayed, Newsletter of 2020. Thanks to all the contributors who responded to the editor's pleas after the submission deadline passed without a single article being sent in. Our quarterly newsletter is a vital part of VSS, allowing members to communicate their activities in a less formal publication than peer reviewed journals. But it needs content so please consider writing a short article about your current projects, be they instrumentation, observation, analysis, datamining or any other aspect of variable star astronomy. I for one am keenly interested in what other people are up to, as I'm sure all our readers are.



COVID-19 travel restrictions lead to the cancellation of this year's NACAA meeting and Variable Stars South Symposium in Parkes. There was a suggestion that they could be rescheduled for Easter 2021. However, considering ongoing uncertainties the NACAA committee have decided the next NACAA will be in Melbourne in 2022 hosted by the Astronomical Society of Victoria. Whether we hold the next VSS Symposium in conjunction with that meeting is still to be determined.

The current Eta Carinae Photometric Campaign: 2019+2021 is progressing very well with Steve Kerr, Dave Blane and myself contributing photometric data for analysis by Prof. Augusto Damineli. It seems that eta Car's brightening has slowed down a little bit. Our observations stopped in mid-August as eta Car approached solar conjunction. In September Prof. Damineli wrote in an email that "additional photometry starting as soon as possible in October will be important to confirm the ascending arm of the light curve up to its maximum in February/May 2021". Eta Car is now a pre-dawn object but my south eastern horizon is blocked by trees so I had not been able to recommence observing at the time of writing this column.

Since our previous newsletter in July observing conditions at Congarinni have continued to be reasonable, with far fewer nights lost to bushfire or hazard reduction smoke compared to this time last year. Let's hope that continues throughout the summer months.

Wishing you all clear skies and good health,

Mark Blackford

An updated O-C diagram for the high amplitude delta Scuti star RS Gruis – *Roy Axelsen*

reaxelsen@gmail.com

RS Gru is an 8th magnitude delta Scuti star with a period of 0.147 d (3.53 h) and an amplitude of about 0.6 magnitude. Data obtained by many observers from 1952 to 2020, a time of 68 years, have been re-reported in the literature. The present author has contributed PEP, DSLR and most recently monochromatic CMOS photometric observations to that dataset, comprising 48 of a total of 82 observations for the O-C diagram. This article reports briefly on the more recent personal data, and how it is considered to change a previous interpretation of the O-C diagram.

Figure 1 shows the O-C diagram of RS Gru drawn from data collected between 1952 and 2020, with the author's data being the most recent. The first part of the diagram, between epochs -170,000 and -79,000 approximately, correspond to the data analysed by Rodriguez et al. (1995) who fitted a quadratic function and therefore considered that the period was decreasing a constant rate.

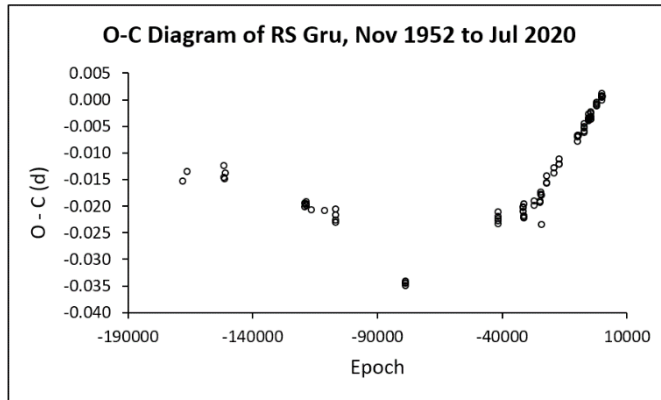


Figure 1. O-C diagram of RS Gru drawn from data collected between 1952 and 2020.

There is a gap in the O-C diagram in Figure 1, between epochs -79,000 and -42,000 approximately. There is no numerical data in the literature to fill this gap, but there is an O-C diagram that covers part of this time. It can be seen in Figure 3 of Laney et al. (2003), shown below as Figure 2 (reproduced with permission). The data points between epochs 0 and 20,000 fill in part of the gap in Figure 1 above. They suggest that a period jump occurred after the initial time when the period of RS Gru was decreasing at a constant rate, and that the period remained constant after the period jump.

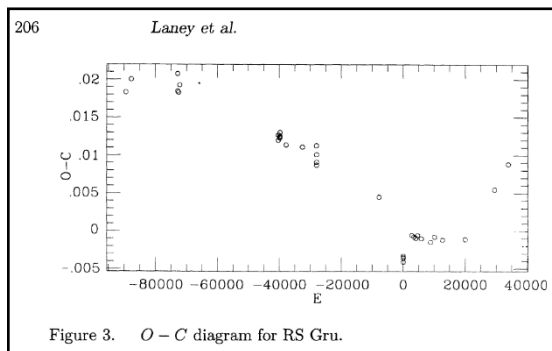


Figure 2. Figure 3 of Laney et al. (2003), reproduced with permission. The part of the O-C diagram between epochs 0 and 20,000 fills in part of the gap in the O-C diagram shown in Figure 1 above.

Figure 3 is an O-C diagram drawn from observations collected between October 2003 and July 2018 and published by Axelsen (2014). The author fitted a quadratic function and interpreted it to mean that the period was increasing at a constant rate. However, close inspection suggest that the last three groups of data may represent a new trend after a period jump. The remaining part of this article describes re-analysis of the O-C diagram in Figure 3, and analysis of the remaining data to 2020.

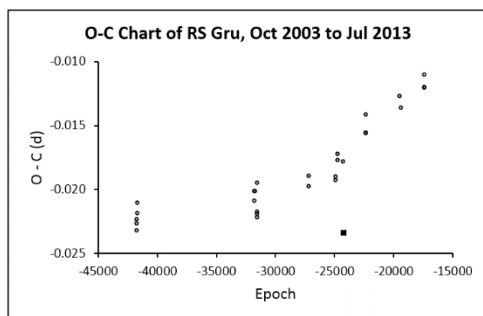


Figure 3. *This represents the O-C diagram of Figure 3 in Axelsen (2014).*

Part of the O-C diagram from Figure 3 was isolated and reanalysed, and the result is shown in Figure 4. After a solitary discrepant data point (shown as a filled square in the figure) was excluded, a quadratic function was fitted, indicating that the period was increasing at a constant rate. The most recent data, from July 2011 to July 2020 are shown in Figure 5. Inspection suggests that a linear trend may be present.

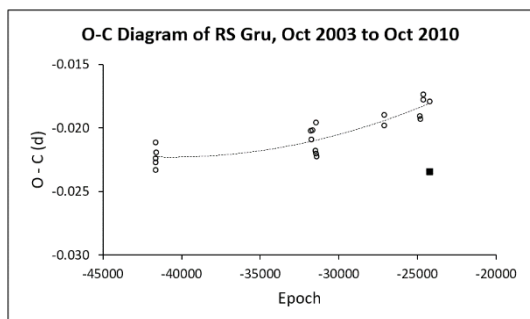


Figure 4. *Part of the O-C diagram from Figure 3, fitted with a quadratic function.*

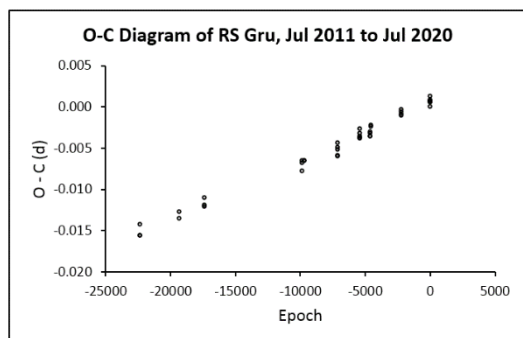


Figure 5. *O-C diagram of from data collected between July 2011 and July 2020*

However, inspection of the residuals from a linear fit show that the fit is not ideal (Figure 6), whereas the residuals from a quadratic fit show a better distribution. The quadratic fit is therefore preferred.

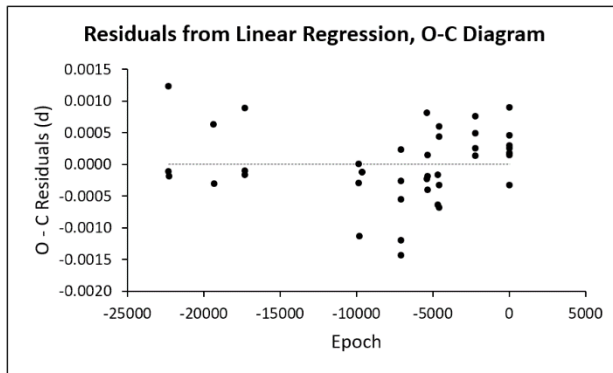


Figure 6. *Residuals from the linear fit to the O-C diagram for data collected between July 2011 and July 2020. The residuals are not uniformly distributed around zero, suggesting that the fit is suboptimal.*

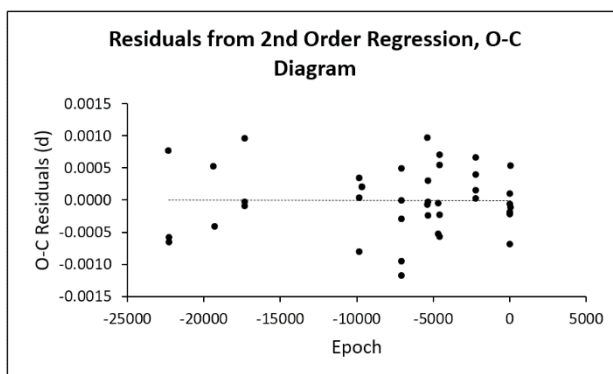


Figure 7 *Residuals from the quadratic fit to the O-C diagram for data collected between July 2011 and July 2020. The residuals are more uniformly distributed around zero than those seen in Figure 6, suggesting that the quadratic fit is to be preferred.*

A new quadratic ephemeris from the 2011 to 2020 observations is provided by the equation:

$$\text{TOM (HJD)} = 2459045.1247 (0.0002) + 0.14701221 (0.00000004) E + 6.0 \times 10^{-12} (1.9 \times 10^{-12}) E^2$$

For this equation, zero time occurred on 14 July 2020 UTC, at which point the period of RS Gru was 0.14701221 (0.00000004) d.

References

- Axelsen, R.A. 2014, J. Amer. Assoc. Var. Star Obs., 42, 44.
 Laney, C.D., Joner, M., Rodriguez, E. 2003, "HADS, multiple periods, period changes and the PL Relation", in "Interplay of Periodic, Cyclic and Stochastic Variability in Selected Areas of the H-R Diagram", Astron. Soc. Pac. Conf. Ser. 292, 203.
 Rodriguez, E., Rolland, A., Costa, V., and Martin, S. 1995, Mon. Not. Roy. Astron. Soc., 277, 965.

Joys and perils of wide field photometry – *Mark Blackford*

(markgblackford@outlook.com)

This coming November 22nd will mark 10 years since my first tentative steps in photometry. Back then I used a DSLR camera and 180mm lens which yielded a field of view some 7.11 x 4.73 degrees, ideal for the brightest variables where suitably bright comparison stars are not usually close-by. Often several variables could be recorded in a single photo. Another side benefit of such a large FoV is that occasionally an interesting deep sky object would be recorded. Unfortunately DSLR photometry requires a degree of defocus so astrophotographers would cringe at these images.

In 2015 I started using an 80mm f6 refractor and DSLR which allowed me to monitor somewhat fainter variables, but at the expense of narrower FoV (2.67 x 1.78 degrees). Then in 2017 I purchased a CCD camera and 14" RC telescope for even fainter targets, but now the FoV was a miserly 18.1 x 12.2 arcmin. With these later instruments serendipitous recording of deep sky objects is extremely rare apart from a few faint background galaxies. My one exception to date was NGC 55 looming in the background of the eclipsing binary UY Scl in images captured through the RC14 (see VSS Newsletter 2019-4).

I revisited UY Scl with my ED80 refractor and Atik One 6.0 CCD (FoV 1.50 x 1.20 degrees) to record NGC 55 in its entirety (Figure 1).

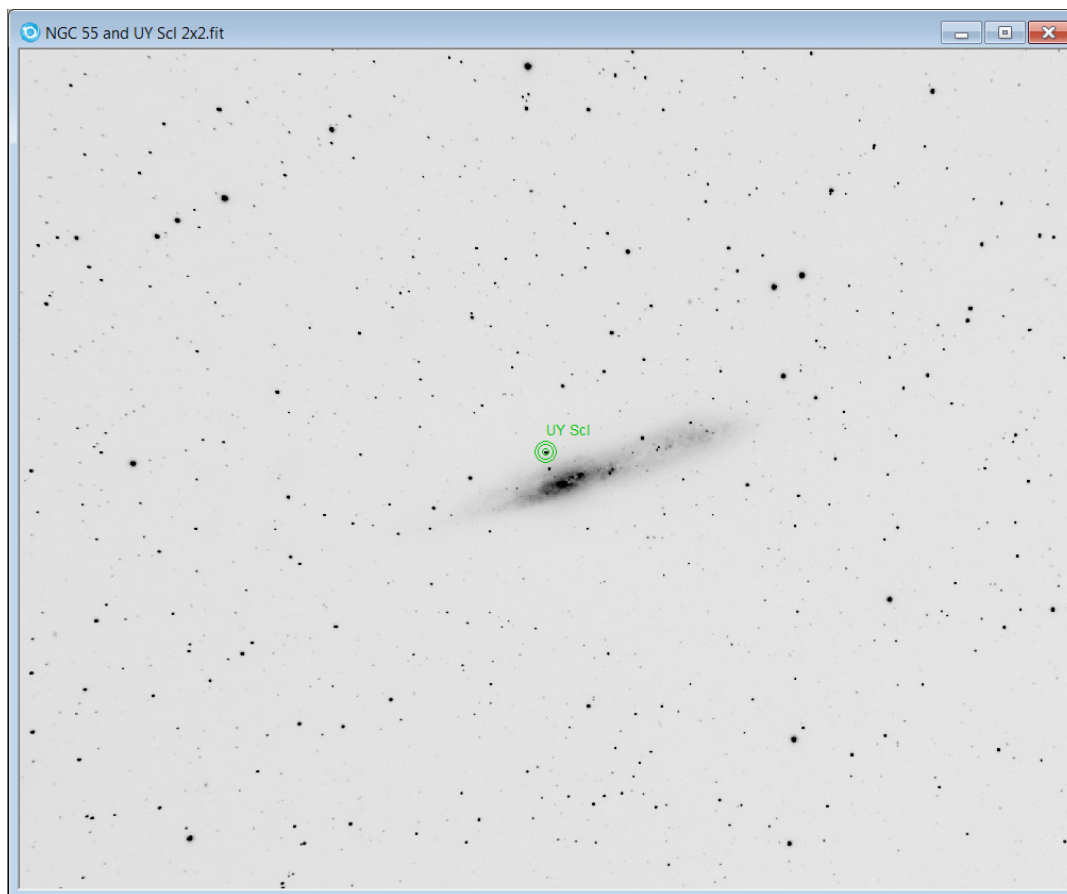


Figure 1. *UY Scl and NGC 55 field captured with ED80 refractor and Atik One 6.0 CCD camera.*

Photometry from these 60 sec unguided exposures was quite acceptable (Figure 2) despite the faintness of the target, check and comp stars. The earlier eclipse is clearly deeper than the later one, yet it is not the primary eclipse according to the period and epoch listed in AAVSO's Variable Star Index. Furthermore, my 2019 and 2020 observations suggest the binary orbit is not circular. More observation in coming years and datamining of various survey photometry databases should shed more light on this interesting system.

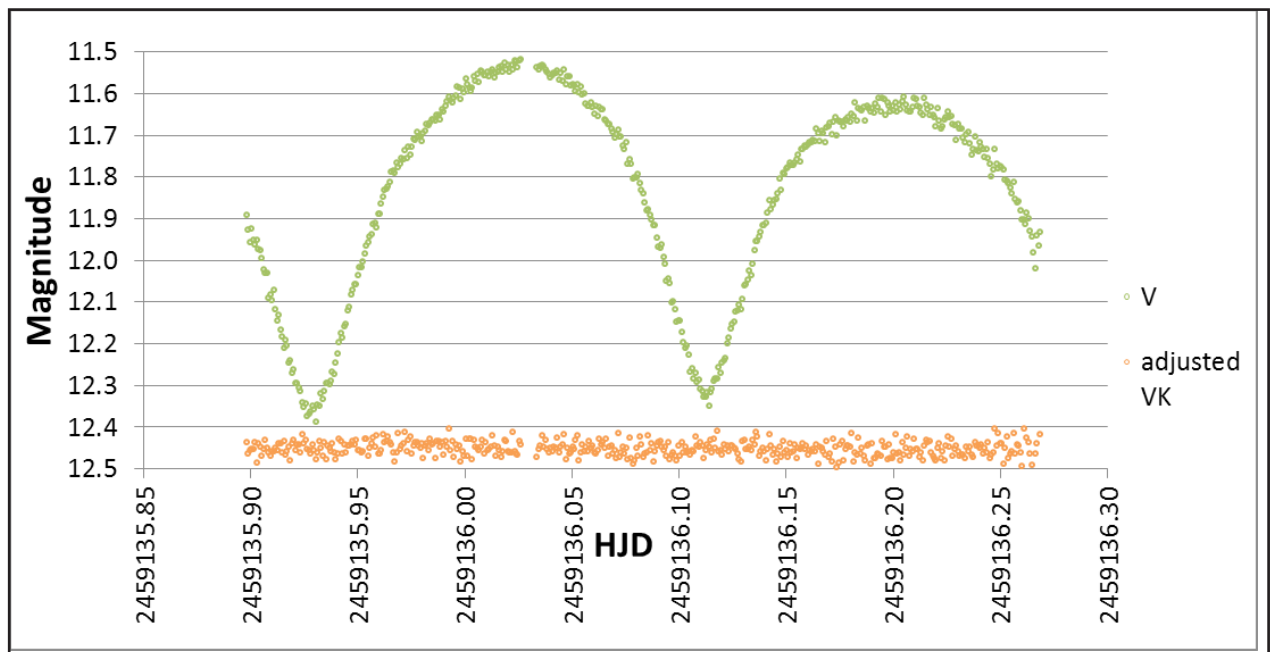


Figure 2. *V* light curve of UY Scl.

Recently Ed Budding proposed a joint photometry and spectroscopy project on a 5th magnitude eclipsing binary for which my current photometry setups were not suitable. So I took the CCD camera off the RC14, attached it to a 200mm f2.8 camera lens and mounted these piggyback on the RC14 (see Figure 3).



Figure 3. 200mm f2.8 camera lens and SBIG STT3200-ME CCD camera.

This combination provides a 4.39 x 2.96 degree FoV which is more than adequate for the proposed target. However I did need to defocus quite a bit to allow exposure times of 20 sec which is the minimum

I prefer to use to reduce the effects of atmospheric scintillation. Full light curves are required through BVI filters but that will have to wait until mid-2021 when the target will be visible all night.

In the meantime I decided to observe other eclipsing binaries to see how well the setup performs. One was RT Sculptoris which I placed off-center to include the bright galaxy NGC 253 and globular cluster NGC 288. Exposure time was 60 seconds for each unguided image. Figure 4 shows a median stack of 329 images recorded over some 5.75 hours. Figure 5 is the V light curve of a primary eclipse measured from those images.

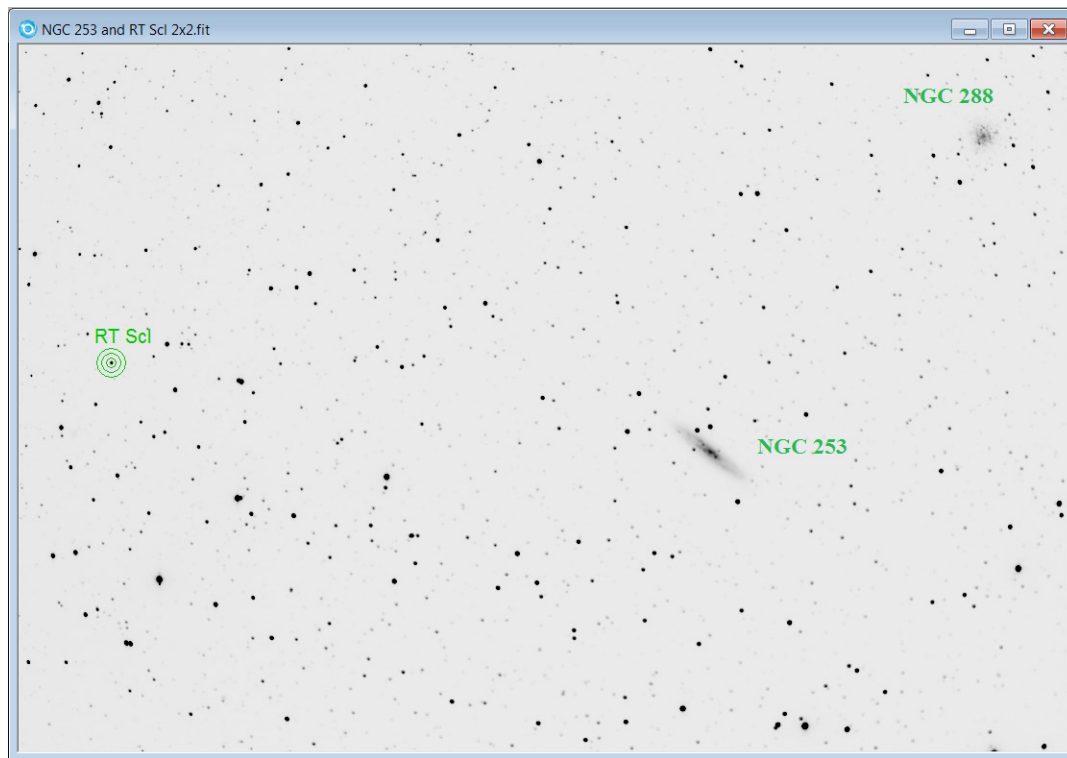


Figure 4. *RT Scl field captured with 200mm f2.8 camera lens and SBIG STT3200-ME CCD camera.*

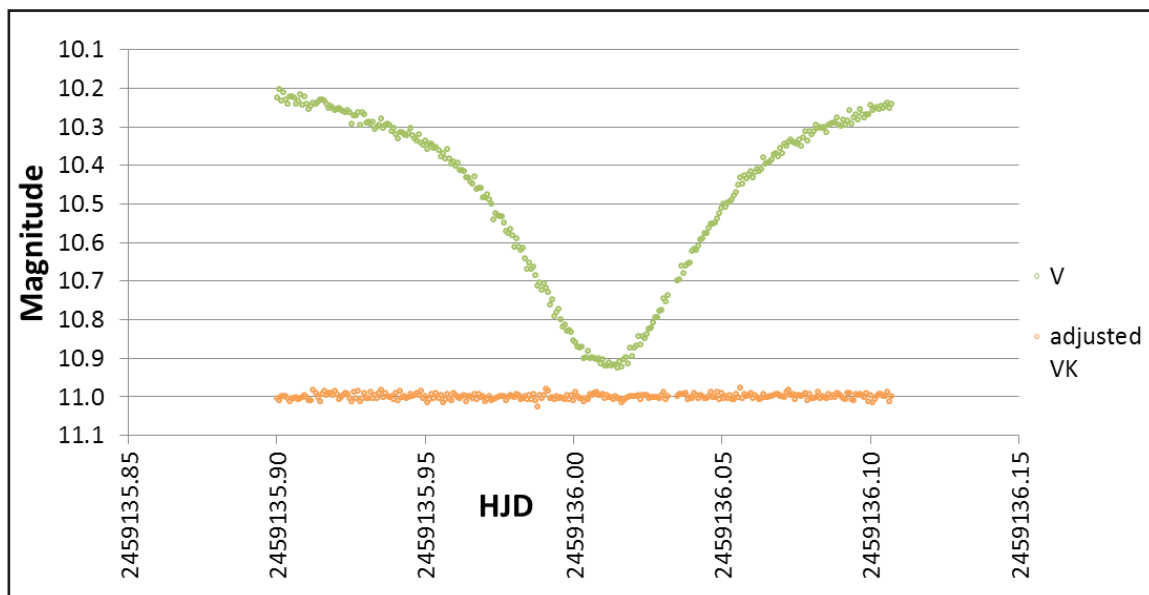


Figure 5. *V light curve of a primary eclipse of RT Scl.*

For brighter targets the photometry precision is even better as can be seen with the light curve of DE Mic in Figures 6. Scatter in the light curves increased toward the end due to greater air mass.

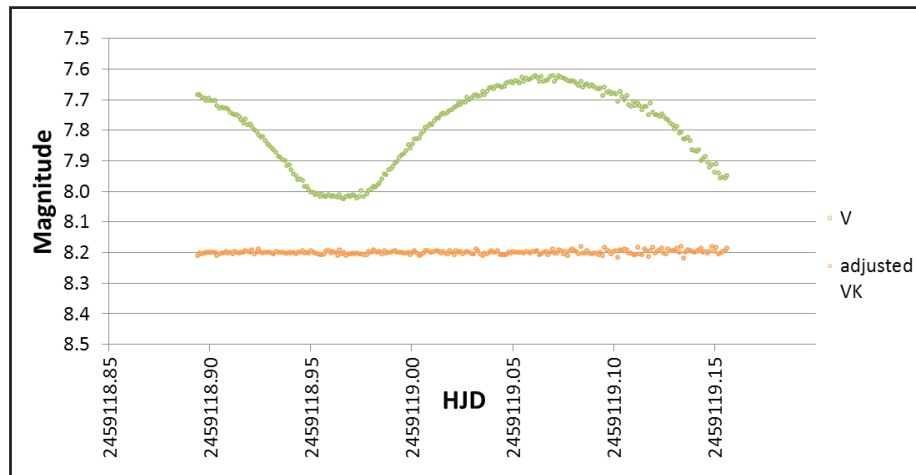


Figure 6. *V* light curve of a primary eclipse of DE Mic.

So wide field images can produce excellent photometry, with increased possibility of capturing nearby deep sky objects and less need for guiding. But they do present several complications. The chance of unwanted interlopers such as satellites and planes is also increased. Figure 7 shows a sum stack of 13 images containing satellite trails passing through the RT Scl FoV. One slow-moving satellite appeared in 8 consecutive images.

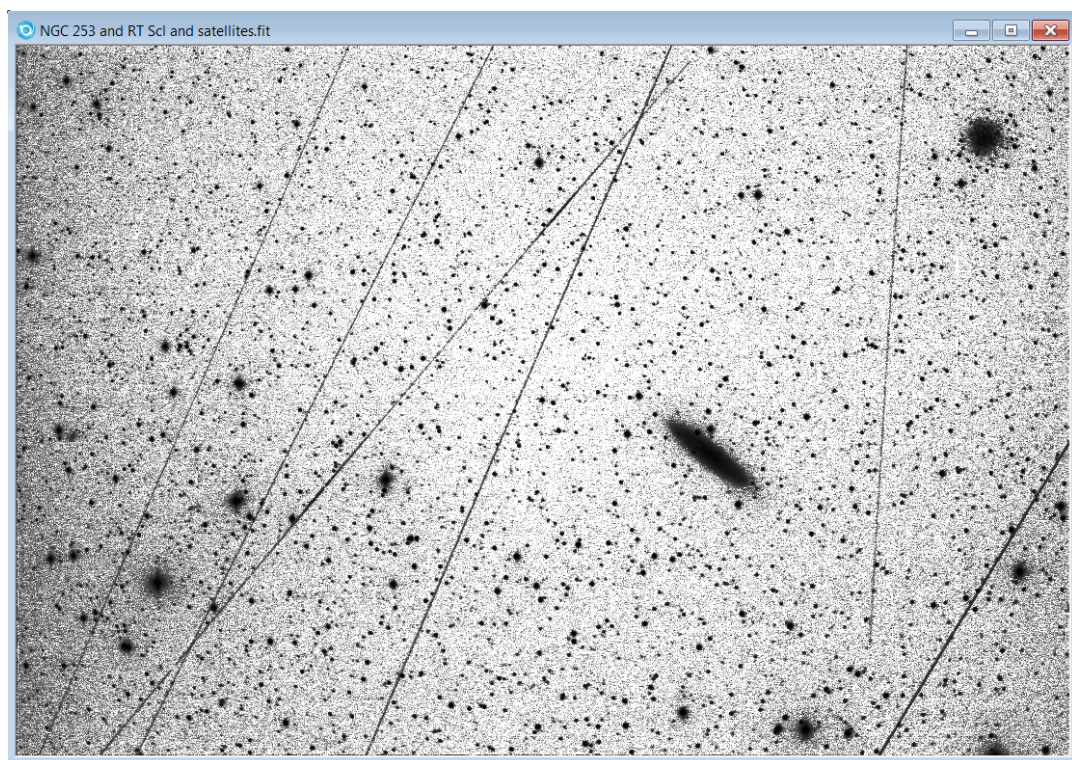


Figure 7. *Six satellites traversed the RT Scl field within a period of 35 minutes.*

Figure 7 also illustrates another problem with wide field imaging with a fast optical system (f2.8 lens in this case). The highly stretched image shows that flat field correction was not perfect despite using a master flat field calibration frame using 16 twilight flats.

Finally, air mass differences across the FoV can be significant, especially when imaging at lower altitudes. This problem can be minimised by selecting comparison and check stars as close as possible to the target and with very similar colour. However, for the most accurate photometry in these situations we should correct both primary and secondary extinction. Just how I go about doing that will be the subject of a future newsletter article.

The period of AQ Tuc – Tom Richards

tomprettyhill@gmail.com

This EW binary has been under observation by Robert Jenkins and myself since 2017. Over that time its period appears to have been entirely constant (Figure 1). From our data we have derived the VSS ephemeris:

$$E0 = \text{HJD } 2458098.0830(7), P = 0.59484055(9) \text{ d } (1)$$

The original GCVS ephemeris (Samus et al, 2017) with a significantly different period, is:

$$E0 = \text{HJD}, P = 0.59484267 \text{ d } (2)$$

Figure 1 is an O-C diagram which shows the residuals of our observed minima estimates against the calculated ephemeris predictions derived from Ephemeris (1). The RMS residual is $OC = 0.00012 \text{ d}$ — a remarkable constancy and belying the large error bars in two of the minima estimates (mine, made by polynomial fitting). This gives confidence in the correctness of the VSS Ephemeris (1), at least for the VSS data points.

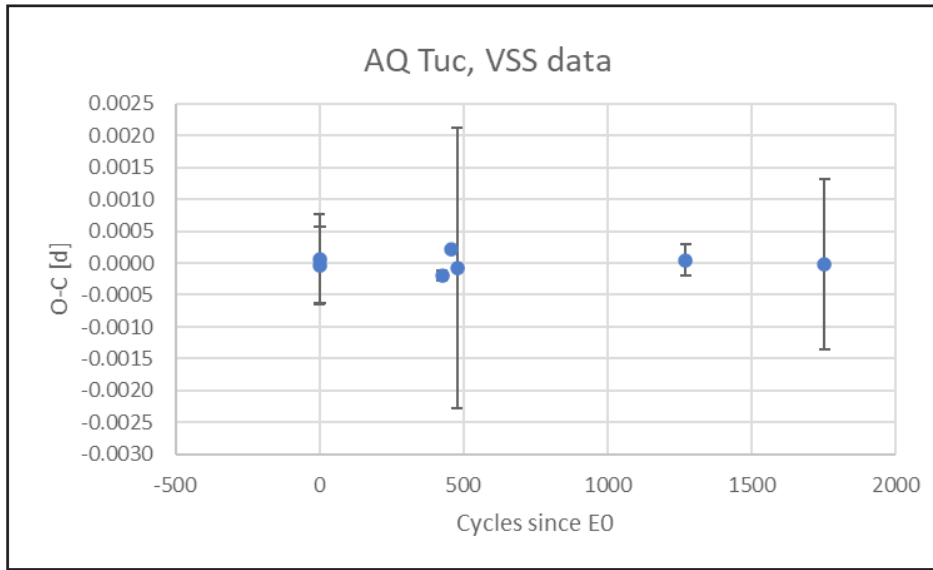


Figure 1. O-C for VSS data points on VSS ephemeris.

Figure 2 also uses the VSS ephemeris (1), but includes the original GCVS epoch near the left edge, and a rather unreliable epoch derived for ASAS3 data by myself (Pojmanski, 2002). If ephemeris (1) is correct, the GCVS O-C of $\sim 0.06 \text{ d}$ is surprisingly large. Additionally the RMS residual is $O-C = 0.003 \text{ d}$, quite large.

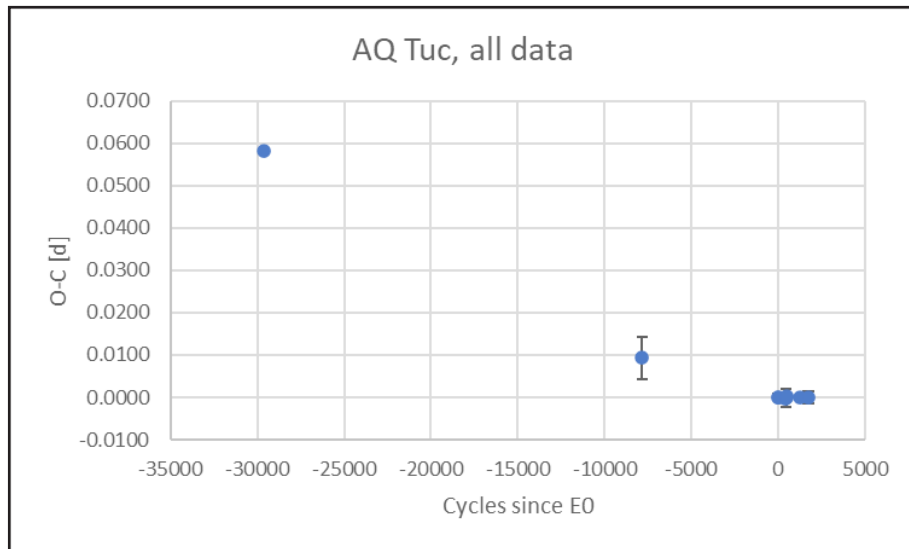


Figure 2. O-C for all data points, using the VSS ephemeris. The GCVS epoch is on the left, the estimated ASAS3 epoch is at cycle ~ 8000 , the rest are the VSS epochs.

The best-fit linear regression through the Figure 2 O-C data using the GCVS epoch, is

$$E0 = \text{HJD } 2440477.773(3), P = 0.59483867(9) \text{ d} \quad (3)$$

Figure 3 shows the O-C diagram based on Ephemeris (3). In it the RMS O-C = 0.003 d, as for Figure 2.

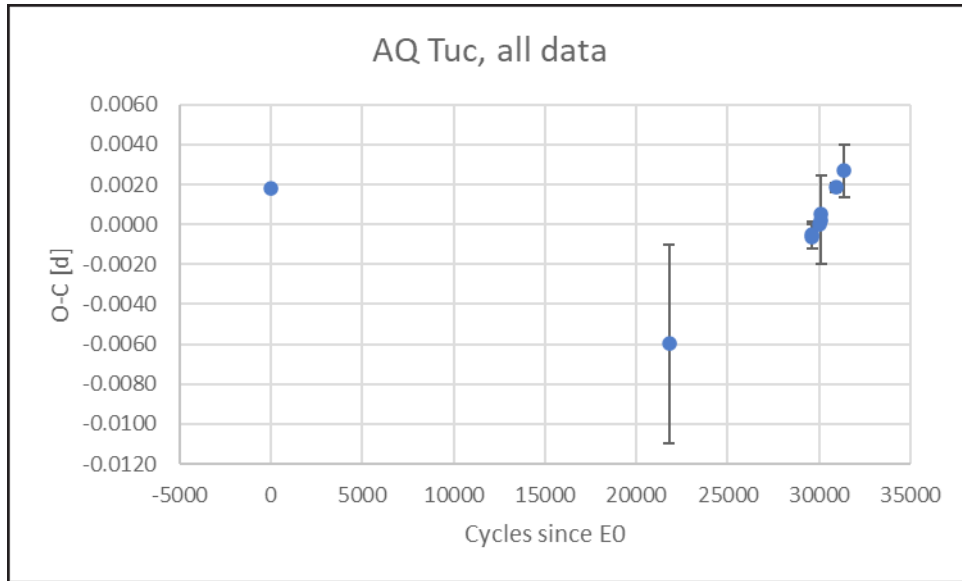


Figure 3 O-C diagram for all data points, using ephemeris (3).

All three periods differ at the 10^{-6} d level. The ASAS3 data for AQ Tuc folds well on all three periods, but the cleanest resulting light curve is for the period in Ephemeris (3), See Figure 4.

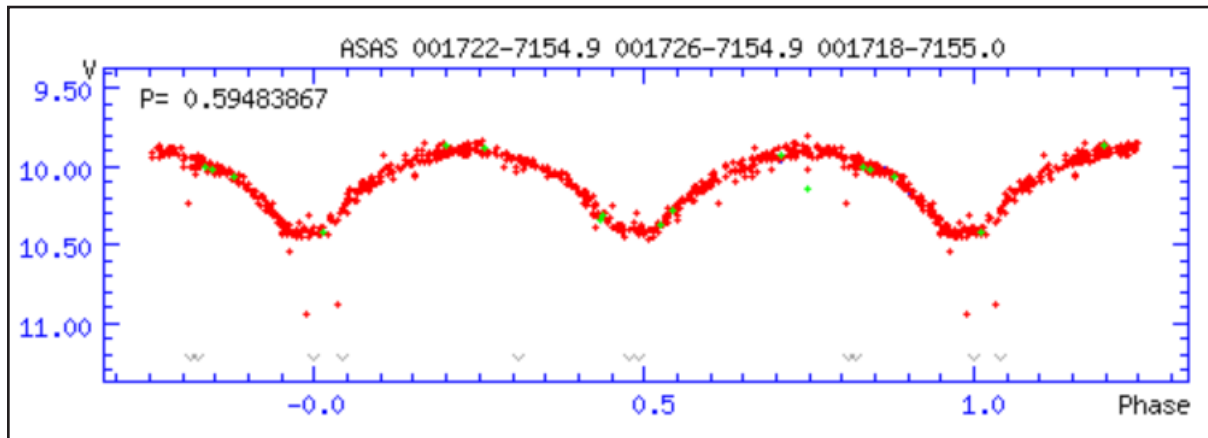


Figure 4. ASAS3 data folded on the period in Ephemeris (3).

In conclusion, no satisfactory linear period emerges from this analysis which can account for all the epoch data without high O-C residuals. The resolution of this situation requires more minima estimates. A second-order ephemeris (parabolic) is suggested by Figure 3 and is not out of the question; but there is no evidence for it without a far better time spread of data points. However, until further progress, Ephemeris (3) can be taken as the best to date.

References

- Pojmanski, G., 2002. *Acta Astronomica* 52, 397. [2002AcA...52..397P](#)
 Samus N.N., Kazarovets E. V., Durevich O.V., Kireeva N.N., Pastukhova E.N., (2017) *General Catalogue of Variable Stars: new version*. GCVS 5.1, *ARep*, 2017, 60, 1. [2017ARep...61...80S](#) Online at <http://www.sai.msu.su/gcvs/gcvs/>

Introduction

Recently there have been two on-line presentations of cataclysmic stars - the first involving the AAVSO section, the second a presentation at the New South Wales society on-line meeting. Both were strong on SU Ursae Majoris stars which are characterised by fairly regular normal outbursts resulting from an abrupt event and the more prolonged and brighter super outbursts where a normal outburst seems to trigger a mechanism which persists for a week or more, dependent upon which star is involved.

Overall, it is a very complex field. The most exhaustive analysis of the whole CV field was by Brian Warner - *Cataclysmic Variable Stars*, Cambridge University Press, 1995. This massive review, 572 pages with 61 pages of references, about 50 per page covers the field as it was then known in incredible detail.

My particular interest is mainly in VW Hydri, possibly the most well studied CV of all time, and this interest has been revived by Ian Kemp's recent work in this field. But a little background is interesting.

Brian Marino and I began visual measures of this in about 1966 after discussions with Frank Bateson and changed to more accurate UBV measures in 1968 when our photometer was completed. Many of these were unfiltered which was ideal for these very blue objects. Along the way we determined its orbital period using the sharp orbital humps as a marker, discovered the chief feature of SU UMa stars, the characteristic superhumps and then showed how the super outbursts of these stars were triggered by a normal outburst when a suitable situation developed. Just what this situation is and what exactly is the nature of these superoutbursts is still uncertain.

Several models have been proposed but each has some uncertain aspects. Unfortunately the measures tend to be fragmentary - with the long existing amateur monitoring supplemented by such short-lived projects as ASAS3, ASAS-SN, Hipparcos and a variety of other space based platforms. This article concludes with some ideas on observational projects well within the abilities of our members.

The super outburst period

The RASNZ VSS records go back to 1954 when Albert Jones began observing VW Hydri. In the first few years a pattern of outburst was determined. They comprise two distinct types - a normal outburst which is caused by a shortlived event causing a brightening of up to five magnitudes in a little over a day, followed by a slower decline back to the normal quiescent brightness. The whole event usually takes about 4 days.

More prolonged events at roughly six monthly intervals are super outbursts which are a two stage event varying slightly in length, dependent upon how long the triggering normal outburst takes to initiate the super outburst mechanism. This second, main stage of the superoutbursts is remarkably consistent in brightness - which is about half a magnitude brighter than a normal outburst - and duration. A figure from the October, 2019, newsletter which shows these clearly is reproduced overleaf as Figure 1.

Ordinary outbursts can occur at varying intervals from 7 to 35 days, usually from 3 to 8 per super outburst cycle. Apart from amplitude changes they are very similar in shape.

In Figures 2 and 3 all super outburst intervals from 1954 to 2020 are shown as an O-C diagram. The vertical scale is days late, a positive value, and days early, a negative value. It's clear that after some uncertainty between 1984 and 1990 the period became longer in 1990. The horizontal scale is the calculated MJD of each epoch.

The longest interval observed has been number 115 at 224.09 days, the shortest number 98 at 99.13 days. Longer intervals are rather more frequent than very short ones - this very short interval seems to have been an anomaly.

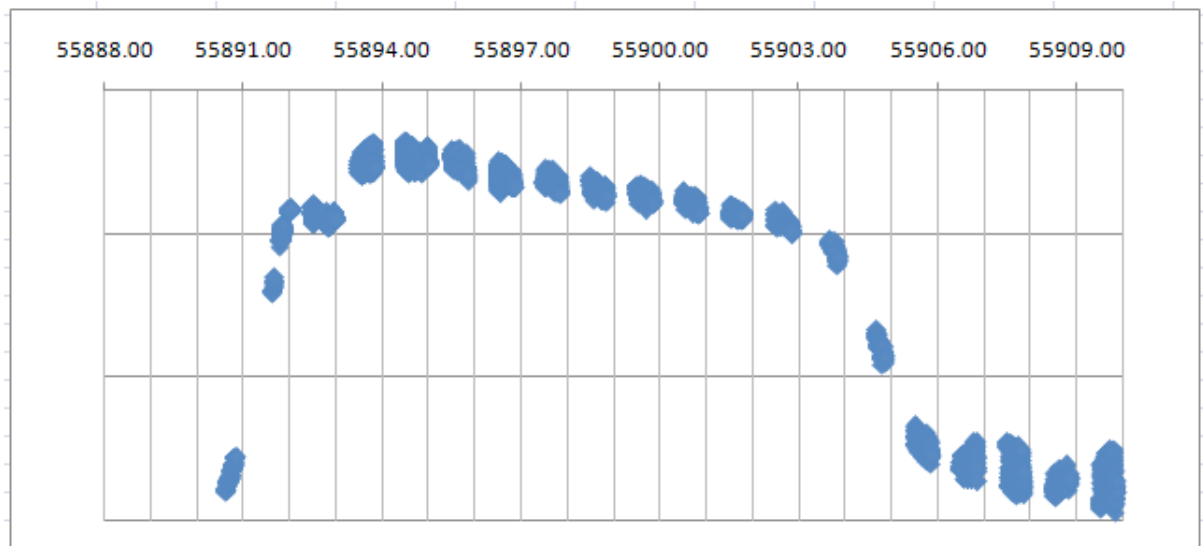


Figure 1. CCD measures by Josch Hamsch and Terry Bohlson in December, 2011. The vertical range is from $V = 14$ to 8.5. The spread of measures each night is real, being caused either by orbital humps, or superhumps during the long outbursts.

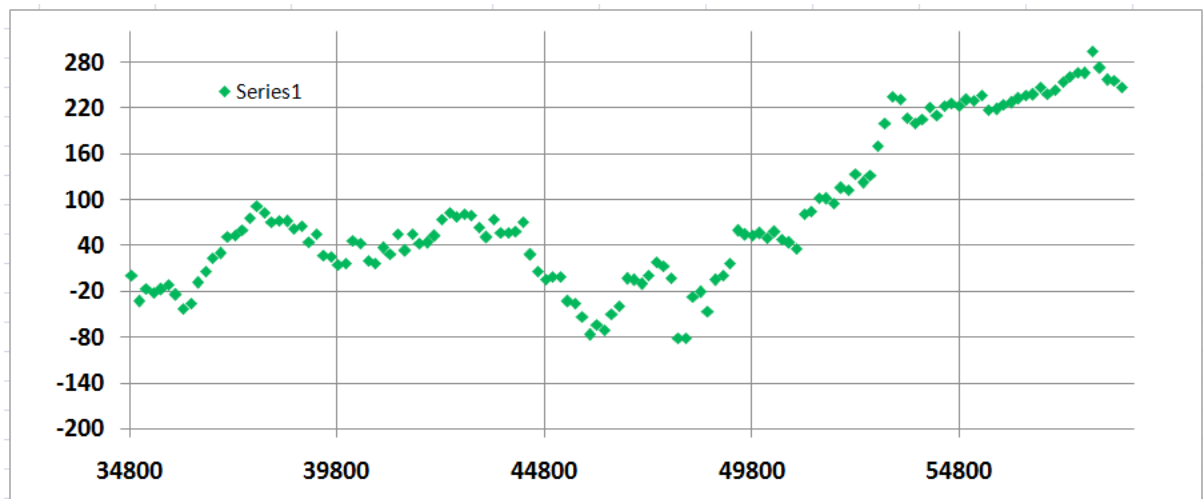


Figure 2. Observed epochs of super outbursts plotted against the ephemeris $JD\ 2434848.0 + 178.00E$.

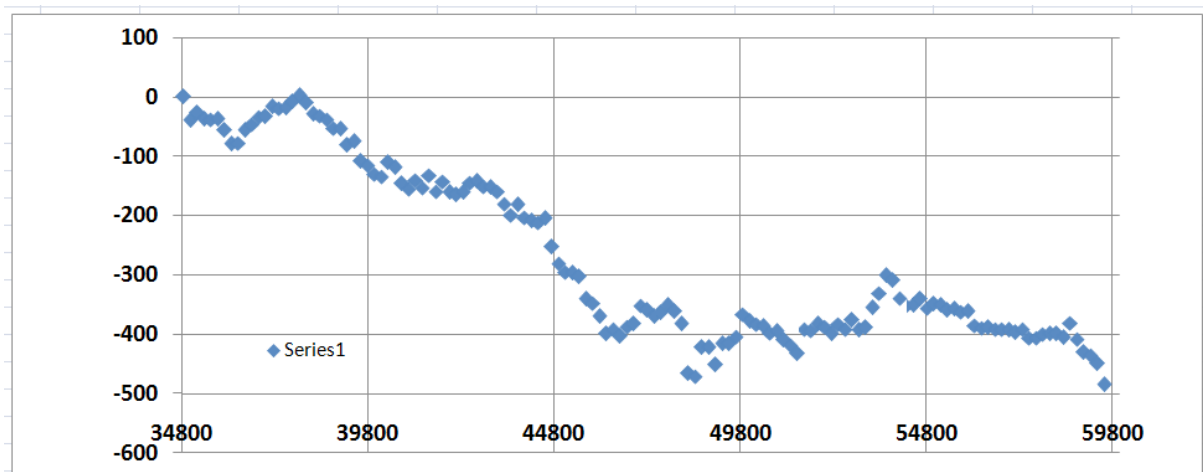


Figure 3. Observed epochs of super outbursts plotted against the ephemeris $JD\ 2445807.0 + 183.2$

The normal outbursts and the orbital period

These normal outbursts follow a pattern in that they become slightly brighter with longer intervals between them as the interval between consecutive super outbursts proceeds. On occasion it appears that a super outburst begins but does not develop, leading to another normal outburst within seven to ten days which does trigger the superoutburst. These normal outbursts are much less consistent than the super outbursts.

The General Catalogue of Variable Stars still quotes our original period and epoch from the 1974 paper - 28 September, 1968, JD 2440128.0222 + 0.0742711. This does not fit the recent measures well. These appear best fitted by a slightly shorter period, 0.07427104. This may indicate that VW Hydri is still in the stage of period shortening before the eventual minimum period is reached in a few million years time!

The current period is difficult to estimate as there are few useful CCD measures. Observations at minimum are frequent but the average observer keeps at it for maybe 20 minutes and then, sure that it is not in outburst, goes on to another star. What is needed to establish a good current epoch are a few nights where 4-5 cycles at minimum are measured each night. Spread over half a dozen nights this will provide a good epoch for 2020. B or V, preferably transformed, are the best filters to use.

Enhanced orbital humps

In 1978, at IAU Colloquium 46 in Hamilton, NZ, Brian Marino and I presented a paper embodying two ideas which fit the observations of VW Hydri. The first, largely based on visual measures but confirmed by photoelectric measures over several super outbursts, was that all super outbursts were triggered by an ordinary outburst at a time when the donor star reached a suitable state. This seemed to occur at six monthly intervals.

This concept is shown in Figure 4 from the Colloquium paper. On the left are shown visual measures of the super outburst component itself, on the right is shown a composite of four triggering outbursts with the super outburst commencing at various levels of the decline. The numbers at the bottom of the right hand graph are some of Bateson's dozen or so types of superoutbursts. The precursor concept showed that these were all similar events with different triggering intervals.

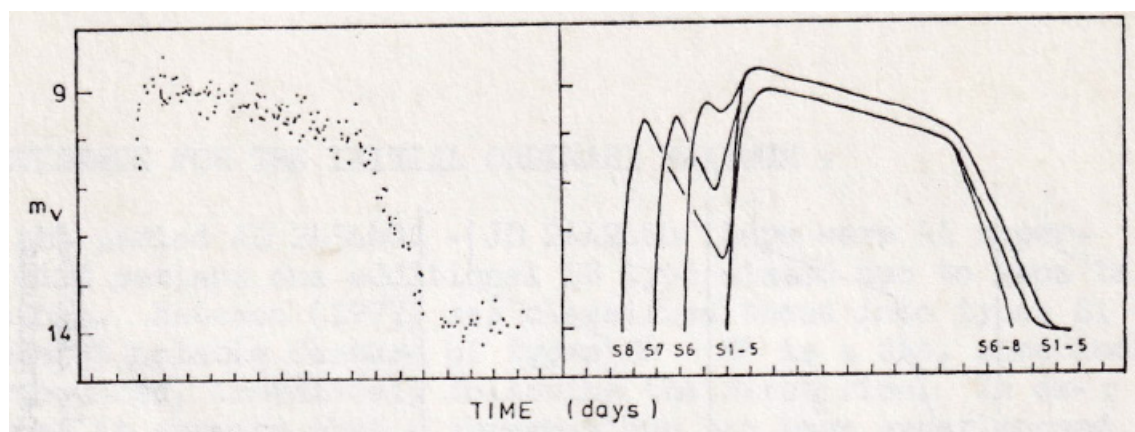


Figure 4. Visual measures of the super outburst component on the left, a montage of different appearing super outbursts showing that they are merely variations in the triggering interval.

The second proposal backed up by observations from the October, 1977, superoutburst was that low amplitude humps fitting the quiescent orbital period but needing 30 times the intensity to be visible at maximum were the result of an enhanced mass flow from the donor star. Good examples of these are shown in Figure 5. These are not visible in normal maxima early in the interval before the next super outburst but are seen in outbursts late in the cycle. They appear to be part of the initiation process and this enhanced mass flow provides the driving mechanism for the super outburst. Nicholas Vogt developed this concept further in a paper in 1982.

The transition from trigger to super outburst proper

I am unaware of any series of measures which follows this period completely. On page 195 of Warner's book he presents measures of V436 Centauri on four consecutive nights which show different stages in the transition. Observations by Terry Bohlson and Josch Hamsch of VW Hydri in 2011 as shown below are also in this area, but there is no clear evidence of what has happened.

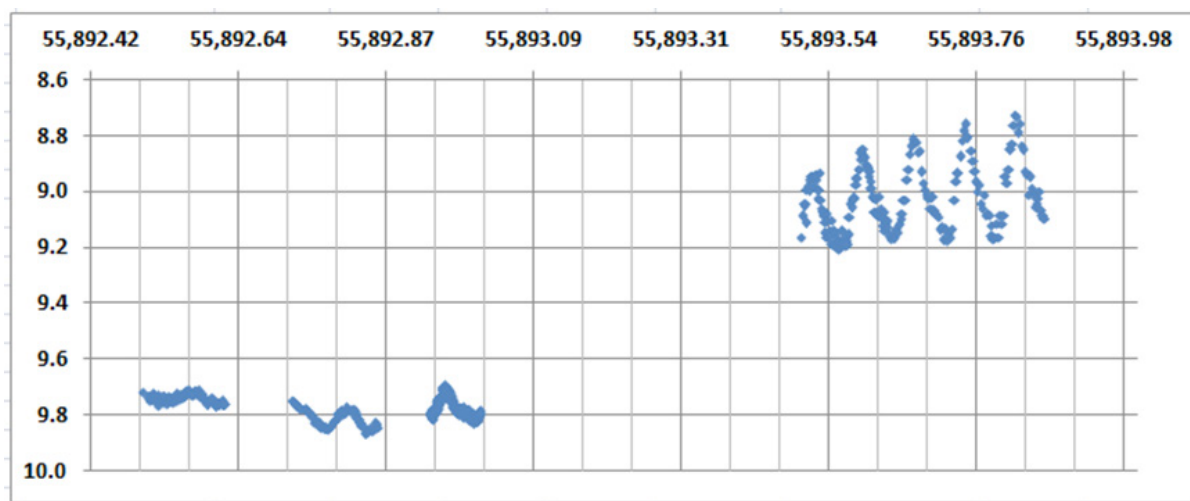


Figure 5. This illustration from the October, 2019, newsletter clear shows the enhanced orbital humps on the left and just possibly the first incipient superhump. But it does not show the ~3% phase changes clearly which, during the half day interval, are quite large in total.

This brings up another event stimulated by Colloquium 46. Chris Sterken proposed an eight day monitoring of EX Hydrae to resolved the dual periodicity. This very successful event was one of the earliest world wide collaborations and resulted in almost complete cover over this interval from NZ, Australia, South America and South Africa. Could Variable Stars South arrange a similar collaboration either in April, 2021 (which has VW Hydri low in the sky, but was often measured through nadir at Auckland from 37 South) or October, 2021, when higher but unpredictable spring weather?

The observing project:

The brightness during the critical interval is around $V = 9.0-10.5$ so is accessible by various detectors - even DSLR cameras can handle things reasonable well at this level. At Auckland we always used a 30 second cadence but the telescope was 50cm. This was always the sum of 3×10 second integrations.

There's adequate time to organise such a collaboration and the results would be valuable and easily reduced to a publishable format.

I don't observe these days - the body doesn't like the cold - but I'm prepared to provide any necessary assistance and help to put it all together in a publishable format whilst all observers will be the main authors depending upon their levels of contribution. It's something well worth doing but needs collaboration. At most, the observing will cover only three or four consecutive nights but we need a good warning system. Like the EX hydrae participation of 1979 it will, if successful, answer many questions!

Update on MR Aps, V610 Ara, YY Gru and DI Mic – *Tom Richards*

tomprettyhill@mail.com

Introduction

These four short-period eclipsing binaries are under observation by members of the Southern Eclipsing Binaries Group of Variable Stars South. They were last reported on in (Richards et al., 2018), recording new linear ephemerides based on our minima data through 2017. With more minima data now available the ephemerides can be updated, and in one cases there is now clear evidence of period change.

A linear regression was executed on all primary minima observed by SEBRG members. The period estimate used as input to the regression was taken from either the GCVS (Samus et al, 2017), or the AAVSO's VSX (Watson, Henden & Price, 2006). The first SEBRG minimum estimate was used as the (un-regressed) zero epoch. The regression then returned a best-fit estimate of the zero epoch and period.

The following table records the revised linear ephemerides. The first five columns list the system, the regressed epoch and standard error, and the regressed period and standard error. The next column records the standard deviation of the residuals of the minima from the regression prediction. The smaller the number, the better are the minima data fitted to a linear fit (constant period). N obs is the number of VSS primary minima estimates used in the regression, and Intvl is the time interval in days covered by them. The last column is the catalogue period used as basis for the regression. It will be noted that in all cases the regressed period P does not differ significantly from it.

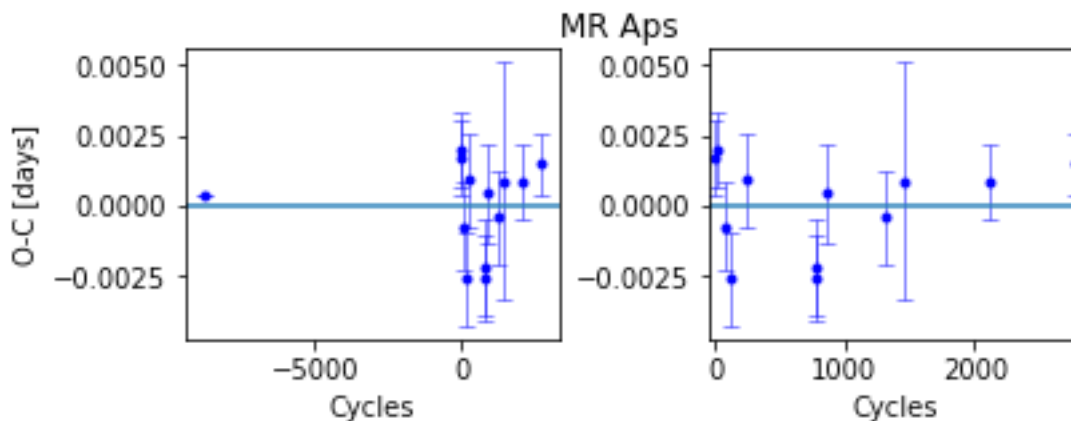
ID	E0	E0_err	P	P_err	SD resid	N obs	Intvl	Cat P
MR Aps	2457159.01014	0.00047	0.527864	1.72E-07	0.001678	12	1461	0.527864
V610 Ara	2458291.03485	0.00064	0.543161	1.54E-07	0.00168	6	744	0.543157
YY Gru	2458014.98480	0.00036	0.292649	4.43E-08	0.000916	6	1093	0.292649
DI Mic	2456884.07780	0.00318	0.286686	5.82E-07	0.010649	12	2188	0.286687

Table 1. Revised linear ephemerides.

In the plots below, the left-hand panes show O-C values for all minima including (on the far left) the data point for the catalogue minimum used for the regression. The right-hand ones zoom in on the SEBRG data. Cycle 0 is at the regressed E0 as listed in Table 1.

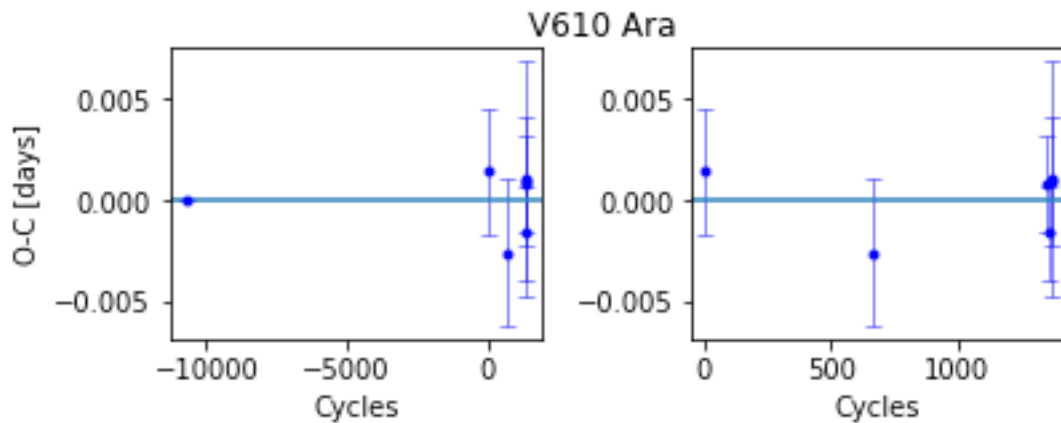
MR Aps

This EW binary has been under observation by Robert Jenkins and myself since 2015. The results here show no evidence of period change since the GCVS epoch (left side of left pane). Unlike the other binaries studied here, the VSX epoch was not used as basis for the regression as it definitely seems to be an outlier.



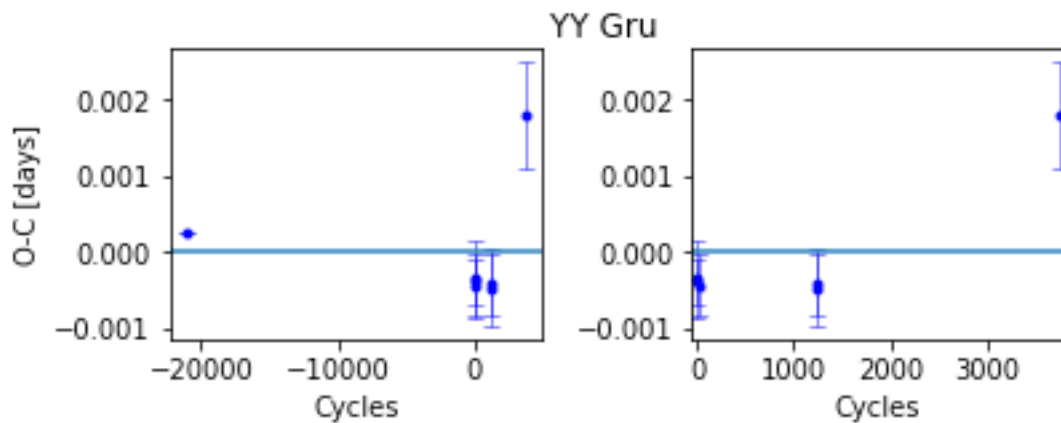
V610 Ara

Another EW binary with ~ 0.5 d period, observations by Roy Axelsen and Neil Butterworth. Again, no evidence of period change. VSX provided the catalogue minimum for the regression.



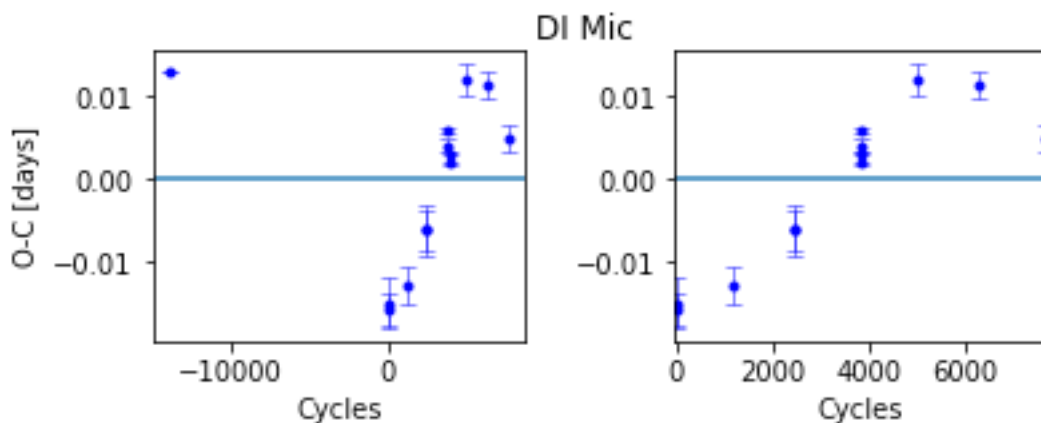
YY Gru

A very short period EW, observations by Mark Blackford and myself; catalogue ephemeris is VSX. In this case there is a possible indication of period change, but it relies on just one observation (the most recent, on the right). So without several further minima estimates, nothing can be concluded.

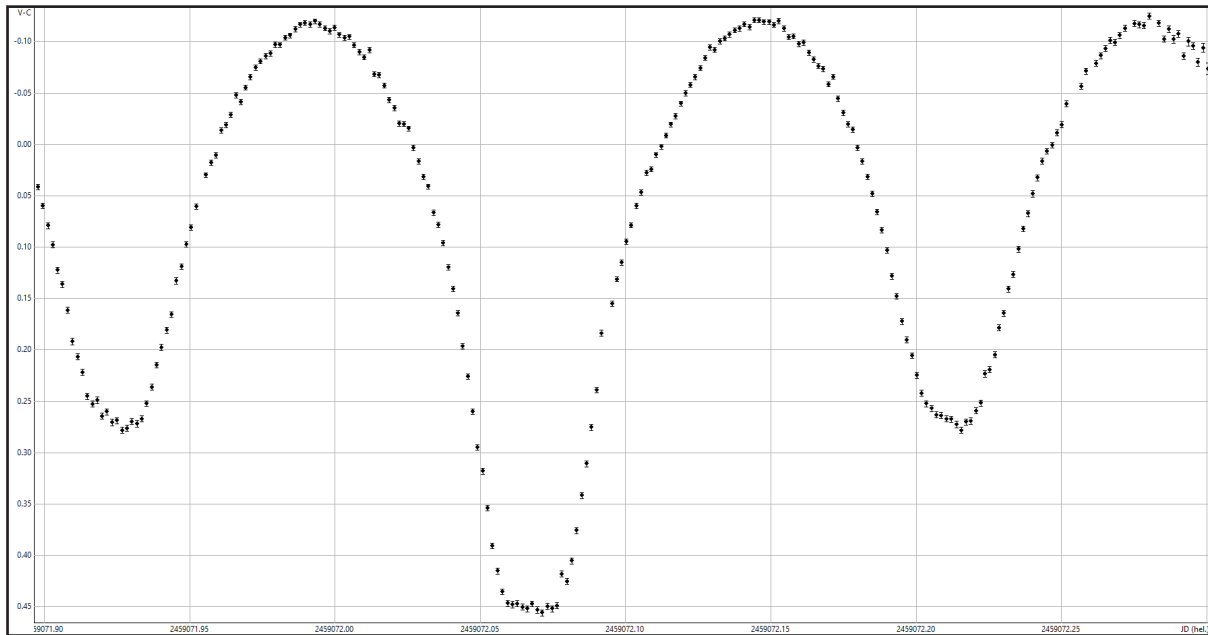


DI Mic

The O-C diagram makes it clear a linear ephemeris is insufficient. A sinusoidal fit, with possibly a parabolic fit as well, is indicated – the subject of a separate investigation.



DI Mic is catalogued by the GCVS as type EA. However the light curve below (TR, 2020-08-10, Sloan r') indicates an EB. Observations by Greg Crawford and myself, catalogue ephemeris in VSX.



References

- Richards, T., Blackford, M., Butterworth, N., Crawford, G., Jenkins, R., 2018.** *"Southern Eclipsing Binary Minima and Light Elements in 2017"*. OEJV 189. 2018OEJV..189.....R
- Samus, N.N., Kazarovets E. V., Durlevich O.V., Kireeva N.N., Pastukhova E.N.,(2017)** General Catalogue of Variable Stars: new version. GCVS 5.1, ARep, 2017, 60, 1. [2017ARep...61...80S](http://www.sai.msu.su/gcvs/gcvs/) Online at <http://www.sai.msu.su/gcvs/gcvs/>
- Watson, C.L., Henden, A. A., and Price, C. A.** 2006, The International Variable Star Index (VSX). 25th Annual Symp., The Society for Astronomical Sciences, 47. [2006SASS...25...47W](http://www.aavso.org/vsx) Access at <http://www.aavso.org/vsx> or [2014yCat....102027W](http://www.aavso.org/vsx)

We planned to discuss the VSS website at the VSS Symposium earlier this year, but of course that and a great many other things got cancelled due to COVID. In place of that discussion, the following covers the material I planned to present. I would ask that all members consider what follows and provide feedback as outlined later in the article.

In the beginning...

The VSS website is the most obvious public facing aspect of VSS and has been an important channel for information since its inception back in August 2009. In those days, Tom Richards managed the site (along with a great many other things) and hand-coded it himself (old school, but easier to manage when there wasn’t a lot of functionality).

In 2010, I (foolishly?) offered to take over the work, as I already maintained one or two other sites using a Content Management Systems (CMS) called Joomla! (and yes, the name included the exclamation mark). A CMS provides the basic mechanics for a website, allows the formatting to be consistently controlled using a template, and allows additional specialist functionality to be added using “plug-ins” so the webmaster doesn’t have to code all the extra features manually.

That site initially duplicated the organising functionality that Tom had developed, but over time we added extra functionality, including:

- An online discussion forum to replace the original Google Groups (basically an email exploder with a web page view as well).
- A database of target stars and comparisons to support the SPADES project
- A whole bunch of additional functionality to support SPADES (charts, constellation information, etc).

The discussion forum was a disaster, with almost no activity! Tom reactivated the VSS Google Group functionality, and that has been operating well for several years. And the SPADES functionality, while a nice piece of work technically (at least from my perspective), was used by only one or two people and was challenging to keep up to date.

The second generation

In 2017, the CMS software we were using was getting very dated, very difficult to upgrade and quite unstable. By that time, I had started working with a different product and a decision was made to migrate the site to the WordPress CMS. That process resulted in the unloved functionality being dropped and a simpler, more streamlined website being created. It did include a feature to allow members to have their own page on the site that allowed them to interact with other members, but once again, this has had limited use, and the concept of “member” became more tenuous with the elimination of fees.

Where are we today?

Currently, there are only two parts of the site that get much attention. These are the repository of VSS newsletters, and the various databases and tools that are provided for people’s information. In this last category, Mati Morel has been very active over the years and is about the only person who contributes. I have also loaded up presentations and publications when I became aware of them, but I’m not entirely sure this is up to date, because unless I’m told about a publication, I don’t know to add it.

The projects area has been moribund almost the entire time. There is a page for each of the projects, but there hasn’t been an update to any of these in some years. The eclipsing binaries project run by Tom and Mark is the exception, but some years ago Tom set up a separate site for that project and the VSS Website does little but point to that site which Tom maintains.

Where to from here?

The website costs a not inconsiderable sum to host each year, and periodically there are fees for the domain name. With no membership fees to provide income, this is potentially a problem. To eliminate the hosting fees, I intend to move the site to my personal/business hosting account – I already did this for the Queensland Astrofest site. None of the sites are very demanding and I already pay for a hosting service more than sufficient to operate VSS as well, so it seems silly to throw money at the hosting provider (it's the same organisation so migration is easy).

I also need to address a flurry of recent hacking attempts - I was getting hundreds of attempts to register fake accounts each week and have temporarily disabled self-registrations. This may see some of the unused member features disabled.

Feedback is needed

As I am planning to do a little work on the site to streamline some of the features, I thought I would open a conversation regarding the site to see if there is anything people are looking for (and would actually use). Once this newsletter is published, I will open a discussion thread on the Google Groups to allow people to throw in ideas/suggestions etc. I am open to all ideas, as long as they are ones that people would actually use (and don't require a lot of maintenance on my part).

So, let me know if you think of anything – this is your website after all!

Publication watch

Tom Richards and the SEB team have had a publication in JAAVSO.

Richards, T, M.Blackford, N.Butterworth, R.Jenkins.(2020). “*Southern Eclipsing Binary Minima and Light Elements in 2019*”. JAAVSO 48:2, 1-6.

Abstract

We present 156 times of minima of 68 southern hemisphere eclipsing binary stars acquired in 2019, plus two earlier (V676 Cen). These observations were acquired and analyzed by the authors who are members of the Southern Eclipsing Binary group of Variable Stars South (VSS) (<http://www.variablestarssouth.org>), using DSLR and CCD detectors. For seven of the systems we have derived updated light elements and present those as well as O–C values for the VSS minima. This paper is the fifth in a series; previous papers were published in the Open European Journal on Variable Stars.

Phil Evans has been named as a co-author in two publications relating to TESS exoplanets:

Bouma, L. G. et al. “*Cluster Difference Imaging Photometric Survey. II. TOI 837: A Young Validated Planet in IC 2602*” 2020 arXiv200907845B

Abstract

We report the discovery of TOI 837b and its validation as a transiting planet. We characterize the system using data from the NASA TESS mission, the ESA Gaia mission, ground-based photometry from El Sauce and ASTEP400, and spectroscopy from CHIRON, FEROS, and Velocite. We find that TOI 837 is a $T=9.9$ mag G0/F9 dwarf in the southern open cluster IC 2602. The star and planet are therefore 35^{+11}_{-5} million years old. Combining the transit photometry with a prior on the stellar parameters derived from the cluster color-magnitude diagram, we find that the planet has an orbital period of 8.3 d and is slightly smaller than Jupiter ($R_p = 0.77^{+0.09}_{-0.07} R_{Jup}$). From radial velocity monitoring, we limit $M_p \sin i$ to less than $1.20 M_{Jup}$ ($3-\sigma$). The transits either graze or nearly graze the stellar limb. Grazing transits are a cause for concern, as they are often indicative of astrophysical false positive scenarios. Our follow-up data show that such scenarios are unlikely. Our combined multi-color photometry, high-resolution imaging, and radial velocities rule out hierarchical eclipsing binary scenarios. Background eclipsing binary scenarios, though limited by speckle imaging, remain a 0.2% possibility. TOI 837b is therefore a validated adolescent exoplanet. The planetary nature of the system can be confirmed or refuted through observations of the stellar obliquity and the planetary mass. Such observations may also improve our understanding of how the physical and orbital properties of exoplanets change in time.

Weiss, L. M. et al. “*The TESS-Keck Survey II: Masses of Three Sub-Neptunes Transiting the Galactic Thick-Disk Star TOI-561.*” 2020 arXiv:2009.03071v1

Abstract

We report the discovery of TOI-561, a multiplanet system containing an ultra-short period planet (USP), based on photometry from the NASA TESS Mission and ground-based follow-up. This bright ($V=10.2$) star hosts three small transiting planets: TOI-561 b (TOI-561.02, $P = 0.44$ days, $R_b = 1.45 \pm 0.11 R_\oplus$, c (TOI-561.01, $P = 10.8$ days, $R_c = 2.90 \pm 0.13 R_\oplus$), and d (TOI-561.03, $P = 16.4$ days, $R_d = 2.32 \pm 0.16 R_\oplus$). The star is chemically ($[Fe/H] = -0.41$, $[alpha/Fe] = +0.23$) and kinematically consistent with the galactic thick disk population, making TOI-561 one of the oldest (10 ± 3 Gyr) and most metal-poor planetary systems discovered yet. We confirm the planetary nature of the candidates with high-contrast imaging, ground-based photometric follow-up and radial velocities from Keck/HIRES. Planet b has a mass and density of $3.2 \pm 0.8 M_\oplus$ and 5.6 ± 2.0 g/cc, consistent with a rocky composition. Its lower-than-average density is consistent with an iron-poor composition, although an Earth-like iron-to-silicates ratio is not ruled out. Planet c is $6.5 \pm 2.4 M_\oplus$ and 1.45 ± 0.55 g/cc, and planet d is $2.4 \pm 2.0 M_\oplus$ and 1.1 ± 0.9 g/cc, both of which are consistent with an interior rocky core overlaid with a low-mass volatile envelope. TOI-561 b is the first rocky world around a galactic thick-disk star confirmed with radial velocities and one of the best rocky planets for thermal emission studies.

About

Variable Stars South is an international association of astronomers, mainly amateur, interested in re-searching the rich and under-explored myriad of southern variable stars.

Renamed from the Variable Star Section of the Royal Astronomical Society of New Zealand, it was founded in 1927 by the late Dr Frank Bateson, OBE, and became the recognised centre for Southern Hemisphere variable star research.

VSS covers many areas and techniques of variable star research, organised into projects such as Beginners' Visual Observations and Dual-Maxima Miras. The goal of each project is to obtain scientifically useful data and results. These may be published in recognised journals, or supplied to international specialist data collection organisations.

VSS is entirely an internet based organisation, working through our website <http://www.VariableStars-South.org> and its e-group <http://groups.google.com/group/vss-members>. It also encourages members to work in with major international organisations such as the British Astronomical Association, the Center for Backyard Astrophysics and the American Association for Variable Star Observers.

To find out more, please visit our website, where, incidentally, you will find PDF copies of all our newsletters. Our website has a great deal of information for VSS members, and for anyone interested in southern hemisphere variable star research. All VSS project information and data is kept here too.

Who's who

Director Mark Blackford

Treasurer/Membership Bob Evans

Newsletter Editor Phil Evans

Webmaster David O'Driscoll

Visit our website to see a list of our area advisers, and to find out about our projects and how to contact their leaders

Membership

New members are welcome. There is no annual subscription but donations would be gratefully received. Find out how to join by visiting the VSS website. There you will find out how to join by post, email, or directly online. If you join by email or online and wish to make a donation you will get a link to pay by PayPal's secure online payment system, from your credit card or bank account.

After you've joined and received your membership certificate, you will be signed up to the VSS-members egroup (see above), and you will also receive a password to access the members' areas of our website.

Newsletter items

These are welcomed and should be sent to the Editor (phil@astrofizz.com). I'd prefer Microsoft Word (or compatible) files with graphics sent separately. Don't use elaborate formatting or fancy fonts and please do not send your contribution as a fully formatted PDF file.

Publication dates are January, April, July and October, nominally on the twentieth day of these months and the copy deadline is the thirteenth of the month though earlier would always be appreciated.

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