

The British Astronomical Association

Variable Star Section Circular

No. 206 December 2025



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Cover Picture

Attendees at the BAA Variable Star Section Meeting
Saturday October 25th, 2025
Northamptonshire Natural History Society
Photograph. James Dawson

From the Director – *Jeremy Shears*

Variable Star Section Meeting

Variable star enthusiasts gathered in Northampton on Saturday October 25 for our Section meeting. It was a good turnout and wonderful to see old faces again and some new ones, too. The Northamptonshire Natural History Society (NNHS) were excellent hosts at their Humfrey Rooms. Many thanks to Nick Hewitt for all the arrangements. He and his NNHS team made us feel very welcome and put on a lovely spread at lunchtime, plus tea & coffee throughout the day.

The agenda featured a superb line up of speakers and I would like to thank them all for their highly informative presentations. A report prepared by Tony Vale appears later in this Circular and recordings of the talks can be viewed via the BAA YouTube channel (or via the VSS meeting webpage: <https://britastro.org/event/variable-star-section-meeting-2025>). Many thanks to Andy Wilson for IT support throughout the day and for recording the presentations and uploading the videos.

We hope to hold the next VSS meeting during 2027, following our biennial routine.

Observing Milestone for Rod Stubbings

As this *Circular* was going to press, news broke that Rod Stubbings of Victoria, Australia, had recorded his 450,000th visual observation. Hearty congratulations to Rod on this remarkable achievement! We wish him well for many more observations in the years to come.

Observing campaigns

Just a reminder of the requests for observations of **ZZ Psc** and **X Per** (see the September *Circular*).

The campaign to detect outbursts and superoutbursts of ER UMa stars coordinated by Stewart Bean continues (see the BAA Forum for updates by Stewart).

As described elsewhere in this *Circular*, Mark Kidger is also keen to receive observations of **OJ 287**. 2025 has been an unusually active year for this blazar, so it will be interesting to see what 2026 brings.

Christmas and New Year wishes

With Christmas fast approaching, I would like to wish all readers a very merry Christmas and many clear skies to enjoy observing variables during 2026 (surely the weather must be better than I've experienced during October and November!).

Look out for the article by Des Loughney on W UMa, the 2026 Variable Star of the Year, in the 2026 BAA *Handbook*. The *Handbook* is due to appear with the December *Journal* and online.

Variable Star Section Meeting 2025
Northamptonshire Natural History Society
Saturday 25th October

Tony Vale

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The Variable star Section meeting was held in Northampton on 25th October 2025. It was very well attended and the nine speakers gave interesting talks which were well received by the attendees.

Welcome and Introduction – Professor Jeremy Shears

Members were welcomed to the meeting by Jeremy Shears who went on to review the key events and activities which had taken place since our last meeting on September 2nd 2023.

Sadly, Roger Pickard passed away on Boxing Day 2023 and also Storm Dunlop in January of this year. The meeting observed a few moments of silence out of respect for them both.

In reviewing member's observations, Jeremy drew attention to the increased number of observations in all categories, visual, digital and spectroscopy this year compared to last. The increase of 127% in digital observations between the two years was particularly remarkable. It was also good to see an increase in the number of visual observers.

Congratulations were extended to Gary Poyner on reaching 350,000 observations in November 2023. The Charles Butterworth Award was presented to Michael Woodman who was the first to observe the 1946 outburst of T CrB. Michael was a 15-year-old schoolboy at the time. He is keen to see the coming eruption as well as the last, something that few other people, if any, are likely to be able to do. Congratulations were also extended to Andy Wilson on the award of his PhD from the University of Exeter.

Jeremy went on to encourage members to consider submitting articles for the Circular and stressed that these need not be scientific in nature. Thanks to the efforts of Chris Lloyd, the circulars are now uploaded to the NASA ADS.

Apart from the circulars (the 200th edition was published in June 2024) the section communicates with members and the outside world through its Website, Facebook page, and the Alert group. There is also the Eclipsing Binary Guide, which was written and updated by Des Loughney.

Jeremy drew attention to the various observing campaigns that have been and in some cases are still ongoing, before thanking his fellow officers for their efforts and support. Jeremy then introduced the first speaker.



Jeremy Shears opening the 2025 BAA Variable Star Section Meeting (*Photo. James Dawson*)

Hinds Variable Nebula - Richard Sargent

Hind's variable nebula is associated with the variable star T Tau, the prototype of the T Tauri class of pre main sequence variable stars. The nebula was discovered by John Russell Hind and is a difficult visual target. It is a reflection nebula, reflecting the light from T Tauri. It is actually a triple system, consisting of T Tau N, T Tau Sa and T Tau Sb. Sa and Sb are an orbiting pair which are themselves orbiting N. Sa and Sb are not visible as they are obscured by a circumbinary ring.

Richard has been taking images of the nebula using his own equipment and has supplemented these with images from the Zwicky Transient Facility (ZTF) which were taken with 48" Schmidt telescope at Palomar. In one of these images he pointed out a faint shadow of the nebula and went on to explain why he believed that the shadow was caused by the circumbinary ring blocking some of the light from N reaching the nebula. He also highlighted two bright patches (the "blobs"). All these features show variations in brightness. For example, the shadow wasn't visible before November 2015 but these variations do not appear to show any periodicity. He then went on to speculate that the blobs are caused by light from T Tauri lighting up parts of the nebula and how variations could arise from obscuration blocking the light from time to time.

Observing extragalactic Variables – Dr Paul Leyland

Paul began by indicating the kinds of objects he would be describing in his presentation. These include bright extragalactic variables such as Recurrent Novae, Miras, LBVs and Cepheids, but not supernovae, for example, which are already being well observed and studied.

There may only be small numbers of rare objects known in our galaxy, but by observing those objects elsewhere we can increase the number and variety available to study. For example, LBVs are uncommon, only 61 are known within the galaxy but 57 are known outside it. Only 10 Recurrent Novae are known in the Milky Way but M31N 2008-12a undergoes a nova explosion every 11 months, the highest frequency known. Other extragalactic Recurrent Novae are also known and a number outburst more frequently than galactic ones. Observing Cepheids or RR Lyrae stars enables distance measurements to be made.

Targets will typically be fainter than magnitude 17 V-band and most will be fainter than magnitude 14. Paul is able to observe magnitude 20 objects with 0.1 magnitude precision with 3 hours integration time using his 40cm telescope. Magnitude 17 objects can be observed with an 8" telescope. He went on to give some more detailed examples of possible targets before issuing a "call to arms" encouraging those who were able to observe extra galactic variables to do so.

Cluster variables in M5 – Professor Jeremy Shears

This talk was included at short notice to fill the gap left by Gary Poyner's talk, "V1363 Cyg: a post Nova CV", as he was unable to attend the meeting.

David Elijah Packer was an amateur astronomer and BAA member from 1892 and the discoverer of two variables, M5 V42 and M5 V84, both located in the globular cluster M5 in Serpens.

Packer was born in London in 1862. By the age of 26 he was using a 4.5" refractor for his observations. His mentor was Herbert Ingall who lived close by. Using his refractor he discovered two variables in M5 in Serpens and confirmed these discoveries using Ingall's 10" telescope. He worked as an oilman's assistant but also as a doorman at the RAS due to his interest in astronomy. By coincidence, he was present at a lecture given by A A Common in 1890 in which Common presented two photographs of M5. Packer was able to identify his variable stars and could see that they were at different magnitudes in the two photographs and announced his discovery. Further confirmation came from Williamina Fleming at Harvard. Both of these stars are now classified as Type II Cepheids with periods of around 25 to 26 days. The distinction between Type I and Type II Cepheids was discovered by Baade during the war. The period luminosity relationship is different for the two classes. Baade reworked Hubble's calculation of the distance of M31 reflecting this difference and doubled Hubble's estimate.

Following his discovery, in 1892 Packer became an observing assistant at Cambridge University but left shortly after due to "professional jealousy". He reported variability in the core of M77, a Seyfert galaxy. Gerard de Vaucouleurs attempted to explain what the cause of these variations might be. He considered the possibility of changes in the brightness of the nucleus but decided this was unlikely given that M77 is a Type II Seyfert which do not show significant variations in visible light. Next he considered if it might have been a supernova but thought this unlikely as supernovae had not been observed in M77 at that time, although one was observed in 2018. Therefore exactly what it was that Packer observed is not known. He reported variations in other objects which we now know do not vary.

After leaving his post at Cambridge University, he moved to Birmingham where he became a librarian and populariser of astronomy.

Targets for Smart Scopes – Dr Christopher Lloyd

Chris began by describing the history and development of smart telescopes and gave a summary of the many brands and types now available. In general, these are small aperture cameras with tri-colour sensors similar to DSLRs. They can locate targets, plate solve, calibrate and stack the images they produce which can be sent to mobile devices on which the images can be stored and displayed in real time. The displayed images are built up as the observation progresses and more and more images are stacked.

They were originally intended for deep sky imaging for people with no previous experience but their convenience has meant that more experienced imagers have begun to use them. Recently Seestar have introduced an equatorial mode thus avoiding field rotation and allowing longer exposure times among other benefits. Other models though, are generally alt-az.

The relatively wide fields of 1° to 2° for smart scopes in general make them suitable for variable star photometry. An AAVSO study of their use for photometry concluded that with a 10s exposure saturation would occur at brighter magnitudes than 8 or 9, depending on gain, and the faintest measurable stars were about magnitude 14. With 5 minute stacked images, stars as faint as magnitude 16 can be measured.

As with DSLRs, the green channel is close to V band and can be easily transformed but first it is necessary to delay the image to separate out the colour channels. Photometry can be carried out on the separate colour channels and reported as TG (green), TB (blue) and TR (red) without transformation, however there is no standard for these categories and magnitudes obtained this way can vary significantly from one instrument to another.

Chris went on to describe some of the sky surveys and their limitations, to highlight the areas where small telescopes could make a contribution. In general he concluded that bright targets and high cadences were either poorly covered by surveys or not covered at all so bright targets and time series are good options. There were essentially two types of observations which could be made, time series such as eclipsing binaries and other targets which show changes over short timescales or monitoring stars such as Miras and LPVs which show changes over longer timescales.



Jeremy Shears introduces AAVSO's Dr. Brian Kloppenborg via Zoom (*Photo. James Dawson*)

How AAVSO is adapting to the sky survey era – Dr Brian Kloppenborg (Executive Director, AAVSO)

Brian joined the meeting remotely from the United States and began by highlighting the range of surveys being planned or carried out by orbiting robotic telescopes typical of the last decade and surveys typical of the next decade, which will tend to be more ground based. He cited some examples, such as:

- The Vera Rubin telescope which will generate a huge number of images of targets between magnitude 16 to 24 in the Sloan g waveband.
- The Argus Array which will consist of 900 8" telescopes surveying every part of the sky every minute collecting data on targets from magnitude 4 to 16 in Sloan g.
- The Roman Space telescope
- NASA Habitable Worlds, which will observe objects as bright as Vega
- ESA Plato which will have 24 cameras recording objects between magnitude 8 and 16 V band every 25 seconds.

There will always be a way for amateurs to collaborate with the surveys. Both amateur spectroscopy and photometry are complementary to sky surveys. In both cases, amateurs cover bright targets and the surveys cover fainter targets. The typical survey range is magnitude 10 to 25 V-band with a revisit rate of 3 days and typically just one filter. Amateurs can observe objects as bright as magnitude -4 and as faint as magnitude 19. For every 100,000 transients identified by the Zwicky Transient Facility survey each night, only 10 to 15 are being followed up leaving a big opportunity for amateurs. Also, professionals prefer long running consistent datasets, so if an observer has been observing a target for a long time they should keep doing it.

The AAVSO is responding to the challenge from surveys by pivoting to:

- Areas where researchers are asking for help
- Giving guidance on where the greatest impact can be made
- Small research programs
- Helping observers to become more skilled
- Hiring full time trainers
- Evaluating training material
- Revamping the AAVSO programs to align with modern learning methods.

With regard to stellar photometry, targets brighter than magnitude 5 are in dire need of data and targets brighter than magnitude 13 are mostly too bright for surveys. Any cadence faster than 3 days is needed. For spectroscopy, anything brighter than magnitude 6 is untouched by surveys and targets between magnitude 6 and 8 are excluded from most surveys. Any cadence faster than 15 days is too fast for most spectroscopic surveys. Exoplanet observations by amateurs are critical in improving confidence in the timings of transits for professionals to study them in more detail. Other areas with potential for amateurs to explore are speckle interferometry with 1-m to 2-m telescopes and polarimetry.

Spectroscopy of the massive eclipsing binary VV Cephei – Dr David Boyd

VV Cep is a 5th magnitude eclipsing binary with a cool red supergiant primary, similar in size and temperature to Betelgeuse and a hot blue secondary orbiting within the supergiant wind from which it has probably acquired an accretion disc. The wind and the disc are likely ionised because of the UV radiation from the hot blue star. The orbital period is 20.4 years and eclipses last around 2 years. It was first studied by Annie Jump Cannon in 1912. Over the last 10 years it's been the subject of an extensive amateur spectroscopic observing campaign, and a call was issued for medium to high resolution spectra for the 2024/25 eclipse. Increased interaction between the components is likely around periastron in late 2025.

David has been studying the resulting spectra from this campaign in collaboration with Manfred Shwarz and Ernst Pollman. Out of a total of 3,541 spectra, 1373 of them were high resolution including the H α region. There were also 300 V-band spectra from the 2017-19 eclipse. V-band photometry was obtained from the AAVSO. The spectra show a combination of the cool supergiant, the hot star, TiO absorption lines from the supergiant and emission lines from the accretion disc due to UV radiation from the hot star. To analyse the spectrum of the hot star, the spectrum of the cool, M2 star can be removed by using a template after first aligning it with the VV Cep spectra using metal

absorption lines. Radial velocities can be determined using the template as the system rest frame, after allowing for Barycentric corrections.

Converting relative flux spectra to absolute values of $\text{ergs/cm}^2/\text{s}/\text{\AA}$, can be done by correlating the spectra with V-band photometry but in this case not all the high resolution spectra cover the V-Band so by using the 300 V-band spectra from the 2017-19 eclipse, and converting them to absolute values using V-band photometry, the mean continuum flux could be calculated around the $\text{H}\alpha$ line. There is a strong correlation between Log $\text{H}\alpha$ continuum flux and V-band so from V-band photometry it was possible to estimate the continuum flux at $\text{H}\alpha$ for each of the high resolution spectra and with this to calibrate the absolute flux in $\text{ergs/cm}^2/\text{s}/\text{\AA}$.

The $\text{H}\alpha$ emission line has the appearance of a twin peak. This is because it consists of two components, one in emission and one in absorption. By comparing spectra to the rest spectra, radial velocity phase diagrams and orbital parameters can be produced of the M2 supergiant, the $\text{H}\alpha$ emission region, close to the hot secondary and the $\text{H}\alpha$ absorption region, the supergiant atmosphere. Combining these radial velocity phase diagrams reveals that the $\text{H}\alpha$ absorption region is redshifted by an average of 20km/s compared to the $\text{H}\alpha$ emission region.

The spectrum of the hot star can be derived by comparing the spectrum outside eclipse, which consists of both stars, with the spectrum during the eclipse which is the spectrum of the supergiant star only. From this spectrum the surface temperature of the hot star can be determined to be $9,000 \pm 250$ K, corresponding to an A1.5V star. The presence of Balmer and Fe II emission lines but not He I lines indicates a surface temperature of less than about 10,000K.

Considering the radial velocity of the $\text{H}\alpha$ emitting region through the eclipse reveals that although the hot star is eclipsed, the $\text{H}\alpha$ emitting region remains visible. Variability also comes from a 43 day modulation in the $\text{H}\alpha$ emission line, thought to come from precessing jets from the hot star. There is also pulsation from the supergiant.

In conclusion, VV Cep is a complicated system. Many of the parameters are uncertain. The temperature of the hot star is lower than previously thought. Finally, amateur observations are providing a solid body of evidence for future study.

Using The MAST Database to study eclipsing binaries – Des Loughney

Des described how the MAST database could be interrogated to obtain light curves from surveys such as TESS for targets including eclipsing binaries. These light curves can reveal the full orbital cycle which can be informative for eclipsing binaries such as ZZ Boo, an EA type eclipsing binary. A typical EA binary does not show variation between eclipses as the components are well separated and don't interact between eclipses. However variations between eclipses could easily be seen in the TESS light curve of ZZ Boo.

The website is equipped with tools to expand parts of the light curve so that they can be examined in more detail. By moving the cursor over the light curve the coordinates of any point on the curve can be determined. This can provide a straightforward method for determining the period.

Another example discussed was the light curve of RS CVn from TESS data from February 2019. Once again there were fluctuations seen between minima which were presumed to be because of star spots. It should be possible to follow the movement of these star spots around the stars as they orbit. Des regularly observes rho Cas and drew the comparison between the 7 observations he was able to make on November 2024 and the thousands of observations made by TESS over the same period

revealing structure and details in the light curve. This led him to believe that he should increase the cadence of his rho Cas observations in order to pick up more detail. He then went on to give some more examples including Algol, RZ Cas (showing delta Scuti variations from the primary star), Z Dra (showing reflection effects between eclipses), and U Cep. The final slide considered the broadening effect accretion discs can have on the light curves around the minima.

50 years of visual photometry – John Toone

The first variable star which John observed was R CrB on 9th May 1975. He has observed it very many times since and on 9th May this year, he observed it again, exactly 50 years after his first observation of it.

His first telescope was a 6cm refractor which he received as a present from his parents in 1972. He used it at first for planetary observations and later for Deep Sky observing. He joined Salford Astronomical Society in 1974. By 1975 he knew the northern sky to the 4th magnitude after he had traced and drafted star charts from the local library. Around 1981 the refractor was retired to be replaced with a C8, later a 16" DOB and then a C14. In 1992 John achieved the milestone of 50,000 observations and received the award from the Astronomer Royal. Soon after, he moved to Shrewsbury to get away from the light pollution in Manchester.

John also enjoys the challenge of observing southern variables from the UK. His record from Shrewsbury is T Cen and RY Sgr (-33°) and from the Lizard he has observed R CrA (-37°) and HT Lup (-34°) and variables in other constellations such as Microscopium, Pyxis and Sculptor. He has carried out variable star observations from many places around the world, having undertaken 52 expeditions, visiting 22 countries and 65 locations and international meetings with the AAVSO and VSS RASNZ. A highlight was presenting the third Butterworth Award to Mike Simonsen at the AAVSO Centenary Meeting in 2011. His travels have led to close encounters with crocodiles, puff adders, emus and baboons and even Police Officers whilst observing.

An advantage of visual observing over such a long time is the long consistent datasets he has built up for many stars and he went on to present some examples of these including Z UMa, Y Lyn, R CrB, U Gem, SS Cyg, Z Cam, X Per, AG Peg, CH Cyg and T CrB. Just the night before the meeting he observed AB Aur at its faintest for the last 100 years. He concluded that visual observing is really good fun. Here's to the next 50 years!

Discovering and characterising white dwarf pulsars – Dr Ingrid Pelisoli (Assistant Professor, University of Warwick)

White dwarfs are compact objects about the mass of the sun but the size of the earth. Their rotation period is typically around a day and they have very strong magnetic fields, much stronger than the sun's. In cataclysmic variables (CVs) the primary is typically a white dwarf and in these systems the process of accretion causes the white dwarf to spin up.

The white dwarfs of intermediate polars have magnetic fields which are sufficiently strong to prevent the formation of the inner part of the accretion disc. The white dwarf will be rotating faster than the orbit because it will have been spun up by the accretion process. The white dwarfs of polars have magnetic fields which are stronger still and prevent the formation of an accretion disc completely. Instead, material is drawn from the secondary, along the magnetic field lines and onto the surface of the white dwarf. In these systems the rotation of the white dwarf is synchronised with the orbital period because the magnetic field acts as a brake on the rotation of the white dwarf.

Gaia has identified more than a million white dwarfs and a few thousand CVs but until recently only one white dwarf pulsar was known, AR Sco.

In the 1970s AR Sco was believed to be a delta Scuti variable but amateur observations showed there to be significant scatter at the brightest part of the light curve. This was investigated further by astronomers at Warwick using large apertures and high cadence observations. This revealed that the scatter was caused by rapid pulsations observable at all wavelengths, including radio. Period analysis of the observations revealed two strong frequencies, one of 3.56 hours, and another of just 1.95 minutes. Apart from pulsars, there was nothing known at the time that could produce such high frequency pulses in radio. However, pulsar frequencies are much higher still (seconds rather than minutes) so this had to be something else. Spectra show that the target consists of a red and blue star, indicating that it's a binary. Radial velocities could be determined from the varying Doppler displacement so AR Sco was presumed to be a CV with an orbital period of 3.56 hours. The 1.95 minutes cycle was the rotation speed of the white dwarf, which is in fact, a white dwarf pulsar. The pulses are caused by magnetic reconnection between the magnetic fields of the two stars as the white dwarf spins. The magnetic reconnection heats and ionises material in the tidally locked red dwarf and accelerates the electrons causing emission at all wavelengths. As in pulsars (i.e. rapidly spinning neutron stars), emission is caused by accelerating charged particles in a magnetic field but unlike pulsars the source of the charged particles is completely different. In pulsars the particles are believed to come from the splitting of photons into particles and anti-particles in the magnetic poles, whereas in white dwarf pulsars electrons are generated from heating and ionisation caused by magnetic reconnection of the magnetic fields of the white dwarf and the red dwarf.

Narrow emission lines in the spectrum indicate that AR Sco is not accreting. The absence of accretion is probably because, as in polars, the strong magnetic field is preventing it, so the question arises as to how it can be spinning so quickly. An evolutionary model was proposed which may explain this. In the first stage, the white dwarf is non-magnetic and rotating slowly in a detached binary (a post-common envelope binary or PCEB). Next, the system becomes a normal dwarf nova, with an accreting white dwarf causing the white dwarf to spin up. The white dwarf cools as it ages and this is believed to generate a strong magnetic field. The system now becomes an intermediate polar. The white dwarf continues to cool and the magnetic field continues to increase until it connects with the field of the secondary. This transfers energy from the spin of the white dwarf to the orbit causing the system to become detached and accretion to stop. This is the white dwarf pulsar stage. The spin of the white dwarf and the orbital motion become synchronised. This would be observed as a pre-polar. Finally, because no energy is being transferred to the orbit, the separation between the components reduces, accretion starts again and we would observe this as a polar.

So in this model, AR Sco is a short lived evolutionary stage in the life of a CV but it would be expected that there should be more than just one or it would have to be an impossibly short stage.

Ingrid went on to describe how she set out to search for more by considering what made AR Sco stand out. She decided to select a sample of stars based on their position in the HR diagram, strong IR variability and strong colour. This gave a sample of 56 stars to examine in more detail and from these she was able to identify a second white dwarf pulsar with frequencies of 4 hours and 5 minutes. Subsequently Professor Boris Gaensicke, also of Warwick University, found a third completely by chance. This one had frequencies of 3.49hrs and 1.54 minutes. Three known examples provide better support for the short lived phase hypothesis but more are needed. The three WD pulsars lie very close to each other on the HR diagram and this may help in focusing the search for more.

Closing Remarks - Professor Jeremy Shears

Jeremy closed the meeting after thanking Northamptonshire Natural History Society for their hospitality and especially for the excellent lunch they provided, Andy Wilson for his technical input and expertise and all the speakers. Finally he thanked everyone for attending and wished everyone a safe journey home.



Speakers L-R; Dr. Ingrid Pelisoli, Dr. David Boyd, Des Loughney, Prof. Jeremy Shears, Dr. Paul Leyland, John Toone, Dr. Christopher Lloyd, Richard Sargent. Front: Dr. Andrew Wilson (techy). (Photo: James Dawson)

CV & E News

Gary Poyner

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Recent activity and light curves for the post-nova CV V1363 Cyg, activity within the RCB stars Z UMi, V742 Lyr and AO Her, and news of the new UGWZ star TCP J05384230+7051377.

V1363 Cyg:

The post nova CV V1363 Cyg entered outburst on September 29 at magnitude 15.19CV – the first outburst activity observed since 2023, when we observed its brightest outburst on record (13.0mv). Outbursts in this system consist of normal type DNe outbursts (above magnitude 16 for 2-3 weeks) and very long active periods with short recurring brightenings over extended periods (2006-2007 for example). We also see short and long declines, sometimes in the period of several months, interrupted by fainter rebrightenings. There are also both high and low states at quiescence. This system seems to have it all.

I have taken any activity above magnitude 16.0 as outburst activity – a starting point is needed. The September 2025 outburst lasted 40 days (Figure 1), peaking at magnitude 15.0CV on October 7.8 UT. Throughout the outburst 0.3-0.4 magnitude QPO's (Quasi Period Oscillations) were evident, reducing slightly in amplitude during the decline. BAAVSS observer Ian Sharp carried out a number of time series runs during the entire outburst, detecting QPO's throughout. Figure 2 reveals his analysis of one run on October 5 from both the UK (C9.25) and Spain (C11). The periods recorded are 7.4h-7.8h. By mid-November, V1363 Cyg had faded to below magnitude 16.0CV.

I asked Ian if he might run his magnitude 16 and fainter data (ignoring the high activity/outburst periods) through Peranso, to see if he can detect the 435 day period mentioned in the paper by Vojtech [1]. This period is thought to be caused by the modulation of the companions mass flow, and/or the rotation of any active regions around L₁. After running Lomb-Scargle, generalised Lomb-Scargle and ANOVA methods, Ian reports periods of 429.430289d, 428.571429d and 432.152118d respectively.

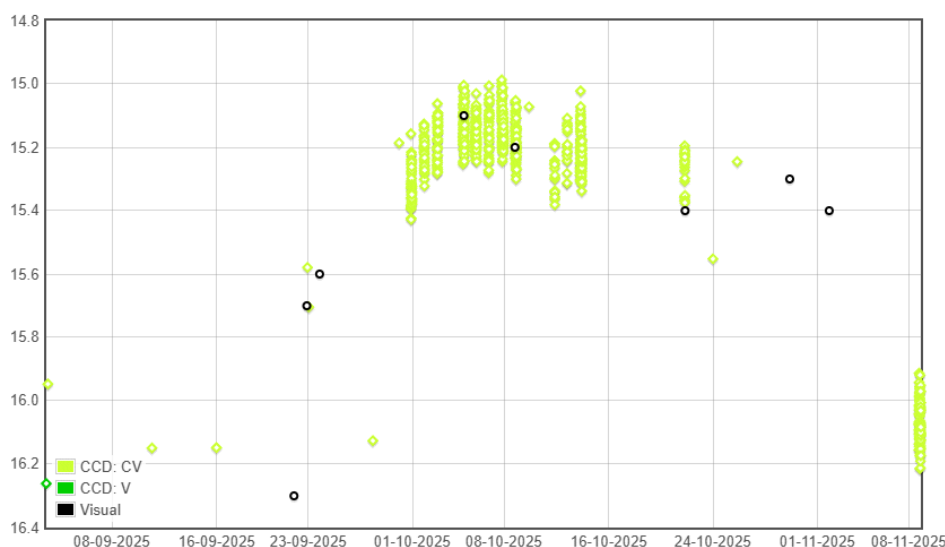


Figure 1. The September-November outburst of V1363 Cyg. G. Poyner, I Sharp (BAAVSS Database)

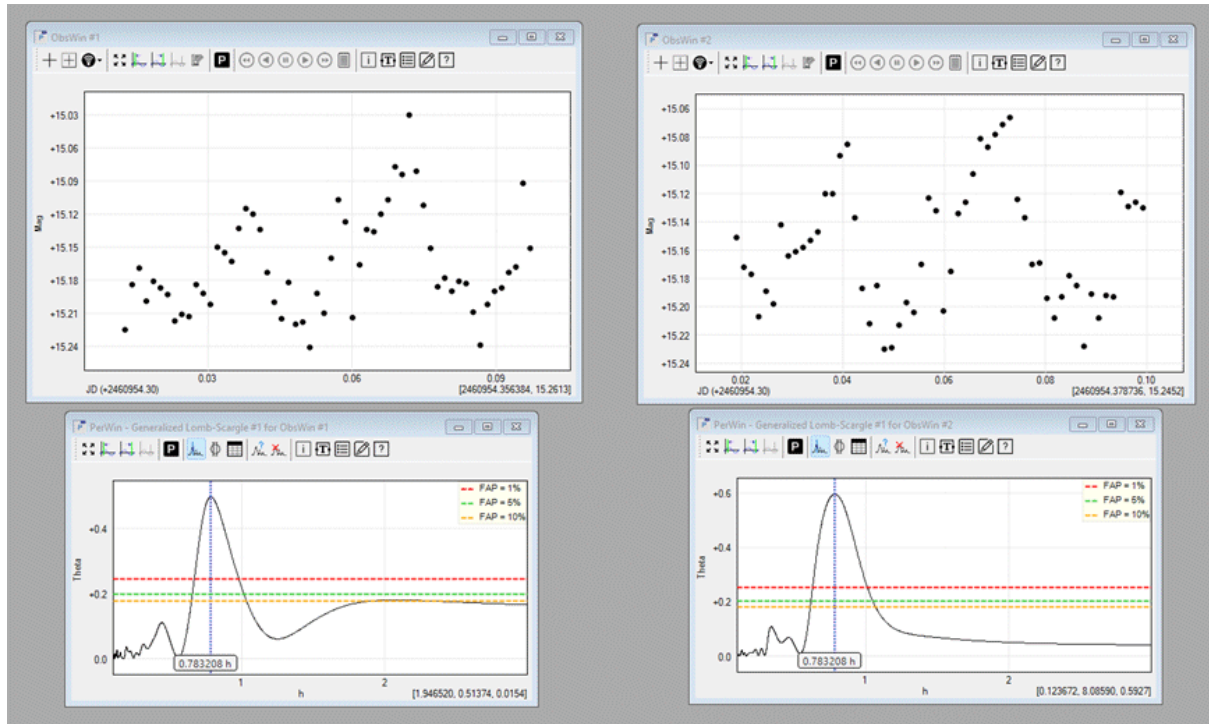


Figure 2. Times series revealing QPO's during October 5, 2025. Ian Sharp.

Z UMi:

The high declination R CrB star Z UMi is currently undergoing a deep fade. Following the very deep fade of October/November 2024, where Z UMi faded to magnitude 18.5V (see [VSSC 205](#)), a slow recovery ended in August 2025, when Z UMi reached its maximum magnitude. During early September however, Z UMi bag to fade again, and by November 13, had reached 16.46V (Figure 3).

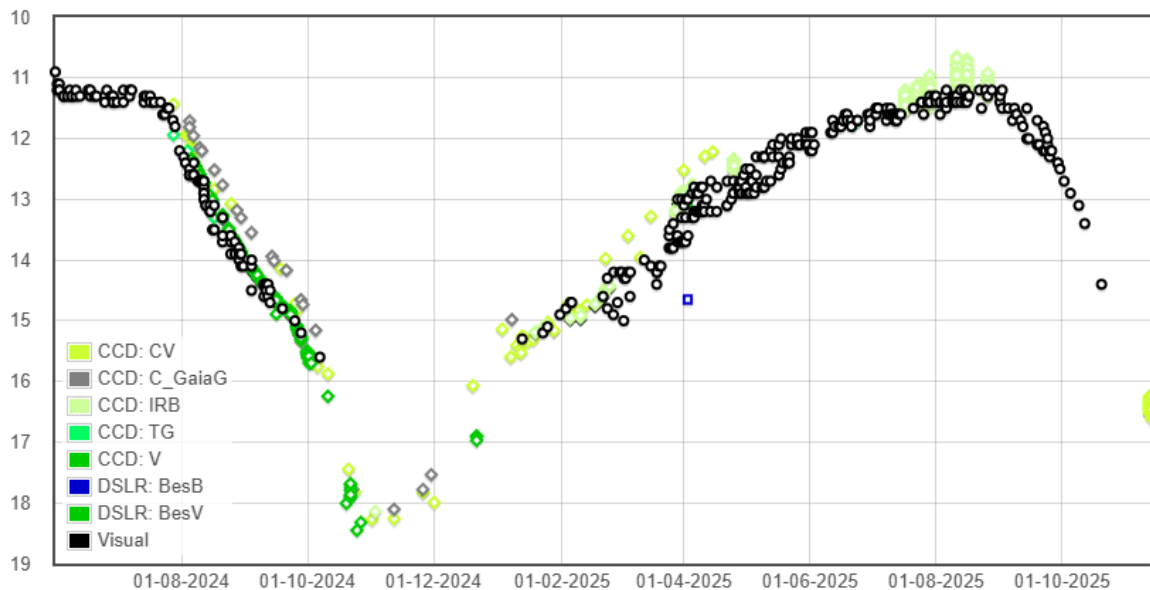


Figure 3. Z UMi 2024-25. Second deep fade of Z UMi in twelve months. RC Dryden, ND James, W Parkes, R Pearce, M Phillips, G Poyner, GJ Privett, I Sharp, J Toone, IL Walton, PB Withers (*BAAVSS Database*)

V742 Lyr:

After a long spell at a deep minimum of magnitude 18.0-19.4CV which began in November 2023, this RCB star finally looks to be recovering slowly to levels where visual observers can rejoin with positive observations. Following a seasonal gap in the data (starting November 2024), the first observations of Spring 2025 (May) show V742 Lyr rising to magnitude 16.0CV by July, only then to fade back one magnitude during August. The recovery began again in early September, and at the time of writing (Nov 16) lies at 14.6mv (Figure 4). Although the minimum was very faint, the star had remained somewhat active, varying between magnitudes 18.0CV and 19.4CV, with several false alarms with regards to a recovery. If this typically slow rise continues, then V742 Lyr will hopefully be back to maximum magnitude during the Winter/Spring months of 2026.

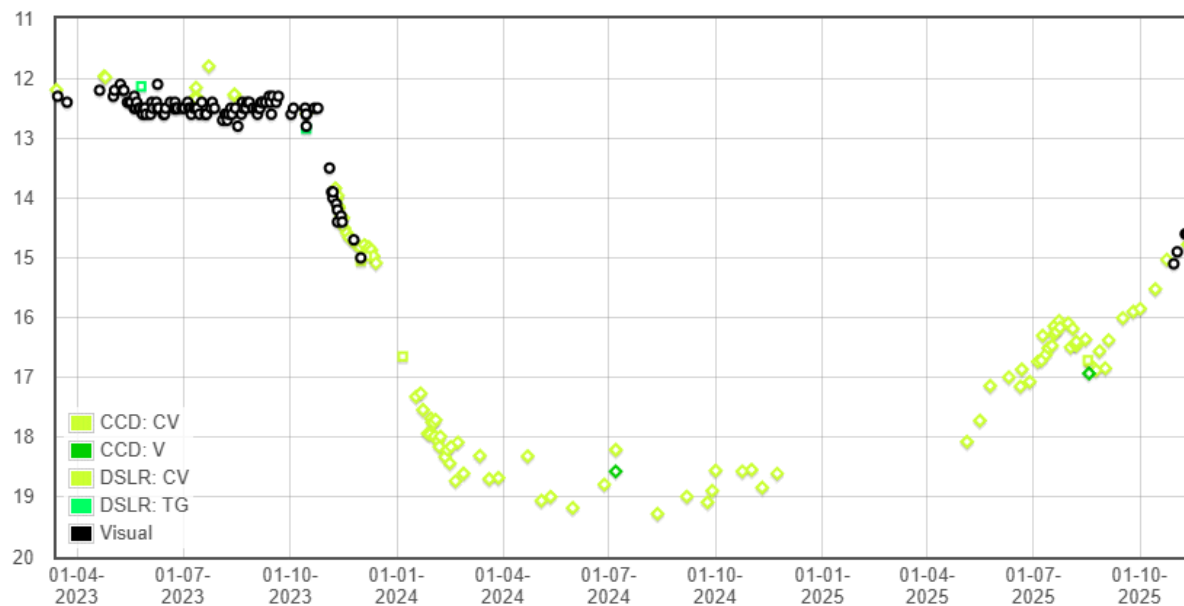


Figure 4. V742 Lyr. The deep minimum of 2024-25 and recovery. RC Dryden, G Fleming, PC Leyland, W Parkes, R Pearce, G Poyner, IL Walton, PB Withers (BAAVSS Database)

AO Her:

One final active RCB star throughout the Summer and Autumn period is AO Her. Figure 5 displays it's activity from April 2023 to present (Nov 18). After spending just four months at maximum brightness between November 2024 and March 2025, AO Her faded to magnitude 13.0 in May for ~8 weeks before rising to magnitude 11.5 for just two weeks. A slow fade began in September and the last positive observation in the VSS database is magnitude 17.32V on October 23.8 UT.

AO Her remains one of the most active RCB stars currently being observed by BAAVSS observers. The longest time spent at maximum brightness over the past decade is just nine months – March to December 2022, with the amplitude measured in that period shown to be 10.5V-19.0CV.

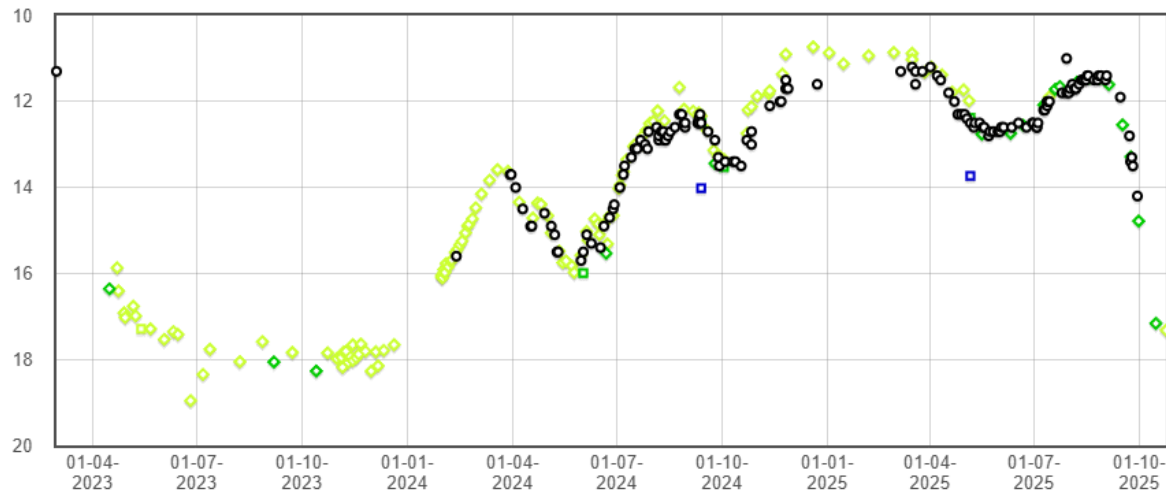


Figure 5: AO Her 2023-2025. RC Dryden, PC Leyland, W Parkes, R Pearce, G Poyner, GJ Privett, IL Walton (BAAVSS Database)

TCP J05384230+7051377:

This Cataclysmic object in Camelopardalis (RA 05 38 42.34 +70 51 37.4 (J2000.0) was discovered by the [NMW survey](#) on Nov 7.0576 at magnitude 12.9CV. Hiromasa Hoke reports on [vsnet-alert 28120](#) that spectroscopic confirmation of type UGWZ was confirmed and reported on [Atel#17485](#).

At the time of writing (Nov 18), the star had faded to magnitude 14.96V

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Update on the recent transients ASASSN-25dc, TCP J16271026-1030020 and TCP J18513997+3522412

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New data cover the final stages of the outbursts of the WZ Sagittae stars ASASSN25dc, TCP J16271026-1030020 and TCP J18513997+3522412, and suggest that all three have outbursts in excess of 50 days. TCP J16271026-1030020 shows a clear rebrightening event that was not covered previously.

In the previous Circular, Lloyd (2025) discussed the outbursts of three new bright WZ Sagittae (UGWZ) systems ASASSN-25dc (Fig. 1), TCP J16271026-1030020 (Fig. 2) and TCP J18513997+3522412 (Fig. 3). At that time the outbursts were declining, but still in progress and the stars had not yet returned to quiescence. All three systems have extensive time-series observations that mark the progress of the outbursts, and the accompanying evolution of the superhumps, but that discussion is not repeated here, so for that and other comments on the light curves, and details of the ATLAS, ASAS-SN and ZTF data please see the previous paper.

All three systems show clear indications of the UGWZ class, most notably the double-peaked early superhumps, but also long recurrence intervals – probably at least a decade, long outbursts, and a conspicuous lack of SU UMa-type normal outbursts. Nevertheless, in many ways these outbursts are very different, and demonstrate the variety of this class, with the dependence on mass, mass ratio and period (see e.g., Kato, 2015; Tampo et al., 2020). TCP J16271026-1030020 shows a likely rebrightening some 10 days after the end of the plateau phase (see also Hameury & Lasota, 2021). One particular interest in UGWZ systems is the identification of 'period bouncers', the evolutionary point where the orbital period starts to increase again after reaching the system's period minimum (see e.g., Patterson, 2009; Neustroev et al., 2017; Schreiber et al., 2023).

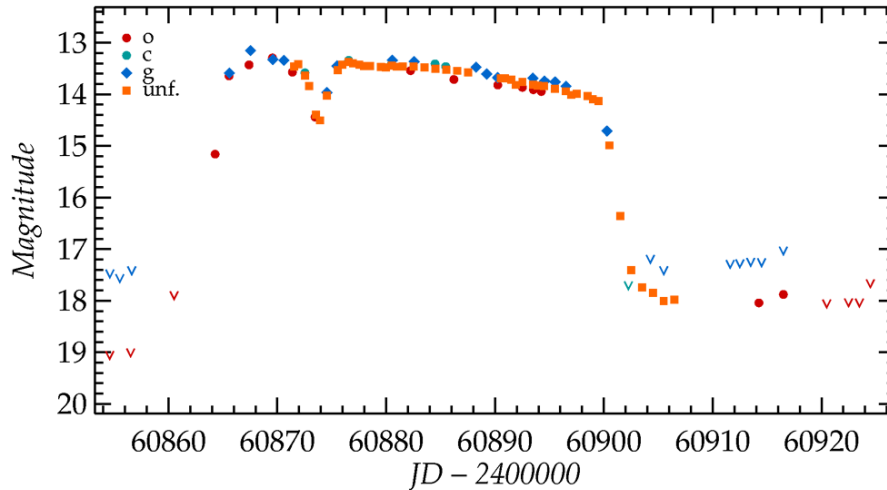


Figure 1: The recent outburst of ASASSN-25dc showing the ATLAS o and c, and ASAS-SN g data, with the means of multiple positive observations (filled symbols), individual observations (open symbols) and upper limits fainter than $m = 19.0$. The means of the time-series runs are also shown as unf. (filled squares). The new data extend the outburst of ASASSN-25dc by about 12 days and continue to show the stall in the steep fade at CV, $o \simeq 17.9$. Two isolated observations extend this feature to 16 days, but they are probably too faint to suggest a rebrightening. In total the plateau phase lasted 36 days, with a curious early dip and a very shallow decline rate, and the system was in outburst for at least 52 days.

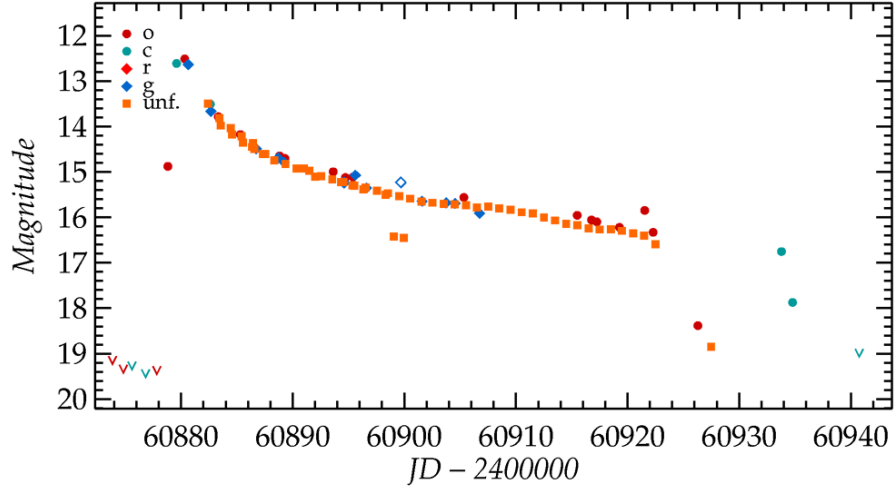


Figure 2: The recent outburst of [TCP J16271026-1030020](#). The new time-series and survey data extend the outburst from JD 2460905, about the middle of the plateau phase. During the first five days the decline rate is $0.39(3) \text{ magd}^{-1}$, which reduces $0.026(6) \text{ magd}^{-1}$ in the central part, and $0.041(8) \text{ magd}^{-1}$ over the final ten days. Over this time the brightness drops by about four magnitudes to $o \approx 16.3$, which is followed by the final steep fade. However, there are two isolated brighter observations that suggest a significant rebrightening at the end of the outburst. The rise and plateau phase last for at least 42 days, but with the fade and rebrightening, the outburst lasted for at least 56 days in total. The symbols are as before.

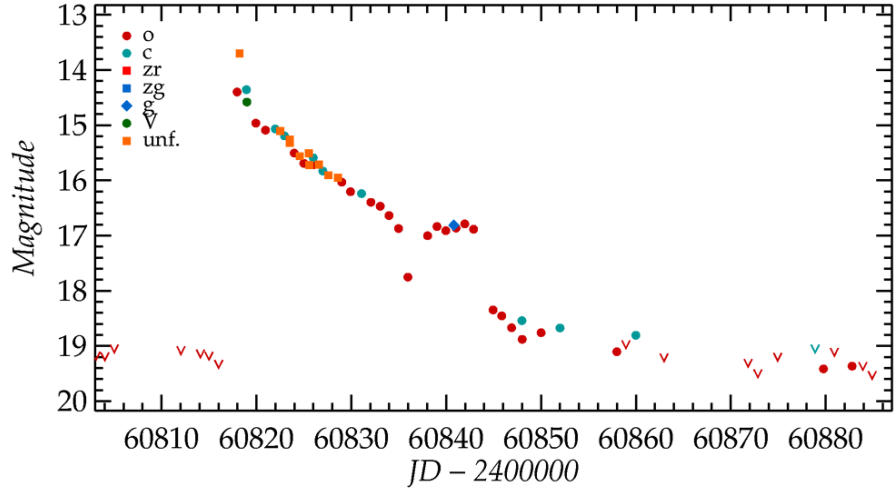


Figure 3: The recent outburst of [TCP J18513997+3522412](#). The new data extend the light curve by about 25 days, but most of these are upper limits, although there are two faint positive observations suggesting persistent, low-level activity at the end of the outburst. The system was above quiescence for at least 40 days, and possibly 60, or more. The symbols are as before.

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Colour variability of OJ287

Time variability of the colours 2015-2025 and through the 2024-25 great minimum.

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The blazar OJ287 has shown an extreme range of historical variability of 5.5 magnitudes, from $V=12.0$ at the peak of the 1971 outburst to $V=17.4$ in deep minima in 1989 and 1999. It is, though best known for the series of pseudo-periodic maxima in the light curve with an approximate periodicity of 11.8 years, observed since 1896. With OJ287 going through a very deep minimum in 2024/25 to $V=17.0$, it is notable that we are entering a key period in the light curve for distinguishing between different binary black hole models with the Valtonen and MOMO models making quite different predictions about the next outburst. In this paper we look at another difference between OJ287, and other blazars is the apparent lack of a clear correlation between brightness and colour. Here, we expand on previous studies that suggest that both slow time variations of the colour of OJ287 and variations of colour with magnitude can be observed and that the colour of OJ287 at minimum tends to that of a giant elliptical galaxy, using four-colour observations taken through the 2024/25 minimum.

Introduction

OJ287 (redshift 0.307) is one of the best known objects in the class of blazars: quasars that show almost constant variability, including on time scales of a few minutes, and light curve amplitudes of several magnitudes. However, there are multiple properties of this object that stand out from other members of its class:

- OJ287 does not show a clear colour correlation with brightness. Blazar colours typically get bluer when in outburst and redder when at minimum. This is interpreted as due to the radiative decay of massive injections of relativistic electrons released when in outburst, which slowly decay, making the spectrum steeper and redder as they do so (e.g., [Brown et al., 1989](#)).
- OJ287 does not show clear evidence of a host galaxy, even when at minimum. Although a host galaxy has been detected (e.g., [Nilssen et al., 2022](#)), the detections have always been marginal and have not allowed the properties of the host galaxy to be studied in detail, although they appear consistent with an early-type giant elliptical.
- Periodicity – or, more correctly, Quasi-Periodic Oscillations (QPOs) – have been observed in OJ287 on time scales of approximately 20 and 40 minutes and also on a time scale of approximately 12 years. This last has been interpreted by, e.g., [Sillanpaa et al. \(1988\)](#) as being due to the orbital motion of a binary central singularity of the Active Galactic Nucleus (AGN), although the respective masses of the primary and secondary have been subject to debate.

The reason why the properties of OJ287 are extreme is that the relativistic jet of OJ287 is so closely aligned with our line of sight that we can actually look into its throat. While there are blazars at larger redshift that have a smaller angle of presentation of the relativistic jet, there is no object in which we can look so deep into the jet itself.

The data

OJ287 has been observed within the programme of the Variable Star Section (BAAVSS) since the 1980s. Attention was drawn to this object by a large outburst that lasted for four years, from 1968 to 1972, during which it reached magnitude 12.0. In 2015 a joint programme started between the BAAVSS, The Astronomer magazine (TA) and Spanish observers within the Observadores-cometas Group to follow the predicted 2015 outburst. This has generated an archive of nearly 18000 observations as shown in Table 1:

Filter	No. observations
B	1011
V	8092
visual	275
Sloan g	683
Gaia G	345
R	5002
Sloan R	962
I	599
Sloan I	772
Total	17741

Table 1: Details of the BAAVSS/TA/Spanish observation archive for OJ287, 2015-2025, that is analysed in the text.

All the data were normalised to BVRI magnitudes by the process outlined in Kidger et al. (2025). The light curve is shown in Figure 1.

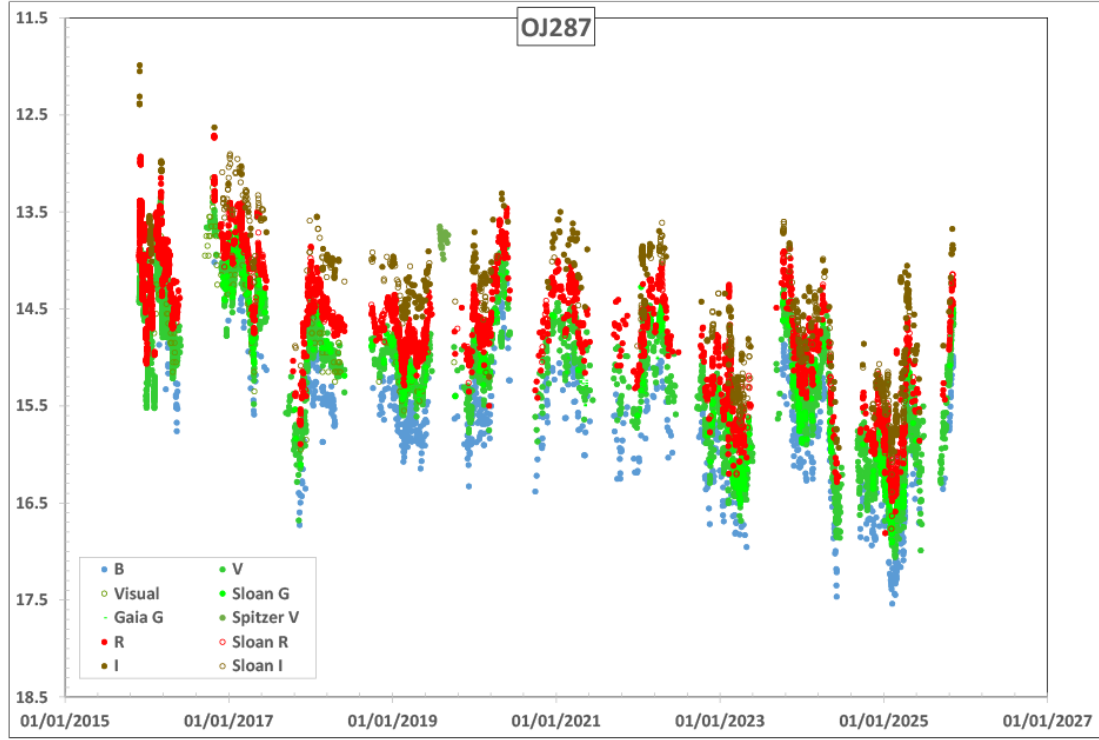


Figure. 1: The light curve of OJ287 from the data listed in Table 1.

A feature of Figure 1 is the apparent steady decline since the peak of the superflare of the 2015 outburst, which peaked on December 5th, 2015. The peak, which reached $R=12.9$ ($V \approx 13.4$) was observed by Faustino García in R. In contrast, during the deep minimum of 2024/25, the light curve reached $B=17.54$ on February 7th, 2025; $V=17.06$ on February 20th, 2025; and $R=16.59$ on February 21st, 2025. A partial recovery from these extremely faint levels took place through March 2025, peaking in mid-April. However, OJ287 again started to fade and had fallen back to $V=17.0$ by June 15th. A further, brief flare was seen just before the blazar entered solar conjunction at the end of the month but was already fading when the object was lost.

The first post-conjunction observations in the second week of September showed that OJ287 was again fainter than $V=16$, averaging $V=16.2$ in the first observations, which were made at low altitude in bright twilight and, thus, had rather large uncertainties. Since then, there has been a steady rise to $V=14.5$ on November 2nd, paused by three distinct knees, in which the blazar faded by as much as half a magnitude in a week to ten days before starting to rise again. Detail of the post-conjunction light curve is shown in Figure 2. While the behaviour in this interval of time looks regular, the number of cycles covered is too few in number to consider it seriously as a temporary, Quasi-Periodic Oscillation (QPO).

At present there are two supermassive binary black hole models for OJ287 that offer sharply differing predictions. The MOMO (Multiwavelength Observations and Modelling of OJ 287) Project and Valtonen (e.g., [Valtonen et al., 2022](#)) make widely differing claims about the binary system parameters and future outbursts. Valtonen finds a primary mass of $1.8 \times 10^{10} M_{\odot}$, while MOMO gives a primary mass approximately three orders of magnitude smaller. MOMO predicts a double outburst in 2026 and 2028 – it is tempting to see the current rise (Figure 2) as the precursor of the former – while Valtonen delays the next outburst to 2031, in which case, the current rise would not continue to outburst. Similarly, MOMO predicted a possible outburst of OJ287 in October 2022 ([Komossa et al., 2023](#)), while the Valtonen prediction was that it would take place during the solar conjunction gap in 2022, so would be unobservable and thus consistent with the lack of observed activity.

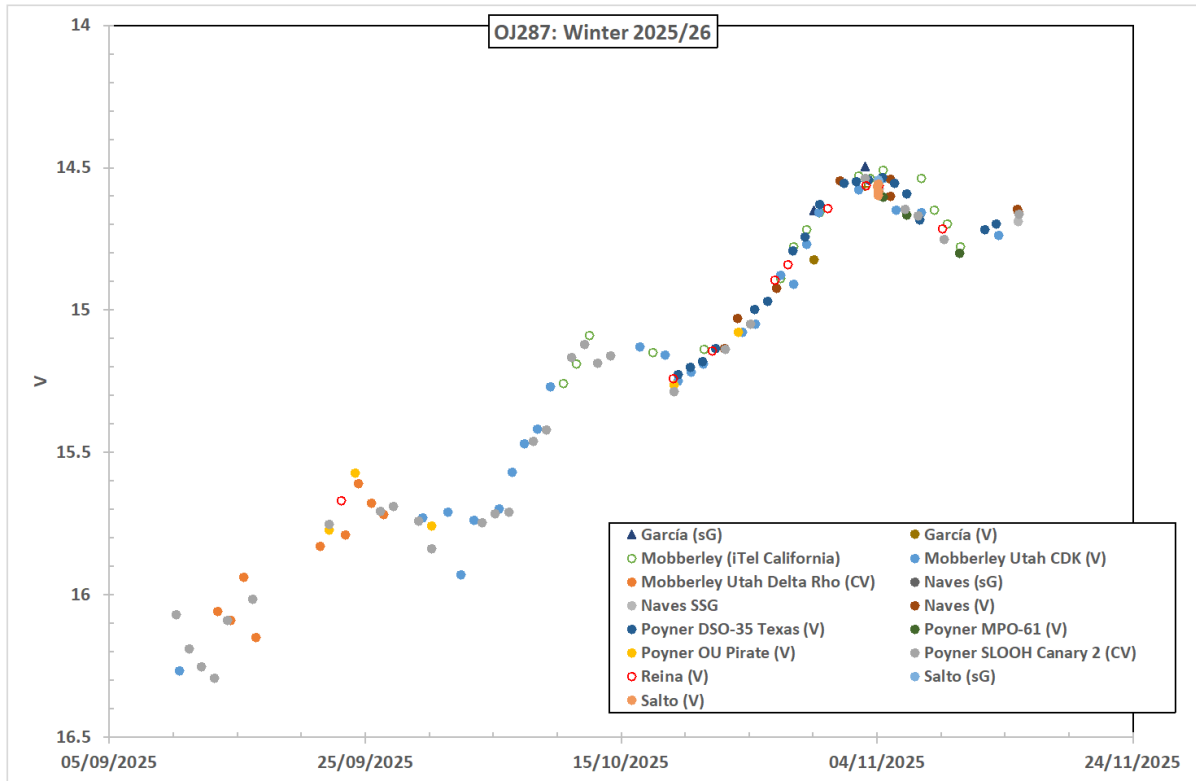


Figure 2: The post-conjunction light curve of OJ287 since the summer 2025 solar conjunction. The rise is characterised by a monotonic increase in brightness of ≈ 0.05 magnitudes/day followed by a halt and fade for 7-10 days before the rise renews.

Colour variations

While OJ287 is unusual in among blazars in not showing a clear colour-magnitude relation, multi-colour photometry at minimum has shown that the colours tend to those of an early-type galaxy as the blazar gets fainter. [Nilsson et al. \(2020\)](#) estimate that, at $V=17.2$, the underlying galaxy and the blazar component of emission each emit $\approx 50\%$ of the total light from the system and that the underlying galaxy has a magnitude of $V \approx 18.2$. As the blazar fades, a progressively larger fraction of the total light comes from the constant component of the underlying galaxy. As a result, the blazar will tend to a base magnitude at minimum that will not be surpassed. However, the influence of the underlying galaxy increases rapidly from B to I, with the shortest wavelengths having the smallest contribution of light from the underlying galaxy. We thus expect the B light curve to be least affected by background contamination at faint magnitudes, with I the most affected band.

The standard method of expressing the colour is to use the standard colour indices: B-V, V-R & V-I. The larger the colour index, the redder the colour, with smaller values indicating bluer colours. 'Standard wisdom' is that OJ287 shows constant colours, with $B-V=+0.4$ and $V-R=+0.5$ (Basta & Lehto, 2005). A large part of published archival data has been transformed using these standard values.

Within the database there are multiple sequences of pseudo-simultaneous BVR(I) photometry. While truly simultaneous colour data can only be obtained with instruments using beam-splitters and multiple detectors, where data in several colours are taken within an interval of 15-20 minutes it is generally a reasonable approximation to consider that rapid variability between successive points is small.

Here, we consider only data obtained since 2016. The rules applied to select data to analyse were:

- Only observations with pseudo-simultaneous data in at least B and V were considered.
- Only data sets with a significant time-base of data (2 years) were used.
- Only data sets with a significant density of coverage were used.
- Data with large errors (≥ 0.1 magnitudes) were depreciated.

Two observers (Poyner and Reina) have long sequences of BVR data that met the criteria above. A third observer (Buczynski) will satisfy the criteria soon. However, for this study, only the first two data sets are considered.

Extending the sample to data with only V and R was considered but rejected. While data in R and I give information on the underlying galaxy and its properties, the V band is essential to mark the flux variation against time and B, least affected by the underlying galaxy is an essential normalising measure. Without data in B, this normalisation is not possible.

Results

A total of 730 sets of BV(RI) data were identified:

- 191 BV only
- 538 BVR
- 75 BVRI

For each observation, the B-V, V-R and V-I colour indices were calculated.

As we have three variables (colour, magnitude, and time) there are two potential correlations that could be seen:

1. Colour index varying with magnitude, and
2. Colour index varying with time.

Both correlations could be present simultaneously in the data, so a correlation between colour index and magnitude could be due to both correlating with time. This significantly complicates analysis.

The classic colour-magnitude plot is shown in Figure 3 for B-V and V-R against V.

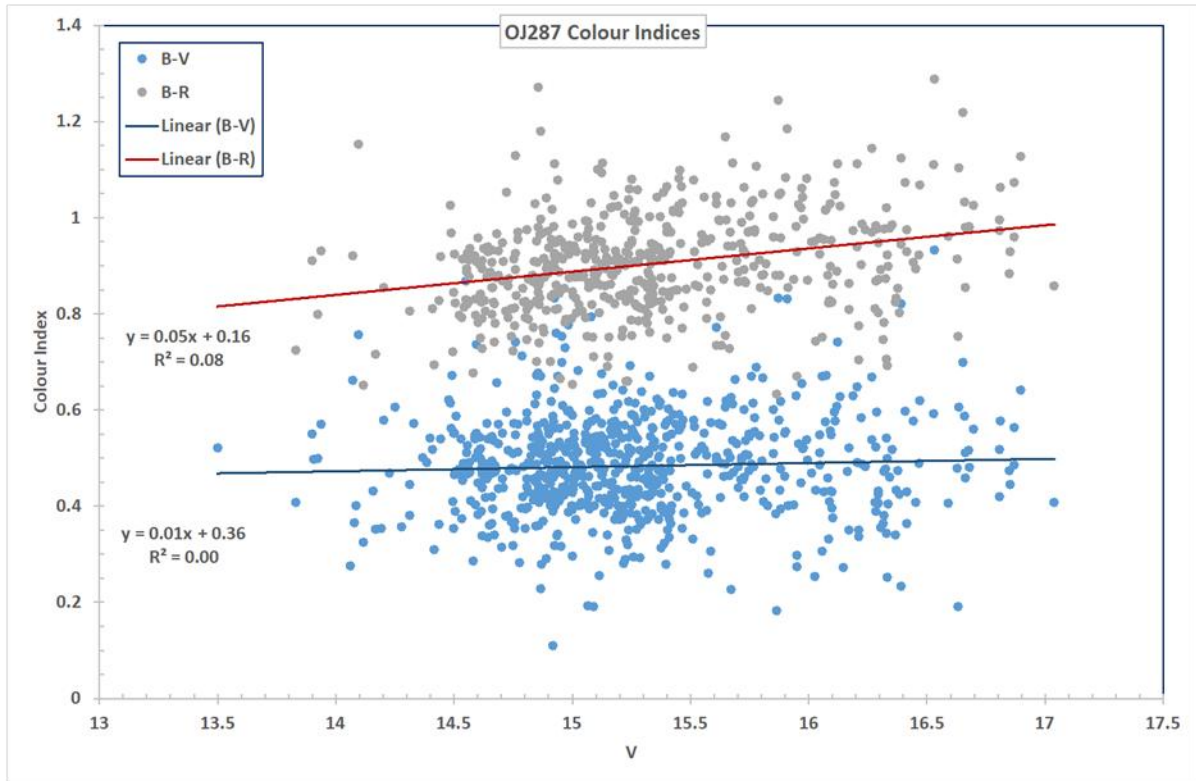


Figure 3: B-V and V-R against V for the data described in the text. The former is a scatter diagram with no correlation between colour and magnitude, indicating that the B-V colour index is constant. In contrast, a weak correlation is seen between the V-R colour index and the V magnitude, with redder colours at fainter magnitude.

The B-V colour index shows no variation with magnitude over the range $13.5 < V < 17$. The B-V colour is a scatter diagram around a median value of $B-V = +0.48$. In contrast, there is a weak correlation between the V-R colour index and V, with a median value of $V-R = +0.41$ and a tendency to redder colour at fainter magnitude. The latter result is the expected one if the light from the blazar is being contaminated with a constant component of light from a strongly red underlying galaxy. However, the weakness of the correlation is a concern.

Data zero-point reassessment

When examining, in particular, the V-R colour, it was obvious that there was an important, systematic difference in the colour indices measured by Poyner and by Reina at the level of ≈ 0.1 magnitudes. This led to a careful reassessment of the zero-point correction for these data that is applied to bring them to the same absolute level.

The technique used to correct these differences was the following. Segments of light curve were identified that showed a high density of coverage, monotonic trends over several weeks, and an absence of scatter between different observers (i.e., all observers who had obtained data in this interval). The light curve level of Poyner and Reina was adjusted carefully to minimise differences with the rest of the dataset. This process was followed in both V and R (in B, the generally larger errors, particularly at faint magnitudes and lack of sufficient normalising data from other observers, makes this process inviable). As a result, both Reina's V and R magnitudes were adjusted from the raw magnitudes by -0.04 magnitudes, leading to a very tight agreement with other observers for 2024 and 2025 data. Such a zero-point difference is due to the convolution of the CCD response and the effective central wavelength of the photometric filter, with positive values indicating that the optical train admits too much light at the long wavelength end and a negative value indicating a deficit of long wavelength light. In general, though, the zero point correction that must be applied to observers using standard V and R filters is usually zero.

Colour variations

If we plot the variation of colour index with time (Figure 4), we see why the colour-magnitude correlation is diluted. Both the B-V and the V-R colour index show slow time variability. In each case, the lowest order polynomial (a cubic) that gives a reasonable fit to the data is used to guide the eye. We see that the B-V colour decreased from a mean value of $B-V=0.56$ in 2016, to a mean value of $B-V = +0.39$ in 2019, before reddening slightly again from 2020-24 and becoming bluer again ($B-V = +0.36$) during the 2025 campaign. Similar, but larger variations are seen in the V-R colours.

As the B-V against V plot shows no correlation with magnitude, the variation in B-V colour index plotted against time must be due to genuine time variability of the colour, independent of magnitude. These time variations mask the expected, weak correlation of the B-V colour with magnitude. Similarly, the time variations in V-R mask in part the correlation of the V-R colour with V.

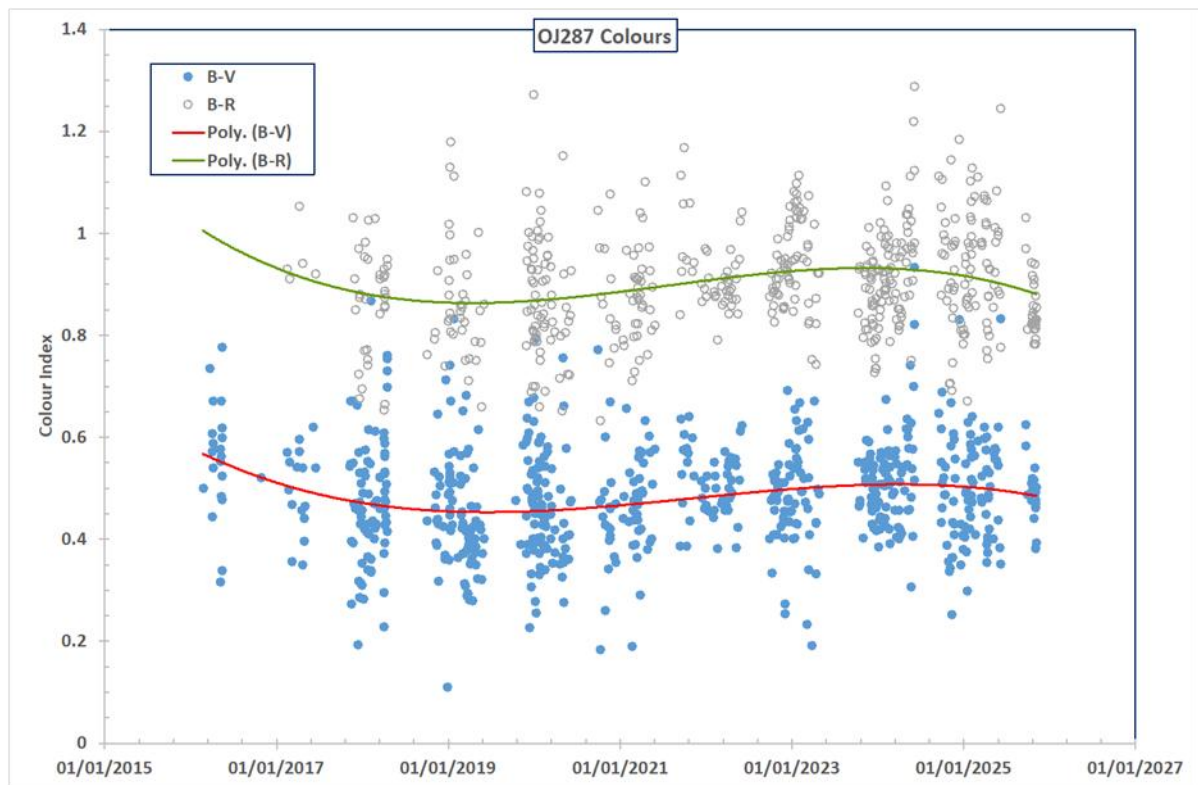


Figure 4: The time variation of the B-V and V-R colour indices. A cubic polynomial fit has been added to guide the eye. We see significant variations in the B-V colour on time scales of years, in particular, a minimum of the B-V colour index in 2019/20 and a maximum in 2016, in the decline from the outburst in late 2015. Similar time variations are seen in the V-R colour index.

A few points in Figure 4 are seen to have discrepant values. There are multiple potential reasons for this. A few cases of data entry errors were identified and corrected. Some are due to larger than usual photometric errors propagating to a very large error in the calculated colour index. Note that, statistically, ~5% of data may be expected to be up to 2σ away from the reported magnitude: if the data in one band is 2σ away from the reported magnitude in one sense and in the other, 2σ away in the opposite sense, a particularly large discrepancy will be seen in the calculated colour index. Some of the discrepant points are also undoubtedly caused by rapidly variability in the light curve. In a small number of cases, although the data headers report that the observation have been conducted in a particular filter, it was suspected that a different filter had been present in the optical train instead. In

practice, little or nothing can be done about most of these factors apart from accumulating more data such that the effects of a small number of 'bad' data on the overall trends are minimised.

Since 2023, Reina has obtained systematic data in the I filter. While the time base of this data is not sufficient to look for slow, time variations, it covers the deepest part of the 2024/25 light curve minimum, giving an excellent opportunity to explore its effects on the colours. The V-I against V plot for data obtained since an arbitrary starting point of 1st January 2024 is shown in Figure 5.

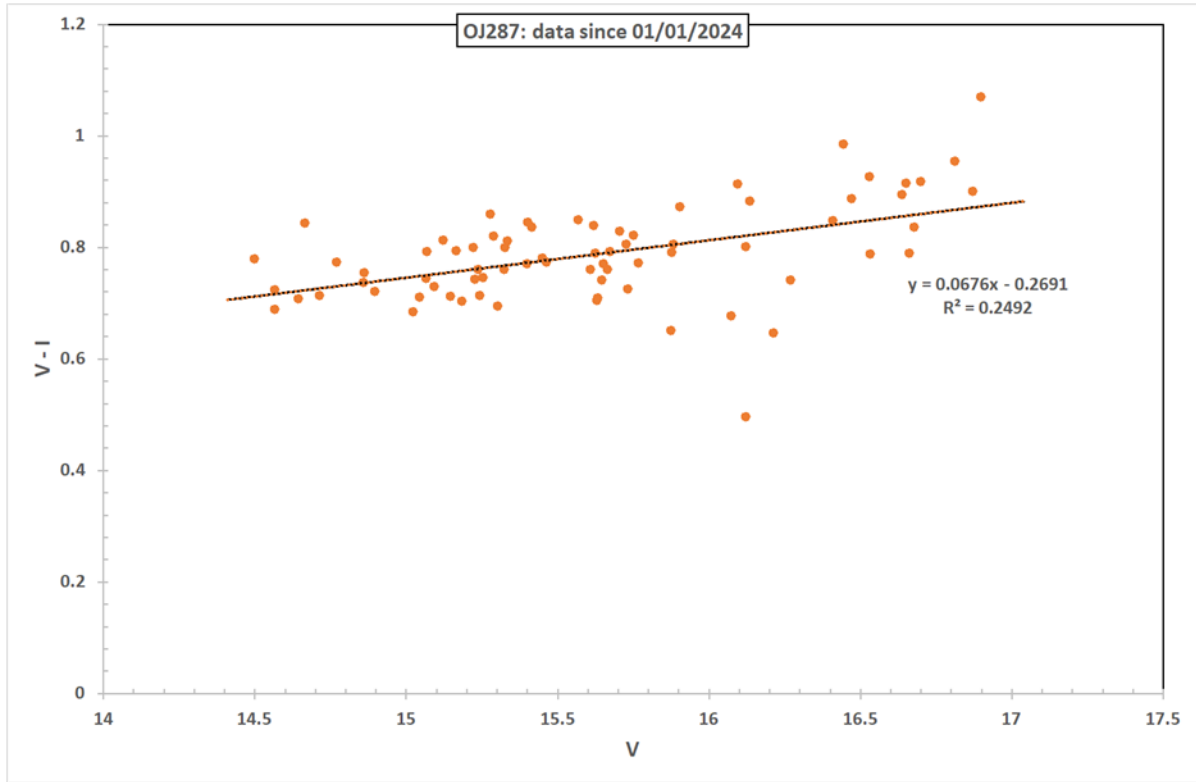


Figure 5: V-I against V for OJ287. The plot uses only data since 1st January 2024 to limit as much as possible the masking effects of slow time variability of the colours. A significant correlation is seen. A linear, least squares regression is fitted to the data. We see no evidence that the colour index is trending exponentially to a constant value event at the faintest magnitudes.

We see a good correlation of the V-I colour index with the V magnitude, which increases by 0.068 magnitudes for every magnitude fainter in V. A linear, least squares fit to the data is shown. The trendline fits the data well over the full magnitude range, so colour changes *are* detectable even at relatively bright magnitudes, rather than only when OJ287 is unusually faint. What we do not see is evidence, even at the faintest magnitudes, that the colour is trending exponentially to a constant value, suggesting that, even at the lowest point of the 2024/25 minimum, the blazar is still the dominant contribution to the total light of the system.

Figure 6 shows the same plot for V-R. We see a much stronger correlation than in Figure 3, showing how the selection of a much shorter time interval for data reduces the influence of the slow time variations of colour. As the galaxy contribution to the total light of the system is smaller in R, the slope of the least squares fit of 0.036 magnitudes/magnitude is only half as large as for V-I. Again, a linear, least squares regression is an excellent fit to the data over the full magnitude range.

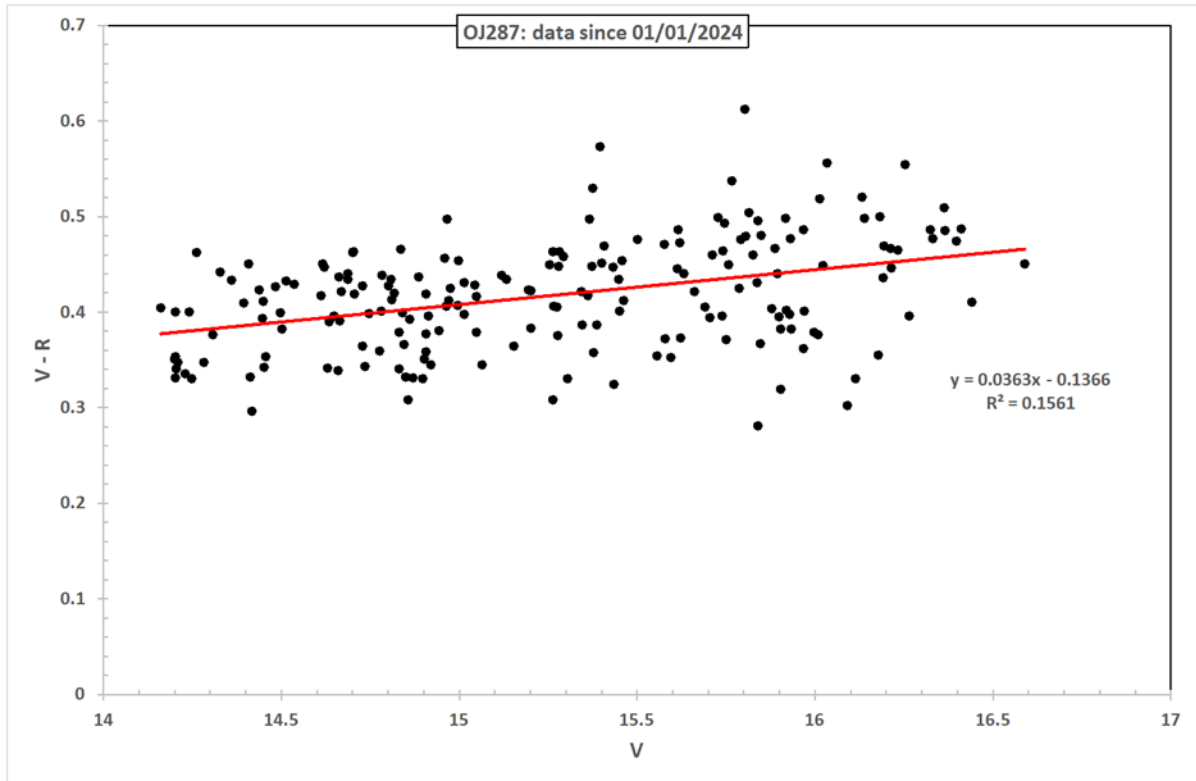


Figure 6: As for Figure 5 for the correlation of the V-R colour index with the V magnitude. The plot uses only data since 1st January 2024 to limit as much as possible the masking effects of slow time variability of the colours.

Analysis

The consequence of Figure 4, 5 and 6 is that both colour variations in the expected sense of redder colours at fainter magnitudes and slow, time variations of the colour indices of OJ287 of ~ 0.2 magnitudes on time scales of a few years are clearly present.

Slow time variability must be due to long timescale processes within the blazar. However, the sense of the variations is unexpected. We see that the colour got bluer – i.e., smaller B-V colour index – after the 2015 outburst when we would expect the outburst to generate a large injection of high energy, relativistic electrons that would then decay progressively radiatively. In other words, in the standard models we would expect to see the blazar bluer at the peak of outburst and then trending redder as the outburst decays. Instead, what we see is exactly the opposite. Similarly, there was no significant change in colours around the 2020 outburst.

This shows that the colour variations are, at least apparently, not directly linked to the large light curve outbursts. However, it is not possible to eliminate the possibility that there is a time delay between large outbursts and the observation of colour variation. In other words, we see the large outburst, but due to the viewing geometry, the injection of relativistic electrons takes time to propagate within the central engine and to become visible to an observer on the Earth. Similarly, the large outbursts may not be the only source of massive injections of relativistic electrons and their subsequent decay.

In this sense, the colour behaviour around and in the years after the predicted 2031 (Valtonen) or 2026/2028 (MOMO) outburst will be very revealing. Colour information covering multiple outbursts will reveal whether or not there is evidence of delayed colour variations after outbursts. At present, the homogeneous data presented here only cover the decline of the 2015 outburst and the time around the 2019 outburst.

We do see unmistakable evidence of colour-magnitude variations. In the restricted dataset covering 2024/25 and the deep light curve minimum, we see that the colour-magnitude relationship is consistent with a two-component model in which there is a constant (red) flux from the host galaxy and a variable (blue) component of flux from the AGN. The B-V colour is constant with magnitude at least to $V=17$. Over nine years of data, the median $B-V = +0.48$, indicating that, at this magnitude, the galaxy is only contributing a few percent to the total flux in B and V. The colour-magnitude relationship is clearly seen in R and much stronger in I. This is consistent in the two-component model in which the non-variable component is an early-type galaxy with red colours.

We have investigated the effect of fitting diverse types of regression lines to the V-I against V colour index plot in search of evidence that the regression starts to flatten at the faintest magnitudes. Second order polynomial, exponential and logarithmic curves all show barely detectable deviations from a straight line, none of them showing detectable flattening at the faintest magnitudes. In contrast, we would expect to see the V-R and, especially, the V-I colour indices trend exponentially to the implied galaxy colours of $V-R=+0.9$, $V-I=+1.6$. This lack of evidence that the colours do trend exponentially to a limiting value demonstrates that even at the faintest magnitude observed during this minimum ($B=17.5$, $V=17.0$, $R=16.6$, $I=16.0$) The background flux from the host galaxy is $<50\%$ of the combined flux of AGN + host galaxy. We can, thus, place a weak limit that the host galaxy must be fainter than $B=18.5$, $V=18.0$, $R=17.6$, $I=17.0$.

The values that were estimated by Nilsson et al. (2022) for the host galaxy are $B=19.4$, $V=18.0$, $R=17.1$ and $I=16.4$. While the values in B and V are consistent with the data presented here, our data is suggestive that the R and I magnitudes of the host galaxy are fainter than suggested by Valtonen et al. (2022).

Conclusions

We have found unambiguous evidence of time variability of the B-V and V-R colours of OJ287 on scales of a few years. We also see unmistakable evidence that there is a colour-magnitude relationship between $V \approx 14$ and $V \approx 17$, with the colours getting redder at fainter magnitudes. However, the colour-magnitude relationship, particularly in V-I may be inconsistent with previously estimated host galaxy parameters, suggesting that the host galaxy is less luminous than previously believed.

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AB Aur – The Sardinian Fade

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An account of the August 2025 fade of AB Aur as seen from Perda Longa, Sardinia.

AB Aur is the Northern hemisphere's brightest Herbig Ae pre-main sequence star, normally fairly steady at magnitude 7 but with occasional dust obscuration events causing fades to magnitude 8. [1] After many years of exhibiting minimal variation and very brief fades, AB Aur showed more extensive variation during its 2024/2025 apparition. [2]

The 2025/2026 apparition of AB Aur has commenced with a deep fade that fortunately coincided with a spell of clear nights on the southern coast of Sardinia where I happened to be on holiday. From 17th August to 31st August 2025, I was in Perda Longa located at 38° 53' 30" N, 8° 49' 32" E close to Capo Spartivento. Conditions were favourable at this location for astronomy with limited local lighting and eight nights were clear & six partly clear.

The villa where I was based had an out-house and accessible rooftop which acted as my observing tower (Figure 1). From the observing tower I had unobstructed views of the constellations of Scorpio & Sagittarius in the evening (Figure 2) and Sculptor & Fornax in the morning. It was good to see Fomalhaut well clear of the southern horizon and the northern part of Grus appearing below it. Of the bright planets Mars was visible in the evening twilight close to gamma Vir, Saturn was in western Pices, Jupiter lay in Gemini and Venus was approaching M44 in Cancer.



Figure 1: The observing tower that was used throughout my stay in Sardinia. I observed from this location for 1160 minutes over the course of 14 nights making 275 visual observations of variable stars. 14 observations were made of AB Aur during 13 of those nights.



Figure 2: A hand-held camera snap of the southern sky from the observing tower on the evening of 24th August 2025. The galactic core within Sagittarius is in the centre of the image with Scorpius lying to the right.

AB Aur had been observed ahead of the Sardinian trip on the 10th August and was estimated at magnitude 7.1, which was not unusual. On the morning of my first night in Sardinia (17/18th August) I could not see AB Aur in 7x50 binoculars, due I thought to the close proximity of the moon which was just after last quarter positioned in Taurus. I adjusted my position slightly to hide the moon behind a tree and tried again with 15x70 binoculars. AB Aur then became visible but it was clearly fainter than normal and my light estimate reduced to magnitude 8.2. This exceeded the level of magnitude 8.0 which I had recorded during previous fades on 2nd December 1997, 18th September 2024 and 6th February 2025.

I reported the fade to Gary Poyner who put out an alert notice the following day. I then proceeded to follow the fade event for the next eleven nights as AB Aur recovered to magnitude 7.1 (Figure 3). It is unfortunate that I had missed the onset of the fade but the coverage of the recovery was very good and I was able to determine that this event was not a rapid fade and recovery like those seen in 1975, 1997 & 2019. The rate of recovery from magnitude 7.9 to 7.1 was linear and measured at 0.2 magnitude/day. By 8th September (twelve days after the end of the fade event) AB Aur had settled down at magnitude 7.3-7.4 which is little below the nominal brightness recorded throughout the period 1978-2023.[3]

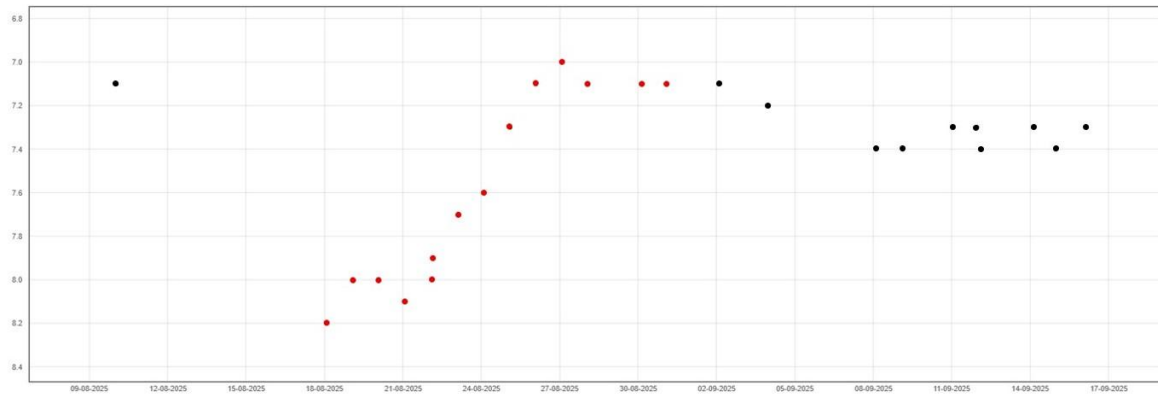


Figure 3: The light curve of AB Aur in August and September 2025 depicting the authors visual observations with 7x50 and 15x70 binoculars. Observations made from Sardinia covering the fade event are coloured red.

The August 2025 fade followed the extensive activity during the 2024/2025 apparition and preceded an even deeper fade of record proportions that occurred in October 2025. AB Aur therefore is certainly well worth monitoring very closely for the remainder of the 2025/2026 apparition.

References

- 1 2019 VSS Circular, [180, 10](#)
- 2 2025 VSS Circular, [203, 11](#)
- 3 2024 VSS Circular, [202, 11](#)

Eclipsing Binary News

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The International Variable Star Index - VSX

This is a database which is maintained and being developed by the AAVSO: vsx.aavso.org. It is now cataloguing 10.2 million variable stars. The VSX database includes eclipsing binaries. One of these is the familiar EB TV Cas which is often observed because it is easy to locate in Cassiopeiae and, from the UK, is visible all year round.

VSX has built on data contained within the GCVS database. TV Cas is now classified correctly as an EA/SD rather than as an EA in the GCVS. The period has been updated from that quoted in the GCVS. There is more information about the system including a reference to Chris Lloyd's article in the BAA-VSSC 177. The amendment was submitted by Sebastian Otero who is registered to make such amendments.

There is scope for more information in the VSX in this era of data from orbiting telescopes and the increased capability of amateurs who use both DSLR and CCD methodology including those with access to remote telescopes. More information can be made available, in the future, on secondary eclipses and on whether the system can be considered to be 'active' - indicating that variations in the light curve between eclipses is evidence of star spots and accretion disks.

UZ Draconis

There is a recent paper on 'Totally Eclipsing Binary UZ Draconis' inspected with TESS' [1].

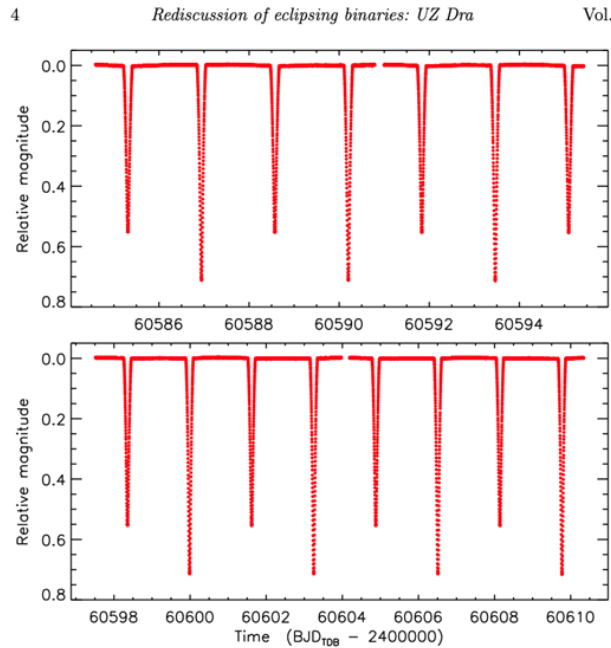


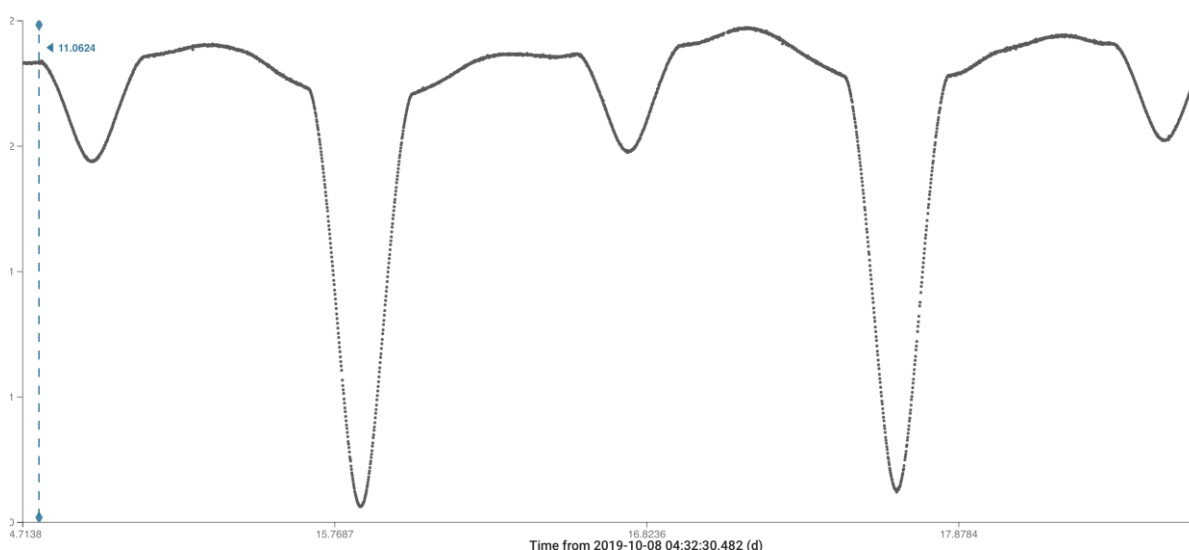
FIG. 1: TESS sector 84 photometry of UZ Dra. The flux measurements have been converted to magnitude units after which the median was subtracted. The other sectors used in this work are very similar so are not plotted.

The system varies from 9.9 to 10.7 and has a period of around 3.26 days. It is classified as an EA/DM, DM stands for 'Detached main-sequence systems. Both components are main-sequence stars and do not fill their inner Roche lobes.' Above is the continuous TESS data over 26 days covering seven primary eclipses and eight secondary eclipses.

The paper describes how the huge amount of excellent TESS data was used to establish the parameters of the system. The light curves of UZ Draconis show starspot modulation on the orbital period which indicates that the stars are tidally synchronized. However, they found no evidence for pulsations, orbital eccentricity, or changes in the orbital period.

TV Cas

Using the MAST database [2], I looked at some of the TESS data for TV Cas. Below is an illustration of the high-quality data from October 2019. Clearly on view are partial primary and secondary eclipses and some variation between eclipses.



The horizontal axis is time measured in days. Each segment of measurements covers continuously in total, 27 days. The figure is an excerpt from a segment that started on 8/10/19. The vertical axis is flux not magnitude. There is a formula for converting TESS flux into magnitudes, as flux is not a measurement of V magnitude. At the recent VSS conference, Chris Lloyd informed us that the flux is a little redder than V magnitude. Despite this the TESS flux is a particularly good guide to relative differences in V magnitude.

The presentation of the light curve includes a cursor which tracks along the light curve and shows the flux and time of every point on the light curve. This enables a check of the period and eclipse depth during the time period covered by an illustration such as the one above.

The VSX database states that TV Cas varies from V7.22 to V8.22, a depth of one magnitude. This is confirmed by my own measurements in recent years. The GCVS database states that the depth of the secondary eclipse is V0.12. The VSX period is 1.8125818 days which dates from 2004.

The illustration shows that measuring the depth of the eclipse has its own complication because there are two possible measurements for each eclipse, one is the depth from the edge of the eclipse, and the other is the depth from the brightest point in between eclipses.

Assuming that the primary eclipse depth is one magnitude and using the flux cursor I was able to estimate the depth of one secondary eclipse was 0.215m and for another 0.198m. This compared with the predicted depth of 0.12m. I was also able, using the cursor for time information, to estimate that the period in October 2019 compared with 2004, to be 1.8139 days.

Looking at a similar illustration for a segment starting on 20/9/22 one can estimate that the depth of the secondary eclipse was 0.24m and the period at one point was 1.8153 days and at another point in the segment 1.8077 days.

A similar segment for the period starting on 25/3/24 indicates that the depth of a secondary eclipse was 0.34 magnitude and that the period is 1.8069 days.

A more accurate determination of the current period can be made by downloading the actual data and using appropriate software. In the meantime, it seems TV Cas is an active system with a shortening period and variations in the depth of eclipses.

References

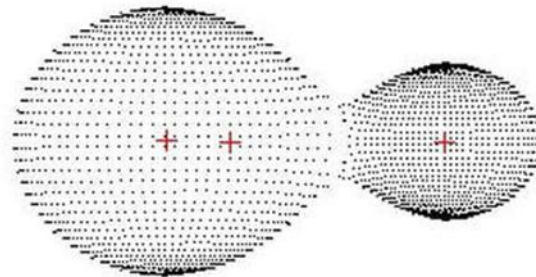
- 1: <https://phys.org/news/2025-11-totally-eclipsing-binary-uz-draconis.html>
- 2: <https://mast.stsci.edu/portal/Mashup/Clients/Mast/Portal.html>

Updated light curve and phase diagram of the Eclipsing Binary SS Comae Berenices

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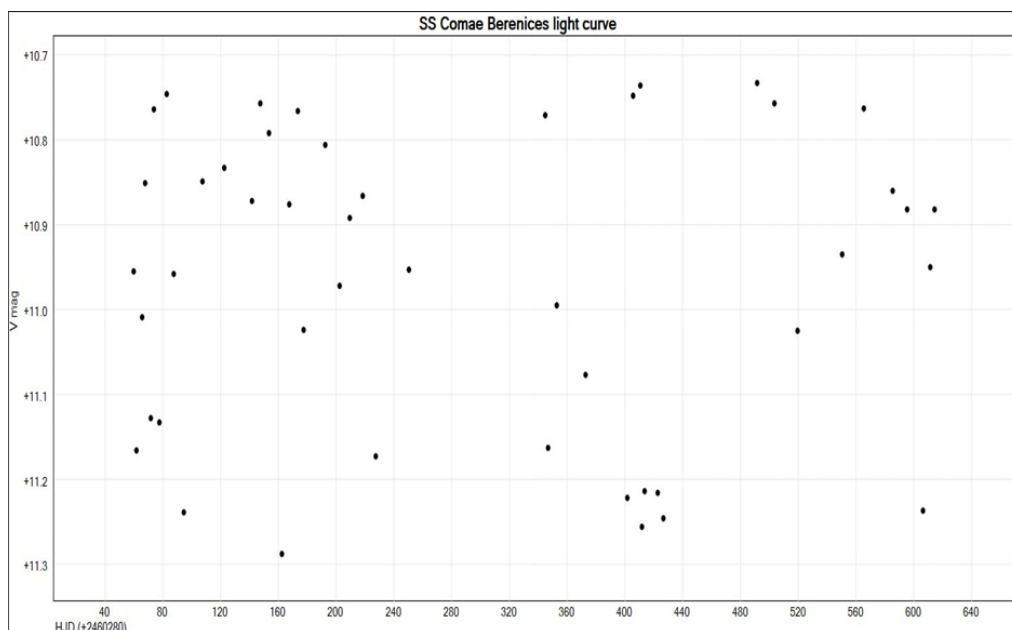
This article updates my observations of the eclipsing binary SS Comae Berenices and includes a comment about incorrect or outdated data in the GCVS.

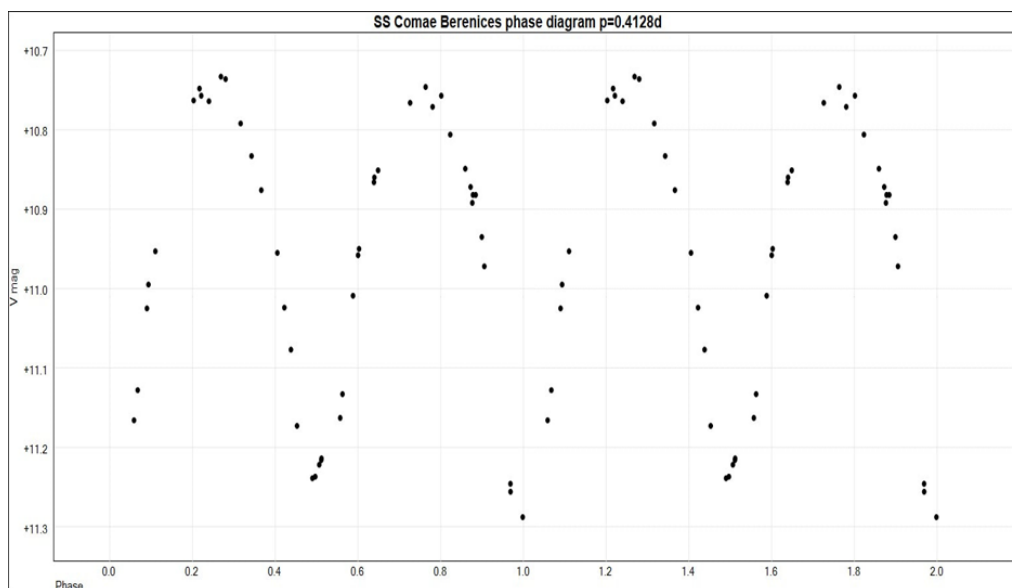


Model constructed in BM3 using data from [S.-B. Qian and L.-Y. Zhu data \(2006\)](#)

Previously mentioned in [VSSC 202](#) (December 2024), here are an updated light curve and phase diagram of the EW/KW type eclipsing binary SS Comae Berenices (SS Com) including a few more observations.

The plot is made from 46 observations made with the Open University [COAST](#) and [PIRATE](#) systems in Tenerife between 2024 January 30 and 2025 August 6 using a V filter.





The catalogue period for this star is 0.4127919 days ([GCVS](#)) and 0.412822 Days ([AAVSO VSX](#)), both accessed 2025 November 15. There is considerable o-c activity with this system ([Kreiner](#)).

NOTE; the current [GCVS](#) values for the maximum and minimum magnitudes (11.3 and 11.9) are inconsistent with these and other observations of this system (e.g. see [AAVSO](#) data). Whether this data is just an incorrect entry or is based on some previous but unreferenced observations (possibly not V mag?), is not immediately evident.

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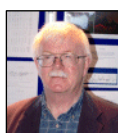
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