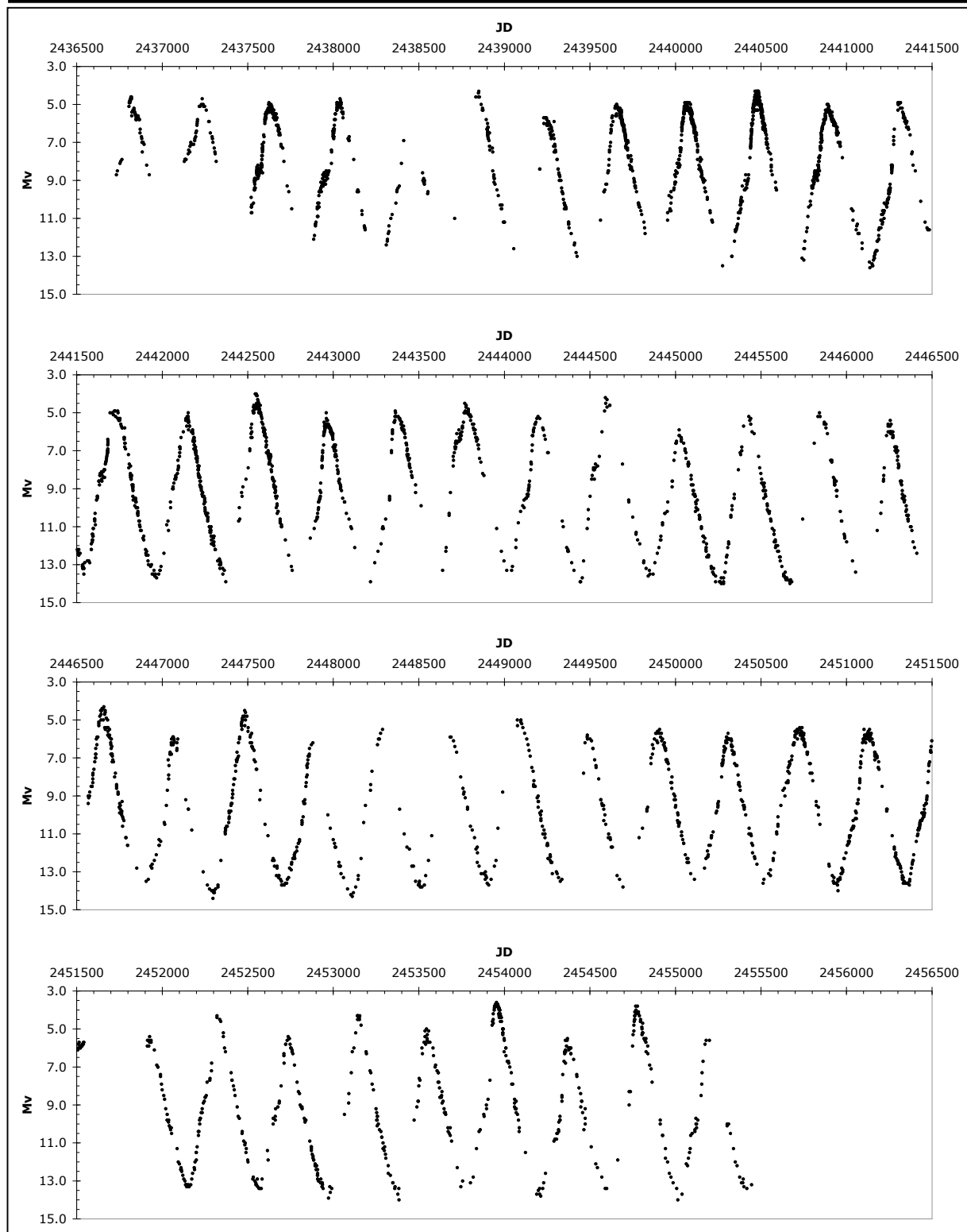


Variabilid

Uitgave van de Werkgroep Veranderlijke Sterren
Nummer 103

Oktober 2010



Colofon

Variabilia is een uitgave van de Werkgroep Veranderlijke Sterren van de Koninklijke Nederlandse Vereniging voor Weer- en Sterrenkunde

Variabilia verschijnt in principe 4x per jaar

Contributie: 10,00 Euro per jaar te voldoen op Postbanknummer 489829 t.n.v.

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Georg Comello verrichtte de allereerste waarneming van Werkgroep Veranderlijke Sterren. Het betrof een schatting aan χ Cygni. In totaal zijn er in de vijftigjarige historie van de werkgroep 4188 schattingen aan deze ster verricht. Op de voorpagina staat een overzichtskromme van χ Cygni, gebaseerd op de waarnemingen van de werkgroep.

Georg Comello performed the very first observation of the Variable Star Section of the Dutch Association of Meteorology and Astronomy. It was an estimate of χ Cygni. In the last 50 years the section performed 4188 observations on this star. On the cover you can see a lightcurve of χ Cygni, based on 50 years of observations of the section.

Preface

Variabilia is the magazine of the Variable Stars Section of the Royal Dutch Society of Meteorology and Astronomy (WVS-KNVWS). The first issue of Variabilia was published in December 1981. Since that date, more than 100 issues of Variabilia have been published. At first the magazine published only about noteworthy activity in variable stars and the most recent observations of our members. Nowadays the magazine has grown into a complete magazine with all kinds of papers: Analyses of our own observations, book reviews, announcements and reports about meetings, articles about interesting papers in the professional literature and so on.

This issue of Variabilia is published in part in English, especially for the attendees of the European Variable Star Meeting. Enjoy it!

Erwin van Ballegoij, editor Variabilia

Program European Variable Star Meeting

Friday October 22

14.30: Registration at Kapteyn Institute

15.30: A Photometric Survey of the Sky (Dr. Arne Henden)

The positions of stars are well-known, with many ground-based and satellite surveys covering the entire sky. The brightness of stars, and their colour or temperature, is a different story. There is no existing photometric catalogue of the entire sky going fainter than what you can see with a pair of binoculars. An enormous amount of large telescope time is spent every year to measure the brightness of stars for scientific projects. The AAVSO is currently conducting an all-sky survey in five wavelength bands to finally solve this problem. The talk will give details of what kind of telescopes, cameras and software are needed, how you perform such a survey, and potential uses of the final database.

16.30: Reception, followed by a visit to Blaauw Observatory

Saturday October 23

10.00: Registration at the University Museum

10.30: Welcome (Theo Jurriens)

10.45: How it all began (Georg Comello)

In June 1959 I started observing variable stars using a 42 mm refractor. This happened in close correspondence with a Belgian society: Société Belge d'Astronomie. So the seed of the Werkgroep Veranderlijke Sterren der KNVWS (the Variable Stars Section of the Royal Dutch Society of Meteorology and Astronomy) lies in Belgium. In March 1960 I started my job for Dr. Lucas Plaut at the Kapteyn Laboratory (Nowadays it is called Kapteyn Institute). I had to estimate the brightness of mainly RR Lyrae stars on the photographic plates of the Palomar-Groningen Survey. Dr. Plaut was very interested in my amateur observations on variable stars and he was surprised about the fact that I did those in close collaboration with a Belgian organization. He took the initiative to start a variable star section within the NVWS. The section was founded in the library of the Utrecht Observatory on the 23rd of October 1960. Since that date the Variable Stars Section is actively promoting the observation of variable stars. In this talk a short report is given on the history of the

Section. Further an overview is given of the problems we had to obtain good charts and useful sequences. This was not easy at the beginning.

11.15: Half a century of variable star research (Prof. Dr. Jan Willem Pel)

Like in every other field in astronomy, the scope of variable star research has changed dramatically over the past 50 years. During these decades - thanks to the developments in space research and radioastronomy - nearly the entire electromagnetic spectrum has become accessible for astronomical observations. This led to the discovery of fascinating new classes of variable objects such as pulsars and X-ray binaries. The body of observational data on variable stars that we have today is not only very much bigger, but also much more diverse than what we had around 1960. At the same time there has been tremendous progress in our theoretical understanding of stellar physics. Starting in the late 1950's the theories of stellar structure, evolution and pulsation developed rapidly. For the first time it became possible to make detailed comparisons between theory and observations of stars. Variable stars turned out to be invaluable as test objects for astrophysical theory. At the same time they play a crucial role as 'standard candles' for the cosmic distance scale. This talk will summarize some highlights from the past half century.

12.00: The Work and Life of Lukas Plaut (Prof. Dr. Adriaan Blaauw)

-abstract is missing-

12.30: Contributions of the WVS to the AAVSO (Dr. Arne Henden)

There have been decades of collaborative observing between the WVS and the AAVSO, plus many prior years of European contributions to our observational database. I will highlight some of the important observers, where your observations have been critical for projects, and make predictions for the future.

13.00: Lunch

14.00: YY Boo and TT Ari, very interesting variable stars (Josch Hamsch)

YY Boo, an Algol like eclipsing binary star, has been found to show also pulsations with high amplitude of 0.1 mag. In a multi-site and multi-month observing campaign in 2010 the complete light curve of this star has been measured in B and V photometric filters. TT Ari is one of the most mysterious cataclysmic variables which has been extensively observed during the last decline in brightness in October 2009, which was the first since the 1980ties. During several months the star was observed showing sometimes variations during one night from 13.5 to 16.5 mag. Results about both stars during their respective campaign will be shown and discussed.

14.30: The Deeply Eclipsing Polar "OT_J0711+44" (Arto Oksanen)

Summary of observations of the newly discovered deeply eclipsing polar CSS 081231:071126+440405 made by Arto Oksanen at the Hankasalmi observatory in Finland. Several light curves covering 22 nights, 52 eclipses and over 5200 data points will be presented. Preliminary results of the analysis will be discussed.

15.00: Using an amateur robotic telescope for observing variable stars (Frans Nieuwenhout)

Since 2005 a telescope has been established in the North of Holland which can be operated from a distance via internet. It has turned out to be a suitable instrument for doing variable star observations. The presentation will show with some examples how this is being done. It can be useful tool to gain some first experience by those people considering to start observing with a CCD camera.

15.15: Break and Group Picture

- 15.45: A Search for Dwarf Novae (Patrick Wils)
Cross-matching blue objects from the Sloan Digital Sky Survey and the Galaxy Evolution Explorer with the astrometric catalogues USNO-B1.0, GSC2.3 and CMC14, and those with large magnitude differences, revealed some 70 dwarf novae candidates. Several of those have been confirmed spectroscopically or have recently been observed in outburst. Data from the Catalina Real-time Transient Survey indicate that the recently discovered dwarf novae have less frequent outbursts compared to those known before. This suggests that a large number of dwarf novae are still unknown.
- 16.15: Supernovae (Prof. Dr. Frank Verbunt)
-abstract is missing-
- 17.00: The Future of Amateur Variable-Star Observing (Dr. Arne Henden)
PanSTARRs is beginning its survey of the sky. ASAS is now covering both northern and southern hemispheres. LSST is just around the corner. Do these and other surveys leave room for the amateur to contribute? I'll discuss this important topic, plus give some ideas of future projects and instrumentation where amateurs will be major players for a long time to come. The Future of Amateur Variable-Star Observing (This talk will be followed by a discussion).
- 19.00: Reception followed by dinner

Sunday October 24

- 10.00: Registration at the University Museum
- 10.30: Period Changes in SY Herculis (Erwin van Ballegoij)
Although the well known Mira variable SY Herculis is extensively studied since the 1960ties, it is still not possible to predict the time of maximum with sufficient accuracy. A first study by Ahnert (1976) showed that the period of SY Her is not constant, but changes from time to time. In this follow-up study the period evolution of SY Her is followed from 1967 until 2010 using AAVSO data.
- 11.00: The challenge of observing transits of exoplanets (Frans Nieuwenhout)
An exoplanet transit causes a dip in stellar intensity of at most a few tens of milli-magnitude. To measure these requires careful attention to reduce all possible sources of error to to a sufficiently low level. Some difficulties will be discussed and ways to overcome them will be shown. A few examples of transits will be given.
- 11.30: Time Series CCD Photometry from Nyrölä and Hankasalmi observatories (Arto Oksanen)
The two country-side observatories of Astronomical association Jyväskylän Sirius will be described. The both observatories have 40 cm telescopes that have been optimized for time-series CCD photometry, but the observing is very different between a "manual" observatory versus a fully automated one. The most important photometric observations made at the observatories will be presented.
- 12.00: Variable Stars from the Chandra Guide Camera (Dr. Arne Henden)
The Aspect Camera, the main guide camera for the Chandra X-Ray Satellite, monitors 4-6 stars continuously for hours to days in order to control the positioning of the satellite. The photometric observations are downloaded to the ground, and checked to ensure proper star acquisition and guiding. The generated light curves have also been examined for stellar variability, and nearly a thousand stars have been found to be variable. These are all in the 8-10mag range, easy to observe with small telescopes, yet are almost all new variables. The majority are low-amplitude stars, ideal for CCD or DSLR observing, but there are some higher amplitude eclipsing systems and long-period variables that can be followed visually. This talk will present some of the

stars, give the website where you can examine the light curves, and suggest a campaign to monitor as many of these stars as possible.

12.30: Departure to Franeker with Lunchbox

4. Werkgroep Veranderlijke Sterren (A. Mak, secretaris)

Op 23 oktober 1960 werd tijdens de amateurbijeenkomst, die gehouden werd in de Utrechtse Sterrenwacht, door een twintigtal amateurs besloten tot het oprichten van een „Werkgroep Veranderlijke Sterren”. Als voorlopige bestuursleden werden gekozen, de heren Plaut, Mak, Meeuw, Van Dijk en Comello.

Het voorlopige bestuur vergaderde op 6 november 1960; het verdeelde de bestuursfuncties als volgt:

Dr. L. Plaut, Voorzitter.

A. Mak, secretaris (waarnemingsleider voor het midden des lands),

Th. van Dijk, penningmeester,

J. Meeus, (waarnemingsleider voor het zuiden en België),

G. Comello, (waarnemingsleider voor het noorden des lands).

In zijn vergadering van 21 december 1960 heeft het bestuur van de Nederlandse Vereniging voor Weer- en Sterrenkunde vastgesteld, dat de werkgroep in oprichting aan de reglementen voldoet en het heeft besloten deze groep als Werkgroep van de Nederlandse Vereniging voor Weer- en Sterrenkunde te erkennen. De werkgroep zal de naam „Werkgroep Veranderlijke Sterren” dragen en tot doel hebben: het waarnemen, bewerken en publiceren van de helderheidsveranderingen van hemellichamen. Een tweetal circulaires werd verzonden aan hen, die zich reeds als lid van de werkgroep hadden aangemeld en aan enkele amateurs, waarvan verwacht kon worden dat zij belangstelling voor deze werkgroep zouden bezitten. Op 31 december 1960 bedroeg het aantal waarnemers: 28.

Daar slechts voorzitter en de penningmeester een besturende functie hebben, bedraagt het aantal leden van de werkgroep op het eind van 1960 juist 30.

De werkgroep is samengesteld uit 19 Nederlandse en 9 Belgische waarnemers. Enkele waarnemers hebben reeds in 1960 waarnemingen verricht. Hiervan mag de heer Comello met name genoemd worden, die met ongeveer 1300 schattingen ons tot voorbeeld mag zijn; dit te meer daar hij zijn waarnemingen met een 42 mm kijker uitvoerde.

Er is hard gewerkt aan het uitzoeken van geschikte veranderlijken en het tekenen van de omgevingskaartjes. Zodra dit werk klaar is, kunnen de waarnemers aan de slag.

Een woord van dank aan het bestuur van de Nederlandse Vereniging voor Weer- en Sterrenkunde is hier op zijn plaats. Het steunde ons initiatief en stelde voor 1961 een subsidie in het vooruitzicht.

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In the “Hemel en Dampkring” of 1961, the magazine of the Dutch Society of Meteorology and Astronomy, on page 109 the founding of a Variable Star Section is announced. Of the first board, two members are still alive: The well known Dutch variable star observer Georg Comello and the well known Belgian calculator Jean Meeus.

Book Review: Analyzing Light Curves

Erwin van Ballegoij

Analyzing Light Curves, A Practical Guide, Grant Foster, www.lulu.com, 2010, ISBN 5800044136636, \$39.95.

For amateurs there is only a limited choice in books about variable star related subjects. Most of them handle observing and/or the classification of variable stars. None of them handle the analyses of variable star observations. But now Grant Foster fills this gap with his “Analyzing Light Curves, A Practical Guide”.

As the title of the book states, this is a practical guide. You cannot find much mathematical background to the techniques he describes for analyzing light curves. You might think this is a serious omission, but I can assure you this is not the case. Grant Foster tells in his introduction that he is already preparing a work to describe the theory behind the analysis techniques. So the readers who would like to understand what they are doing, will have to wait a little bit longer.

Contents

The first chapter explains the magnitude scale, Julian day, light curves, smoothed light curves and the pitfalls of smoothing. Further he introduces the freeware statistical software package R, which is available for many platforms. After reading this book it has become very clear that R is a useful tool to analyse light curves.

In the second chapter Grant explains modelling data with a simple model. He does this with the measurements on the CO₂ concentration in the Earth's atmosphere as measured from Mauna Loa in Hawaii. He uses a linear trend with periodic fluctuations.

Chapter 3 deals with noise, followed by chapter 4 about signal and how to test for signal in a series of observations. Chapter 5 discusses the modelling of data, especially modelling with polynomial models. In chap-

ter 6 the modelling is continued with periodic functions. Chapter 7 deals with the way you can find the period of periodic functions using periodograms. In chapter 8 the pitfalls of periodograms are discussed. In chapter 9 the Fourier series are discussed. In the next chapter all what you have learned so far is used to analyse a light curve of the dwarf nova BZ UMa.

What do you have to do when the period of a variable star is not constant, but changes over time because of evolutionary changes? This is discussed in chapter 11, using the example of the Mira star T UMi. Some variables have more than one period. Chapter 12 explains how you have to handle these cases.

In chapter 13 O-C analysis is discussed. This is a very powerful tool to discover evolutionary changes in a variable or a third component in an eclipsing binary. Chapter 14 wraps it all up.

Some criticism

“Analyzing Light Curves” is meant to be a hands-on book. It contains many illustrations made in R. One thing I really would like to do, is to sit behind my computer and to try to reproduce the programs and illustrations in R while I read the book. Unfortunately, the data he is using is neither available in the book nor online.

When discussing the O-C analysis in chapter 13, I was expecting instructions on how to find the Times of Maximum (ToM's) in a light curve. In my eyes, this would be very convenient if you want to do an O-C analysis. But this is the only major omission I could find.

Conclusion

“Analyzing Light Curves” is a very good handbook for people who would like to analyse light curves. For myself: I will use it as a reference guide for many years to come. This book won't sit idle on my bookshelf for long.

A Question of Identity

Mike Simonsen

Question: When is a supernova not a supernova? Answer: Now that's an interesting story...

It all started on Christmas night 2005, when astronomers using the Katzman Automatic Imaging Telescope (KAIT) in California discovered an apparent supernova not far from the centre of the elliptical galaxy NGC 2274. There was nothing there on an image they had taken two weeks prior. Twelve hours later, astronomers at the National Astronomical Observatory of China confirmed the 18th magnitude object was real. It was named SN2005md and the discovery was announced in CBET #332 on December 26.

A spectrogram taken on December 28 showed it to be most probably a "young Type-II supernova". This was announced in an IAU Circular (8650) on the 29th of December. Subsequent KAIT images showed that SN2005md faded rather quickly and it was fainter than magnitude 19.8 by January 2006.

Normally that would be the end of the story, but this time it wasn't. First, it is generally accepted that the progenitors of core-collapse supernovae are massive young stars. These massive young stars are almost always found in spiral or irregular galaxies dominated by young stellar populations.

NGC 2274 is a strangely shaped early irregular galaxy (an E-type galaxy), so SN2005md was unusual. In fact, it was only one of 22 examples found in an extensive literature search of all early irregular galaxies containing core-collapse supernovae in history.

A paper published in 2008 by Hakobyan et al. (2008, A&A, 488, 523) examined all these cases and found that 19 of the galaxies had been mis-classified, and were actually spiral (17), irregular (1) or ring (1) galaxies. Of the 3 remaining galaxies with early type classification, one (NGC 2768) is a suspected merger remnant, another (NGC 4589) is definitely a merger, and the third (our NGC 2274) is in close interaction with another galaxy. This seemed to explain the contradiction of core-collapse stars residing in old non-star-forming irregular galaxies, since some

amount of young stellar population in these interacting galaxies is expected.

Well then, all was right in the Universe once more...or was it. In February 2008, while Hakobyan and company were putting the final touches to their paper for submission, an electronic telegram (CBET 1265) was issued announcing that either a new supernova in NGC 2274, very close to the position of SN2005md has erupted at magnitude 18.5, or that SN2005md itself had suddenly re-brightened!

The difference between the previously reported position of SN2005md and the "new" object was on 0.1 arc seconds in R.A. and 0.4 arc seconds in declination, but at the distance of NGC 2274 (estimated to be 70 mega parsecs) that could mean they were unrelated objects 120 parsecs apart. Measuring the exact positions of anything that faint close to a galaxy is tricky business and the likelihood they were the same object seemed greater than the probability they were two SN in the same galaxy that close together.

The fact that the previously reported spectrum only showed a featureless blue continuum, with no obvious broad supernova features, and that the object faded so quickly added to the suspicion that SN2005md wasn't a supernova at all.

The telegram went on to explain if the new object was indeed a re-brightening of 2005md, possible explanations were that it was the super-outbursts of a luminous blue variable (LBV), or multiple flares of the LBV as part of an extended eruption. Other possible explanations included a Galactic variable star or a background AGN/blazar.

Needless to say, SN2005md was a mystery. Further observations were encouraged.

Flash forward to July 2010. Astronomers Telegram (ATEL) #2750 finally sorts it all out for us. A fully reduced spectrum taken with the LRISp on the Keck I 10 meter telescope on December 31, 2005 shows that the object originally classified as a young Type IIb supernova is in fact a galactic cataclysmic variable. That's right, it's in our own Milky Way galaxy. NGC 2274 just happens to lie in the background very close to its position on the sky. The CVs spectrum shows features typical of a

dwarf nova in outburst. The Balmer emission lines were the clincher. They have an average redshift of about 300km/second, which is far too little to be part of a galaxy estimated to be receding from us at 5000+km/second.

This also explains the re-brightening in 2008, since CVs are prone to outburst over and over on various timescales from weeks to years. It also resolves the conundrum of having a core-collapse supernova in an E-type galaxy with few signs of active star formation.

Observaria

Novae

Nova Aquilae 2010 = V1723 Aquilae

Begin september verscheen er een nova in de Arend. Een gunstige verschijning aan de avondhemel. Helaas betrof het een zwakke nova die bij maximum niet helderder werd dan magnitude 16V. Vandaar dat er in amateur-kringen weinig aandacht is besteed aan V1723 Aql.

De nova is omstreeks 11 september ontdekt door de Japanners K. Nishiyama en F. Kabashima. De Brit D. Boyd heeft de volgende positie van V1723 Aql bepaald:

R.K.: 18^h 47^m 38,38^s

Decl: -03° 47' 13,8"

Momenteel is de nova een object van de achttiende grootte en buiten het bereik van visuele waarnemers.

Dwergnovae

Stilstand Z Camelopardalis

De helderheid van de bekende circumpolaire dwergnova Z Cam schommelt sinds half jui tussen magnitude 11,5 en 12,0. Dat is ruim een magnitude zwakker dan bij een uitbarsting en ruim een magnitude helderder dan de rusthelderheid. Met andere woorden: de ster ondergaat een stilstand. Hoe lang zal deze nog duren? Is de stilstand al voorbij als jullie dit lezen, of duurt deze nog jaren?

WW Ceti

De dwergnova WW Cet is sinds begin augustus actief. Misschien nog wel langer, maar dat was door de zonsconjunction niet

And once again, order has been restored to the Universe.

The only mystery that remains is why it took them so long to figure this out. The spectrum that resolved this issue was obtained New Years Eve, 2005!

This content is distributed by the AAVSO Writer's Bureau. It originally appeared on http://simostronomy.blogspot.com/2010/07/question-of-identity_23.html

Erwin van Ballegoij

te zien. Hoewel van WW Cet al lang wordt vermoed dat het een UGZ dwergnova betreft, is deze ster nog nooit in een stilstand waargenomen. Dat lijkt nu wel het geval te zijn. Houd deze interessante ster daarom goed in de gaten.

Symbiotische veranderlijken

CI Cygni

In de periode 1970-1978 was de symbiotische ster CI Cyg erg actief. De ster bereikte toen drie maxima. Daarna was CI Cyg 30 jaar inactief, voordat de ster in 2008 weer verhelderde.

De huidige actieve periode lijkt een kopie van de vorige actieve periode te worden. Na de uitbarsting van 2008 nam de helderheid in eerste instantie af, om vervolgens dit voorjaar weer langzaam maar zeker toe te nemen. Eind augustus bereikte de ster een maximum de tiende grootte.

Daarna werd de actieve witte dwerg geleidelijk bedekt door door de koele reuzenster van spectraalklasse M6III. Begin oktober was de helderheid van CI Cyg afgenomen tot de elfde grootte. Houd deze ster de komende jaren in de gaten. Er komt mogelijk nog een derde maximum aan.

RCB sterren

ES Aquilae

ES Aql lijkt weer te herstellen van het laatste minimum. Tijdens dit minimum is de ster zwakker geweest dan de achttiende grootte. Hoe zwak precies is niet bekend, want er zijn geen positieve metingen ver-

richt. Nu is de ster weer binnen het bereik van grote amateurkijkers als een object van de veertiende grootte.

R Coronae Borealis

R CrB vertoont geen verdere tekenen van herstel. De helderheid van deze ster bedraagt al enkele maanden magnitude 14,5.

Een analyse van visuele waarnemingen aan U Cepheï

Robert Schippers

Van december 2009 tot en met april 2010 heb ik visuele waarnemingen verricht aan de eclipsveranderlijke U Cepheï. Deze ster heeft een periode van 2,493 dagen ($P=59,8$ uur), een rusthelderheid van magnitude 6,8 en een minimumhelderheid van 9,2. Omdat er binnen een gebied van 1° rondom de veranderlijke veel vergelijkingssterren voorhanden zijn, is U Cepheï visueel goed te schatten.

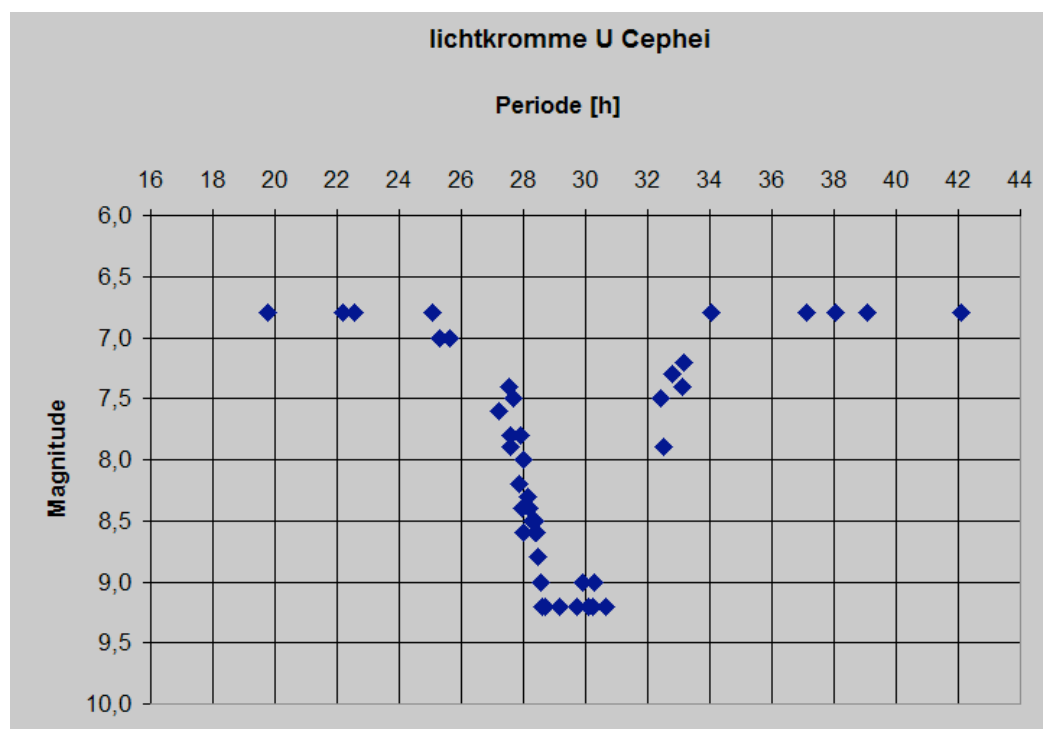
U Cepheï bestaat uit een primaire ster van spectraalklasse B6 en een secundaire ster van klasse G2 [4]. Vanaf 1880 is bekend dat U Cepheï veranderlijk is, hoewel er aanwijzingen zijn dat al in 1828 een minimum is waargenomen [1]. Omdat we vanaf de Aarde nagenoeg tegen de zijkant van de baan van de secundaire ster aankijken en één (of beide) ster(ren) bij de opeenvolgende minima geheel wordt verduisterd, is er sprake van een Algol-veranderlijke.

In totaal heb ik in de genoemde periode 67 helderheidschattingen gedaan waaronder

9 keer aan gedeelten van minima. In deze data is alleen een primair minimum te herkennen en ontbreekt een secundair minimum. U Cepheï heeft wel een secundair minimum, maar dit is slechts 0,1 magnitude diep en daarom visueel niet of zeer moeilijk waarneembaar [1].

De gemaakte helderheidsschattingen zijn geplott in de bijgaande figuur. Hierin zijn voor de duidelijkheid alleen de schattingen rond het minimum van U Cep afgebeeld, genormeerd naar een enkele cyclus. De totale tijdsduur van het minimum kan hieruit worden geschat op $M = 9$ uur. Tevens valt het vlakke plateau rond de minimumhelderheid op: bijna 2 uur (N) blijft de ster nagenoeg onveranderd op magnitude 9,2 steken.

Uit de afgebeelde lichtcurve is een aantal eigenschappen van het stersysteem af te leiden.



Wanneer we de grootste ster A noemen en de kleinste B, dan volgt de verhouding van de sterdiameters ten opzichte van de diameter van de omloopbaan D uit:

$$R_A = \frac{M}{0,5 * P} = 0,3D$$

$$R_B = \left(1 - \frac{M - N}{2 * M}\right) R_A = 0,18D$$

Bepaling van de helderheid van beide componenten levert alleen een reële oplossing als wordt aangenomen dat de secundaire (zwakste) ster de grootste van beide is en tijdens het minimum de hoofdstel geheel bedekt:

$$H_A + H_B = 100$$

$$H_A = 11,09 \Rightarrow H_B = 88,91$$

Hierbij is aangenomen dat beide sterren samen 100% van de helderheid leveren. De factor 11,09 komt uit het 2,4 magnitude helderheidsverschil tussen de sterren:

$$\left(\frac{100}{2,5^{2,4}}\right)$$

Teruggerekend leveren de factoren H helderheden op van: $Mag_B=6,9$ en $Mag_A=9,2$.

Met behulp van de wet van Stefan-Boltzmann kan tevens de verhouding van de temperaturen worden bepaald:

$$\frac{T_B}{T_A} = \sqrt[4]{\frac{R_A^2 * H_B}{R_B^2 * H_A}} = 2,17$$

Ter vergelijking zijn in de literatuur de volgende waarden te vinden voor de hierboven berekende eigenschappen [1], [3], [4]:

$$\begin{aligned} M &= 10^h 5^m,6 \\ N &= 1^h 54^m,8 \\ 0,3082D < R_A < 0,3225D \\ 0,1911D < R_B < 0,200D \\ Mag_A &= 9,1 \\ Mag_B &= 6,9 \\ T_A &= 6800K \text{ en } T_B = 14.500K, \text{ zodat } \frac{T_B}{T_A} = 2,1 \end{aligned}$$

Duidelijk is dat de uit de schattingen bepaalde verhoudingen hier vrij goed mee overeenstemmen.

U Cephei stoot regelmatig gasschillen of -ringen uit, zodat het minimum helderder kan zijn dan magnitude 9,2 [2]. Dit zou, naast natuurlijk de mogelijkheid van een onnauwkeurige schatting, de reden kunnen zijn voor de twee punten op magnitude 9,0 in het minimum (beide gezien op dezelfde avond).

U Cephei is een interessante ster om ook gedurende langere tijd te volgen. Door de genoemde massaoverdracht van de G naar de B-ster en het hieruit voortkomende weglekken van gas naar de interstellaire ruimte, neemt de omlooptijd van U Cephei in de loop van de tijd langzaam toe. De geschatte verlenging van de omlooptijd bedraagt 6 seconden in 60 jaar [1].

Bronnen:

[1] Raymond Smith Dugan, A photometric study of U Cephei, Princeton University Observatory, juli 1920

[2] Mr. Kari A. Tikkanen

(<http://www.student oulu.fi/~ktikkane/astO LD.html>)

[3] Y. Kondo, G.E. McCluskey, C.A. Harvel, IUE Ultraviolet spectra of the interacting binary U Cephei, 1981

[4] A.H. Batten, P.G. Laskarides, Hydrogen-line emission in the spectrum of U Cephei, 1969

Maxima Mira sterren 4^e kwartaal 2010

Erwin van Ballegoij

Deze lijst bevat de verwachte maxima van Mira sterren in het vierde kwartaal van 2010. De kaarten van de Mira sterren zijn te downloaden vanaf de website van de AAVSO (www.aavso.org).

Als de waarden van de maximale en de minimale helderheid tussen "< >" staan, dan betreffen het de gemiddelde maximale en de gemiddelde minimale helderheid. Zonder "< >" staan de getallen voor het helderste maximum en het zwakste minimum.

Een "#" geeft aan dat de AAVSO waarnemingen van deze ster goed kan gebruiken. Een "&" geeft aan dat de AAVSO dringend

waarnemingen van deze ster nodig heeft en "@" geeft aan dat de AAVSO zeer dringend waarnemingen van deze ster nodig heeft. Een '%' geeft aan dat de AAVSO CCD data van deze ster heeft, maar dat er weinig visuele schattingen aan deze ster verricht zijn. Van een aantal sterren is het voorspelde maximumtijdstip dusdanig onzeker, dat achter het voorspelde tijdstip een vraagteken staat.

Deze lijst is samengesteld met behulp van Bulletin 73 van de AAVSO. De veranderingen met een zuidelijker declinatie dan -25° zijn uit deze lijst verwijderd.

| | | | | | | | | | | | |
|-----------|----------|----|-------------|-----|-----|-----------|--------|----|-------------|-----|-----|
| *0535+38 | SZ Aur | %# | 8.6-15.2 | Okt | 1? | 0930-14 | X Hya | %& | <8.4-12.8> | Nov | 1 |
| *1905+27 | TY Lyr | | 9.3-15.0 | Okt | 1? | *1927+34 | DD Cyg | | 9.6-14.1 | Nov | 1? |
| *1903+33 | AB Lyr | | 10.1-15.5 | Okt | 2? | *2106+12 | AN Peg | # | 10.0-(15.5) | Nov | 1? |
| *2326+42 | BG And | | 8.9-(15.0) | Okt | 2? | *1657+22 | SY Her | | 7.8-13.2 | Nov | 2? |
| *1229-17 | U Crv | %@ | 9.6-15.9 | Okt | 4? | 1324-22 | R Hya | | <4.5-9.5> | Nov | 3 |
| 1913-19 | S Sgr | | <10.2-14.8> | Okt | 4 | 1405-12A | Z Vir | %& | <10.4-14.9> | Nov | 3 |
| 2010+08 | R Del | %# | <8.3-13.3> | Okt | 4 | *0707+17 | UZ Gem | %@ | 8.8-(15.0) | Nov | 4? |
| 2041-04 | W Aqr | | <8.9-14.2> | Okt | 4 | 1209-05 | T Vir | %& | <9.6-14.2> | Nov | 4 |
| *1540-20 | Z Lib | %@ | 11.7-(15.5) | Okt | 5? | 0041+32 | RW And | | <8.7-14.8> | Nov | 5 |
| *0009+28 | UW And | & | 9.6-(15.0) | Okt | 6? | 0242+17 | T Ari | | <8.3-10.9> | Nov | 5 |
| 0018+38 | R And | | <6.9-14.3> | Okt | 6 | *0617+25 | ZZ Gem | # | 9.0-12.2 | Nov | 6? |
| 1239+61 | S UMa | | <7.8-11.7> | Okt | 6 | *0110+55A | VZ Cas | | 9.5-14.0 | Nov | 8? |
| 2156+05 | V Peg | | <8.7-14.4> | Okt | 6 | 0112+72 | S Cas | | <9.7-14.8> | Nov | 8 |
| *0641+08 | ST Mon | %@ | 9.9-15.7 | Okt | 7? | 2116-15 | T Cap | # | <9.5-13.9> | Nov | 8 |
| *0911-04 | UZ Hya | | 9.1-14.1 | Okt | 7? | *1353-04 | SY Vir | %& | 9.0-15.0 | Nov | 9? |
| 1233+07 | R Vir | | <6.9-11.5> | Okt | 7 | *1755+23 | WY Her | %@ | 9.2-(15.5) | Nov | 9? |
| 1550-18 | RR Lib | %& | <8.6-14.2> | Okt | 7 | *1805+18 | XZ Her | %& | 10.2-(15.5) | Nov | 10? |
| *2144+43 | WY Cyg | | 8.6-14.8 | Okt | 9? | 1806+66 | X Dra | | <11.0-14.7> | Nov | 10 |
| *0120+20 | RX Psc | %& | 9.5-(14.7) | Okt | 10? | 0228-13 | U Cet | %& | <7.5-12.6> | Nov | 11 |
| 1246+06 | U Vir | %& | <8.2-13.1> | Okt | 10 | *0634+44A | AA Aur | | 9.2-(15.5) | Nov | 11? |
| 1532-15 | W Lib | %@ | <11.1-15.0> | Okt | 11 | 0727+08 | S Cmi | | <7.5-12.6> | Nov | 11 |
| *1859+47 | WZ Lyr | %# | 10.0-15.5 | Okt | 11? | 1545+36 | X CrB | | <9.1-13.6> | Nov | 11 |
| 2315+08 | S Peg | | <8.0-13.0> | Okt | 11 | 0453+07 | R Ori | | <9.6-13.1> | Nov | 12 |
| *2318+39 | BU And | %# | 9.5-15.5 | Okt | 11? | *1950+55 | CU Cyg | & | 10.3-(15.0) | Nov | 12? |
| *0807+14 | SU Cnc | %# | 10.5-(15.4) | Okt | 12? | 0530+68 | S Cam | | <8.1-11.0> | Nov | 13 |
| *1107-06 | U Crt | %& | 9.0-(14.0) | Okt | 14? | *0655+10A | BI Mon | %& | 10.1-(16.0) | Nov | 14? |
| 0133+38 | Y And | %# | <9.2-14.2> | Okt | 15 | *0619+47 | GQ Aur | | 10.4-(15.2) | Nov | 15? |
| 0214-03 | Omi Cet | | <3.4-9.3> | Okt | 16 | 0900-24 | S Pyx | %& | <9.0-13.9> | Nov | 15 |
| 1600-21 | Z Sco | %& | <9.2-13.4> | Okt | 17 | 1315+46 | V CVn | | <6.8-8.8> | Nov | 15 |
| *1905+29B | VZ Lyr | %# | 10.3-(15.5) | Okt | 17? | 1935+09 | RV Aql | | <9.0-14.2> | Nov | 15 |
| 1621-12 | V Oph | | <7.5-10.2> | Okt | 18 | *0450-07 | SX Eri | %@ | 9.6-(14.5) | Nov | 16? |
| 0004+51 | SS Cas | | <9.8-13.1> | Okt | 19 | *2151+47 | LV Cyg | %& | 10.5-(15.0) | Nov | 16? |
| *0852-02 | WW Hya | %& | 8.8-14.4 | Okt | 19? | *1443+39 | RR Boo | | <8.8-12.7> | Nov | 17? |
| 1432+27 | R Boo | | <7.2-12.3> | Okt | 19 | 1706+27A | RT Her | | <9.4-15.0> | Nov | 17 |
| 0703+10 | R Cmi | # | <8.0-11.0> | Okt | 22 | *1906+27A | UV Lyr | | 10.6-(15.5) | Nov | 17? |
| *1626+23 | DO Her | | 10.3-(16.0) | Okt | 22? | *2035+37A | FF Cyg | | 9.2-15.0 | Nov | 17? |
| 2105-04 | RS Aqr | | <10.0-14.0> | Okt | 22 | 2314+25 | W Peg | | <8.2-12.7> | Nov | 17 |
| *0619+25 | VV Gem | & | 10.1-14.8 | Okt | 24? | 0604+50 | X Aur | | <8.6-12.7> | Nov | 19 |
| 1547-15 | R Lib | %# | <10.3-14.8> | Okt | 24 | 2259+14 | RW Peg | | <9.7-14.0> | Nov | 19 |
| *0625+64 | RT Cam | # | 9.3-(15.0) | Okt | 25? | *1555+02 | BC Ser | | 9.4-15.4 | Nov | 20? |
| 1611-22B | S Sco | %# | <10.5-14.6> | Okt | 25 | 1831+49A | SV Dra | | <9.7-14.3> | Nov | 21 |
| 0210+24 | R Ari | | <8.2-13.2> | Okt | 26 | 1833+08 | X Oph | | <6.8-8.8> | Nov | 21 |
| 1536-20A | U Lib | | <9.6-14.4> | Okt | 26 | 2029+54 | ST Cyg | | <9.9-13.9> | Nov | 21 |
| *1821+72 | RT Dra | | 9.1-14.5 | Okt | 26? | *2137+53 | RU Cyg | | <8.0-9.4> | Nov | 21? |
| 0229+80 | RR Cep | | <10.2-14.7> | Okt | 27 | 0101-02 | Z Cet | & | <8.9-13.5> | Nov | 22 |
| 2116+14 | X Peg | | <9.4-13.8> | Okt | 27 | *0259+19 | RT Ari | @ | 9.8-(15.0) | Nov | 22? |
| 1214-18 | R Crv | | <7.5-13.8> | Okt | 28 | 1943+48 | TU Cyg | | <9.4-14.2> | Nov | 22 |
| 1805+31 | T Her | | <8.0-12.8> | Okt | 28 | 0850-08 | T Hya | | <7.8-12.6> | Nov | 23 |
| 1857+37 | RT Lyr | | <10.1-14.6> | Okt | 28 | *1437-19A | SX Lib | # | 9.2-(15.5) | Nov | 23? |
| *1634+14 | AS Her | | 8.3-14.1 | Okt | 29? | 0010+46 | X And | %# | <9.0-14.8> | Nov | 24 |
| 1652-02 | SS Oph | | <8.7-13.5> | Okt | 29 | 0735+08 | U Cmi | | <8.8-13.0> | Nov | 24 |
| *0054+27 | W Psc | # | 9.8-15.6 | Okt | 30? | *1850+36 | SU Lyr | %@ | 11.2-(18.0) | Nov | 24? |
| *1939+54 | V369 Cyg | | 9.7-14.2 | Okt | 31? | *1906+43 | ST Lyr | | 9.8-(15.5) | Nov | 24? |

| | | | | | | | |
|-----------|--------|----------------|---------|-----------|--------|---------------|---------|
| 0221+50 | RR Per | <9.2-14.4> | Nov 25 | 2008-22 | W Cap | <11.7-14.8> | Dec 12 |
| *0830+13 | UY Cnc | %& 10.5-15.3 | Nov 25? | *0808+37 | RT Lyn | 9.1-15.2 | Dec 13? |
| 1037+69 | R UMA | <7.5-13.0> | Nov 25 | 0954+21 | V Leo | <9.1-13.7> | Dec 13 |
| 2040+16 | T Del | <9.3-14.8> | Nov 25 | 1558-23 | RZ Sco | %# <8.8-12.2> | Dec 13 |
| *0202+27 | Z Tri | %& 9.4-15.2 | Nov 26? | 0848+03 | S Hya | & <7.8-12.7> | Dec 14 |
| 1605-19 | W Sco | %@ <11.5-14.6> | Nov 27 | 1105+06 | S Leo | <10.1-13.9> | Dec 15 |
| 0446+17 | V Tau | <9.2-13.7> | Nov 28 | *1010-58B | AF Car | %@ 9.7-(14.5 | Dec 16? |
| *1934+11A | SV Aql | %& 10.2-(15.5 | Nov 28? | *1813+06 | BC Oph | 8.8-15.6 | Dec 16? |
| *1757+18 | WZ Her | 10.8-(15.0 | Nov 30? | 1714+01 | Z Oph | <8.1-12.7> | Dec 16 |
| *1934+28 | BG Cyg | <9.1-12.4> | Nov 30? | 2101-24 | V Cap | %@ <9.2>-14.4 | Dec 16 |
| *2015+59 | CN Cyg | 8.1-14.6 | Nov 30? | *0022+30 | YZ And | 10.1-15.9 | Dec 17? |
| 0046+33 | RR And | <9.1-15.1> | Dec 1 | 0652-08 | X Mon | <7.4-9.1> | Dec 18 |
| 0305+14 | U Ari | # <8.1-14.6> | Dec 3 | 1621+19 | U Her | <7.5-12.5> | Dec 19 |
| 0651+11 | Y Mon | %@ <9.1-13.9> | Dec 3 | 0500-22 | T Lep | <8.3-12.9> | Dec 20 |
| *2158+13 | DG Peg | 10.2-15.2 | Dec 4? | 1225+32 | T CVn | <9.6-11.9> | Dec 20 |
| 2102-21 | X Cap | %@ <11.1-14.8> | Dec 4 | 1850+32 | RX Lyr | <11.9-(15.5> | Dec 20 |
| 1811+36 | W Lyr | <7.9-12.2> | Dec 5 | *0607+46A | ST Aur | %@ 10.3-15.8 | Dec 22? |
| 1842+43 | RW Lyr | <11.3-15.6> | Dec 7 | *2002+50 | BU Cyg | 9.6-(16.0 | Dec 22? |
| *1820+39 | TW Lyr | %& 9.7-15.5 | Dec 8? | *1955+51 | CM Cyg | 9.5-(15.0 | Dec 24? |
| *2331+09 | FF Peg | 9.8-15.8 | Dec 8? | *2219+55B | SU Lac | %@ 10.3-(15.0 | Dec 25? |
| 1425+39 | V Boo | <7.0-11.3> | Dec 8 | *0302+26 | Z Ari | # 10.2-(15.0 | Dec 26? |
| *1740+21 | CF Her | # 9.1-15.9 | Dec 11? | 1702-15 | R Oph | <7.6-13.3> | Dec 26 |
| 0631+59 | U Lyn | <9.5-14.4> | Dec 11 | 1546+39 | V CrB | <7.5-11.0> | Dec 30 |
| 2009-06 | Z Aql | <9.0-13.9> | Dec 11 | *1915+17 | W Sge | %# 9.0-(15.5 | Dec 31? |
| *0127+46 | SX And | 8.6-14.6 | Dec 12? | 0701+22A | R Gem | <7.1-13.5> | Dec 31 |
| *1918+31 | AN Lyr | 9.3-(15.0 | Dec 12? | | | | |

Totalen 3^e kwartaal 2010

Erwin van Ballegoij

In het afgelopen kwartaal zijn door 6 waarnemers 687 schattingen aan 166 veranderlijken verricht.

Juli was redelijk. Over de maand verspreid waren er regelmatig heldere nachten. Eind

juli sloeg het weer om en er volgde een lange periode van wisselvallig weer waarin weinig kon worden waargenomen. Pas in september verbeterde het weer en kon er weer regelmatig worden waargenomen.

| | Code | Jul 10 | Aug 10 | Sep 10 | Totaal |
|---------------------|------|------------|------------|------------|------------|
| Erwin van Ballegoij | BVE | 308 | 81 | 102 | 491 |
| Georg Comello | CMG | 1 | | | 1 |
| Guus Gilein | GGU | | 13 | | 13 |
| Robert Schippers | SRBR | 8 | 19 | 33 | 60 |
| Glynis van Uden | VUG | 6 | 15 | 9 | 30 |
| Eltjo Wubbena | WUB | 28 | 38 | 26 | 92 |
| | | 351 | 166 | 170 | 687 |

Schattingen 3^e kwartaal 2010

Erwin van Ballegoij

De volgende tabel bevat de waarnemingen uit de periode juli – september 2010.

Elke reeks waarnemingen aan een ster begint met de naam en het type van de ster, met daaronder de helderheidsschattingen.

In de kolommen staan vermeld de Juliaanse Datum, de helderheid en de waarnemer. Voor de helderheid kan “<” staan. Dit betreft

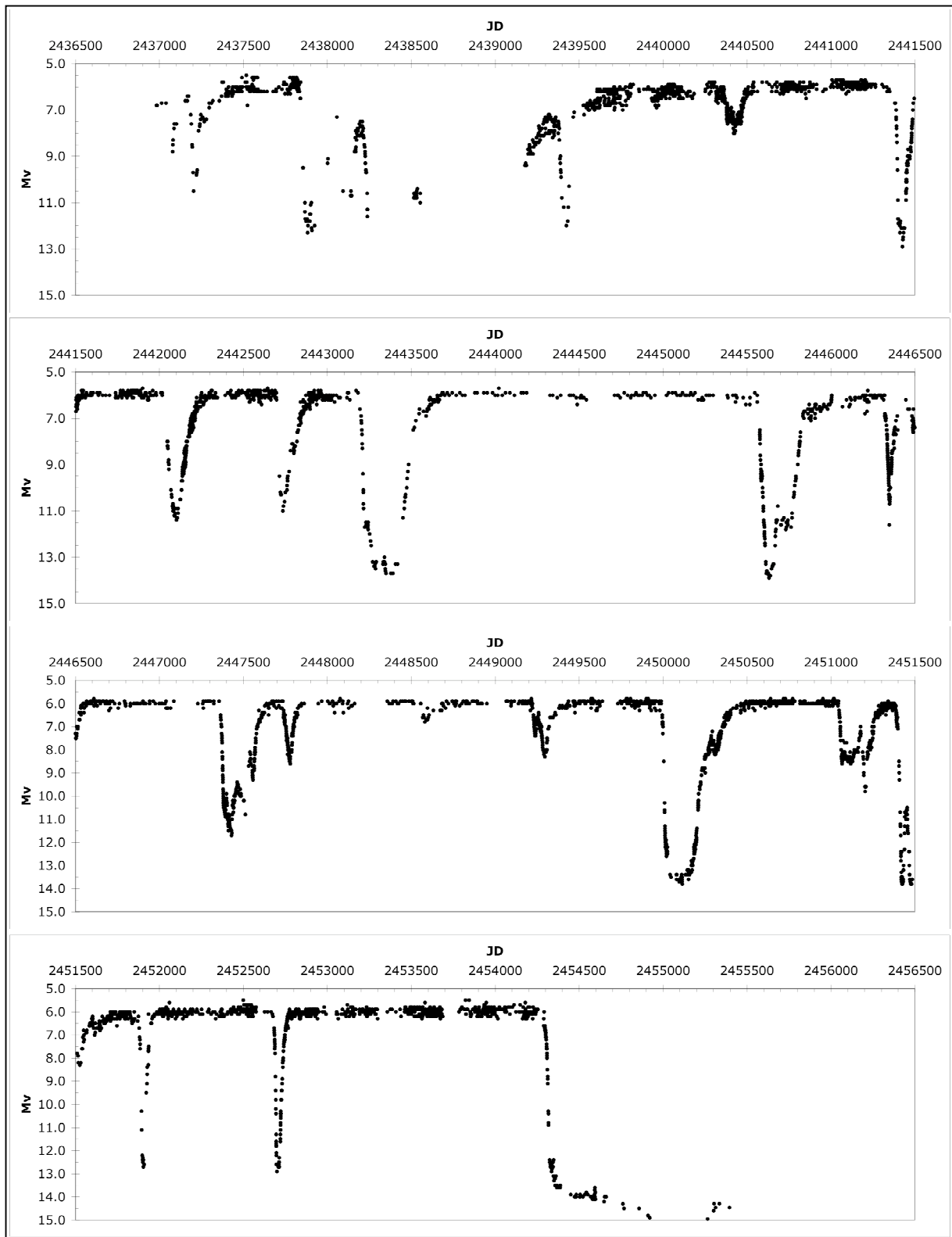
een ‘zwakker dan’ waarneming. Voor de helderheid kan ook een “:” staan. Dit betreft een onzekere waarneming. Verder kan er na de helderheid ook nog een “V”, een “B” of een “U” staan. Dit betreft respectievelijk CCDV, CCDB of ongefilterde CCD waarnemingen.

Voor de JD geldt: JD = JD + 2455000

| | | | | | | | | | | | | | | |
|-------|------|-------|-------|------|-------|-------|------|---------|---------|------|---------|--------|------|-----|
| R And | M | 397,4 | 13,1 | BVE | 393,4 | 10,5 | BVE | 454,3 | 11,9 | WUB | 445,489 | 9,6 | BVE | |
| 400,4 | 13,1 | WUB | 438,4 | 12,9 | WUB | 400,4 | 10,4 | BVE | Z And | ZAND | RU And | | SRA | |
| 438,4 | 9,1 | WUB | 454,3 | 12,7 | WUB | 417,5 | 9,4 | BVE | 386,496 | 9,6 | BVE | 397,4 | 11,8 | BVE |
| 454,3 | 8,6 | WUB | U And | | M | 445,4 | 9,6 | BVE | 393,469 | 9,4 | BVE | 417,5 | 11,7 | BVE |
| T And | M | 454,4 | 11,0 | WUB | X And | | M | 400,470 | 9,4 | BVE | 445,4 | 11,6 | BVE | |
| 396,4 | 13,2 | WUB | W And | | M | 438,4 | 12,9 | WUB | 417,496 | 9,5 | BVE | RW And | | M |

| | | | | | | | | | | | | | | |
|---------|--------|-------|---------|------|------|---------|--------|-------|-----------|--------|------|----------|--------|------|
| 396,5 | 16,06V | BVE | 397,4 | 12,4 | BVE | 417,4 | 11,8 | BVE | 428,340 | 6,8 | SRBR | 445,4 | 10,2 | BVE |
| RX And | UGZ | | 404,4 | 12,8 | BVE | 445,4 | 9,8 | BVE | 439,322 | 6,8 | SRBR | Z Cyg | | M |
| 386,497 | 11,1 | BVE | 449,3 | 13,1 | BVE | T Cas | | M | 452,323 | 6,8 | SRBR | 386,4 | 9,9 | BVE |
| 390,510 | <14,3 | BVE | U Boo | | SRB | 386,4 | 11,2 | BVE | 458,397 | 6,8 | SRBR | 393,4 | 9,1 | BVE |
| 396,448 | 13,4 | WUB | 390,4 | 10,8 | BVE | 393,4 | 11,6 | BVE | 462,311 | 6,8 | SRBR | 400,4 | 9,0 | BVE |
| 397,487 | 11,0 | BVE | 397,4 | 10,6 | BVE | 400,4 | 11,2 | BVE | 469,314 | 6,8 | SRBR | 417,4 | 9,5 | BVE |
| 400,417 | 10,9 | WUB | 404,4 | 10,8 | BVE | 417,4 | 10,8 | BVE | RY Cep | | M | 445,4 | 9,7 | BVE |
| 400,481 | 11,5 | BVE | 449,3 | 12,0 | BVE | 437,4 | 10,3 | WUB | 386,4 | 11,5 | BVE | RT Cyg | | M |
| 411,420 | 10,2 | WUB | V Boo | | SRA | 445,4 | 10,2 | BVE | 393,4 | 11,7 | BVE | 386,4 | 9,6 | BVE |
| 417,438 | 10,5 | WUB | 386,4 | 9,1 | WUB | 454,3 | 9,1 | WUB | 400,4 | 12,1 | BVE | 393,4 | 8,5 | BVE |
| 417,499 | 11,1 | BVE | 390,4 | 8,9 | BVE | U Cas | | M | 417,4 | 13,2 | BVE | 400,4 | 8,0 | BVE |
| 438,392 | <13,0 | WUB | 397,4 | 8,6 | BVE | 396,5 | 10,24V | BVE | 445,4 | 11,6 | BVE | 417,4 | 7,9 | BVE |
| 439,368 | <13,3 | WUB | 404,4 | 8,5 | BVE | 400,4 | 10,4 | BVE | EE Cep | | EA | 445,4 | 8,6 | BVE |
| 442,378 | 11,4 | WUB | 449,3 | 9,4 | BVE | 417,4 | 9,4 | BVE | 393,450 | 11,0 | BVE | SS Cyg | | UGSS |
| 454,410 | 10,9 | WUB | Z Boo | | M | 445,4 | 9,5 | BVE | 417,441 | 10,9 | BVE | 386,469 | 12,1 | WUB |
| BG And | | M | 386,4 | 9,9 | BVE | V Cas | | M | 445,433 | 10,9 | BVE | 386,476 | 11,8 | BVE |
| 396,5 | 10,70V | BVE | 393,4 | 9,5 | BVE | 386,4 | 9,1 | BVE | delta Cep | | DCEP | 389,448 | 12,3 | WUB |
| 400,4 | 10,9 | BVE | 400,4 | 9,4 | BVE | 393,4 | 9,4 | BVE | 385,431 | 3,9 | VUG | 393,437 | 12,2 | BVE |
| 417,4 | 11,3 | BVE | RR Boo | | M | 400,4 | 9,5 | BVE | 386,478 | 4,0 | BVE | 396,417 | 11,8 | WUB |
| 445,4 | 10,9 | BVE | 390,4 | 13,5 | BVE | 417,4 | 11,0 | BVE | 390,479 | 4,0 | BVE | 400,413 | 8,9 | WUB |
| T Aqr | | M | RT Boo | | M | 437,4 | 11,7 | WUB | 393,441 | 3,9 | BVE | 400,436 | 8,5 | BVE |
| 390,4 | 12,5 | BVE | 397,4 | 10,8 | BVE | 445,4 | 12,4 | BVE | 400,445 | 3,9 | BVE | 411,385 | 11,7 | WUB |
| 397,4 | 12,1 | BVE | 404,4 | 10,4 | BVE | 454,3 | 12,4 | WUB | 408,406 | 4,1 | BVE | 417,420 | 11,7 | WUB |
| 417,4 | 10,7 | BVE | 449,3 | 10,3 | BVE | W Cas | | M | 414,380 | 3,9 | VUG | 417,429 | 12,0 | BVE |
| 445,4 | 8,3 | BVE | RX Boo | | SRB | 386,4 | 12,4 | BVE | 414,395 | 4,0 | BVE | 437,351 | 12,3 | WUB |
| V Aqr | | SRA | 390,4 | 8,4 | BVE | 393,4 | 12,4 | BVE | 417,439 | 3,9 | BVE | 438,354 | 12,2 | WUB |
| 390,4 | 8,6 | BVE | 397,4 | 8,4 | BVE | 400,4 | 12,4 | BVE | 439,368 | 3,9 | VUG | 439,347 | 12,1 | WUB |
| 397,4 | 8,7 | BVE | 404,4 | 8,3 | BVE | 411,4 | 11,8 | WUB | 440,378 | 3,9 | VUG | 442,372 | 8,3 | WUB |
| 417,4 | 8,9 | BVE | 449,3 | 8,2 | BVE | 417,4 | 12,1 | BVE | 444,387 | 3,8 | VUG | 445,418 | 8,3 | BVE |
| 445,4 | 8,6 | BVE | R Cam | | M | 437,4 | 11,0 | WUB | 445,425 | 4,0 | BVE | 449,391 | 8,5 | BVE |
| W Aqr | | M | 386,4 | 9,6 | BVE | 445,4 | 11,5 | BVE | 449,390 | 4,0 | BVE | 452,409 | 9,3 | BVE |
| 390,4 | 12,0 | BVE | 393,4 | 9,6 | BVE | 454,3 | 10,6 | WUB | 452,410 | 4,0 | BVE | 454,306 | 10,6 | WUB |
| 397,4 | 12,0 | BVE | 400,4 | 9,7 | BVE | RV Cas | | M | mu Cep | | SRC | TY Cyg | | M |
| 417,4 | 11,0 | BVE | 414,3 | 10,3 | GGU | 386,4 | 13,0 | BVE | 439,3 | 3,8 | VUG | 386,4 | 11,0 | BVE |
| 445,4 | 9,6 | BVE | 417,4 | 10,4 | BVE | 393,4 | 13,1 | BVE | R CrB | | RCB | 393,4 | 11,5 | BVE |
| Y Aqr | | M | 449,3 | 12,1 | BVE | RZ Cas | | EA/SD | 396,410 | 14,46V | BVE | 400,4 | 11,3 | BVE |
| 390,4 | 12,2 | BVE | T Cam | | M | 441,351 | 6,3 | SRBR | 396,431 | <13,4 | WUB | 417,4 | 12,1 | BVE |
| 397,4 | 12,2 | BVE | 386,5 | 8,8 | BVE | 458,428 | 6,2 | SRBR | 442,368 | <13,0 | WUB | 445,3 | 13,1 | BVE |
| 417,4 | 13,0 | BVE | 393,4 | 8,8 | BVE | 462,330 | 6,4 | SRBR | S CrB | | M | WY Cyg | | M |
| RR Aqr | | M | 400,4 | 8,5 | BVE | 462,354 | 6,7 | SRBR | 390,4 | 12,6 | BVE | 396,4 | 13,40V | BVE |
| 390,4 | 10,8 | BVE | 417,4 | 8,9 | BVE | 469,317 | 6,2 | SRBR | 397,4 | 11,9 | BVE | BF Cyg | | ZAND |
| 397,4 | 10,5 | BVE | 445,4 | 8,8 | BVE | SS Cas | | M | 404,4 | 11,4 | BVE | 386,457 | 9,8 | BVE |
| 417,4 | 9,7 | BVE | X Cam | | M | 386,4 | 12,7 | BVE | 442,3 | 8,9 | WUB | 393,420 | 9,8 | BVE |
| 445,4 | 10,5 | BVE | 386,5 | 12,5 | BVE | 393,4 | 13,1 | BVE | 449,3 | 8,2 | BVE | 400,420 | 9,8 | BVE |
| AE Aqr | | XP | 393,4 | 12,2 | BVE | 400,4 | 13,1 | BVE | T CrB | | NR | 417,409 | 9,8 | BVE |
| 390,484 | 11,4 | BVE | 400,4 | 11,6 | BVE | 417,4 | 13,1 | BVE | 390,445 | 10,5 | BVE | 445,394 | 9,7 | BVE |
| 397,467 | 11,5 | BVE | 417,4 | 9,3 | BVE | 445,4 | 12,9 | BVE | 397,439 | 10,5 | BVE | BG Cyg | | M |
| 417,475 | 11,5 | BVE | 445,4 | 8,2 | BVE | SU Cas | | DCEPS | 404,413 | 10,4 | BVE | 386,4 | 12,7 | BVE |
| 445,436 | 11,4 | BVE | Z Cam | | UGZ | 441,352 | 6,1 | SRBR | 449,368 | 10,3 | BVE | 393,4 | 12,6 | BVE |
| R Aql | | M | 386,420 | 10,9 | WUB | 458,428 | 6,1 | SRBR | V CrB | | M | 400,4 | 12,4 | BVE |
| 390,4 | 8,2 | BVE | 386,452 | 10,6 | BVE | 462,331 | 6,0 | SRBR | 389,5 | 11,5 | WUB | 417,4 | 12,5 | BVE |
| 397,4 | 8,5 | BVE | 389,451 | 11,5 | WUB | 469,317 | 6,0 | SRBR | 390,4 | 11,2 | BVE | 445,3 | 11,5 | BVE |
| 417,3 | 9,2 | BVE | 390,422 | 11,7 | BVE | UV Cas | | RCB | 397,4 | 11,2 | BVE | BU Cyg | | M |
| 445,3 | 10,2 | BVE | 393,411 | 12,1 | BVE | 386,485 | 11,0 | BVE | 404,4 | 11,2 | BVE | 386,4 | 10,8 | BVE |
| X Aql | | M | 397,420 | 11,8 | BVE | 393,456 | 10,9 | BVE | 442,4 | 10,8 | WUB | 393,4 | 10,7 | BVE |
| 390,4 | 13,1 | BVE | 400,414 | 11,7 | BVE | 400,452 | 11,0 | BVE | 449,3 | 11,0 | BVE | 400,4 | 11,1 | BVE |
| EU Aql | | M | 400,431 | 11,5 | WUB | 417,442 | 10,9 | BVE | W CrB | | M | 417,4 | 11,7 | BVE |
| 396,4 | 14,36V | BVE | 404,392 | 12,0 | BVE | 445,453 | 11,0 | BVE | 442,4 | 8,7 | WUB | CH Cyg | | ZAND |
| eta Aql | | DCEP | 411,392 | 11,5 | WUB | BB Cas | | M | X CrB | | M | 386,467 | 9,4 | BVE |
| 439,374 | 4,0 | VUG | 417,427 | 11,8 | WUB | 396,4 | 11,70V | BVE | 389,5 | 12,6 | WUB | 393,429 | 9,4 | BVE |
| 440,380 | 3,9 | VUG | 417,464 | 11,8 | BVE | 400,4 | 12,2 | BVE | 442,3 | 12,1 | WUB | 400,427 | 9,6 | BVE |
| 444,380 | 3,8 | VUG | 439,354 | 11,6 | WUB | 417,4 | 12,7 | BVE | Z CrB | | M | 417,418 | 9,8 | BVE |
| R Aur | | M | 445,496 | 11,8 | BVE | rho Cas | | SRD | 390,4 | 13,4 | BVE | 445,407 | 10,0 | BVE |
| 449,3 | 8,8 | BVE | 449,394 | 11,7 | BVE | 385,4 | 4,8 | VUG | 396,4 | 13,17V | BVE | CI Cyg | | ZAND |
| Z Aur | | SRD | R CVn | | M | 390,4 | 4,8 | BVE | R Cyg | | M | 386,466 | 10,3 | BVE |
| 449,3 | 10,5 | BVE | 390,4 | 8,5 | BVE | 414,3 | 4,8 | VUG | 386,4 | 11,5 | BVE | 393,427 | 10,8 | BVE |
| eps Aur | | EA/GS | 397,4 | 8,3 | BVE | 414,3 | 4,7 | BVE | 393,4 | 11,7 | BVE | 400,425 | 10,8 | BVE |
| 395,521 | 3,6 | SRBR | 404,4 | 7,8 | BVE | 439,3 | 4,8 | VUG | 396,4 | 11,9 | WUB | 447,416 | 10,7 | BVE |
| 422,556 | 3,6 | VUG | 449,3 | 7,6 | BVE | 445,4 | 4,8 | BVE | 400,4 | 11,7 | BVE | 445,406 | 10,5 | BVE |
| 423,507 | 3,7 | SRBR | R Cas | | M | S Cep | | M | 411,4 | 12,6 | WUB | V482 Cyg | | RCB |
| 439,368 | 3,7 | SRBR | 386,4 | 8,3 | BVE | 386,4 | 8,7 | BVE | 417,4 | 12,6 | BVE | 386,463 | 10,8 | BVE |
| 443,653 | 3,7 | SRBR | 393,4 | 8,7 | BVE | 393,4 | 8,3 | BVE | 445,4 | 13,1 | BVE | 393,426 | 11,0 | BVE |
| 452,366 | 3,8 | SRBR | 400,4 | 9,2 | BVE | 400,4 | 9,0 | BVE | U Cyg | | M | 400,424 | 10,9 | BVE |
| 458,451 | 3,8 | SRBR | 411,4 | 9,6 | WUB | 417,4 | 8,6 | BVE | 386,4 | 10,2 | BVE | 417,414 | 11,0 | BVE |
| R Boo | | M | 417,4 | 9,6 | BVE | 445,4 | 9,4 | BVE | 393,4 | 10,3 | BVE | 445,404 | 11,1 | BVE |
| 386,4 | 12,3 | WUB | 437,4 | 9,8 | WUB | T Cep | | M | 400,4 | 10,3 | BVE | P Cyg | | SD |
| 390,4 | 11,7 | BVE | 441,3 | 9,8 | SRBR | 386,4 | 10,4 | BVE | 417,4 | 10,3 | BVE | 385,4 | 4,9 | VUG |
| 397,4 | 11,8 | BVE | 445,4 | 10,0 | BVE | 393,4 | 10,3 | BVE | 445,4 | 10,5 | BVE | 408,3 | 5,0 | VUG |
| 404,4 | 11,8 | BVE | 454,3 | 10,3 | WUB | 400,4 | 10,4 | BVE | V Cyg | | M | 414,3 | 5,0 | VUG |
| 442,3 | 8,9 | WUB | S Cas | | M | 417,4 | 10,4 | BVE | 386,4 | 9,3 | BVE | 439,3 | 5,0 | VUG |
| 449,3 | 8,7 | BVE | 386,4 | 11,9 | BVE | 445,4 | 10,1 | BVE | 393,4 | 9,4 | BVE | chi Cyg | | M |
| S Boo | | M | 393,4 | 11,7 | BVE | U Cep | | EA/SD | 400,4 | 9,6 | BVE | 386,4 | 13,1 | BVE |
| 390,4 | 12,4 | BVE | 400,4 | 11,8 | BVE | 395,478 | 6,8 | SRBR | 417,4 | 9,9 | BVE | 393,4 | 13,1 | BVE |

| | | | | | | | | | | | | | | |
|---------|--------|------|-----------|--------|-------|---------|--------|----------|---------|--------|-------|---------|--------|------|
| 396,4 | 12,9 | WUB | 390,4 | 10,2 | BVE | 386,4 | 9,8 | BVE | 397,477 | 11,6 | BVE | 458,4 | 8,6 | SRBR |
| 400,4 | 13,3 | BVE | 397,4 | 9,8 | BVE | 393,4 | 9,7 | BVE | 417,485 | 11,6 | BVE | 469,3 | 8,6 | SRBR |
| 417,4 | 13,4 | BVE | 404,4 | 9,3 | BVE | 404,4 | 9,9 | BVE | 445,445 | 11,7 | BVE | T UMa | | M |
| 445,4 | 13,2 | BVE | 417,3 | 9,0 | BVE | 417,3 | 10,0 | BVE | R Per | | M | 386,4 | 8,7 | WUB |
| T Del | | M | 442,4 | 8,5 | WUB | V Oph | | M | 445,4 | 9,5 | BVE | 390,4 | 9,0 | BVE |
| 396,4 | 15,01V | BVE | 449,3 | 8,2 | BVE | 386,4 | 9,7 | BVE | S Per | | SRC | 397,4 | 9,4 | BVE |
| X Del | | M | 454,3 | 8,5 | WUB | 393,4 | 8,9 | BVE | 386,4 | 10,7 | BVE | 404,4 | 9,5 | BVE |
| 390,4 | 9,7 | BVE | 454,3 | 8,5 | WUB | 400,4 | 9,3 | BVE | 393,4 | 10,6 | BVE | 414,4 | 10,6 | GGU |
| 397,4 | 10,4 | BVE | RU Her | | M | 417,3 | 9,1 | BVE | 400,4 | 10,7 | BVE | 439,4 | 11,2 | WUB |
| 417,4 | 11,1 | BVE | 386,4 | 12,8 | WUB | W Oph | | M | 417,4 | 10,7 | BVE | 449,3 | 11,1 | BVE |
| 439,3 | 12,5 | SRBR | RY Her | | M | 393,4 | 13,4 | BVE | 445,4 | 10,7 | BVE | Z UMa | | SRB |
| 445,3 | 12,6 | BVE | 390,4 | 9,9 | BVE | X Oph | | M | U Per | | M | 390,4 | 8,3 | BVE |
| Z Del | | M | 397,4 | 10,4 | BVE | 390,4 | 8,6 | BVE | 386,5 | 10,7 | BVE | 397,4 | 8,8 | BVE |
| 397,4 | 11,9 | BVE | 417,3 | 10,8 | BVE | 397,4 | 8,6 | BVE | 393,4 | 11,0 | BVE | 404,4 | 8,9 | BVE |
| 417,4 | 11,5 | BVE | 449,3 | 12,4 | BVE | 404,4 | 8,1 | BVE | 400,4 | 11,1 | BVE | 449,3 | 7,6 | BVE |
| 445,3 | 9,6 | BVE | SS Her | | M | 417,3 | 8,1 | BVE | 417,4 | 11,3 | BVE | RR UMa | | M |
| 462,3 | 9,5 | SRBR | 439,4 | 9,7 | WUB | 449,3 | 7,5 | BVE | 445,4 | 11,6 | BVE | 414,4 | 9,5 | GGU |
| RX Del | | M | SY Her | | M | Z Oph | | M | Y Per | | M | RS UMa | | M |
| 396,4 | 13,65V | BVE | 390,4 | 8,1 | BVE | 390,4 | 13,2 | BVE | 386,5 | 9,2 | BVE | 386,4 | 9,4 | WUB |
| XZ Del | | M | 397,4 | 8,1 | BVE | 397,4 | 13,3 | BVE | 393,4 | 9,2 | BVE | 390,4 | 9,2 | BVE |
| 396,4 | 12,14V | BVE | 404,4 | 8,6 | BVE | RS Oph | | NR | 400,4 | 9,2 | BVE | 397,4 | 9,6 | BVE |
| EU Del | | SRB | 417,3 | 9,7 | BVE | 390,453 | 10,6 | BVE | 417,4 | 9,5 | BVE | 404,4 | 10,0 | BVE |
| 444,3 | 6,3 | VUG | 449,3 | 12,6 | BVE | 397,444 | 10,8 | BVE | 445,4 | 9,7 | BVE | 414,4 | 9,6 | GGU |
| R Dra | | M | TV Her | | M | 404,421 | 11,2 | BVE | UV Per | | UGSS | 439,4 | 11,0 | WUB |
| 386,4 | 7,9 | WUB | 389,5 | 13,1 | WUB | 417,376 | 11,3 | BVE | 445,477 | 13,2 | BVE | 449,3 | 12,3 | BVE |
| 386,4 | 8,0 | BVE | 439,4 | 13,6 | WUB | 449,376 | 10,8 | BVE | DY Per | | RCB | R UMi | | SRA |
| 393,4 | 8,1 | BVE | 454,3 | <13,2 | WUB | RT Oph | | M | 386,502 | 11,0 | BVE | 414,4 | 9,5 | GGU |
| 400,4 | 8,2 | BVE | DS Her | | M | 396,4 | 13,11V | BVE | 393,474 | 11,2 | BVE | S UMi | | M |
| 414,4 | 9,0 | GGU | 396,4 | 14,81V | BVE | RY Oph | | M | 400,475 | 11,0 | BVE | 386,4 | 9,8 | WUB |
| 417,4 | 9,4 | BVE | G Her | | SRB | 396,4 | 10,56V | BVE | 417,459 | 11,7 | BVE | 390,4 | 10,1 | BVE |
| 428,3 | 10,0 | SRBR | 444,4 | 4,9 | VUG | 404,4 | 9,8 | BVE | 445,482 | 11,9 | BVE | 395,4 | 10,4 | SRBR |
| 439,4 | 10,3 | WUB | 68 Her | | EA/SD | 417,3 | 8,9 | BVE | GK Per | | NA+XP | 397,4 | 10,2 | BVE |
| 441,3 | 10,7 | SRBR | 440,385 | 5,1 | VUG | 449,3 | 9,5 | BVE | 386,506 | 13,1 | BVE | 404,3 | 10,2 | BVE |
| 449,3 | 11,2 | BVE | 444,382 | 5,3 | VUG | SS Oph | | M | X Psc | | M | 414,4 | 10,4 | GGU |
| 458,4 | 11,2 | SRBR | alpha Her | | SRC | 386,4 | 12,4 | BVE | 452,4 | 11,2 | BVE | 428,3 | 11,0 | SRBR |
| U Dra | | M | 444,4 | 3,2 | VUG | 393,4 | 11,6 | BVE | TX Psc | | LB | 439,3 | 11,0 | SRBR |
| 386,4 | 13,1 | BVE | R Lac | | M | 400,4 | 11,6 | BVE | 444,4 | 5,6 | VUG | 439,4 | 10,9 | WUB |
| 393,4 | 13,6 | BVE | 386,4 | 9,3 | BVE | VV Oph | | M | V Sge | | NL+E | 449,3 | 12,8 | BVE |
| 400,4 | 13,7 | BVE | 393,4 | 9,1 | BVE | 396,4 | 14,38V | BVE | 390,476 | 10,8 | BVE | T UMi | | M |
| RT Dra | | M | 400,4 | 9,1 | BVE | AY Oph | | M | 397,462 | 10,8 | BVE | 390,4 | 11,5 | BVE |
| 414,4 | 14,1 | GGU | 417,4 | 9,7 | BVE | 417,3 | 12,1 | BVE | 417,401 | 10,8 | BVE | 397,4 | 11,8 | BVE |
| AG Dra | | ZAND | 445,4 | 11,2 | BVE | 449,3 | <14,1 | BVE | 445,387 | 11,0 | BVE | 404,3 | 11,5 | BVE |
| 386,449 | 9,8 | BVE | S Lac | | M | R Peg | | M | SV Sge | | RCB | 414,4 | 11,7 | GGU |
| 393,409 | 9,8 | BVE | 386,4 | 8,9 | BVE | 438,4 | <13,0 | WUB | 390,475 | 10,7 | BVE | 449,3 | 11,9 | BVE |
| 395,507 | 9,8 | SRBR | 393,4 | 9,1 | BVE | 454,3 | 12,8 | WUB | 397,461 | 10,6 | BVE | U UMi | | M |
| 400,411 | 9,8 | BVE | 400,4 | 9,4 | BVE | T Peg | | M | 417,400 | 10,6 | BVE | 386,4 | 8,8 | WUB |
| 414,409 | 10,1 | GGU | 417,4 | 10,8 | BVE | 396,4 | 11,82V | BVE | 445,386 | 10,7 | BVE | 390,4 | 9,1 | BVE |
| 417,472 | 9,8 | BVE | 438,4 | 11,5 | WUB | Y Peg | | M | W Sgr | | DCEP | 397,4 | 9,1 | BVE |
| 428,352 | 9,8 | SRBR | 445,4 | 12,5 | BVE | 396,4 | 14,34V | BVE | 444,340 | 5,0 | SRBR | 404,3 | 9,0 | BVE |
| 441,336 | 9,7 | SRBR | R Lyr | | SRB | Z Peg | | M | 445,344 | 4,5 | SRBR | 414,4 | 8,5 | GGU |
| 449,366 | 9,8 | BVE | 423,5 | 5,0 | SRBR | 390,5 | 13,2 | BVE | 450,354 | 4,6 | SRBR | 439,4 | 8,5 | WUB |
| S Her | | M | 429,3 | 5,0 | SRBR | 397,4 | 13,2 | BVE | X Sgr | | DCEP | 449,3 | 7,9 | BVE |
| 390,4 | 8,7 | BVE | 439,3 | 5,0 | SRBR | 417,4 | 13,0 | BVE | 450,356 | 4,6 | SRBR | V UMi | | SRB |
| 397,4 | 8,7 | BVE | 444,3 | 4,8 | VUG | 445,4 | 11,9 | BVE | R Sct | | RVA | 395,4 | 7,9 | SRBR |
| 404,4 | 8,3 | BVE | 458,4 | 5,0 | SRBR | RS Peg | | M | 386,431 | 5,9 | CMG | 428,3 | 7,6 | SRBR |
| 417,3 | 8,2 | BVE | W Lyr | | M | 396,4 | 15,03V | BVE | R Ser | | M | 439,3 | 7,7 | SRBR |
| 449,3 | 7,9 | BVE | 390,4 | 10,5 | BVE | RT Peg | | M | 396,4 | 11,45V | BVE | 452,3 | 7,6 | SRBR |
| T Her | | M | 395,5 | 10,8 | SRBR | 390,4 | 11,3 | BVE | 404,4 | 11,9 | BVE | 458,4 | 7,5 | SRBR |
| 389,5 | 10,8 | WUB | 397,4 | 11,0 | BVE | 397,4 | 11,2 | BVE | 449,3 | 7,6 | BVE | 469,3 | 7,5 | SRBR |
| 390,4 | 10,2 | BVE | 417,3 | 12,6 | BVE | 417,4 | 11,1 | BVE | U Ser | | M | Z UMi | | RCB |
| 397,4 | 11,2 | BVE | 439,4 | 12,4 | WUB | 445,4 | 9,7 | BVE | 390,4 | 9,8 | BVE | 390,427 | 11,0 | BVE |
| 417,3 | 12,7 | BVE | 445,3 | 13,0 | BVE | RU Peg | | UGSS+ZZ: | 397,4 | 9,8 | BVE | 397,419 | 11,1 | BVE |
| 439,4 | <13,3 | WUB | 454,3 | 12,1 | WUB | 390,504 | 12,6 | BVE | 404,4 | 10,4 | BVE | 404,397 | 11,0 | BVE |
| 449,3 | 12,8 | BVE | RY Lyr | | M | 397,481 | 12,6 | BVE | BU Tau | | GCAS | 414,395 | 11,1 | GGU |
| 454,3 | 11,8 | WUB | 396,4 | 13,2 | WUB | 417,490 | 12,6 | BVE | 423,5 | 5,4 | SRBR | 449,363 | 11,2 | BVE |
| U Her | | M | 411,4 | 12,3 | WUB | 438,354 | <12,6 | WUB | R UMa | | M | RS Vir | | M |
| 390,4 | 13,1 | BVE | 439,4 | 10,6 | WUB | 445,449 | 12,6 | BVE | 386,4 | <12,5 | WUB | 386,4 | 10,6 | BVE |
| 397,4 | 13,1 | BVE | 454,3 | 10,4 | WUB | RW Peg | | M | 390,4 | 12,7 | BVE | 393,4 | 11,1 | BVE |
| 404,4 | 13,1 | BVE | beta Lyr | | EB | 390,5 | 12,9 | BVE | 397,4 | 12,8 | BVE | 400,4 | 11,2 | BVE |
| 417,3 | 12,1 | BVE | 385,420 | 3,7 | VUG | 397,4 | 12,9 | BVE | 404,3 | 13,0 | BVE | R Vul | | M |
| 449,3 | 11,2 | BVE | 408,394 | 3,9 | VUG | AG Peg | | ZAND | 439,4 | 12,2 | WUB | 396,4 | 10,87V | BVE |
| W Her | | M | 414,374 | 3,7 | VUG | 390,495 | 8,8 | BVE | 449,3 | 11,1 | BVE | 417,4 | 9,1 | BVE |
| 390,4 | 7,8 | BVE | 439,365 | 3,7 | VUG | 397,475 | 8,8 | BVE | S UMa | | M | 438,4 | 8,6 | WUB |
| 395,5 | 8,7 | SRBR | 440,382 | 3,7 | VUG | 417,484 | 8,9 | BVE | 390,4 | 11,6 | BVE | RV Vul | | M |
| 397,4 | 8,2 | BVE | 444,383 | 3,6 | VUG | 445,443 | 8,8 | BVE | 395,4 | 11,3 | SRBR | 396,4 | 16,47V | BVE |
| 404,4 | 8,6 | BVE | R Oph | | M | DG Peg | | M | 397,4 | 10,9 | BVE | PU Vul | | NC |
| 417,3 | 9,0 | BVE | 396,4 | 13,42V | BVE | 390,4 | 10,8 | BVE | 404,4 | 10,4 | BVE | 390,477 | 12,4 | BVE |
| 428,3 | 9,4 | SRBR | S Oph | | M | 397,4 | 11,0 | BVE | 414,4 | 9,9 | GGU | 397,463 | 12,6 | BVE |
| 439,3 | 9,6 | SRBR | 386,4 | 10,2 | BVE | 417,4 | 11,7 | BVE | 428,3 | 9,0 | SRBR | 417,402 | 12,4 | BVE |
| 449,3 | 10,5 | BVE | 393,4 | 11,2 | BVE | 445,4 | 14,0 | BVE | 439,3 | 9,0 | SRBR | 445,389 | 12,4 | BVE |
| 458,4 | 10,8 | SRBR | 417,3 | 11,8 | BVE | LS Peg | | UG: | 449,3 | 8,2 | BVE | | | |
| RS Her | | M | T Oph | | M | 390,496 | 11,8 | BVE | 452,3 | 9,2 | SRBR | | | |



Lichtkromme van R CrB, gebaseerd op de 5924 helderheidsschattingen die de afgelopen 50 jaar door leden van Werkgroep Veranderlijke Sterren zijn verricht.

Light curve of R CrB, based upon the 5924 estimates performed by members of the Dutch Variable Stars Section during the last 50 years.