synoptic astronomical exploration that covers thirty three thousand square degrees of the sky in order discover rare and interesting transient phenomena. The survey utilizes data taken by the three dedicated telescopes of the highly successful Catalina Sky Survey (CSS) NEO project. CRTS detects and openly publishes all transients within minutes of observation so that all astronomers may follow ongoing events. CRTS builds on the work performed for the Palomar Quest survey and continues to pave the way for deeper upcoming transient surveys (LSST), by automating the event discovery and classification processes so that robust decisions can enable intelligent human and robotic follow up.

The AAVSO Photometric All-Sky Survey (APASS)

http://www.aavso.org/apass

APASS is an all-sky photometric survey and a public service to the astronomical community. It was funded through generous contributions from the Robert Martin Ayers Sciences Fund and the AAVSO endowment. Data release 1 of APASS occurred on 2010 September 10, and contained photometry for approximately four million stars distributed among several hundred discrete fields between -10.15 < Dec < +87.35. Data release 2 occurred on 2011 February 10, and included an additional four million stars from the southern hemisphere, acquired from our site at CTIO. Data Release 3 occurred on 2011 August 10, and further extended southern hemisphere coverage. Data Release 4 occurred in early January 2012. Data Release 5 then occurred on 2012 February 21, and Data Release 6 occurred on 2012 June 8. The catalog now contains photometry for 42 million objects in about 95% of the sky.

Kepler Input Catalog (KIC)

http://kepler.nasa.gov/
http://archive.stsci.edu/kepler/kic.html

The Kepler Input Catalog (or KIC) is a publicly searchable database of roughly 13.2 million targets used for the Kepler Spectral Classification Program (SCP) and Kepler. The Kepler Mission, is specifically designed to survey our region of the Milky Way galaxy to discover hundreds of Earth-size and smaller planets in or near the habitable zone and determine how many of the billions of stars in our galaxy have such planets. The KIC, or Kepler Input Catalog, is the primary source of information about objects observed as part of the ground-based Kepler Spectral Classification Program (SCP) in preparation for the selection of Kepler PI and GO targets. The KIC lists objects down to 21mag, but it is not complete to this limit. Light from only about 1/3 of these objects falls on the Kepler CCD detector.

Lincoln Near-Earth Asteroid Research (LINEAR)

http://neo.jpl.nasa.gov/programs/linear.html
https://astroweb.lanl.gov/lineardb

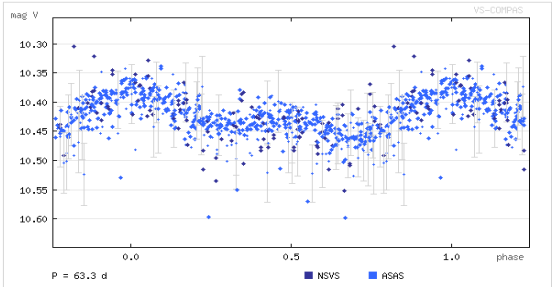
Nearly 5 billion photometric measurements for more than 24 million objects covering a time baseline of about 7 years. Lincoln Near Earth Asteroid Research (LINEAR) is an MIT Lincoln Laboratory program funded by the United States Air Force and NASA. The goal of LINEAR is to demonstrate the application of technology originally developed for the surveillance of Earth orbiting satellites, to the problem of detecting and cataloging near - Earth asteroids — also referred to as near-Earth objects (NEOs) — that threaten the Earth. As a by-product, there is a stellar photometry available.

Obviously, there are more surveys will be conducted in the near future. The presented list of surveys should serve as a good starting point for amateur variable stars researchers.

Ivan Adamin

Variable Stars Observer Bulletin

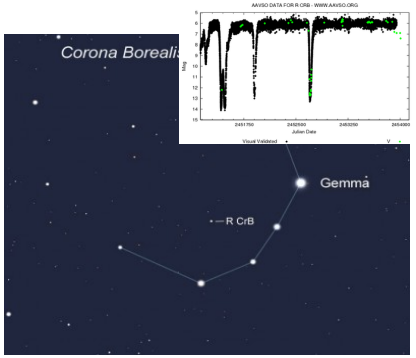
ISSUE HIGHLIGHTS

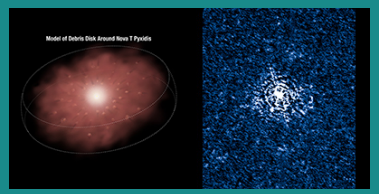


NSVS 15314262 - A new ACV variable

discovered in Canis Major by Aleksandr Ditkovsky, VS-COMPAS team member. It is the sixth-brightest known ACV variable in the constellation. // p.4

What are the R Coronae Borealis stars? // p.12





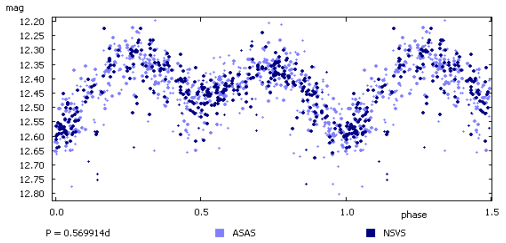
Debris disk detected around T Pyxidis star // p.9

Images Credit: NASA, ESA, A. Crotts, J. Sokoloski, and H. Uthas (Columbia University), and S. Lawrence (Hofstra University)

* images are published for educational purpose

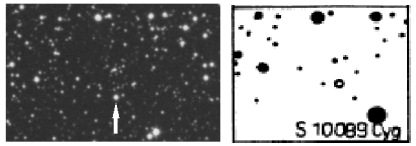
Six new close binary systems with O'Connell effect

As part of the VS-COMPAS research program, here are six new objects proposed for which the presence of O'Connell effect in the light curve is clearly noted. // p.5



NSV 13636 Classification Revised

Being initially referenced by C.Hoffmeister as S 10089 Cyg, a long-periodic suspect, the NSV 13636 was finally resolved to a SRA variable with period of 168.5 days. // p.8



VS-COMPAS Project: variable stars research and data mining. More at **http://vs-compas.belastro.net**

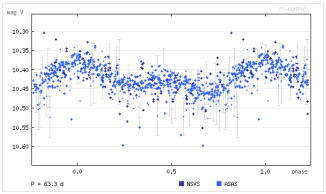
Variable Stars Observer Bulletin
Amateurs' Guide to Variable Stars

July-August 2013 | Issue #1

NSVS 15314262 - A new ACV variable discovered in Canis Major [4]

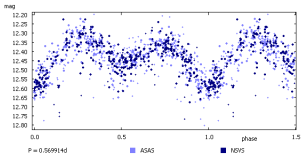
by Ivan Adamin

A new fairly bright ACV variable star has been discovered by Alexandr Ditkovsky recently. With the median nearly 10.42m, it is the sixth-brightest ACV variable in the constellation of Canis Major.



Six new close binary systems with O'Connell effect [5]

by Ivan Adamin



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Elements for two T Tauri variables in Taurus [7]

by Ivan Adamin

There are two T Tauri-alike variable sources were discovered in the constellation of Taurus by the VS-COMPAS team. Elements are refined.

NSV 13636 Classification Revised [8]

by Ivan Adamin

Being initially referenced by C.Hoffmeister as S 10089 Cyg, a long-periodic suspect, the NSV 13636 was finally resolved to a SRA variable with period of 168.5 days.

HST Reveals Debris Disk Around T Pyxidis [9]

by Ivan Adamin

Hubble Space Telescope photographed T Pyx's latest outburst in April 2011, giving a rare look at stellar eruption in details.

Expanding the list of W Virginis variable stars [10]

by Ivan Adamin

As of August 2013, the VSX database contains 252 records of CWA variables with only 32 of them known in the Northern hemisphere. Here are two new CWA stars are presented, discovered by the VS-COMPAS team members: NSVS 13622006 and 2MASS J18144389+5531238.

Bright and interesting Cepheid variable stars [11]

by Ivan Adamin

Cepheids are yellow supergiant pulsating variable stars, which are probably the best-known and important of all pulsating variables. A list of easy to observe cepheids for mid-nothern amateurs.

What are the R Coronae Borealis stars? [12]

by Ivan Adamin

The RCB stars are interesting and important as they represent a short-lived stage of stellar evolution and reveal some detail on dust formation processes.

T Coronae Borealis – a recurrent nova [12]

Magnificient variable exhibit rare outbursts: worth to follow it.

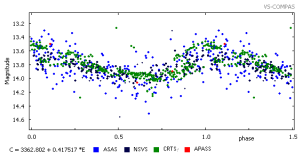
The Blazhko Effect mystery [14]

by Ivan Adamin

The Blazhko effect is a long-term, irregular modulation of the amplitude and period that occurs in some RR Lyrae stars and related pulsating variables The physical origin of the effect remains unknown for over a century.

Six new RR Lyrae stars with Blazhko effect [13]

by Ivan Adamin



As part of VS-COMPAS data-mining program, here are six new pulsating RR Lyrae variables with the presence of the Blazhko effect listed.

Public Photometry Banks as a Source for Data Mining [15]

by Ivan Adamin

Photometric surveys are essential for variable stars science. There are several useful online photometry sources described.

Public Photometry Banks as a Source for Data Mining

Photometric surveys are essential for variable stars science. Nowadays an individual may access publicly available photometry sources for a research instead of maintaining own one. Surveys usually cover a significant area of the sky with millions of light measurements. This provides some advantages and allows a "fast start" though an user is restricted to only a data gathered during a pre-defined period in the past.

There is also a challenging task: since available data belongs to a period in the past (sometimes years ago), it is possible to build a light curve with own equipment and try to enhance a variability period significantly. Being scattered over hundreds or even thousands of possible period cycles apart, the data may be improved and have a stronger quality. This reveals a huge field for automatic research available even to amateur astronomers.

Combining all available data for an object is an important phase of a research. Since every survey may have its own data format and access options, it usually takes quite a bit of time to combine the data from different surveys into one light curve manually. Thus, it is worth to use some purposely built software for aggregation and processing the data. This may significantly reduce the time one would spend on data joining.

There are several useful online photometry sources outside.

Northern Sky Variability Survey (NSVS)

http://skydot.lanl.gov/nsvs/nsvs.php

The Northern Sky Variability Survey (NSVS) is a temporal record of the sky over the optical magnitude range from 8 to 15.5. It was conducted in the course of the first generation Robotic Optical Transient Search Experiment (ROTSE-I) using a robotic system of four co-mounted unfiltered telephoto lenses equipped with CCD cameras. The survey was conducted from Los Alamos, NM, and primarily covers the entire northern sky. Some data in southern fields between declinations 0 and -38 deg is also available, although with fewer epochs and noticeably lesser quality. The NSVS contains light curves for approximately 14 million objects. With a one year baseline and typically 100-500 measurements per object, the NSVS is one of the most extensive records of stellar variability across the bright sky available today. The database provides a cone search interface and online access to light curves.

All Sky Automated Survey (ASAS)

http://www.astrouw.edu.pl/asas/

The All Sky Automated Survey (ASAS) is a low cost Polish project dedicated to constant photometric monitoring of the whole available sky. The project's ultimate goal is detection and investigation of of any kind of the photometric variability. One of the main obectives of ASAS is to find and catalog variable stars. ASAS is implemented on 7 April 1997 to do photometric monitoring of approximately 20 million stars brighter than 14 magnitude all over the sky. The automatic telescopes discovered two new comets in 2004 and 2006. The ASAS-South, located in Chile and ASAS-North, located in Hawai'i, are managed by Grzegorz Pojmanski of the Warsaw University Observatory via the internet.

Catalina Real-Time Transient Survey (CRTS)

http://crts.caltech.edu/

The Catalina Real-Time Transient Survey is a

Here is a resulting table containing basic data about the presented variables.

Object Designation	RA (J2000)	DEC (J2000)	Type	Epoch *	Period	Mag. Range
VSX J092806.8+090728	09 28 06.81	+09 07 28.3	RRAB	4140.837	0.54259	14.05 - 15.04 V
NSVS 10303225	10 43 06.15	+09 03 40.4	RRC	3362.802	0.417517	13.48 - 14.05 V
NSVS 13082928	10 57 31.42	+04 57 03.7	RRC	2732.721	0.348758	13.62 - 14.13 V
CSS_J130739.5+011029	13 07 39.46	+01 10 29.0	RRAB	3464.700	0.636095	15.45 - 15.74 CV
VSX J133154.0+300010	13 31 54.00	+30 00 10.9	RRAB	4923.752	0.500977	13.80 - 14.96 CV
NSVS 10564788	15 07 40.60	+12 41 42.9	RRC	4663.561	0.41189	13.32 - 13.92 V

* Epoch is given as HJD-2450000

Ivan Adamin

The Blazhko Effect mystery

The Blazhko effect is a long-term, irregular modulation of the amplitude and period that occurs in some RR Lyrae stars and related pulsating variables The physical origin of the effect remains unknown for over a century.

RR Lyrae variables are periodic pulsating variable stars with periods of 0.2-1.1 day. They commonly found in globular clusters. The relationship between pulsation period and absolute magnitude of RR Lyraes allows to use them as "standard candles" for distance measurements to relatively near objects, particularly within the Milky Way. Having similar light curve properties to Cepheids, the RR Lyraes became distinct from them in the first half of the XX century due to shorter periods and differing locations within the galaxy. Moreover, their chemical differences and metal-poor nature means they are old Population II stars.

Sergey Blazhko (1870 – 1956), a Russian and Soviet astronomer, was the first to report this phenomenon in 1907 for RW Dra.

In 2010, interesting news came from the data analysis of the Kepler spacecraft mission. For V808 Cyg and V355 Lyr stars (which are RR Lyrae stars), the was the first detection of the period doubling phenomenon is reported. Remarkably, both of these stars exhibit Blazhko modulation as well.

The most plausible theories to explain the phenomenon mostly focus on two types of models, both involving non-radial pulsation components: the resonance models and the magnetic models. There is also the third model which assumes that cycles in the convection cause the alternations and the modulations.

More on the subject can be read in the Doug Welch's article called "The (Now) Less Mysterious Blazhko Effect in RR Lyrae Variables" and "Does Kepler unveil the mystery of the Blazhko effect?" (Szabo et al., 2010).

The role of amateurs in variable stars science advancement

Undoubtedly, amateurs always played a significant role in the field of variable stars astronomy. It is true that the major science and theory is advancing by professionals to a level where amateurs cannot contribute much. But there is a case and a space for those who is interested in data collecting, objects monitoring and even analyzing the data.

Without that activity, there will be less chances for professionals to find data they need. The reason is simple. Variable stars, as everything else in astronomy, need to be constantly monitored to obtain enough data to analyze. Obviously, the number of variable stars is so huge, so it is only possible to follow them by accumulating of efforts of thousands volunteers, who can dedicate plenty of their time, energy and hardware to help in expanding the data base.

Indeed, now amateurs have not only telescopes, but advanced CCD cameras, instant online access to the data and powerful computers. With all of these combined, there is a new direction of activity emerging in the variable stars science field called *data mining*. Data mining is all about the extraction of useful data from a large data archives.

It is the time of digital sky surveys and automated analysis. Just a couple of decades ago anyone who was seeking for a particular star data would have needed to open a paper catalog or a scientific publications index to obtain the data. With no guarantee that the object is even listed there. Nowadays, it will take a few seconds to get the whole list of observations and build a light curve. Even if those photometric measurements have been recently conducted on the space telescope. Isn't that amazing? It is.

The very neat thing is that surveys' data is available online for amateur astronomers. Thousands of people across the globe can do their small piece of job making the overall progress in database fulfillment. Photometry submission was never so easy and powerful, where an object can be monitored 24 hours a day, if needed, conducting from different places on Earth.

Someone may ask here: Hey, I know that! What else? The answer is: there are always people who are beginners. It is important for scientists to capture their attention and guide them through the jungles of scientific data. It is the key of making progress in the future.

Taking all that into consideration, we decided to start a journey by issuing a bulletin, where simplified contemporary data on variable stars science can be found. Hopefully, this undertaking will be useful for people who wants to expand their background in the field. One may say that «the world doesn't need one more bulletin, there are plenty of data can be found using the famous search engine and books» :) No attempt means no result. At least, we'll never know till we try …

Ivan Adamin

The VS-COMPAS Project

The project was started in fall of 2011 by four amateur astronomers from Belarus. The main intention is to expand the International Variable Star Index (VSX) catalog with new variable stars, variable stars data analysis and research. Among the most significant achievements it is worth to mention more than 1150 variable stars discovered by combined efforts of seven active team members. All data about discovered stars is submitted to the VSX catalog running by the AAVSO. Another valuable goal the project has is increasing public interest to variable stars science.

More information about the team and discoveries can be found at http://vs-compas.belastro.net

NSVS 15314262 - A new ACV variable discovered in Canis Major

A new fairly bright ACV variable star has been discovered by Alexandr Ditkovsky recently. With the median nearly 10.42m, it is the sixth-brightest ACV variable in the constellation of Canis Major.

NSVS 15314262 (ACV)	
AAVSO UID:	000-BKV-399
Constellation:	Canis Major
J2000.0:	07 15 31.92 -15 05 20.5
Mag. range:	10.38 - 10.47 V
Epoch:	HJD 2453077.00 (12 Mar 2004)
Period:	63.29 days

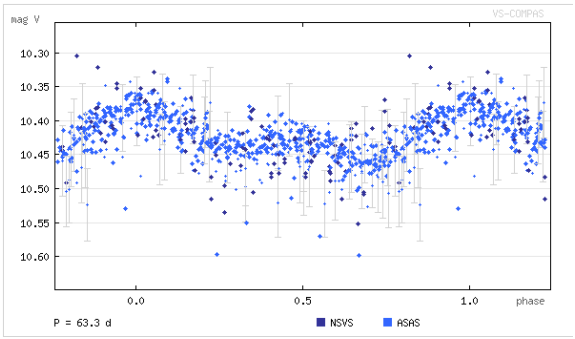
Preliminarily, ASAS-3 data shows the magnitude range of 10.37-10.47m with a period of 63.29 days. Due to peculiar physical properties of these variables one can see a very distinctive light curve with a bump. Available photometric data is quite clear with reasonable error value and covers full cycle many times, so the folded curve is complete and reliable at 63.29 days period.

It is believed the powerful magnetic field of an α^2 CVn star gives rise to different compositions and brightness at different parts of the stellar surface. ACV is a type of rotating variable, also known as a spectrum *peculiar A* variable (Ap). Their magnetic activity was revealed in 1946, when Horace Babcock discovered a strong magnetic field in the Ap star 78 Virginis. Unlike the Sun, which magnetic field is produced by a dynamo effect in the convective outer layers of the star, in sun-spots area, Ap stars are mostly modeled using strong dipole magnetic field.

Currently there are more than 500 known ACV variables in the VSX database. Most of them are brighter than 10.5m.

Alpha2 Canum Venaticorum (ACV) variables

According to GCVS classification, ACVs are main-sequence stars with spectral types B8p-A7p and displaying strong magnetic fields. Spectra show abnormally strong lines of Si, Sr, Cr, and rare earths whose intensities vary with rotation.



NSVS 15314262. Folded light curve.
M = *HJD* 2453077.0 + 63.29 * E.
by Alexandr Ditkovsky (VS-COMPAS)

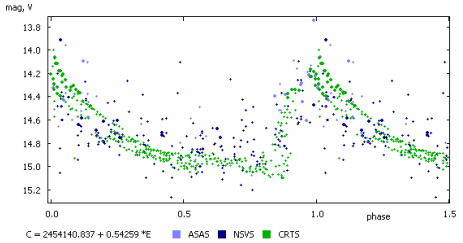
ACVs exhibit magnetic field and brightness changes, periods of 0.5-160 days or more. The amplitudes of the brightness changes are usually within 0.01-0.1 mag in V. The type-star which this class is named after is α^2 Canum Venaticorum, its brightness fluctuates by 0.14m with a period of 5.47 days.

Ivan Adamin

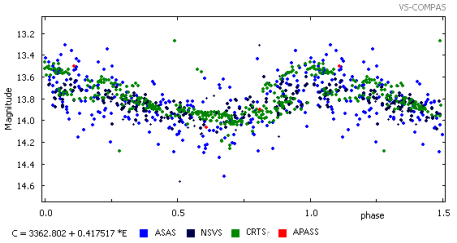
Six new RR Lyrae stars with Blazhko effect

As part of VS-COMPAS data-mining program, here are six new pulsating RR Lyrae variables with the presence of the Blazhko effect listed. The research result on these objects is submitted to the VSX catalog for the first time by the VS-COMPAS team members. Photometric data from publicly available surveys (NSVS, CRTS, ASAS) was used as a source for light curves.

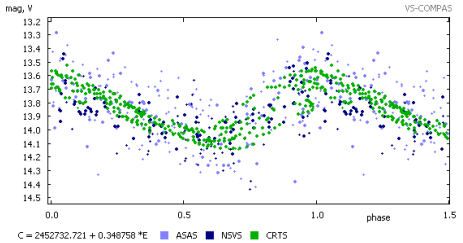
Below each object is presented along with the resulting folded light curve and some notes, if any.



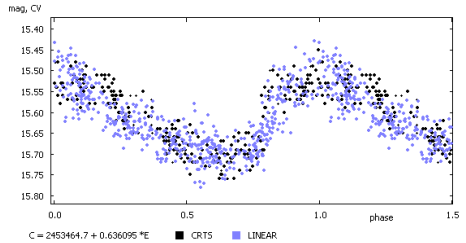
VSX J092806.8+090728 in Leo
by Alexandr Ditkovsky (VS-COMPAS)
J-K = 0.23



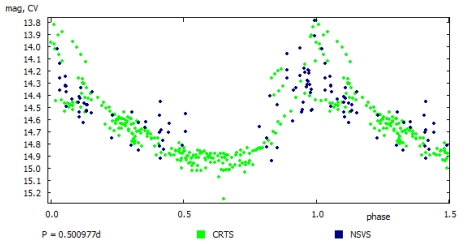
NSVS 10303225 in Leo
by Alexandr Ditkovsky (VS-COMPAS)
NSVS and ASAS-3 data are contaminated by 2MASS J10430453+0903402 (V= 14.9, sep. 24").
Data has been deblended. J-K= 0.23



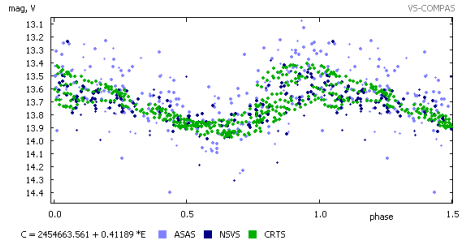
NSVS 13082928 in Leo
by Alexandr Ditkovsky (VS-COMPAS)
J-K = 0.238



CSS_J130739.5+011029 in Virgo
by Andrey Prokopovich, Ivan Adamin (VS-COMPAS)
J-K = 0.2. Secondary period is 0.62179



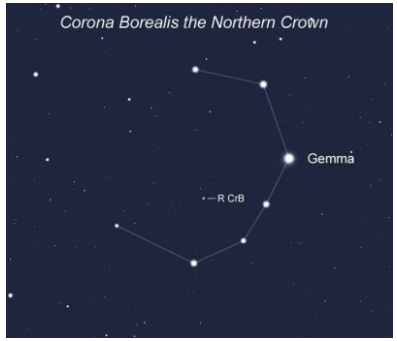
VSX J133154.0+300010 in Canes Venatici
by Alexandr Ditkovsky (VS-COMPAS)



NSVS 10564788 in Bootes
by Alexandr Ditkovsky (VS-COMPAS)
J-K= 0.214

What are the R Coronae Borealis stars?

The RCB stars are interesting and important as they represent a short-lived stage of stellar evolution and reveal some detail on dust formation processes. Thus, R Coronae Borealis and other RCB stars are quite unusual and worthy of much attention. Since the Pigott's first observation, only about 100 RCB variables have been discovered, making this class a very rare kind of variable stars.

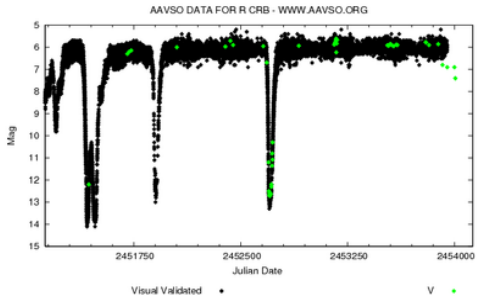


English amateur Edward Pigott was the first to notice **R Coronae Borealis**' (R CrB) peculiarity of fading down, in 1795, while most of other variables outbursts by brightening. RCB stars are yellow supergiants usually ten thousand times as bright as the sun. Their atmospheres are rich in helium and carbon.

These stars spend most of their time at the brightest magnitude and then unpredictably turns faint down by up to 6-8m! The current fading is the deepest and longest on the record.

Edward Pigott (1753 – 1825) was an English astronomer who left a considerable contribution to the science. Working as an astronomer with his father, he observed Jupiter's satellites and the transit of Venus of 3 June 1769. On 23 March 1779 he discovered a nebula in the constellation of Coma Berenices, which later became known as M64. Notably, this discovery occurred just 12 days before that by Bode and almost a year before Charles Messier independently reported of the same object. In 1784 Edward Pigott detected the variability of Eta Aquilae, the first known representative of Delta Cephei stars.

There are more questions than answers in models shedding light on carbon dust formation near the R Coronae Borealis stars. Two models have been proposed, but there is definitely much of research ahead.



Among other notable RCB stars are:
DY Persei, U Aquarii, UX Antliae, W Mensae, RY Sagittarii, V854 Centauri.

T Coronae Borealis – a recurrent nova

Not far from the magnificient R CrB, there is an interesting variable star with the opposite behavior. T Coronae Borealis is a recurring nova. It spends decades at 10th magnitude, then rises its brightness to 2nd or 3rd magnitude. Its last eruptions came in 1866 and 1946. The next could happen any time, so it is important to monitor it.

Ivan Adamin

Six new close binary systems with O'Connell effect

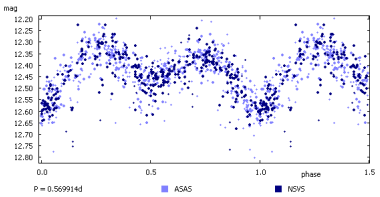
As part of the VS-COMPAS research program, here are six new objects proposed for which the presence of O'Connell effect in the light curve is clearly noted. All of them are short-periodic close binaries of EW type, except one: NSVS 3878776 is an interesting Beta Lyrae-like system.

The prototype of EW variables is an eclipsing binary with period less than a day. Like Beta Lyrae stars, the light curve varies continuously, but the depths of the minima are usually similar, though rarely exactly identical. Systems that exhibit such light curves are considered to be close or "contact" binaries. The characteristic shape of an eclipsing binary light curve consists of two out-of-eclipse maxima and two mid-eclipse minima.

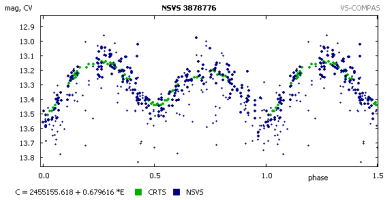
Some EW stars are suspected of being magnetically active because the primary and secondary maxima in the light curves have different magnitudes. This phenomenon sometimes referred to as the "O'Connell effect", which can be found in many close binary systems, but often in W-type UMa systems. Some theoretical models for explaining the O'Connell effect of close binary stars are based on the hypothesis that the circumstellar material of a binary system is captured by its components.

So far, this asymmetry has not been convincingly explained aside from a few individual systems. Most theories attribute the O'Connell effect to phenomena such as starspots, clouds of circumstellar gas and dust, or a hot spot caused by the impact of a mass-transferring gas stream.

For more detailed theoretical analysis of the effect, please refer to the following paper: "Revisiting the O'Connell Effect in Eclipsing Binary Systems" (Wilsey, Beaky; 2009).



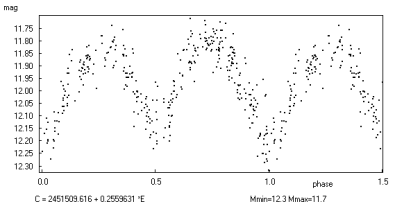
VSX J044611.7-072815 in Eridanus (EW)
by Andrey Prokopovich, Ivan Adamin (VS-COMPAS)



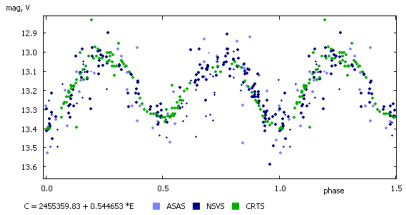
NSVS 3878776 in Andromeda (EB)
by Alexandr Ditkovsky (VS-COMPAS)

Here six binary systems with O'Connell effect are presented, object by object. The light curves are combined using photometric data from different public surveys, such as NSVS, ASAS, CRTS. Such an approach allows to use observation points from different time range, increasing the accuracy of period determination by covering more cycles.

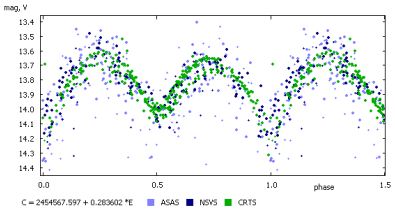
NSVS 3878776 is a EB binary orbiting at 0.67962 days period. The secondary minimum is 13.44 CV, while the primary is 13.55 CV. The next EW - NSVS 8817984 - is from Pegasus and has orbital period of 0.544653d. The light curve shows 13.0 - 13.4 visual magnitude range. The NSVS 4316778 is possibly identical to the X-ray source 1RXS J045947.1+492512 (located 20" NE).



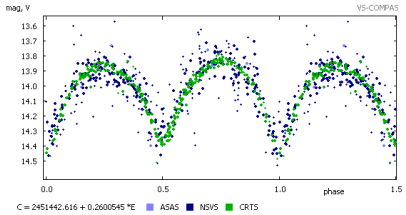
NSVS 4316778 in Auriga (EW)
by Andrey Prokopovich, Ivan Adamin (VS-COMPAS)



NSVS 8817984 in Pegasus (EW)
by Valery Tsehmeystrenko (VS-COMPAS)



NSVS 13003351 in Sextant (EW/RS)
by Alexandr Ditkovsky (VS-COMPAS)



NSVS 6260959 in Pegasus (EW)
by Valery Tsehmeystrenko (VS-COMPAS)

The last two objects are EWs with similar periods: 0.283602 days for NSVS 13003351 and 0.260055 days for NSVS 6260959. Both stars as bright as 13.8 visually.

Mentioned stars were discovered and analyzed by the VS-COMPAS team members as a part of their photometric surveys data mining program (please, refer to the project's website for details: http://vs-compas.belastro.net).

All the data about these binaries is submitted to the VSX catalog, so the objects are available for further research publicly. Magnitudes for Max I and Max II extrema are given to prove the O'Connell effect.

Object Designation	RA (J2000)	DEC (J2000)	Type	Epoch *	Period	Max I	Max II
NSVS 3878776	01 36 13.87	+47 31 07.4	EB	5155.61800	0.679616	13.15CV	13.25CV
VSX J044611.7-072815	04 46 11.79	-07 28 15.2	EW	3704.75300	0.569914	12.32 V	12.36 V
NSVS 4316778	04 59 45.33	+49 25 03.2	EW	1509.61600	0.255963	11.85R1	11.80R1
NSVS 13003351	09 57 47.50	+06 03 19.0	EW/RS	4567.59700	0.283602	13.60 V	13.70 V
NSVS 8817984	22 14 37.86	+28 17 23.1	EW	5359.83000	0.544653	13.00 V	13.10 V
NSVS 6260959	23 29 13.15	+28 23 11.3	EW	1442.61600	0.260055	13.85 V	13.80 V

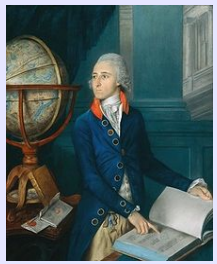
* Epoch is given as HJD-2450000

Ivan Adamin

Bright and interesting Cepheids

Cepheids are yellow supergiant pulsating variable stars, which are probably the best-known and important of all pulsating variables. Generally, Cepheids have large amplitudes, making it possible to find them even in distant galaxies. The reason Cepheids change their brightness is believed due to pulsations mechanizm.

The term *cepheid* originates from Delta Cephei in the constellation Cepheus, identified by John Goodricke in 1784. But, historically, the first known representative of the class of Classical Cepheid variables is Eta Aquilae which variability was detected on September 10, 1784 by Edward Pigott (1753 – 1825).



John Goodricke (1764 – 1786) was an extraordinary amateur astronomer. Since early childhood, he was deaf due to a severe illness. By that time, several stars were only known as variables. Among them, the Algol (Beta Persei).

He made a suggestion that apparent magnitude is changing due to eclipsing nature of the satellite motion, means the star has a companion. Years later it was confirmed, and similar variables is now known as eclipsing binaries. Goodricke was elected a Fellow of the Royal Society on 16 April 1786, but died just four days later...

Cepheids are mostly known for their period-luminosity relation discovered by Henrietta Leavitt in 1908 (published in 1912), as a result of investigation of hundreds of variable stars in the Magellanic Clouds. This important relation allowed to measure distance within the Universe.

The closest Cepheid is Polaris, but its range in visual band is only 0.02 magnitude. The Hipparcos satellite measured Polaris' parallax to be 0.00756 arc sec, giving the distance about 430 light years.

The table on the right is the list of the most interesting and easy to observe Cepheids visible from mid-nothern latitudes.

Ivan Adamin

Star	HD #	Mag. Range (V)	Period
α UMi	8890	1.86 – 2.13	3.9696
T Mon	44990	5.58 – 6.62	27.024649
RT Aur	45412	5.00 – 5.82	3.728115
ζ Gem	52973	3.62 - 4.18	10.15073
X Sgr	161592	4.20 – 4.90	7.01283
W Sgr	164975	4.29 – 5.14	7.59503
SU Cyg	186688	6.44 – 7.22	3.845547
FF Aql	176155	5.18 – 5.68	4.470916
S Vul	338867	8.69 – 9.42	68.464
V473 Lyr	180583	6.00 – 6.35	1.49078
SV Vul	187921	6.72 – 7.79	45.0121
η Aql	187929	3.48 – 4.39	7.176641
S Sge	188727	5.24 – 6.04	8.382086
X Cyg	197572	5.85 – 6.91	16.386332
T Vul	198726	5.41 – 6.09	4.435462
δ Cep	213306	3.48 – 4.37	5.366341

Expanding the list of W Virginis variable stars

As of August 2013, the VSX database contains 252 records of CWA variables with only 32 of them known in the Northern hemisphere. Here are two new CWA stars are presented, discovered by the VS-COMPAS team members: NSVS 13622006 and 2MASS J18144389+5531238.

W Virginis variables are a subclass of Type II Cepheids which exhibit pulsation periods more than 8 days. They were first recognized as being distinct from classical Cepheids by Walter Baade in 1942, in a study of Cepheids in the Andromeda Galaxy that proposed that stars in that galaxy were of two populations. The variability of W Virginis itself was discovered by Eduard Schönfeld, assistant to Argelander, in 1866.

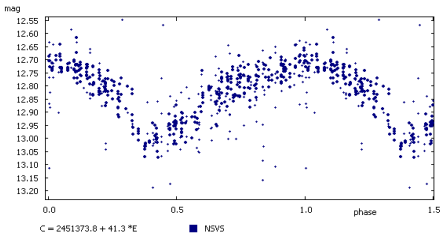
Most of known, nearly 85%, CWA variables have periods less than 25 days. VS-COMPAS team found two new W Virginis variables with periods 38.56 and 41.3 days. Only 11 confirmed CWA stars in the whole VSX database have periods larger than 35 days, means those objects found recently are at least notable ones.

2MASS J18144389+5531238 (see the folded light curve on the right) in the constellation of Draco has a period of 41.3 days. The stars with periods greater than 20 days often have RV Tauri characteristics, and it is difficult to distinguish W Virginis, RV Tauri and SRd variables.

Below you can find some details about two presented CWA stars. NSVS 13622006 exhibits quite a large amplitude of 1.0m in visual band.

Walter Baade
(1893 – 1960) - a German astronomer. During his work at Mount Wilson Observatory he resolved stars in the center of the Andromeda galaxy for the first time. This led him to define distinct "populations" for stars: Population I and Population II.


Wilhelm Walter Baade
1893-1960



2MASS J18144389+5531238
with the period of 41.3 days shows a typical "flat-topped" curve.
by Ivan Sergey, Andrey Prokopovich

Object Designation	RA (J2000)	DEC (J2000)	Type	Epoch *	Period	Mag. Range
NSVS 13622006	17 03 08.72	-05 18 50.2	CWA	1341.0	38.56	13.8 - 14.8 V
2MASS J18144389+5531238	18 14 43.90	+55 31 23.8	CWA	1373.8	41.3	12.68 - 13.02 R1

* Epoch is given as HJD-2450000

Ivan Adamin

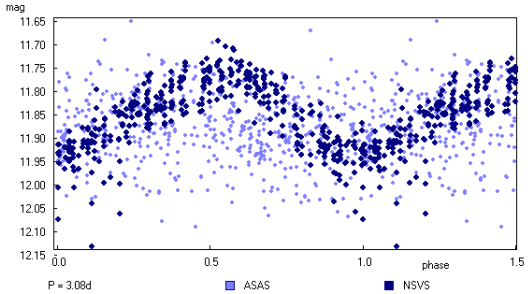
Elements for two T Tauri variables in Taurus

Photometric elements for two T Tauri-alike variable sources in the constellation of Taurus were refined by the VS-COMPAS team.

T Tauri itself is the prototype for a class of very young stars, still in the process of gravitational contraction; that is, they have yet to evolve to reach the main sequence. These are pre–main sequence stars – the youngest visible of F, G, K, M spectral type.

2MASS J05003003+1723591 (WTTS/ROT)	
AAVSO UID:	000-BKG-285
Constellation:	Taurus
J2000.0:	05 00 30.04 +17 23 59.2
Mag. range:	11.78 - 11.93 V
Epoch:	HJD 2451594.56 (20 Feb 2000)
Period:	3.08 days

Target stars are VSX J034605.3+292034 and a Weak-line T Tauri star 2MASS J05003003+1723591. For VSX J034605.3+292034, there is a possible flare at HJD = 2454743 that reaches 12.05 in CRTS data. The star is present in "Compiled catalog of Per OB2 star forming complex" (Belikov+, 2002).



2MASS J05003003+1723591 (WTTS/ROT). Period is 3.08 days.
by Andrey Prokopovich, Ivan Adamin (VS-COMPAS), Sebastian Otero

Mean magnitude changes in ASAS-3 data and the period may be slightly different between datasets for 2MASS J05003003+1723591 (WTTS/ROT), which is a Weak-line T Tauri star. Type is derived from 1998A&AS..132..173L. Spectral type is confirmed to be G5IV. The brightness varies between 11.78 and 11.93 V. Rotational period believed to be 3.08 days, according to the NSVS data.

Roughly half of T Tauri stars have circumstellar disks, which in this case are called protoplanetary discs because they are probably the progenitors of planetary systems like the solar system. Circumstellar discs are estimated to dissipate on timescales of up to 10 million years. Most T Tauri stars are in binary star systems. In various stages of their life, they are called Young Stellar Objects (YSOs).

Ivan Adamin

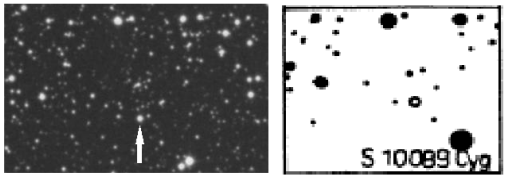
NSV 13636 Classification Revised

Being initially referenced by C.Hoffmeister as S 10089 Cyg, a long-periodic suspect, the NSV 13636 was finally resolved to SRA variable with period of 168.5 days.

NSV 13636 (SRA)	
AAVSO UID:	000-BLC-565
Constellation:	Cygnus
J2000.0:	21 16 54.19 +41 33 56.1
Mag. range:	14.4 - <15.4 V
Epoch:	HJD 2451631.0 (27 Mar 2000)
Period:	168.5 days

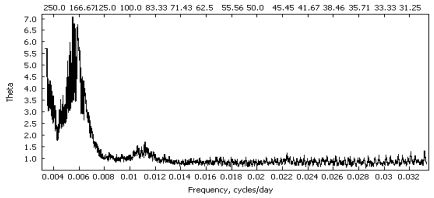
The NSVS 5897136 photometric data set was initially pointed out by Ivan Adamin as the red object worth to revise back in 2012.

Hoffmeister, in his "Mitteilungen über neuentdeckte Veränderliche Sterne" (1967), referenced the object called S 10089 Cyg (J1855.0: RA = 21h 11.4m; DEC = +40° 58') as a long-period variable, but no precise type or period were declared. Though there was a finding chart published in the same paper, related to the "Field 20h58m+44°" (Epoch 1855.0) in Cygnus, which is quite close to the famous planetary nebula NGC 7027.



Hoffmeister's finding chart for **S 10089 Cyg** (right) and the DSS chart for **NSV 13636** (left)

Comparing Hoffmeister's chart with the DSS plate for the mentioned region one can unambiguously figure out that S 10089 Cyg, NSVS 5897136 and NSV 13636 is exactly the same object referenced by different names.



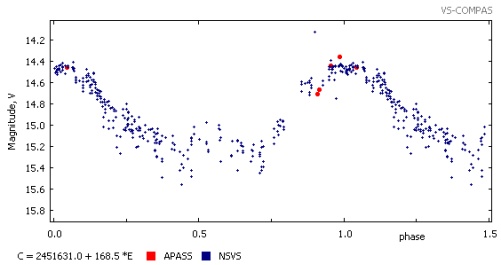
Periodogram for the **NSV 13636** data.

A period search was performed on the NSVS data by Siarhey Hadon (VS-COMPAS project). Calculated periodogram has a strong peak around 168.5 days. This period has a good match with a contemporary data from the APASS survey, conducted by the AAVSO.

Moreover, APASS data was obtained around the maximum brightness, giving a good match with the NSVS photometry. The star is in highly populated area in Cygnus, means there are some close neighbors around contaminating the light for wide-angle optics.

Particularly, the NSVS magnitudes of are contaminated by the following stars:

1) **2MASS J21165325+4133591**
J-K= 1.59, V= 17.1, sep. 9"
2) **2MASS J21165635+4134093**
J-K= 0.24, V= 16.6, sep. 27"
3) **2MASS J21165663+4133582**
J-K= 0.28, V= 17.5, sep. 28"
4) **2MASS J21165651+4134144**
J-K= 0.71, V= 17.5, sep. 32".



NSV 13636 in Cygnus. Period is 168.5 days
by Ivan Adamin, Siarhey Hadon (VS-COMPAS)

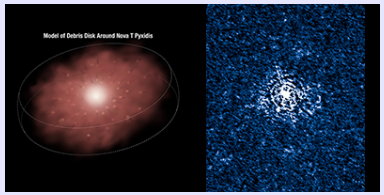
To get the real magnitude range, there was a deblending method applied to the light curve data. This is allowed to get a better estimate for the minima. The VSX record for NSV 13636 was updated with the new data, so NSV 13636 joined the ranks of known variable stars.

This is a good candidate to complement the list of 177 other NSV records listed in the "Confirmation of 177 objects in the New Suspected Variables Catalogue as red long period variables" (Greaves, 2006), though Greaves processed ASAS3 time series data. NSV 13636 was not covered by ASAS3 survey, unfortunately.

Ivan Adamin

HST Reveals Debris Disk Around T Pyxidis

T Pyx is a recurrent nova, erupting every 12 to 50 years and ejecting material that has formed the disk around the bright star. Hubble Space Telescope photographed T Pyx's latest outburst in April 2011, giving a rare look at stellar eruption in details.



Debris disk around T Pyxidis star

Credit: NASA, ESA, A. Crotts, J. Sokoloski, H. Uthas (Columbia University), and S. Lawrence (Hofstra University)

The light echo after explosion in the double-star system reveals that material ejected by previous T Pyx outbursts is sticking around the star and form a debris disk. The study represents the first time the area around an erupting star has been mapped in three dimensions, researchers said. According to their measurements, the debris disk is about 1 light-year wide.

The erupting T Pyx star is a white dwarf, the burned-out core of a star much like our own sun.

White dwarfs are small but dense objects. Imagine the mass of the sun packed into a volume the size of Earth. The system is binary, hence has a companion star. The believed reason of the explosion is a high volume of hydrogen on the white dwarf's surface built up by accretion from a companion star.

Typical outbursts increase T Pyx's brightness ten thousand times over a single day. Apart from the 2011 event, eruptions were registered in 1890, 1902, 1920, 1944, and 1966 The new HST observations also help refine the distance to the star: about 15600 light-years from Earth.

Ivan Adamin