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New and confirmed cepheid variables found in the NSVS and ASAS-3 databases

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Abstract:
A search for variable stars in the NSVS and ASAS-3 databases resulted in the discovery or confirmation of seven pulsating variables of the CW or DCEP types.

Methodology

The public data release from the Northern Sky Variability Survey (NSVS; Wozniak et al., 2004) was search for variable stars using the SQL interface available from the Skydot website (http://skydot.lanl.gov/nsvs/nsvs.php). Stars were selected on the basis of a number of statistical criteria as explained in Otero et al. (2004). The stars needed to have at least 80 data points, and a significantly larger standard deviation compared to the average value for their magnitude and the skewness calculated from a star's magnitudes had to be smaller than 1 (making it easier to find stars that spend more time at minimum than at maximum). Standard flagged data and data with the APINCOMPL mask set (Wozniak et al., 2004) were not taken into account during these calculations.
Also data for stars in the New Catalogue of Suspected Variable Stars (NSV) (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovetz et al., 1998) were checked against the ASAS-3 database (Pojmanski, 2002) to confirm their suspected variability. The cepheid nature of two of the stars in this paper (NSV 3571 and NSV 9046) was discovered that way.
Periods were found with AVE (Barberá, 1996) and then refined using Microsoft Excel. Elements were determined from the folded ligthcurves using all the available data combined as a single dataset. The time span of the observations varies depending on the star, but NSVS observations were taken in 1999 and 2000 while ASAS-3 data span from the year 2000 to the present. The accuracy of the elements given depends on the quality and quantity of the observations. The formula given in Lenz and Breger (2005) was adopted as a first step to determine the errors for the periods found but the resulting values were far too optimistic. The original photometric errors were underestimated by a factor of two or three in the original publications as became evident in the folded lightcurves. The total scatter in magnitudes was used instead of the magnitude uncertainty:

(sqrt(6/N)*scatter on mag/semi-amplitude/pi/T)*P^2

where **N** = number of data points; **T** = time span of the observations and **P** = period.

The new error values for all the stars were empirically checked against the phase plots and were more realistic. This seems to be a useful way to derive errors for datasets containing individual data points from different nights and not from a single night lightcurve.
Epochs were also determined from the phase plots and are uncertain for stars with flat maxima.
The aim of this paper is to present and classify these stars. Further study will help improve these provisional elements.

Results

Table 1 gives positions and cross-identifications for all the variables. The first column gives the star's number in this paper. The following columns give the ASAS or NSVS identifier; the GSC number; a GCVS name if available and the star's position according to the NOMAD catalogue (Zacharias et al., 2005).

Table 1 – Positions and cross-identifications for the seven cepheids studied

#	Star Name			NOMAD position (J2000.0)
	ASAS/NSVS ID	GSC ID	GCVS ID	
1	NSVS 71579	GSC 4621-0688	New	04 56 53.16 +85 28 23.4
2	NSVS 6848896	GSC 2388-0772	New	05 03 29.65 +31 09 41.7
3	ASAS 072315-2943.3	GSC 6549-2823	NSV 3571	07 23 15.15 -29 43 20.8
4	NSVS 103348	GSC 4547-1890	New	09 24 14.77 +81 13 28.5
5	ASAS 173122-1743.7		NSV 9046	17 31 21.88 -17 43 39.5
6	ASAS 192007+1247.7	GSC 1050-0361	New	19 20 06.95 +12 47 43.0
7	NSVS 141961	GSC 4613-1113	New	23 05 59.02 +81 10 42.4

Table 2 lists the elements and data for the seven cepheids found. The first column gives the star's number in this paper. The other columns give the brightness range of the variable; the passband of the observations (V for ASAS-V magnitudes and R1 for ROTSE1 magnitudes); the variability type; the period; the epoch of maximum light derived from the complete dataset; the number of observations used for the analysis; the time span of the observations and the J-K color from the 2MASS catalogue.

Table 2 – Elements and data for the seven cepheids studied

#	Magnitude range		Filt	Type	Period (days)	Epoch (HJD)	Number Obs.	Time span (days) + years of obs.	J-K
	Max	Min							
1	12.7	13.3	R1	CWA	20.95(9)	2451353.8(4)	81	138 (1999)	0.80
2	11.60	12.10	R1	CWA	16.98(3)	2451444.3(9)	237	233 (1999-2000)	0.91
3	12.5	13.25	V	DCEP	3.3363(2)	2452496.49(4)	248	2023 (2000-2006)	0.48
4	14.05	14.9	R1	CWB	1.8118(3)	2451449.82(3)	637	359 (1999-2000)	0.44
5	13.35	14.6	V	CWB	1.17156(2)	2452463.615(9)	169	2323 (1999-2005)	0.54
6	10.21	10.60	V	CW	8.6274(6)	2452915.6(6)	231	1848 (1999-2004)	0.85
7	12.45	12.7	R1	CWA	45.35(15)	2451379(1)	682	341 (1999-2000)	0.77

Notes and other cross-identifications for individual stars:

#1 – 2MASS J04565325+8528232

#2 – 1RXS J050328.9+310955 = UCAC2 42717226 = 2MASS J05032964+3109416

#3 – AN 845.1936 = HV 08082 = 2MASS J07231515-2943208 = UCAC2 19338235

#4 – NSVS 844618 = NSVS 760484 = NSVS 722462 = 2MASS J09241476+8113284

#5 – NSVS 16594505 = HV 03958 = 2MASS J17312188-1743394 = UCAC2 25125897

#6 – BD+12 3884 = MSX6C G047.5638-00.4203 = NSVS 11164699 = 2MASS J19200694+1247429 = UCAC2 36348612. Classified as DCEP-FU in the ASAS catalogue with a period of 8.627245 d.

#7 – NSVS 1422651 = 2MASS J23055895+8110421

Figures 1 to 7 show the lightcurves of all the cepheids studied in this paper.

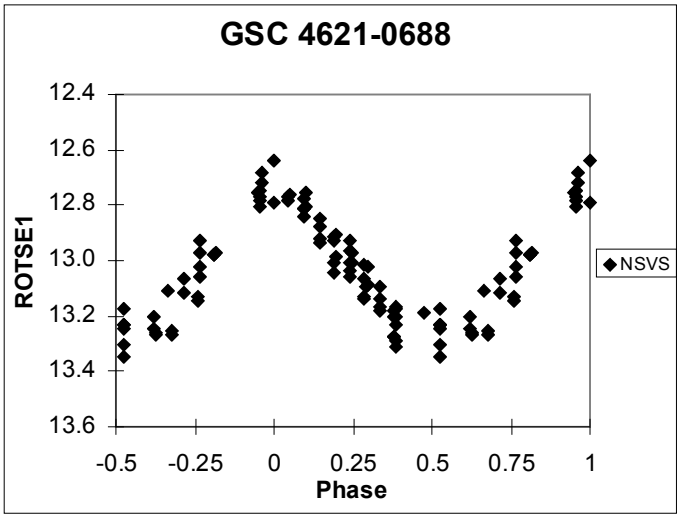

Fig. 1 – Lightcurve of GSC 4621-0688

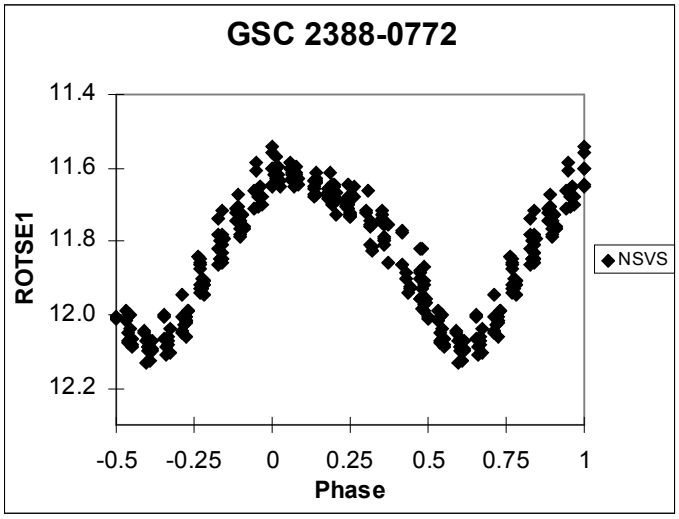

Fig. 2 – Lightcurve of GSC 2388-0772

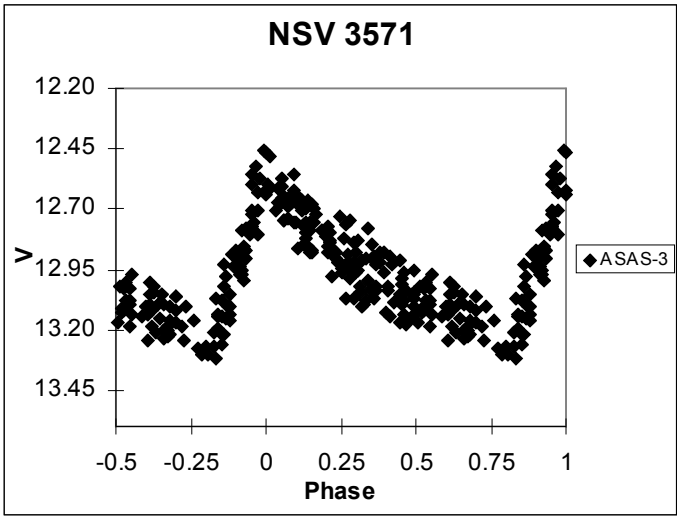

Fig. 3 – Lightcurve of NSV 3571

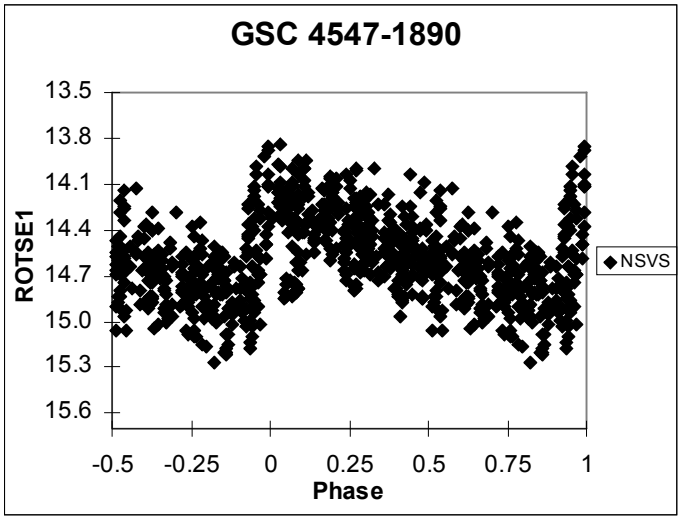

Fig. 4 – Lightcurve of GSC 4547-1890

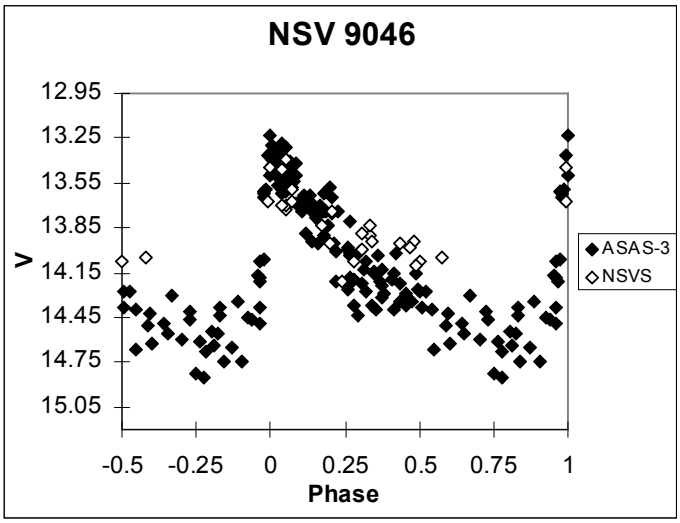

Fig. 5 – Lightcurve of NSV 9046

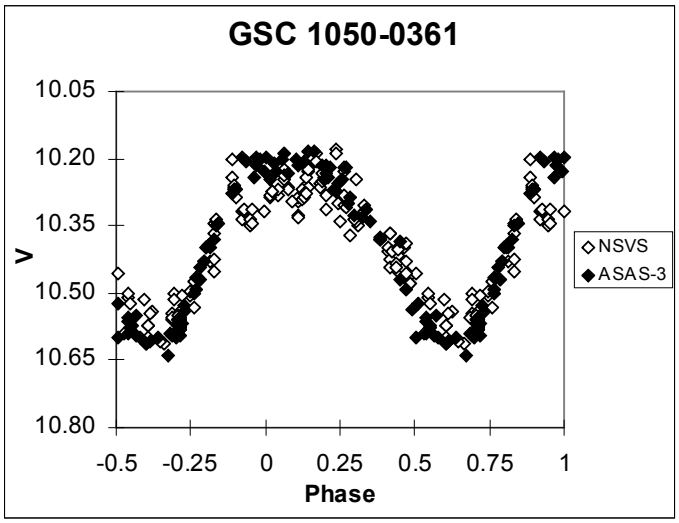

Fig. 6 – Lightcurve of GSC 1050-0361

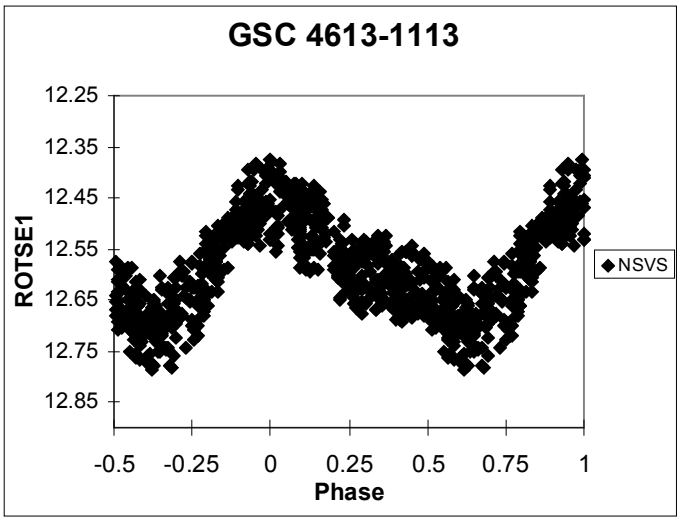

Fig. 7 – Lightcurve of GSC 4613-1113

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