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NEW GALACTIC DOUBLE PERIODIC VARIABLES

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We have searched the ASAS[1] catalogue of semi-detached eclipsing binaries (Pojmański 1997) for interacting binaries of the type Double Periodic Variable (DPV). These are intermediate-mass binaries characterized by a long photometric period lasting about 33 times the orbital period (Mennickent et al. 2003, 2012a, 2013, Poleski et al. 2010). This long periodicity has been interpreted as evidence of mass loss cycles (Mennickent et al. 2008, 2012b). We performed a visual inspection of the light curves provided by ASAS, and selected DPV candidates characterized by long-term tendencies in the upper and lower boundaries of the forest of data points. We determined the orbital and long periods by using the PDM IRAF[2] program (Stellingwerf 1978). Errors for the orbital periods were estimated by visually inspecting the light curves phased with trial periods near the minimum of the periodogram. Then we disentangled the two main photometric frequencies by using a code specially designed for this purpose by Zbigniew Kołaczkowski. The code adjusts the orbital signal with a Fourier series consisting of the fundamental frequency plus their harmonics. Then it removes this signal from the original time series letting the long periodicity present in a residual light curve. The program fits this remaining signal with another Fourier series consisting of a fundamental frequency and harmonics and removes it. As result we obtain the cleaned light curve with no additional frequencies and two light curves for the isolated orbital and long frequencies. Following this procedure we found two new DPVs and 3 DPV candidates. In the second group the long cycle is observed almost once and it is of low amplitude, so the classification is uncertain. The result of this search is summarized in Tables 1 and 2. The disentangled light curves are shown in Figures 1 and 2.

The two confirmed new DPVs are V495 Cen and V4142 Sgr. They show a total primary eclipse and have relatively long orbital periods. They are ideal targets for follow-up spectroscopic studies and light curve modeling. All stars in Table 1 show longer orbital period than those 11 Galactic DPVs reported by Mennickent et al. (2012a). For the suspected DPVs half of the orbital period was also a possible solution; we followed the ASAS choice, giving a period ratio around 33. We checked the WISE image survey[3] (Wright et al. 2010), especially in the band W4, and find that none of these targets show evidence of close nebulosity, which could be relevant when discussing systemic mass loss and evolutionary stage.

[1] http://www.astrouw.edu.pl/asas/

[2] IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

[3] http://irsa.ipac.caltech.edu/applications/wise/

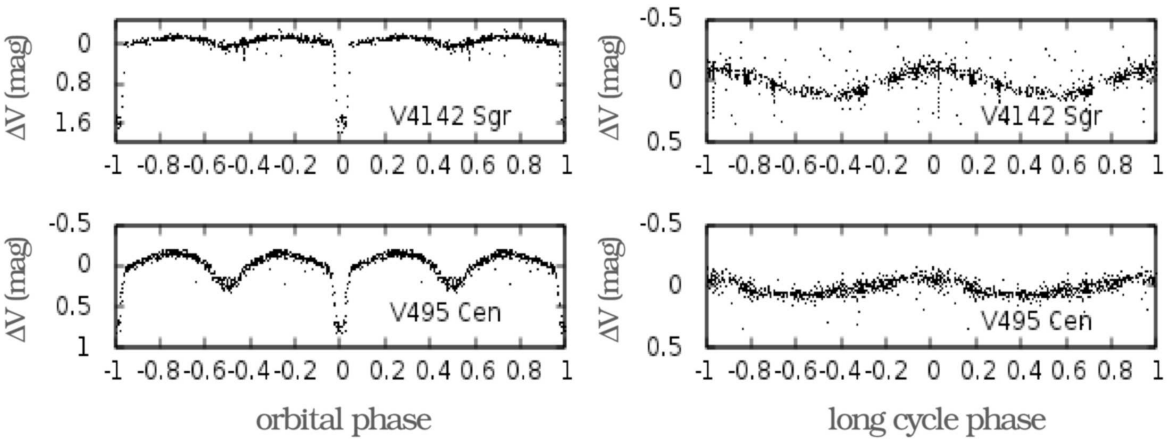

Figure 1. Disentangled ASAS V-band light curves of the new confirmed Double Periodic Variables.

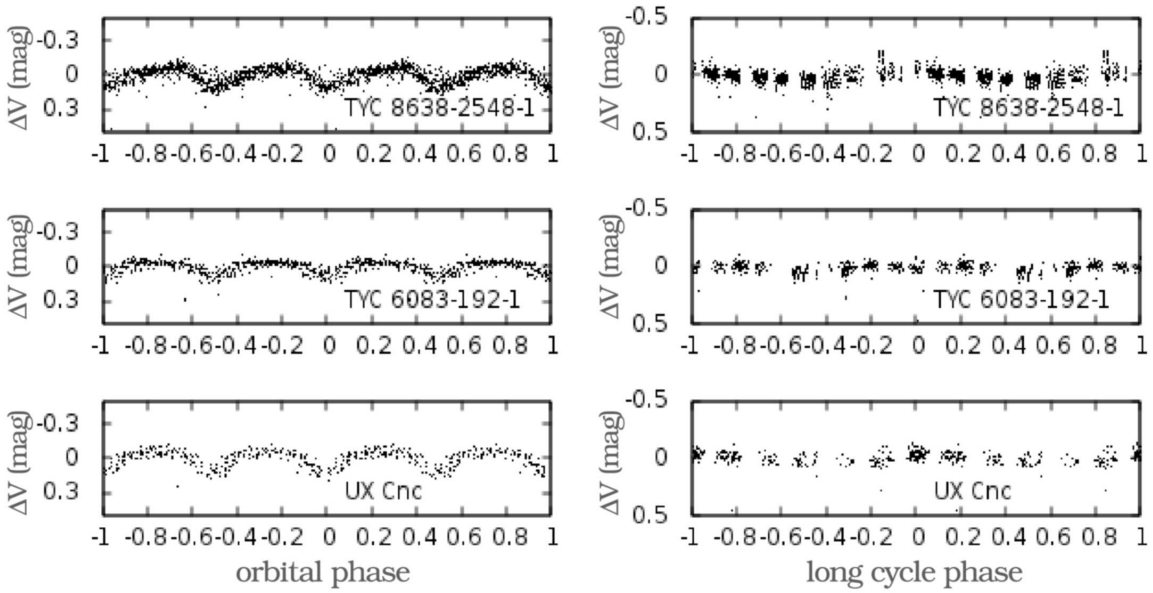

Figure 2. Disentangled ASAS V-band light curves of the new candidate Double Periodic Variables.

Table 1: New confirmed Double Periodic Variables and their orbital (P_o) and long (P_l) periods. Epochs for the minimum brightness of the orbital light curve and the maximum brightness of the long-cycle light curve are also given.

ASAS-ID	Other ID	RA (2000)	DEC (2000)	P_o (days)	P_l (days)	$T_0(min_o)$ −2450000	$T_0(max_l)$ −2450000	V (ASAS) (mag)
130135−5605.5	V0495 Cen	13:01:35	−56:05:30	33.490(18)	1283	4609.8460	4894.6	9.9
180745−2824.1	V4142 Sgr	18:07:45	−28:24:06	30.633(27)	1206	4726.5550	3546.7	10.95

Table 2: New candidates Double Periodic Variables and their orbital (P_o) and long (P_l) periods. Epochs for the minimum brightness of the orbital light curve and the maximum brightness of the long-cycle light curve are also given. Brightness values are from the ASAS database.

ASAS-ID	Other ID	RA (2000)	DEC (2000)	P_o (days)	P_l (days)	$T_0(min_o)$ −2450000	$T_0(max_l)$ −2450000	V (mag)
090329+0735.7	UX Cnc	09:03:29	07:35:42	84.761(10)	2158:	2715.5975	2703.4	11.75
111014−2007.1	TYC 6083-192-1	11:10:14	−20:07:06	90.386(60)	3497:	3125.4230	3799.8	9.37
114033−5641.8	TYC 8638-2548-1	11:40:33	−56:41:48	101.295(22)	3400:	3423.3300	2471.0	10.51

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