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**PLATE ARCHIVE PHOTOMETRY OF CANDIDATE
VARIABLE STARS IN CEPHEUS OB3 ASSOCIATION**

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Name of the object:	
USNO-B1.0 1525-0418386, USNO-B1.0 1525-0418333, USNO-B1.0 1525-0418196	
Equatorial coordinates:	Equinox:
R.A. = 22 ^h 53 ^m DEC. = +62°5	2000
Observatory and telescope:	
Asiago 67/92 cm Schmidt Telescope	
Detector:	plates
Filter(s):	<i>BVR_CI_C</i>
Date(s) of the observation(s):	
From August 16, 1971 to November 1, 1978	
Comparison star(s):	surrounding <i>BVR_CI_C</i> photometric comparison sequence calibrated by Semkov and Peneva (2008)
Availability of the data:	
Available at the IBVS website as 5885-t1.txt	
Remarks:	
While they were obtaining CCD photometry of the pre-main sequence object V733 Cephei, Semkov and Peneva (2008, hereafter SP08) noticed the possible variability of three nearby stars, USNO-B1.0 1525-0418386, USNO-B1.0 1525-0418333, and USNO-B1.0 1525-0418196 (for short Var.1, Var.2, and Var.3 hereafter). Their amplitudes of variability were reported by SP08 as $\Delta V = 2.98$ (19.26–16.28) and $\Delta I_C = 2.36$ (16.24–13.88) for Var. 1, $\Delta V = 1.02$ (17.38–16.36) and $\Delta I_C = 0.67$ (14.54–13.87) for Var. 2, and $\Delta V = 0.35$ (15.61–15.26) and $\Delta I_C = 0.27$ (13.33–13.06) for Var. 3. They observed the candidate variable stars on 12 dates distributed over the period February 2007 to February 2008, and suggested that Var. 1 could be a Mira and Var. 2 a pre-main sequence object.	

Remarks:

To help shed light on the matter, we estimated the brightness of the three possible new variables on 40 plates that we found in the plate archive of the Asiago 67/92cm Schmidt telescope. The plates were exposed on Cep OB3 from August 16, 1971 to November 1, 1978. The filter + emulsion combinations corresponds to the B , V , R_C and I_C photometric bands. The magnitude of the three possible new variable stars was estimated at the microscope against the local BVR_CI_C photometric sequence calibrated by SP08. The measurements were repeated in an unbiased manner for all plates on different days. All measurements were found to repeat within 0.1 mag. The resulting magnitudes and observing details are given in Table 1 (Fig. 1).

Var.1 (USNO-B1.0 1525-0418386). The mean values (and dispersion) we measured on the 1971-1978 Asiago plates are: $\langle B \rangle = 18.8$ ($\sigma = 0.9$), $\langle V \rangle = 16.93$ ($\sigma = 0.05$), $\langle I_C \rangle = 14.49$ ($\sigma = 0.15$). They are within the range of variability reported by SP08. The star is confirmed, beyond doubt, to vary on the B band plates we examined, while the variability at I_C is far less pronounced (much less than listed by SP08). SP08 suggested Var.1 to be a Mira variable. To lie within the Galaxy in that direction (9 kpc) and to shine at $\langle V \rangle = 16.9$, Var.1 must be extinguished by $A_V \geq 1.1$ for an absolute magnitude $M_V = -1$, typical for Miras. It would correspond to $E_{V-I} \geq 0.5$ for a standard reddening law, and thus to an intrinsic $(V - I_C)_0 \leq 2.5$ for the range of $V - I_C$ measured by SP08. Comparing with intrinsic colors by Bessell (1990) the corresponding spectral type would equal or earlier than M3III. Such an early spectral type would corresponds to a Mira with a short pulsation period and low amplitude, in agreement with our data. The $\Delta I_C = 2.36$ reported by SP08 (and not confirmed by our data) would be far too large for such a Mira.

Var.2 (USNO-B1.0 1525-0418333). The star does not vary on the 1971-1978 plates we examined. The mean values (and dispersion) are: $\langle B \rangle = 17.68$ ($\sigma=0.04$), $\langle V \rangle = 16.40$ ($\sigma=0.00$), $\langle I_C \rangle = 13.83$ ($\sigma=0.11$).

Var.3 (USNO-B1.0 1525-0418196). This star too does not vary on the 1971-1978 plates we examined. The mean values (and dispersion) are: $\langle B \rangle = 16.95$ ($\sigma=0.05$), $\langle V \rangle = 15.03$ ($\sigma=0.12$), $\langle I_C \rangle = 13.01$ ($\sigma=0.12$).

Our values for both Var.2 and Var.3 correspond to the the bright end of the range of variability reported by SP08. If they are indeed variable stars, their variability appears confined to rare episodes of drop in brightness from a protracted and stable bright state.

References:

- Bessell, M., 1990, *PASP*, **102**, 1181
 Semkov, E.H., Peneva, S.P., 2008, *IBVS*, 5831

<i>N.</i>	HJD	<i>date</i>	$\langle UT \rangle$	<i>plate + filter</i>			<i>Var.1</i>	<i>Var.2</i>	<i>Var.3</i>
4577	2441180.42001	1971 08 16	22:03	103a-O	GG13	B	>19.5	17.6	17.0
4669	2441216.50252	1971 09 21	24:00	0a-O	GG13	B	19.5	17.7	17.0
4709	2441240.35147	1971 10 15	20:22	0a-O	GG13	B	>17.7	17.7	17.0
4810	2441246.33759	1971 10 21	20:02	103a-O	GG13	B	19.0	17.6	16.9
4989	2441251.51882	1971 10 26	24:23	103a-O	GG13	B	17.8	17.7	16.9
5012	2441293.23595	1971 12 07	17:37	Ia-O	GG13	B	17.7	17.6	17.0
5065	2441298.24062	1971 12 12	17:44	Ia-O	GG13	B	>17.7	17.7	16.9
5097	2441301.25091	1971 12 15	17:59	Ia-O	GG13	B	17.8	17.6	16.9
5656	2441596.45764	1972 10 05	22:55	103a-O	GG13	B	19.3	17.7	16.9
5749	2441624.37154	1972 11 02	20:51	103a-O	GG13	B	>19.5	17.7	16.9
5809	2441628.35829	1972 11 06	20:32	103a-O	GG13	B	18.8	17.7	16.9
5935	2441651.24176	1972 11 29	17:45	103a-O	GG13	B	18.6	17.7	16.9
9284	2443455.43327	1977 11 07	22:20	103a-O	GG13	B	–	–	17.0
9348	2443480.38055	1977 12 02	21:05	103a-O	GG13	B	17.8	17.7	16.9
9374	2443492.35648	1977 12 14	20:31	103a-O	GG13	B	17.6	17.7	17.0
9713	2443814.34655	1978 11 01	20:15	103a-O	GG13	B	>19.5	17.7	17.0
9796	2443837.37734	1978 11 24	21:00	104a-O	GG13	B	>17.7	17.7	17.0
4579	2441180.47349	1971 08 16	23:20	IN	RG5	Ic	14.3	13.6	13.1
4670	2441216.53030	1971 09 21	24:40	IN	RG5	Ic	14.6	13.7	13.2
4710	2441240.38202	1971 10 15	21:06	IN	RG5	Ic	14.7	13.9	12.9
4811	2441246.36606	1971 10 21	20:43	IN	RG5	Ic	14.6	13.6	13.1
5011	2441293.21165	1971 12 07	17:02	IN	RG5	Ic	14.6	13.9	12.9
5064	2441298.21354	1971 12 12	17:05	IN	RG5	Ic	>14.3	13.8	12.9
5096	2441301.22383	1971 12 15	17:20	IN	RG5	Ic	14.6	13.9	13.1
5657	2441596.47987	1972 10 05	23:27	IN	RG5	Ic	14.7	13.8	13.1
5748	2441624.35140	1972 11 02	20:22	IN	RG5	Ic	14.6	13.8	12.9
5808	2441628.33815	1972 11 06	20:03	IN	RG5	Ic	14.5	13.8	12.7
5934	2441651.22023	1972 11 29	17:14	IN	RG5	Ic	14.3	13.8	13.1
5980	2441663.31632	1972 12 11	19:33	IN	RG5	Ic	14.6	14.0	12.9
6025	2441676.21091	1972 12 24	17:02	IN	RG5	Ic	14.3	13.9	12.9
9285	2443455.45758	1977 11 07	22:55	IN	RG5	Ic	14.5	13.9	13.1
9296	2443458.34850	1977 11 10	20:18	IN	RG5	Ic	14.3	13.8	13.1
9325	2443464.37893	1977 11 16	21:02	IN	RG5	Ic	14.5	13.9	13.2
9349	2443480.40625	1977 12 02	21:42	IN	RG5	Ic	14.3	13.9	12.9
9373	2443492.33010	1977 12 14	19:53	IN	RG5	Ic	14.3	14.0	13.2
9714	2443814.37363	1978 11 01	20:54	IN	RG5	Ic	14.5	13.8	12.9
4578	2441180.44710	1971 08 16	22:42	103a-E	RG1	Rc	15.7	14.9	14.2
5982	2441663.38854	1972 12 11	21:17	103a-D	GG14	V	16.9	16.4	14.9
6026	2441676.23104	1972 12 24	17:31	103a-D	GG14	V	16.9	16.4	15.0
9795	2443837.35998	1978 11 24	20:35	103a-D	GG14	V	17.0	16.4	15.2

Figure 1. (Table 1) BVR_CI_C photometry of the suspected variables on 1971-1978 plates from the archive of the Asiago 67/92 Schmidt telescope.