

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5406

Konkoly Observatory
Budapest
5 May 2003

HU ISSN 0374 – 0676

THREE NEW PMS VARIABLES IN THE VICINITY OF NGC 7129

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The previous observations suggest that NGC 7129 is a region of active star formation (Magakian and Movsesian, 1997). The small emission nebula and the dark clouds around are a part from the giant molecular cloud complex in Cepheus. T Tauri and Herbig's Ae/Be stars, Herbig-Haro objects, collimated jets and cometary nebulae are observed in the region of NGC 7129. One of the best-studied objects in this region is the Pre-Main Sequence star (PMS) V391 Cep (Semkov, 2003). The star lie in the dark clouds 40' northwest from the center of NGC 7129. In this paper we present photometric data for tree new PMS variables in the close proximity of V391 Cep.

Our CCD photometric observations were made with three telescopes: the 2-m RCC and the 50/70/172 cm Schmidt telescopes of the National Astronomical Observatory Rozhen (Bulgaria) and the 1.3-m RC telescope of the Skinakas Observatory¹ of the Institute of Astronomy, University of Crete (Greece). The observations ware taken with the purpose to study variability of V391 Cep and all information concerning used CCD cameras, filters, exposures, standards and aperture photometry is summarized in Semkov (2003).

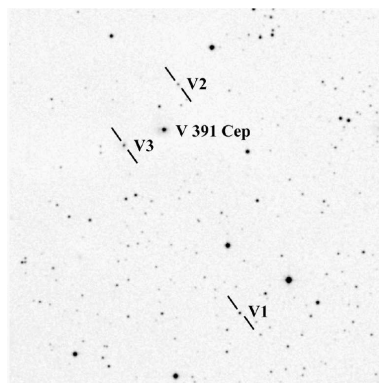


Figure 1. Finding chart of the new variable stars

The finding chart of the new variable stars is presented in Fig. 1. New variables are labeled V1, V2 and V3 in order of their R. A. The position of V391 Cep is also marked on the figure. The field is 10' \times 10', north is at the top and east to the left. The chart is retrieved from the STScI Digitized Sky Survey Second Generation Red. The positions of the tree new variables (J2000.0) in the Aladin Sky Atlas are:

¹Skinakas Observatory is a collaborative project of the University of Crete, the Foundation for Research and Technology - Hellas, and the Max-Planck-Institut für Extraterrestrische Physik.

V1 R.A. = $21^{\text{h}}40^{\text{m}}11^{\text{s}}.75$ and Dec = $66^{\circ}30'21''.4$
 V2 R.A. = $21^{\text{h}}40^{\text{m}}22^{\text{s}}.88$ and Dec = $66^{\circ}36'31''.6$
 V3 R.A. = $21^{\text{h}}40^{\text{m}}38^{\text{s}}.79$ and Dec = $66^{\circ}35'02''.7$

The results from our CCD photometric observations of V1, V2 and V3 are given in Tables 1, 2 and 3 respectively. The tables contains Date, Julian Date, V magnitude, $B - V$, $V - R_C$ and $V - I_C$ indices and telescope used. The V -light curves of the new variables are presented in Fig. 2, Fig. 3 and Fig. 4. V2 and V3 were discovered as variables during our campaign to calibrate a standard comparison sequence in the field of V391 Cep. The both objects exhibit extended emission a characteristic typical of PMS stars. The new variable V1 was discovered and as an $H\alpha$ emission source in our objective prism survey (Semkov and Tsvetkov, 1986).

Our observations revealed that the V1, V2 and V3 show irregular variability with amplitudes of $0^{\text{m}}.7$, $1^{\text{m}}.1$ and $1^{\text{m}}.2$ (V -light) respectively. Having in mind the observed irregular variability, extended emission around V2 and V3 and observed $H\alpha$ emission for V1 it is possible to suspect that the three new variables belong to the class of PMS stars.

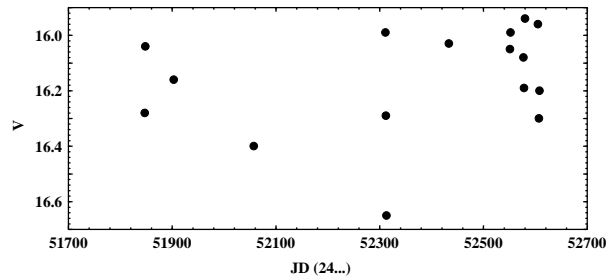


Figure 2. V -light curve of V1 during the period of observations

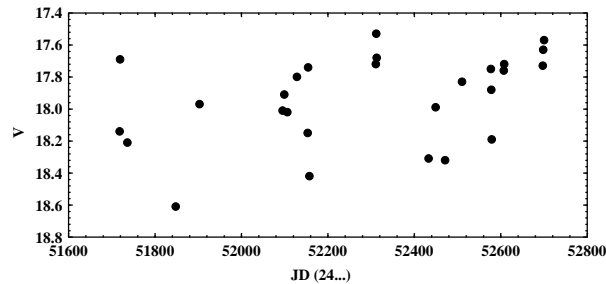


Figure 3. V -light curve of V2 during the period of observations

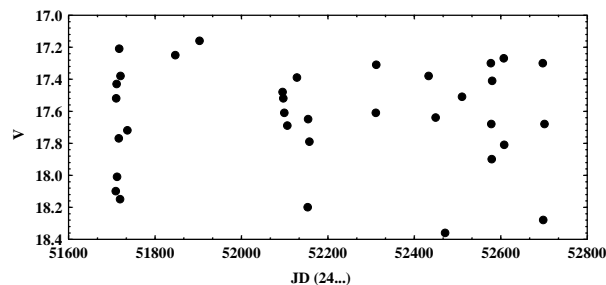


Figure 4. V -light curve of V3 during the period of observations

Table 1: Photometric observations of V1 in the period October 2000 - November 2002

Date	J.D. (24...)	V	$B - V$	$V - R_C$	$V - I_C$	Tel.
29.10.2000	51847.379	16.28	1.32	0.83	1.88	Scm
30.10.2000	51848.419	16.04	1.36	0.81	1.75	Scm
24.12.2000	51903.287	16.16	1.13	0.89	1.88	Scm
27.05.2001	52057.492	16.40	—	—	1.58	Scm
5.02.2002	52311.261	15.99	1.14	0.83	1.92	Scm
6.02.2002	52312.259	16.29	—	0.80	1.83	Scm
7.02.2002	52313.247	16.65	1.84	0.99	2.08	Scm
8.06.2002	52433.536	16.03	1.26	0.82	1.76	1.3m
3.10.2002	52551.459	16.05	—	0.79	1.64	Scm
4.10.2002	52552.487	15.99	—	0.77	1.71	Scm
29.10.2002	52577.375	16.08	1.20	0.81	1.82	Scm
30.10.2002	52578.371	16.19	1.34	0.87	1.90	Scm
31.10.2002	52579.275	16.09	1.12	0.83	1.75	Scm
1.11.2002	52580.258	15.94	1.21	0.78	1.73	Scm
26.11.2002	52605.233	15.96	—	—	1.76	Scm
28.11.2002	52607.258	16.30	1.29	0.87	1.94	Scm
29.11.2002	52608.246	16.20	1.28	0.87	1.91	Scm

Table 2: Photometric observations of V2 in the period June 2000 - March 2003

Date	J.D. (24...)	V	$B - V$	$V - R_C$	$V - I_C$	Tel.
22.06.2000	51718.449	18.14	—	1.07	2.24	1.3m
23.06.2000	51719.448	17.69	1.32	1.04	2.18	1.3m
24.06.2000	51720.384	17.67	1.34	—	2.18	1.3m
11.07.2000	51736.507	18.21	1.28	1.02	2.21	1.3m
30.10.2000	51848.419	18.61	—	1.28	2.37	Scm
24.12.2000	51903.287	17.97	—	0.89	2.14	Scm
5.07.2001	52095.559	18.01	1.12	1.08	2.16	1.3m
6.07.2001	52097.298	17.99	—	—	2.21	1.3m
8.07.2001	52099.293	17.91	—	—	2.10	1.3m
16.07.2001	52106.536	18.02	1.34	—	2.22	1.3m
7.08.2001	52128.528	17.80	1.33	—	2.15	1.3m
1.09.2001	52153.592	18.15	1.54	—	2.41	1.3m
2.09.2001	52154.575	17.74	1.06	—	2.19	1.3m
5.09.2001	52157.546	18.42	—	—	2.39	1.3m
5.02.2002	52311.261	17.72	—	1.20	2.34	Scm
6.02.2002	52312.259	17.53	—	0.87	2.00	Scm
7.02.2002	52313.247	17.68	—	0.75	1.88	Scm
8.06.2002	52433.536	18.31	1.38	1.13	2.29	1.3m
24.06.2002	52449.532	17.99	—	—	2.05	1.3m
16.07.2002	52471.540	18.32	—	—	2.36	1.3m
23.08.2002	52510.564	17.83	1.53	1.13	2.23	1.3m
29.10.2002	52577.375	17.75	—	0.78	2.07	Scm
30.10.2002	52578.371	17.88	—	0.96	2.14	Scm
31.10.2002	52579.275	18.19	—	1.23	2.43	Scm
1.11.2002	52580.258	17.86	—	1.01	2.26	Scm
28.11.2002	52607.258	17.76	—	1.07	2.32	Scm
29.11.2002	52608.246	17.72	—	1.12	2.31	Scm
27.02.2003	52697.599	17.73	1.37	1.10	2.13	2m
28.02.2003	52698.559	17.63	1.38	1.09	2.15	2m
2.03.2003	52700.547	17.57	1.29	1.11	2.20	2m
3.03.2003	52701.509	17.64	—	1.12	2.14	2m

Table 3: Photometric observations of V3 in the period June 2000 - March 2003

Date	J.D. (24...)	V	B - V	V - R _C	V - I _C	Tel.
13.06.2000	51709.485	18.10	—	1.27	2.63	1.3m
14.06.2000	51710.497	17.52	—	1.16	2.44	1.3m
15.06.2000	51711.493	17.43	—	1.14	2.44	1.3m
16.06.2000	51712.490	18.01	1.21	—	2.49	1.3m
21.06.2000	51716.512	17.77	1.71	1.18	2.49	1.3m
21.06.2000	51717.392	17.21	—	—	2.36	1.3m
22.06.2000	51718.449	17.41	1.63	1.12	2.40	1.3m
23.06.2000	51719.448	18.15	1.67	1.19	2.50	1.3m
24.06.2000	51720.384	17.38	1.92	—	2.40	1.3m
11.07.2000	51736.507	17.72	1.80	1.17	2.53	1.3m
29.10.2000	51847.379	17.25	—	1.18	2.51	Scm
30.10.2000	51848.419	17.26	1.29	1.26	2.61	Scm
24.12.2000	51903.287	17.16	—	1.09	2.42	Scm
5.07.2001	52095.559	17.48	—	1.07	2.34	1.3m
6.07.2001	52097.298	17.52	—	—	2.37	1.3m
8.07.2001	52099.293	17.61	1.54	—	2.32	1.3m
16.07.2001	52106.536	17.69	1.71	—	2.42	1.3m
7.08.2001	52128.528	17.39	1.74	—	2.38	1.3m
1.09.2001	52153.592	18.20	1.13	—	2.78	1.3m
2.09.2001	52154.575	17.65	1.24	—	2.56	1.3m
5.09.2001	52157.546	17.79	—	—	2.67	1.3m
5.02.2002	52311.261	17.61	—	1.16	2.58	Scm
6.02.2002	52312.259	17.31	—	1.26	2.57	Scm
7.02.2002	52313.247	17.30	—	1.14	2.59	Scm
8.06.2002	52433.536	17.38	1.74	1.19	2.49	1.3m
24.06.2002	52449.532	17.64	—	—	2.62	1.3m
16.07.2002	52471.540	18.36	—	—	2.66	1.3m
23.08.2002	52510.564	17.51	1.41	1.24	2.54	1.3m
29.10.2002	52577.375	17.30	—	1.15	2.59	Scm
30.10.2002	52578.371	17.68	—	1.08	2.46	Scm
31.10.2002	52579.275	17.90	—	1.21	2.42	Scm
1.11.2002	52580.258	17.41	—	1.12	2.57	Scm
28.11.2002	52607.258	17.27	—	1.13	2.50	Scm
29.11.2002	52608.246	17.81	—	1.17	2.62	Scm
27.02.2003	52697.599	17.30	1.49	1.19	2.33	2m
28.02.2003	52698.559	18.28	1.44	1.32	2.48	2m
2.03.2003	52700.547	17.30	1.43	1.16	2.30	2m
3.03.2003	52701.509	17.68	—	1.24	2.47	2m

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