ISSN 0917-2211

VARIABLE STAR BULLETIN

No. 20 Aug. '95

PHOTOGRAPHIC OBSERVATION OF NSV12245, 12376, 12656, 12883 & 13204 BY PROF. HURUHATA

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Prof. K.Suzuki and Prof. M.Huruhata discovered 7 new variable stars in 1938 at National Science Museum, Tokyo. They took photographs of the field of alpha and eta Cygnus using astrophotograph (Dia.=104 mm, focal length=500 mm) and Agfa Isochrome Plate of the Museum. After checking 78 plates (17° x 12°) taken from Aug. '37 to Jan. '38, they announced the discovery of 7 new variable stars. [1),2)] However, only one of seven was registered as the variable, named V403 Cyg. The other 6 stars are still remained as the suspected variables.

One of the discoverer, Prof. M.Huruhata carried out photographic observation at his home after retirement from the director of Tokyo Astronomical Observatory. Among the remained films, the author has estimated magnitudes of the above mentioned suspected 6 variables. As far as these stars are concerned, Prof. Huruhata took photographs by 500 mm focal length camera, Tri-X film and with yellow green filters.[3)]

For V403 Cyg, the observation will be announced in near future including Prof.Huruhata's and the author's recent estimation.

All of the finding charts shown here were cited from the discoveror's original report. Diameter of circle is 30 and top of chart is north direction. The sequence of comparison star was adopted from GSC.

(1) NSV12245 = 28.1938 19h36m23s +35° 45′ (1950.0)
Discoveror suggests UG type irregular variable having mag. range 10.7 - 116(p). Prof.Huruhata's 33 films (from Oct.15 '77 to Feb.20 '78) show only 10.7 - 11.1 mag. change. Fig.1 shows finding chart.

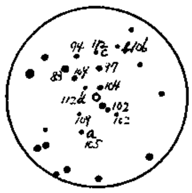

Fig.1

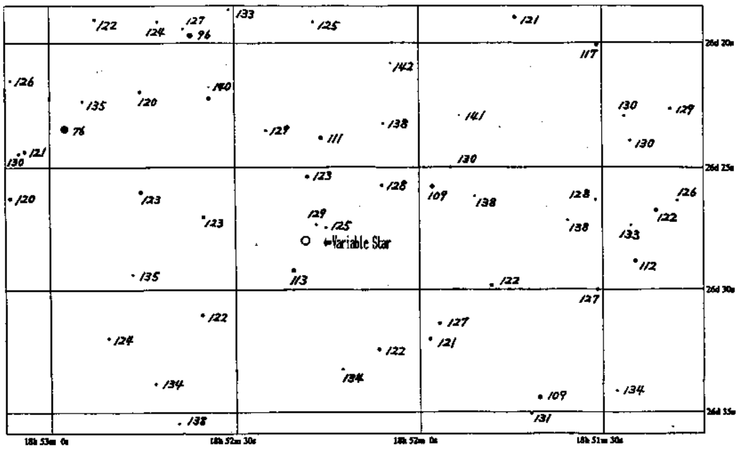

FIG.2 Finding Chart

Acknowledgments

I would like to thank the National Astronomical Observatory, Dynik Astropark Ten-Kyu-kan and Japan Amateur Photoelectric Observers Association for providing support for this work. The star is identified with IRAS 18491-2631 by them.

Revised orbital period of IP Peg and possible existence of superhump-like periodicity during outbursts

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Abstract: Observation of IP Peg from November 1985 are summarized. The cycle length of outbursts varied from 55 to 117 days. Using 33 independent observations of 22 eclipses, the orbital period is determined as 0.15820599 days. Possible period of 0.1745 days is detected in four outbursts, which may be analogous to superhumps.

IP Peg is the only dwarf nova with an orbital period above the period gap which shows deep eclipses even during outbursts. The star is relatively bright (mv~12 at maximum) for amateur telescopes and several individual reports have been published (see preceding issues of this Bulletin). However, it is evident from these reports that the orbital period by Goranskij et al.(1985), and Orlowsky and Goranskij (1986) gives large O-C values recently. We here present a revised element deduced from observations by VSOLJ.

The observed outbursts since November 1985 are summarized in Table 1. The star was observed from June through January of the next year. Unfortunately poor weather often hindered determination of initial rises of outburts. So the start and the duration of an outburst is approximate and some short outbursts may have escaped detection.

The interval between successive outbursts varied from 55 to 117 days, 78 days in average. This value is substantially shorter than that given by Goranskij et al.(1985).

In contrast to many dwarf novae with orbital periods above the gap, the star sometimes shows linear decay (~0.1magnitude/day) of brightness at plateau phases after the star reached its peak brightness. Such phenomenon is rarely seen in dwarf novae with similar orbital periods (e.g. U Gem) and more resembles superoutbursts of SU UMa stars.

Eclipses were observed for many of outbursts. Table 2 summarizes observed minima of eclipses. The times of minima are calculated from the raw data of estimations, so these may differ from already published values. Neglecting observations with large O-C values (most of them were done under poor condition or when the star was faint) and linking the element of Goranskij et al., we derived more accurate orbital period of 0.15820599 days.

Reported magnitudes at quiesence varied from 15.0 to 16.0. But occasions when the star was as bright as mv=14.5 were also reported, resembling short outbursts. But most of these observations were done between 0.72 and 0.79 orbital phase, close to the orbital hump at phase 0.81 reported by Goranskij et al. So these occasions can not be considered to be real outbursts. Such bright humps were often observed just prior to outbursts, suggesting that orbital humps get brighter before outbursts. Similar phenomena are also seen in recent AAVSO circulars where they are suspected to be short outbursts.

Light curves in outbursts outside eclipses are analysed to search latent periodocity. Results of five outbursts which have sufficient data are given in Table 3. None of these outbursts show periodicity caused by the orbital period. Although contaminated by aliasing peaks, there exists a period near 0.1745 days common to four of these outbursts. The value is 10% longer than the orbital period. Such phenomenon is known as superhumps in SU UMa systems with orbital periods below the period gap. An example TU Men, which has an orbital period above the gap, is also known to show superhumps.

According to the recent theories of superhumps (Whitehurst 1988; Osaki 1989), the appearance of superhumps during outbursts is probably regulated by the mass ratio ($q=M1/M2$) rather than the orbital period. Because IP Peg has one of the highest mass ratio system above the gap with $q=2.3\pm0.7$ (Wood and Crawford 1986), which is larger than well-established SU UMa system T Leo with $q=1.4\pm0.3$, it is possible that superhumps were actually observed. It is also noticeable that the exceptional outburst which does not show this periodocity resembles a normal long outburst of SS Cyg or U Gem, with a flat-topped maximum. More accurete photometry is strongly needed to determine whether the star really show superhumps.

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Table I. Observed outbursts of IP Peg.

Date	JD	maximum	duration(*1)	light curve(*2)
1985 Nov. 1	2446371	12.5mv	>3 days	constant brightness
Dec.31	46431	13.0	>1	rapid decline
1986 Jul.29	46641	12.8	>5	slow decline
Sep.22	46696	13.5	2	rapid decline
Nov.17	46752	12.5	>5	slow decline
1987 Feb. 5	46832	13.0	>1	
Jul.22	46999	12.8	>5	slow decline
Nov.16	47116	12.3	10	constant, followed by slow decline
1988 Jul. 4	47347	12.3	>5	very slow decline
Oct.19	47454	12.8	10	constant brightness
1989 Jan. 1	47528	13.3	>3	slow decline
Jul.12	47720	12.3	>1	

(*1) Period brighter than mv=14.
(*2) Shape of a light curve at the plateau phase (if exists) following the maximum.

Table 2. Observed eclipses.

E	Min.JD.Hel	observer	O-C(1)	O-C(2)	O-C(3)	O-C(4)
0	2446372.9083	Kato	-0.0019	0.0036	0.0032	
1	46373.0637	Fujino	-0.0047	0.0008	0.0004	-0.0004
1	46373.0650	Kato	-0.0034	0.0021	0.0017	0.0009
1708	46643.1220	Kato	-0.0069	0.0011	0.0008	0.0003
1709	46643.2712	Ishida	-0.0159	-0.0079	-0.0082	
1715	46644.2302	Kato	-0.0061	0.0018	0.0016	0.0011
2043	46696.1204	Kato	-0.0080	0.0004	0.0002	-0.0003
2049	46697.0648	Kato	-0.0129	-0.0045	-0.0046	
2403	46753.0722	Kato	-0.0110	-0.0021	-0.0022	
2409	46754.0239	Fujino	-0.0085	0.0004	0.0002	-0.0002
2409	46754.0239	Koshiro	-0.0085	0.0004	0.0002	-0.0002
2409	46754.0246	Iida	-0.0078	0.0011	0.0009	0.0005
2409	46754.0246	Kato	-0.0078	0.0011	0.0009	0.0005
3965	47000.1900	Hirosawa	-0.0135	-0.0024	-0.0024	
3965	47000.1917	Makiguchi	-0.0118	-0.0007	-0.0007	-0.0009
4697	47115.9990	Fujino	-0.0125	-0.0004	-0.0003	-0.0004
4697	47115.9994	Kato	-0.0121	0.0000	0.0001	0.0000
4697	47116.0001	Iida	-0.0114	0.0007	0.0008	0.0007
4703	47116.9468	Yamada	-0.0140	-0.0018	-0.0018	-0.0018
4703	47116.9481	Kato	-0.0127	-0.0005	-0.0005	-0.0005
4704	47117.1067	Iida	-0.0123	-0.0001	-0.0001	-0.0001
4704	47117.1068	Kato	-0.0122	0.0000	0.0000	0.0000
4710	47118.0559	Kato	-0.0123	-0.0002	-0.0001	-0.0002
4722	47119.9556	Kato	-0.0111	0.0010	0.0011	0.0010
4722	47119.9559	Iida	-0.0108	0.0013	0.0014	0.0013
4722	47119.9569	Yamada	-0.0098	0.0023	0.0024	
4723	47120.1128	Kato	-0.0121	0.0000	0.0001	0.0000
4735	47122.0118	Iida	-0.0116	0.0006	0.0006	0.0006
4741	47122.9592	Iida	-0.0134	-0.0013	-0.0012	-0.0013
4748	47124.0674	Kato	-0.0127	-0.0005	-0.0005	-0.0005
6158	47347.1428	Kato	-0.0101	0.0041	0.0043	
6164	47348.0895	Kato	-0.0126	0.0015	0.0017	0.0019
6834	47454.0844	Kato	-0.0168	-0.0017	-0.0015	-0.0012

O-C(1) Min.JD.Hel = 2445933.4094 + 0.15820764 (E+2778), Goranskij et al.
O-C(2) Min.JD.Hel = 2446372.9047 + 0.15820624 E, derived from observations by VSOLJ.
O-C(3) Min.JD.Hel = 2446372.9051 + 0.15820615 E, (1) and (2), connected
O-C(4) Min.JD.Hel = 2446372.9058 + 0.15820599 E, neglecting large O-C data from (3)

Instruments and methods:
Kato: 20cm reflector, visual
Fujino: 31cm Wright-Schmidt camera, photographic, Tri-X with P00 filter
Ishida: 20cm reflector, visual
Koshiro: 31cm reflector, visual
Iida: 26cm reflector, visual
Hirosawa: 21cm reflector, visual
Makiguchi: 25cm reflector, visual
Yamada: 20cm reflector, visual

Table 3. Result of period analysis during outbursts.

Outburst	Possible period between 0.15 and 0.20 days
July, 1986	five aliasing peaks including 0.1673 and 0.1748
Nov., 1986	0.1752, 0.1919
July, 1987	0.1552, 0.1637, 0.1739, 0.1854, 0.1977
Nov., 1987	0.1564, 0.1604, 0.1639, 0.1689, 0.1739, 0.1901
Oct., 1988	no significant periodicity

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