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PHOTOELECTRIC UBV OBSERVATIONS OF PU Vul IN 1982

The following observations are a continuation of similar measurements performed on the same object in 1981 (IBVS No. 2071).

All data presented were obtained with the 24 inch Ritchey-Chrêtien telescope of the L.Figl Observatory. Except for the addition of a digital counter (R70) and a printer the same equipment was used for the observations as described in our first paper. BD $+21^{\circ}4165$ = SAO 88548 (star A) was used as primary comparison star which in turn was checked in most nights against BD $+20^{\circ}4533$= SAO 88572 (not SAO 88573 as erroneously written in IBVS No. 2071). A slight systematic light variation of about $\Delta V = \pm 0^{m}.01$ between these two stars seems to be present. No final conclusion could be drawn on the nature of this variation. With regard to this we plan to follow both objects more closely during the next observing season.

As in 1981 all measurements were reduced to star A with its adopted magnitudes V = 9.300, B - V = + 0.520 and U - B = + 0.030. This is somewhat arbitrary since we have not yet performed an accurate tie-in of this star to the UBV system. Since star A is very close to the variable no correction for extinction was applied.

Table I shows the numerical results. All errors quoted are the mean errors of the mean. n gives the number of comparisons in each colour. In several nights with very poor sky conditions only V magnitudes could be obtained.

During the whole observing period lasting from early April to December PU Vul was always at maximum light. This means that the actual maximum has been lasting already 130 days longer than the previous one. Compared to the last year the object showed much more structure in the light curve, which is plotted for V, B and U in Figure 1. In general the variations behave more similar for V and B compared to U.

This is even more evident from the two colour diagram (Figure 2) producing a pronounced scatter in the vertical direction. The most remarkable activity started around September 7 with a steep decrease of the B and V brightnesses followed a few days later by the U brightness. The respective gradient for

Table I

UT 1982	JD 2445..	V	n	B - V	n	U - B	n
04 06,10	065,60	8,567±0,004	10	0,669±0,004	10	0,450±0,004	10
17,13	076,63	8,599	2 14	0,669	4 12	0,448	4 7
05 15,03	104,53	8,581	2 10	0,698	2 11	0,481	4 10
16,02	105,52	8,556	3 10	0,711	3 10	0,477	5 10
17,03	106,53	8,578	3 10	0,708	4 10	0,490	3 12
18,02	107,52	8,590	7 6	0,730	7 6	0,471	8 3
19,02	108,52	8,589	2 10	0,706	4 10	0,500	5 10
27,03	116,53	8,562	3 10	0,709	4 10	0,502	6 10
28,02	117,52	8,561	5 10	0,720	6 10	0,485	8 10
31,02	120,52	8,558	3 9	0,710	3 10	0,493	4 10
06 01,05	121,55	8,545	1 5	0,717	3 5	0,493	6 5
06,00	126,50	8,563	3 10	0,705	3 6	0,496	3 6
08,98	128,48	8,548	9 10	0,717	9 10	0,459	13 4
07 02,89	153,39	8,664	6 6				
02,95	153,45	8,658	3 12	0,738	4 10	0,487	2 10
03,00	153,50	8,672	3 7				
05,92	156,42	8,657	3 12	0,710	4 10	0,476	4 10
08,97	159,47	8,612	4 10	0,700	5 8	0,482	7 9
10,93	161,43	8,611	2 13	0,699	3 10	0,479	6 9
14,89	165,39	8,581	2 10	0,694	3 11	0,473	4 10
21,90	172,40	8,604	2 7	0,683	3 3	0,534	11 5
29,99	180,49	8,692	4 10	0,682	10 9		
30,96	181,46	8,713	2 4				
08 01,95	183,45	8,743	3 18	0,685	4 13	0,408	5 12
04,01	185,51	8,796	5 17				
05,93	187,43	8,738	3 10	0,682	5 10	0,413	9 10
10,95	192,45	8,645	10 4				
11,87	193,37	8,625	3 12	0,725	4 11	0,497	6 8
15,87	197,37	8,607	3 10	0,706	4 11	0,509	7 9
18,82	200,32	8,631	2 5	0,729	6 6	0,539	8 5
22,81	204,31	8,654	4 12	0,699	7 5	0,519	10 6
25,80	207,30	8,622	3 9	0,688	5 6		
09 03,91	216,41	8,599	3 10	0,684	4 8	0,523	7 8
04,85	217,35	8,567	2 6	0,691	4 7	0,569	10 6
13,86	226,36	8,625	6 9	0,710	8 10	0,484	5 9
14,83	227,33	8,665	5 10	0,700	7 10	0,477	11 10

Table I cont.

UT 1982	JD 2445..	V	n	B - V	n	U - B	n
09 17,82	230,32	8,927±0,003	10	0,699±0,004	10	0,381±0,007	10
18,82	231,32	8,949 3	10	0,674 4	10	0,357 7	10
18,85	231,35	8,939 7	3	0,685 7	3	0,340 4	3
18,88	231,38	8,931 9	3	0,676 10	3	0,349 31	3
18,90	231,40	8,930 13	3	0,688 14	3	0,356 9	3
18,91	231,41	8,941 5	3	0,662 7	3		
18,94	231,44	8,928 2	3	0,675 5	3		
18,95	231,45	8,947 5	3	0,654 7	3		
18,98	231,48	8,924 2	3	0,670 5	3		
19,00	231,50	8,921 5	3	0,679 7	3		
19,81	232,31	8,870 4	10	0,680 5	10	0,389 16	12
19,84	232,34	8,875 6	3	0,681 9	3		
19,86	232,36	8,882 5	3	0,656 9	3		
19,89	232,39	8,864 3	3	0,689 5	3		
19,91	232,41	8,886 8	3	0,675 9	3		
19,93	232,43	8,883 2	3	0,679 3	3		
19,95	232,45	8,889 3	3	0,672 4	3		
19,97	232,47	8,886 8	3	0,667 11	3		
20,00	232,50	8,876 7	3	0,677 7	3		
20,82	233,32	8,845 4	9	0,699 4	8	0,401 8	9
20,95	233,45	8,826 5	8				
20,98	233,48	8,824 8	5				
21,01	233,51	8,824 4	6				
28,87	241,37	8,612 18	12	0,684 19	17	0,483 13	10
29,78	242,28	8,600 3	12	0,682 3	11	0,464 4	12
10 03,81	246,31	8,646 3	10	0,674 5	10	0,473 8	10
07,82	250,32	8,623 3	11	0,626 4	10	0,455 7	10
11,79	254,29	8,635 6	10	0,56:			
16,77	259,27	8,528 3	11	0,584 4	11	0,353 5	10
18,81	261,31	8,587 4	11	0,566 5	10	0,380 9	8
20,76	263,26	8,596 2	9	0,556 3	8	0,355 8	9
22,77	265,27	8,599 5	9	0,538 7	9	0,336 10	9
27,78	270,28	8,520 4	9	0,542 4	9	0,294 8	9
30,74	273,24	8,504 4	9	0,546 8	9	0,254 10	9
31,74	274,24	8,472 6	9	0,547 6	9	0,252 6	9
11 01,74	275,24	8,472 2	6	0,540 3	6	0,255 4	9

Table I cont.

UT 1982	JD 2445..	V	n	B - V	n	U - B	n
11 02,76	276,24	8,464±0,002	6	0,535±0,003	6	0,244±0,006	7
03,81	277,31	8,480	1 5	0,526	2 5	0,227	8 4
04,75	278,25	8,464	3 6	0,516	5 6	0,225	7 7
06,72	280,22	8,467	3 9	0,522	5 7	0,229	7 9
11,72	285,22	8,469	5 9	0,500	5 9	0,226	9 9
12,73	286,23	8,476	2 9	0,506	4 9	0,245	9 9
19,73	293,23	8,497	3 8	0,521	4 9	0,285	11 3
20,68	294,18	8,508	3 10	0,517	5 6	0,270	7 6
21,72	295,22	8,507	4 9	0,506	4 9	0,267	5 9
22,71	296,21	8,487	2 3	0,511	4 3	0,289	12 3
23,73	297,23	8,495	3 7	0,517	4 9	0,271	9 13
25,73	299,23	8,489	2 7	0,517	4 4	0,266	7 9
12 03,70	307,20	8,522	4 9	0,528	4 4	0,286	3 9
05,69	309,19	8,516	4 5	0,530	4 4	0,282	5 9
10,69	316,19	8,522	29 4				

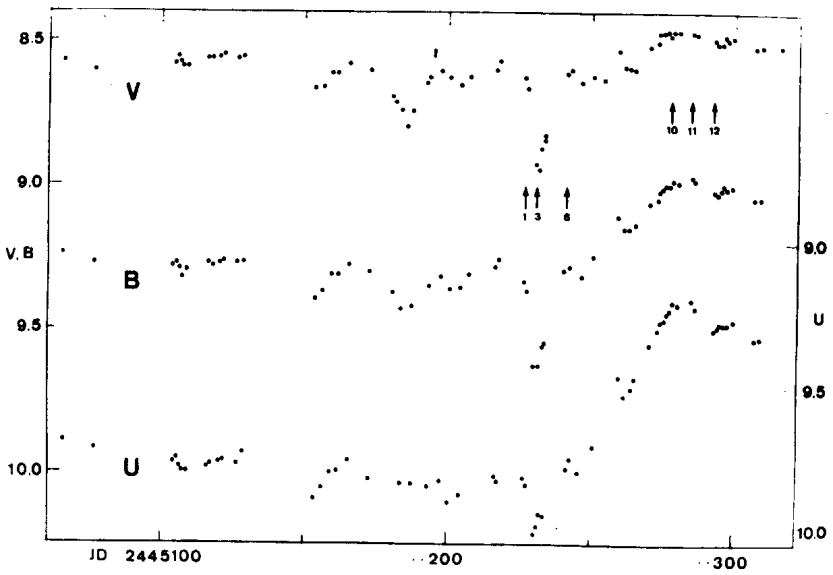

Figure 1

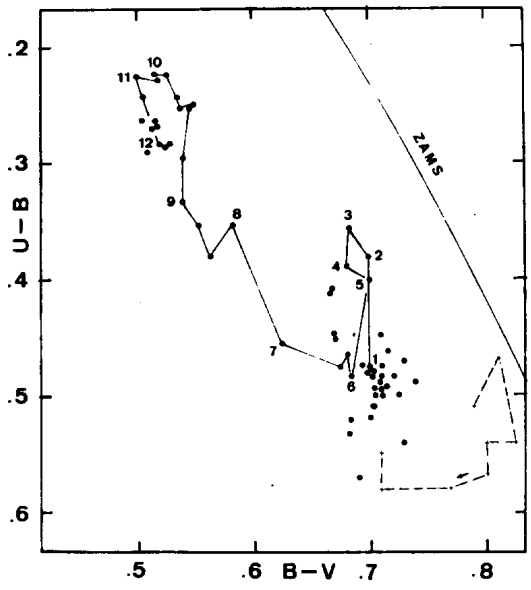

Figure 2

all three colours was almost $0^m.1$ day^{-1}. In the U band this "minimum" ($\Delta U \approx 0^m.2$) was only half as deep as in B and V. Two weeks later PU Vul in all three colours reached the original level again. The following increase was strongest in U ($\Delta U \approx 0^m.6$; gradient about $0^m.016$ day^{-1}) while in V the brightening amounted only to $0^m.15$. A new "maximum" in all three bands occured around November 6. Since then the object faded slowly with some oscillation, somewhat faster in B and V and still faster in U. Figure 2 shows the path of the variable at this long active phase in the two colour diagram. For comparison we also indicated the path of the rise of PU Vul last year according to our own observations by a dashed line. The position of PU Vul in the two colour diagram at maximum light during last year is well within the bulk for 1982. The numbers in Figure 2 refer to phases indicated in Figure 1 by arrows. The last three weeks of the slow fading are characterized

by a relatively stable position in the two colour diagram.

Chochol et al. (1981) suggested the presence of a 78 respectively 75 days period with an amplitude of some $0^m.2$ in V. Considering the observed activities we did not attempt to check this hypothesis.

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