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UBV PHOTOMETRY OF THE 1985 ECLIPSE OF 22 VULPECULAE

The newly-discovered ζ Aurigae system 22 Vul was the target of several photometric observers at its eclipse in August 1984, including the present authors (IBVS 2668, 1985) and Fernie and Lyons (IBVS 2658, 1985). The observations have been collected and analysed by Parsons, Ake, and Hopkins (preprint, 1985). They determined that the time of mid-eclipse was JD 2445942.3 ± 0.2, and this, combined with the spectroscopic period of 249.1 days found by Parsons (Ap. J. Suppl. 83, 553, 1983), permitted prediction that the next eclipse would be centred at JD 2446191.4 or 1985 May 5.9 U.T. The times of contacts were less certain, but the duration of total eclipse was predicted to be 9.8 ± 0.2 days.

We have obtained UBV observations of the May 1985 eclipse of 22 Vul, concentrating on nights near the times of contacts in order to try to locate these times more precisely. Our equipment was the same as for the UBVRI observations described previously, but R and I observations were not made since the eclipse is very shallow indeed at these wavelengths.

The observations were again made differentially with respect to HD 192712, but this time 18 Sge was observed as a check star each night. For it, our differential magnitudes and colours, in the sense 18 Sge minus HD 192712 are, with uncertainty ±0.01 in each case,

$$\Delta V = -1.05$$
$$\Delta(B-V) = 0.09$$
$$\Delta(U-B) = 0.23$$

Our new nightly mean differential magnitudes are given in Table I. Each is the average of three to seven individual observations, except for that of JD 2446187.929, when only a single observation was possible before clouds intervened.

On the first, second and last of these nights the system was outside eclipse, and the magnitude differences agree (within 3σ) with those found in 1984. However during totality (the third, fourth and fifth nights), 22 Vul was brighter than in August in all three bands although in B this difference was less than 3σ. Indeed in V the depth of the 1985 eclipse was all but undetectable. These results are summarized in Table II.

Table I. The Observations

HJD 2446000+	ΔU	ΔB	ΔV
183.979	-2.00	-1.94	-2.00
184.954	-1.98	-1.94	-2.03
187.929	-1.72:	-1.81:	-2.01:
188.946	-1.71	-1.82	-2.00
194.952	-1.67	-1.81	-2.00
196.959	-1.86	-1.90	-2.00
200.963	-1.99	-1.93	-2.00

Table II. Mean Magnitude Differences

Out of Eclipse

	1984	1985
ΔV	-2.005 ± 0.003	-2.014 ± 0.005
ΔB	-1.936 ± 0.003	-1.934 ± 0.006
ΔU	-2.011 ± 0.005	-1.992 ± 0.005

Totality

	1984	1985
ΔV	-1.953 ± 0.003	-1.997 ± 0.009
ΔB	-1.794 ± 0.005	-1.816 ± 0.008
ΔU	-1.644 ± 0.006	-1.689 ± 0.009

The observations of JD 2446196 clearly were obtained during the partial phases of egress, shortly before fourth contact. The phase of these data on the ephemeris of Parsons, Ake and Hopkins is 5.56 days, and this allows us to suggest that the partial phases in optical light do indeed last about one day, in agreement with the estimate made by those authors.

Since the apparent change in the depth of eclipse from 1984 to 1985 is based on several nights' observations and is fairly consistent in all three colours, it is difficult to ascribe it to observational error or to the effect of poor observing conditions, although the hour angle at which the new observations were made was necessarily large. The other possibility, that the G star was slightly brighter in 1985, and the B star correspondingly fainter, is not much more palatable. It is however supported by the out of eclipse observations, which indicate that the system as a whole was slightly redder in 1985, although its B magnitude was unchanged. The U-B colour index of the B star is unaltered at -0.21 ± 0.10; the eclipse depth in V is too shallow to permit its B-V to be found.

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